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Proceedings of the 23rd European Conference on Research Methodology for Business and Management Studies

Hosted by ISCAP, Porto Portugal

4-5 July 2024

Dr Ana Isabel Azevedo

Dr José Manuel Azevedo

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Proceedings of the

23rd European Conference on Research Methodology for Business and Management Studies

ECRM 2024

A Conference Hosted By

ISCAP, Porto, Portugal

4-5 July 2024

Edited by Dr Ana Isabel Azevedo

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Contents

Preface v

Committee vi

Biographies vii

Academic Papers

The Legal Research Methodology as a Method for Researching in Business Area: A Case Study Applied to Gymnasiums
Susana Aldeia, Natacha Jesus-Silva, Sergio Nanez 1-7

A Landscape of Case-Based Research: Methodological Rigor in an Emerging Economy Context
Paulo Cauchick-Miguel, Eloiza Kohlbeck, Thayla Tavares de Sousa Zomer 8-16

A Mixed-Methods Strategy for Small Samples in Ill-Structured Literature
Irene Ciccarino, Jorge da Silva 17-25

Econometric Advances in the Estimation of Housing Price Determinants
Antonio M. Cunha 26-34

Design Science for Networks Designing: A Service-Dominant Logic Approach
Agostinho da Silva, Antonio Cardoso 35-42

A Bidirectional Research Method to Design a Smart City Evaluation System
Renata Dameri, Monica Bruzzone 43-50

Rational Thinking in Complex Qualitative Business and Management Research Using Systems Methodologies.
Julian de Villez 51-62

Reimagining how the Critical Realist Ways of Methodological Triangulation Might Allow for Resolving Paradigm In/Commensurability in Research Methodologies
Valindawo Valile M Dwayi 63-70

Pragmatism as a Research Paradigm
Mohamed Elgeddawy, Mahmoud Abouraia 71-74

Natural Experiments and Causation in Strategy Research
Scott Erickson, Helen Rothberg 75-81

Advancements in Bankruptcy Prediction Models and Bibliometric Analysis
Amanda Zetzsche, Cristina Lopes, Rui Bertuzi da Silva 82-91

Applicability of Both/and Thinking in International Sustainable Business Studies
Juan Marcelo Gómez , Jane McKenzie 92-98

Experimental Designs in Management Studies for Bias Assessment: Setting and Stimulus Material
Maria João Guedes, Ricardo Rodrigues, Luís Gouveia 99-107

Effects of Action Learning Strategies and Reflection in Teaching Business Research Methods in Business and Management Education
Ketty Grishikashvili 108-114

Research Methods – is Agile different ?
Elizaveta Gromova, Eduardo Tomé 115-120

Developing Methods for Assessing the Social Impact of Scientific Study
Tadeusz A. Grzeszczyk 121-127

Researching the Topic of AI Data Analysis in Loyalty Programs
Andrii Kushnarevych 128-135

Data Scientist Knowledge and Skills Evaluation towards a Data-Driven Research Methodology
Jing Lu 136-144

The Influence of Demographic Factors on Creativity Level of Undergraduate Agricultural Students
Mbulaheni Lordwin Mavhungu 145-152

Sensory Panel Training: Developing Hospitality Students Analytical and Research Skills
Sandra Vasconcelos, Bebiana Monteiro 153-160

On the Use of Generative AI for Literature Reviews: An Exploration of Tools and Techniques
Peter Mozelius, Niklas Humble 161-168

Making Sense of Legitimacy Across Universities: Ecocritical Ontological Perspective
Pumela Msweli 169-176

Influence of Quality Education on FDI Inflows in Subs-Saharan Africa: A Theoretical and Empirical Research
Aman Nthangu, Pumela Msweli 177-184

Applying a Systematic Literature Review Process in a Grounded Theory Investigation
Sinéad O'Mahony 185-193

Teaching Research in an Employability-Focused Undergraduate Curriculum
Martin Rich 194-198

The Challenges of Health Units During Covid19: Qualitative Analysis Through the Lens of Dynamic Capacities
Jorge Simões, Rúben Loureiro , Eunice R. Lopes, Ana Pacheco 199-208

Efficiency Indicators as Management Research Tools at Scientific Institutions
Inese Spica, Kalevs Kants, Ernests Spics, Baiba Berzina 209-216

Integrating Qualitative Content and Narrative Analysis: A Five-Step Approach
Sirja Sulakatko 217-225

Methods for Learning in Tripartite Collaboration – A Study Inspired by Action Research
Ann Svensson, Madeleine Johansson 226-230

Soliloquy Methodology: a Cradle for Credible, Practice-Based Research
Jocene Vallack 231-237

PhD Papers
Using Grounded Theory to Derive Performance Improvement Model for South African Municipalities
Basia Bless 239-248

Masters Papers
Identification and Mapping of Fintech Clustering Using a Qualitative-dominant Mixed Method
Saima Karim, Isobel Cunningham, Laura Bradley McCauley 250-258

Work in Progress Papers
Unlocking the Dynamics of Social Entrepreneurship: An Investigation in Northwest Ireland Research Method Paper
Suzhou Wei, Isobel Cunningham, Laura Bradley 260-263

ECRM Preface

These proceedings represent the work of contributors to the 23rd European Conference on Research Methodology (ECRM 2024), hosted by ISCAP in Porto, Portugal on 4-5 July 2024. The Conference Co-Chairs are Dr Ana Isabel Azevedo and Dr José Manuel Azevedo, both from ISCAP Portugal.

ECRM is a well-established event on the academic research calendar and now in its 23rd year and remains an opportunity for participants to share ideas and meet. The aims and scope of this conference is to bring together researchers from a range of disciplines and sectors to share expertise and novel approaches in business and management research methods. ECRM is interested in contributions on the subject of research methods used in business and management research. The papers tend to either focus directly on creating and implementing innovative methodologies or research papers which highlight an interesting use of methodologies in their study.

The opening keynote presentation is given by Marta Agostinho, Executive Director of EU-LIFE with the title Excellent Scientific Research: What Does it Mean and Why Should we Care About it? On the second day, Professor Susanne Tietze from The University of Sheffield Hallam, UK will give a talk on the subject Cross-Language Research Methods: Translation and Linguistic Reflexivity.

With an initial submission of 90 abstracts, after the double blind, peer review process there are 30 Academic research papers, 1 PhD research paper, 1 Masters Research paper and 1 work-in-progress paper published in these Conference Proceedings. These papers represent research from India, Australia, Brazil, Canada, China, Czech Republic, Estonia, Germany, India, Ireland, Italy, Latvia, Morocco, Norway, Oman, Poland, Portugal, Slovakia, South Africa, Sweden, UK and the USA.

We hope you enjoy the conference.

Dr Ana Isabel Azevedo and Dr José Manuel Azevedo
ISCAP, Port
Portugal
July 2024

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Dr Ana Isabel Azevedo has been a director of CEOS.PP since March 2023 and a member of its Directive Board for 4 years since its foundation in 2017. She holds a PhD in Information Systems and Technologies. She is a member of the Scientific Board of the Master in E-Business, a member of the Scientific Council, and senior lecturer at ISCAP. She is editor-in-chief of IJBIR; associate editor of IJTHI, IJDSST, and EJBRM; member of the Editorial Advisory Board of IJILT; member of the Editorial Review Board of IJGUC, EJEL, and Future Internet. She serves as chair for several conferences and as guest editor for several books and special issues in journals. Regularly publishes articles in journals, conferences, and other sources. Her research interest includes Business Intelligence, Analytics, Decision Support Systems, E-Business and Digital Transformation, and Research Methodologies.

Dr José Manuel Azevedo has been a Lecturer in the Mathematics Department of ISCAP/ Polytechnic Institute of Porto (P.PORTO) since 1998. He obtained is PhD in Education (Mathematics) at the University of Beira Interior, Covilhã, Portugal. He published several articles in conferences and journals. He is a member of the program committee of some conferences in his areas of research. In addition, he also serves as a reviewer for some conferences. He supervises master students in related areas of his research interests. Researcher at CEOS.PP Research Center. His research interests are Analytics, Mathematics Education, E-Assessment, Financial Mathematics, Financial Time Series, Data Mining and E-Learning.

Keynote Speakers

Marta Agostinho is the Executive Director of EU-LIFE, an alliance of leading European research institutes in the life sciences that aims at promoting excellence in research and acting as a voice for research institutes in the European policy landscape. Her fields of action include science policy, research governance & culture, strategic science management and communication, outreach and public dialogue with science. She is also expert evaluator in EU programmes. As Executive Director of EU-LIFE, M. Agostinho oversees the implementation of the strategy of the alliance and leads the science policy area. She is currently based in Barcelona, Spain. Agostinho holds a PhD in Cell Biology (2007) and a post-graduation in Science Communication (2009). She has over 15 years' experience in knowledge mediation in international settings, after 10 years' experience of research in life sciences and 5 years as Invited lecturer in Genetic Engineering. She was Director of the Communication & Training Unit at Instituto de Medicina Molecular (IMM), Lisbon, Portugal (2008-2012), which provided a coordinated framework for Science Communication, Advanced Training and Science Funding. She also worked as PhD programme manager (2007, IMM) and Project Manager (2012-2014, NOVA Medical School (FCM/UNL), Lisbon, Portugal) responsible for the coordination of a European Joint Action in Mental Health policy with over 50 partner institutions mandated by the EU Member States Governments from 27 European Countries. She has extensive experience as trainer and teacher (graduate and post-graduate). LinkedIn:https://www.linkedin.com/in/marta-agostinho-1794a72/. Twitter: @Meagostinho

Susanne Tietze, PhD, MA, MBA, efmd diploma (teaching) is (Emerita) Professor of Multilingual Management at Sheffield Hallam University, UK. She has a long-standing interest in sense-making and discursive approaches to understand workplace settings and these frameworks have been applied to workplace flexibility, organizational change, time and space management and leadership roles. Also, she has researched multilingual

workplaces empirically, and has, more recently, addressed questions of methods and methodologies in cross-language research. She has worked and studies in many European countries including UK, Germany, Austria, Switzerland, France and Finland. She has been Principal Investigator of both ESRC (Economic and Social Research Council) and AHRC (Arts and Humanities Research Council) grants about language/translation matters; and her most recent publications reflect her interest in cross-language research and translation. She has published over 100 publications, including peer-reviewed journals such as Journal of International Business Studies, Journal of World Business, Organization Studies, Journal of Management Studies and she (with Aguzzoli and Chidlow) is currently working at a textbook contracted with Cambridge University Press about research methods for cross-language business & management studies.

Mini Track Chairs

Rui Bertuzi holds a PhD in Business Sciences. He is a Senior Lecturer at Porto Accounting and Business School of the Polytechnic Institute of Porto (ISCAP-IPP) in the scientific area of Accounting. He is a researcher at the Centre for Organisational and Social Studies of the Polytechnic Institute of Porto (CEOS.PP). He is the Vice-Director of CEOS.PP. In the research field, he has supervised and been a jury of several Master's dissertations. He has been involved in several European projects related to Business Science topics.

Isabel Cristina Lopes has a degree in Mathematics, PhD in Industrial Engineering and a post-graduation in Statistics. She has a position at ISCAP - Polytechnic of Porto, lecturing Mathematics, Statistics and Operations Research. She is vice-director of the Centre for Organisational and Social Studies of P. Porto (CEOS.PP), and collaborator of LEMA-Mathematical Engineering Lab.

Anabela Mesquita has a PhD in Technologies and Information Systems, she is a Professor at the ISCAP / IPP since 1990 where she was the Vice Dean between 2007 - 2018. Anabela is involved in many European and National research projects both as a researcher and as a coordinator. She has published numerous papers in various international journals and conference proceedings. Anabela is an Associate Editor of the Information Resources Management Journal and co-Editor-in-Chief of the International Journal of Technology and Human Interaction and Associate Editor of Helyion. Evaluator and reviewer for Erasmus+ National Agency and European Commission projects. She has been teaching research methodologies (undergraduate and master level) for the last 15 years.

Adriana José de Oliveira has a PhD in Communication Sciences. higher education teacher. She is a researcher at Centre for Organizational and Social Studies of Polytechnic of Porto – in the areas of organizational communication, social media, digital communication, and technology as the basis for the research of digital transformation and tourism. Participates in national and international projects. In addition to higher education teaching, focused on professional qualifications, non-formal qualifications and consulting activities.

The Legal Research Methodology as a Method for Researching in Business Area: A Case Study Applied to Gymnasiums

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Abstract: Purpose – The main objective of this paper is to understand how the analysis of laws and jurisprudence influences the decisions of gym managers in Portugal. Design/methodology/approach – For this purpose, the Portuguese tax law was investigated, particularly the Value Added Tax law and additional legal dispositions. It also researches the arbitral case law related to nutrition consulting in sports activity companies. Findings – The nutrition consultation is considered a medical act subject to the legal disposition of article 9º of the Value Added Tax Code, which means that when the medical service is provided by a professional, the beneficiary of the services can benefit from the VAT exemption. This disposition observes the European Union Directive 2006/112/EC of the European Council. Nevertheless, when a nutritionist provides these services through an entity that offers sports activities like gyms, some doubts are raised because it can be considered that nutritional monitoring has no therapeutic purpose. Customers could not benefit from the VAT exemption if some conditions were not observed. The arbitral tax court has been considering that it needs to keep some requirements for that exemption could be applied to the gym services. In several cases, fulfilling the conditions is complex and generates litigation between the Portuguese Tax Authority and gyms. In the personal sphere, there are two possibilities for the service's recognition i) if the service is recognized as a consultation, it could benefit as a medical expense in the personal income tax statement; ii) if it is not considered as a medical expense, each person can deduct 15% of the VAT in the same statement. Originality: This paper demonstrates the role that court rulings play in clarifying day-to-day issues for managers. It also shows that laws and court rulings are an essential source of data in management research. Research limitations/implications – This study only analyses the Portuguese case, it could be interesting to study other countries that do not apply the value-added tax law.

Keywords: Gyms, Nutrition consulting, Portugal, Tax arbitration, Tax law, Case law based research

1. Introduction

Nowadays, people pay attention to eating and sporting habits (Gieniusz-Wojczyk, Dabek, & Kulik, 2021). In consequence, nutritional and sports services gain new users every day, which is verifiable not only in the male user but also the female (de Araujo et al., 2019). Traditionally, women pay more attention to their physical and dietary health, but men have also focused their interest on this matter (Rahmawati, Willcox, van der Pligt, & Worsley, 2021; Rustad & Smith, 2013).

In this context, it is essential to understand how the Portuguese legislature has framed the nutritional services gyms provide to users of sports academies and whether this treatment generates conflict between the service providers and the tax authority. As far as it is possible, this study has yet to be carried out concerning the Portuguese case. To this end, the study applies the legal research methodology (Epstein & King, 2002), analysing data relevant to achieving the objectives. The following data were investigated: The Value Added Tax law, sentences of the Portuguese arbitration court - CAAD, and other related legal provisions. The paper aims to understand the taxation related to gyms' nutrition services to Portuguese people. In addition, to study if this topic is a source of litigation between companies and Portuguese tax authorities.

This research comprises five sections: first, the introduction, where a general framework of the topic is made, the study's objective is presented and the methodology collected for this purpose. Second, the literature chapter, where concepts related to the case are explained. Thirdly, the methods and the selection of the sample of court sentences. After that, it presents the results, namely, the legal framework of nutrition consultations and an analysis of the CAAD sentences related to the theme. Finally, the conclusions of the study.

2. Literature Review

The Order of Nutritionists argues that the VAT exemption should cover nutrition consultations provided in establishments intended for physical exercise and sport.

"The nutritionist is a health professional, regardless of where he is carrying out his professional activity," says the president, Alexandra Bento. Recalling that "the professional practice of the nutritionist in the nutrition consultation always has a therapeutic purpose, so that we do not accept different tax treatment in an activity that can only be understood, in all cases, as therapy."

The statement follows what the Order considers an "ambiguous decision" by the Supreme Administrative Court, which concludes that gyms that provide nutrition consultations to their customers can bill separately and apply the VAT exemption to them. However, only if the service has therapeutic purposes must the situation be evaluated on a case-by-case basis. However, if nutrition is an ancillary provision of gym services, it must be taxed in the same way, at a rate of 23%.

The Order of Nutritionists considers that the nutritionist's professional practice in nutrition consultation always has a therapeutic purpose, whether in the context of disease prevention and health promotion or the treatment of a disease, regardless of where it operates and its context.

There are more than 4 thousand members; at least 5% of nutritionists work in gyms, and there has been an increase in the integration of these professionals in establishments dedicated to physical exercise.

In this regard, in 2019, the Order of Nutritionists launched a Professional Guidance Standard (NOP) that regulates the activity of nutritionists in establishments dedicated to physical exercise and sports. Rules can be highlighted, such as the consultation must be carried out in an office that guarantees privacy and the obligatory availability of equipment that allows a correct nutritional assessment.

Remember that, for the Order, it is essential that nutritionists are in places where their presence impacts the health of citizens, whether in schools, primary health care, pharmacies, gyms, or other locations.

3. Methodology

Legal research is an appropriate method in the tax field, as it helps researchers gather the information and resources needed to properly understand and address legal issues (Zalcmane, Kamenecka-Usova, & Bickovskis, 2021). This can involve researching statutes, regulations, case law, and other legal sources such as treatises and legal commentary (Chacha, Ramos, & Sanchez, 2021). In addition to helping scholars understand the relevant laws and legal principles, legal research can also help them identify potential arguments and strategies for handling a case (Ismail, Mustafa, & Jalil, 2019).

The paper aims to understand the taxation related to the nutrition services gyms provide to Portuguese people. Additionally, to study if this topic is a source of litigation between gyms and tax authorities. They studied the Value-Added tax law and Portugal's arbitral court case law to achieve these goals.

The court website was accessed to collect court cases related to the topic and the judgments identified[1]. A search was made in the "theme" field using the word "nutrition," and in the kind of taxes, it was selected "IVA (Imposto Sobre o Valor Acrescentado)." This search identified 58 lawsuits related to nutrition services provided by gymnasium companies.

4. Results

4.1 Tax law Framework

Article 9 of the VAT code refers to VAT exemption on internal transactions; this means that certain professional activities are exempt from paying VAT to the State on services performed (Nabais, 2021). This exemption is independent of turnover, contrary to article 53 of the same code, which states an exemption to companies than have annual sales until 12 500€ (Catarino & Guimarães, 2021).

However, regardless of the turnover mentioned in article 53 of the VAT Code, article 9 of the VAT code lists the internal operations that are exempt from VAT (Lima, 2003), in this specific case of nutrition consultations and through article 9 n 1, which says: 1) The provision of services carried out in the exercise of the medical

[1] https://caad.org.pt/tributario/decisoes/

professions, In particular, the works of a doctor, dentist, midwife, nurse, and other paramedical professions are exempt from tax.

Given that no concept in CIVA defines paramedical activities, it is necessary to resort to Decree-Law no. of August 11 (both from the Ministry of Health) since these two diplomas contain the requirements to be observed for the exercise of the respective activities. No. 3 of article 1 of Decree-Law no. 261/93, of 24 July, determines that paramedical activities are those contained in the list attached to the diploma as mentioned above, of which it is an integral part, and comprise the use of science-based techniques for health promotion and prevention, diagnosis and treatment of disease, or rehabilitation. It is also an essential condition for the exercise of these professional health activities and a determining factor for granting the exemption provided for in paragraph 1) of article 9 of the CIVA, the verification of certain conditions, namely the ownership of a course, obtained under the terms of the article 4 of Decree-Law no. 320/99, of 11 August.

The list attached to Decree-Law No. 261/93 of July 24, provides the activity of dietetics and physiotherapy in its items 5 and 7. This legal disposition clarifies the concept of dietetics as the application of nutrition and dietetics knowledge in general health and the education of groups and individuals, whether in a situation of well-being or illness, namely in the promotion and treatment and management of food resources.

Additionally, it defines physiotherapy as an activity that focuses on the analysis and evaluation of movement and posture based on the structure and function of the body, using specific educational and therapeutic modalities, essentially based on training, manipulative therapies, and physical and natural means, to promote health and preventing illness, disability, disability, and maladjustment and treat, enabling or rehabilitating individuals with physical, mental, developmental or other disorders, including pain, to help them achieve maximum functionality and quality of life.

According to the description provided therein, this activity comprises the “Application of knowledge of nutrition and dietetics in general health and the education of groups and individuals, whether in a situation of well-being or illness, namely in the field of promotion and treatment and the management of food resources.” The activity of a nutritionist falls within the description foreseen for the exercise of the movement of "dietetics" expected in the Decrees Law above. For this reason, the AT has understood that the provision of services carried out by nutritionists may be covered by the exemption provided for in paragraph 1) of article 9 of the CIVA, provided that the conditions listed in the said diplomas are met and referred to operations covered by item 5 of the annex to Decree-Law no. 261/93.

In this assumption, the services provided by dieticians and nutritionists, whether offered directly to the user or provided to any entity with whom they contract their services, are covered by the exemption provided for in paragraph 1) of article 9 of the CIVA. This exemption refers to the objective exercise of the activities and not the legal form that characterizes it. Thus making, the action making theed are exempt even if carried out within the scope of the companies. Such an understanding stems from the interpretation of this legal provision by the Court of Justice of the European Union (CJEU), namely in the Judgment of September 10, 2002, issued in the context of case C-141/00 (Kugler case, ECR I-6833, n.º 26), which summarizes the objective character of the exemption in fulfilling two conditions: it is medical or paramedical services and that these are provided by people who have the required professional qualifications.

In this way, the provision of nutrition and physiotherapy services that may be carried out by the gym, which are billed directly to users, may benefit from the exemption provided for in paragraph 1) of article 9 of the CIVA, provided that they are ensured by professionals (dietitians, nutritionists, and physiotherapists) qualified to carry out this activity, under the terms of the applicable legislation. In this case, the invoices to be issued to users must contain a reference to the exemption above.

About the VAT rate to be applied in nutrition consultations, more is needed to indicate it separately on the invoice; they must be operations capable of disaggregating. For example, suppose the gym charges a single fee for access to the gym, giving the customer the possibility of accessing nutrition consultations. In that case, this is a one-off operation, with a VAT rate of 23 percent applicable. Suppose the acquisition of nutrition consultations can be made separately from the amount charged for access to the gym, with separate actions; these two services are provided in the invoice. In that case, the nutrition consultation may be exempt if the conditions described above are verified.

From the point of view of the customer who pays for the gym, this can, as provided for in article 78-F, n1 - Deductions due to invoice requirements: An amount corresponding to 15% of the VAT paid by any member of the household, with a global limit of €250 per household, which appears on invoices that certify the provision of

services communicated to the Tax and Customs Authority under the terms of Decree-Law No. 198/2012, of 24 August, or issued on the Finance Portal, under subparagraph a) of paragraph 1 of article 115, by issuers who are classified, by the Portuguese Classification of Economic Activities, Revision 3 (CAE – Rev. 3), approved by Decree-Law No. 381/2007, of November 14, in the following sectors of activity: f) Section P, class 85510 (Sports and recreational education) and Section R class93120 (Activities of sports clubs) and 93130 (gym activities – fitness)."

4.2 Case law tax Portuguese tax Arbitration

The Portuguese Legal regime of Arbitration in Tax Matters allows disputes related to taxes to be resolved through arbitration (Villa-Lobos & Pereira, 2015) rather than through the traditional judicial system. This can be a valuable option for businesses and individuals who want to resolve tax disputes more efficiently and cost-effectively. It's important to note that not all tax disputes are eligible for arbitration, and some arguments may need to be resolved through the judicial system (Villa-Lobos & Pereira, 2015). In this search, they were, identified 58 legal processes related to nutrition services provided in gymnasium companies in value-added tax matters. The following table shows the cases clarified by the Portuguese Tax Arbitration Regime – CAAD.

	Process	Decision date	Types of Tax	Theme
1	626/2021-T	10/24/2022	VAT	VAT - Provision of Nutrition Services - Accessory - Gym Services.
2	599/2021-T	11/7/2022	VAT	VAT - Provision of Nutrition and Fitness Services - Exemption - Article 9, al. 1) CIVA.
3	379/2021-T	2/22/2022	VAT	VAT - Gyms. Nutritional consultations. Exemption. Ancillary services. CJEU case law.
4	365/2021-T	6/27/2022	VAT	VAT - Gymnasiums; Nutrition Consultations; Exemption; Article 9 CIVA
5	320/2021-T	1/31/2022	VAT	VAT - VAT, Gymnasiums. Nutrition consultations.
6	319/2021-T	11/25/2021	VAT	VAT, gyms. Nutrition consultations. Lack of registration with the Health Regulatory Authority. Absence of proof of nutrition services.
7	256/2021-T	2/15/2022	VAT	VAT - Provision of Nutrition Services in a Gymnasium; Assessment of the legality of acts in the light of their reasoning; a posteriori reasoning.
8	66/2021-T	5/9/2022	VAT	VAT - Provision of Nutrition Services - Exemption - Art. 9, 1) CIVA
9	43/2021-T	11/5/2021	VAT	VAT, Gymnasiums. Nutrition Consultations. Lack of registration with the Health Regulatory Authority. Absence of proof of nutrition services.
10	668/2020-T	7/2/2021	VAT	VAT, Gymnasiums. Nutrition Consultations. Lack of registration with the Health Regulatory Authority. Absence of proof of nutrition services.
11	599/2020-T	9/16/2021	VAT	VAT - Gyms. Nutritional consultations. Exemption. Ancillary services. CJEU Case Law. Scope of the arbitration proceedings
12	593/2020-T	9/13/2021	VAT	VAT treatment of nutrition services provided in a gymnasium context. (In)applicability of the exemption in Article 9(1) of the VAT Code.
13	571/2020-T	9/7/2021	VAT	VAT - Gymnasiums; nutrition services/consultations; exemption. Article 9, 1) of the VAT Code.
14	563/2020-T	6/30/2021	VAT	VAT. Gymnasiums. Nutrition consultations. Taxable amount.
15	562/2020-T	11/20/2021	VAT	VAT - Gymnasiums - Nutrition services
16	551/2020-T	7/16/2021	VAT	VAT - Gymnasiums - Nutrition services - "Packages" of services
17	549/2020-T	7/20/2021	VAT	VAT - Gymnasiums - Nutrition services - "Packages" of services.
18	519/2020-T	9/16/2021	VAT	VAT. Gymnasiums. Nutritional consultations. Exemption. Ancillary services. CJEU Case Law. Scope of the arbitration proceedings
19	477/2020-T	9/21/2021	VAT	VAT - Provision of Nutrition Services - Exemption - Article 9, 1) of the CIVA

20	442/2020-T	5/31/2021	VAT	VAT - Article 9.1 of the VAT Code (exemption - Nutrition Services) IRC - Article 23 - Costs Accepted for Tax Purposes; Burden of Proof; Unnecessary Prejudicial Relief
21	426/2020-T	11/30/2021	VAT	VAT - Exemption provided for in Article 9(1) of the VAT Code. Gymnasiums - Nutrition services.
22	408/2020-T	5/21/2021	VAT	VAT. Gymnasiums. Nutritional consultations. Exemption. Ancillary services
23	404/2020-T	5/10/2021	VAT	VAT. Gymnasiums. Nutritional consultations. Exemption. Ancillary services
24	399/2020-T	5/14/2021	VAT	VAT. Gymnasiums. Nutritional consultations. Exemption. Ancillary services. Lack of good faith
25	395/2020-T	5/18/2021	VAT	VAT. Gymnasiums. Nutritional consultations. Exemption. Supplementary services
26	380/2020-T	6/18/2021	VAT	VAT - Provision of Nutrition Services - Exemption and Accessory - Article 9, 1) of the CIVA
27	372/2020-T	4/26/2021	VAT	VAT - Gymnasiums; Nutrition Consultations.
28	335/2020-T	8/31/2021	VAT	VAT - Provision of Nutrition and Insurance Services - Exemption - Art. 9, 1) and 28) of the CIVA - Judgement of the TJ C-581/19.
29	244/2020-T	7/19/2021	VAT	VAT - Supplies of nutrition and physiotherapy services; therapeutic purpose; Article 132(1)(c) of the VAT Directive: CJEU judgment of 4.3.20121, Case C-581/19.
30	236/2020-T	3/1/2021	VAT	VAT - Provision of physiotherapy and nutrition services - Exemption - Article 9(1) of the VAT Code; Reference for a preliminary ruling
31	196/2020-T	11/12/2020	VAT	VAT - Nutrition Services - Gym.
32	179/2020-T	1/29/2021	VAT	VAT-Gymnasiums; Nutritional consultations; Exemption (Article 9(1) of the VAT Code); No need for a preliminary ruling.
33	152/2020-T	6/18/2021	VAT	VAT - Gymnasiums; Nutrition Consultations.
34	137/2020-T	6/6/2021	VAT	VAT - Provision of Nutrition Services - Exemption - Article 9, no. 1) of the CIVA. Dismissal of the application for an order for costs in part
35	116/2020-T	5/19/2021	VAT	VAT - Gymnasiums; nutrition services; exemption. Article 9, 1), of the CIVA.
36	87/2020-T	11/20/2020	VAT	VAT - Gymnasiums; Nutrition consultations; Exemption; Life insurance.
37	870/2019-T	6/5/2021	VAT	VAT - Gymnasiums - Nutrition Consultations
38	807/2019-T	5/29/2021	VAT	VAT - Gymnasiums - Nutrition Consultations
39	760/2019-T	8/31/2020	VAT	VAT - Provision of nutrition services - Exemption - Art. 9, 1) of the CIVA. Prejudicial remittance; Compensation for undue guarantee;
40	740/2019-T	9/5/2020	VAT	VAT - Gymnasiums; nutrition consultations; exemption of art. 9, 1) of the VAT Code; critical information.
41	727/2019-T	7/16/2020	VAT	VAT - Gymnasiums, Nutrition Consultations; Exemption.
42	695/2019-T	11/29/2020	VAT	VAT - Provision of Nutrition Services - Exemption - Article 9, no. 1) of the CIVA.
43	693/2019-T	7/28/2021	VAT	VAT - Right to deduct; Gymnasiums; Nutrition Consultations
44	544/2019-T	4/23/2020	VAT	VAT - Provision of nutrition services - Exemption - Art. 9, 1) of the CIVA. Prejudicial remittance; Compensation for undue guarantee.
45	356/2019-T	5/22/2021	VAT	VAT - Provision of nutrition services - exemption. Reference for a preliminary ruling. Lack of jurisdiction of the Court to examine applications for annulment or termination of tax enforcement proceedings and administrative offense proceedings

46	264/2019-T	5/29/2020	VAT	VAT - Services Rendered; Nutrition in Gymnasiums; Exemption of Article 9, 1) of the VAT Code; Strict interpretation; Unique economic operation composed of several elements.
47	181/2019-T	11/27/2019	VAT	VAT - Gymnasiums; Nutrition Consultations; Exemption; No need for a preliminary reference; Deduction; Article 19(3) of the CIVA. Appeal for revision of arbitral award. International appeal instance. Arbitral Award (annexed to the Decision).
48	174/2019-T	1/21/2020	VAT	VAT - Partial Material Lack of Jurisdiction - Fines; Provision of Nutrition Services; Exemption; Art. 9, 1) of the CIVA; Nonancillary nature of the transactions - Distinct taxable persons; fitness and nutrition package - gyms/health clubs; No need for a Reference for a Preliminary Ruling.
49	170/2019-T	3/5/2020	VAT	VAT - Provision of Nutrition Services - Exemption - Art. 9, 1) of the VAT Code.
50	169/2019-T	11/6/2019	VAT	VAT - Gymnasiums; Nutritional Consultations; Exemption; Exemption from Reference for a Preliminary Ruling.
51	164/2019-T	11/4/2019	VAT	VAT - Gymnasiums; Nutrition consultations; Exemption; No need for a preliminary ruling
52	163/2019-T	1/10/2020	VAT	VAT - Gymnasiums - Nutrition services - "Package" of services.
53	162/2019-T	12/23/2019	VAT	VAT - Provision of Nutrition Services - Exemption - Article 9, paragraph 1 of the VAT Code;
54	161/2019-T	10/31/2019	VAT	VAT - Provision of Nutrition Services - Exemption - Article 9, 1) of the CIVA.
55	159/2019-T	11/5/2019	VAT	VAT - Gymnasiums; Nutrition consultations; Exemption; No need for a preliminary ruling
56	570/2018-T	9/30/2019	VAT	VAT - Provision of Nutrition Services - Exemption - Article 9, 1) of the CIVA.
57	504/2018-T	7/22/2019	VAT	VAT - Gymnasiums; nutrition services; Reference for a preliminary ruling (annexed to the Decision - Decision for a preliminary order (annexed to the Decision).
58	454/2017-T	4/2/2018	VAT	VAT - Gymnasiums - Nutrition services - "Packages" of services.

The table analysis allows us to identify the value-added tax as the tax matter that promotes litigation between companies and the tax authority. This problem has generated fiscal conflict between the period 2017 to 2021, with the particular incidence in the years 2019 and 2020.

The exemption provided for in article 9(1) of the VAT law and its application is the main reason that leads gyms to request clarification from the arbitral body. In particular, the companies have doubts about the application of the in cases such as (1) the lack of registration with the health regulator, (2) the lack of proof of nutrition services, (3) the applicability and inapplicability of the exemption, (4) the VAT taxable base, (5) nutrition services in the context of "packages of services," (6) the fiscally accepted costs in the context of the provision of these services, (7) the related insurance, (8) the therapeutic purpose of nutrition services.

Among the cases identified are cases extending the request for clarification not only to nutrition services but also to physiotherapy services and their relevance in the health of gym users. Additionally, in 18 of the 58 awards, an appeal for review of the arbitral award was requested at the international level, meaning that interveners are not satisfied with the meaning of the decision.

One case, Case 264/2019-T of 29 May 2020, appealed the decision of the arbitral tribunal to the Supreme Administrative Court (STA), and the STA confirmed the meaning of the previous decision allowing for uniformity of jurisprudence.

The analysis of the case law allows understanding that when a nutritionist provides these services through an entity offering sports activities such as gyms, some doubts arise because the nutritional accompaniment may be considered as not having any therapeutic purpose. Clients could only benefit from the VAT exemption if certain conditions were observed. The arbitral tribunal has held that it is necessary to maintain specific requirements for this exemption to apply to gymnastics services. In several cases, the fulfilment of the conditions is complex and generates disputes between the Portuguese Tax Authority and the gyms.

5. Conclusions

The main objective of this article is to understand the legal framework of nutrition consultations provided by gyms and to know whether this issue leads companies to make legal claims to the arbitral tribunal. The results show that nutrition consultations benefit from an exemption in article 9 of the VAT law when provided in medical offices.

However, this understanding has yet to be directly recognized in the case of nutrition consultations provided within sports academies. More consultations are needed in gyms; specific requirements must be met for the service to benefit from an exemption. Additionally, the legal framework of these services has generated several application doubts, which led sports companies to claim in court for a clarification of the application of the law to the sector.

Despite the contribution to the literature, this research only studies the Portuguese case, which is a limitation. It would be interesting to replicate the study in other jurisdictions that have available the resolution of tax disputes through arbitration.

This academic paper highlights the significance of court rulings in providing much-needed clarity on various day-to-day challenges faced by managers. Moreover, it sheds light on the crucial role that laws and court rulings play as a vital source of valuable data in management research, enabling managers to make informed decisions based on legal precedents and best practices.

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A Landscape of Case-Based Research: Methodological Rigor in an Emerging Economy Context

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Abstract: In the evolving field of Production Engineering, the robustness of case-based research plays a crucial role in theory development and practical application. Recognizing this criticality, this paper delves into a systematic examination of methodological rigor in Production Engineering case research, scrutinizing a significant corpus of research to discern patterns and practices in methodological execution. This work seeks to shed light on the prevailing trends and identify potential avenues for strengthening the methodological foundations of case study research within the Production Engineering domain. The search was based on case studies from select publications in the Scielo database, a relevant Brazilian source that make available journal articles published in journals in various areas of knowledge. The analysis delineates a framework of four quality criteria – construct validity, internal and external validity, and reliability – to augment methodological rigour. The findings reveal a critical need for a more explicit engagement with these criteria in research design, data collection, and analysis. The research highlights strategies to fortify rigour and, by extension, the quality of case-based research, paving the way for more robust theoretical contributions in Production Engineering. This work in progress not only considers the recent landscape of case-based research but also provides actionable insights to refine future research methodologies, ultimately fostering a paradigm of excellence in qualitative research. The enhancement of methodological rigour in Production Engineering case-based research within the scientific community in a developing country is of paramount importance. As scholars strive to amplify their voices in the international arena, the meticulous application of robust research methodologies becomes critical. It serves not only to fortify the validity and reliability of findings but also to ensure the reproducibility of research. Enhancing methodological rigour aids in building a legacy of credibility and trust in the Brazilian scholarship that can contribute significantly to both regional and global advancements in Production Engineering.

Keywords: Case study, Research quality, Methodological rigour, Methodology, Production engineering, Validity

1. Introduction

In the realms of Production Engineering and Operations Management, the case study methodology is prevalent, and lauded for its effectiveness in theory generation and deepening understanding (Cauchick-Miguel, 2007; Voss, Tsikriktsis, and Frohlich, 2002; Zomer et al., 2022). Despite its growing popularity, the method's rigorous application remains contentious (Abreu et al., 2022), as there are studies that do not present a sampling logic, or do not describe the data analysis for extracting the results (Barratt, Choi and Li, 2011). Case studies, typically employed in the nascent phases of theory development, can have enduring impacts if methodological issues aren't addressed early on, as they set the stage for further exploration and validation of relationships between variables (Eisenhardt and Graebner, 2007). Thus, this method has merits over quantitative methods, as it provides important information for assessing the empirical generalizability of results (Tsang, 2014), making inductive case research consistent with the emphasis of theory (Eisenhardt and Graebner, 2007). Consequently, there is an ongoing discourse urging the enhancement of qualitative research rigor (Grodal, Anteby, and Holm, 2021; Harley and Cornelissen, 2022).

Past scholarship has often debated the optimal development of case studies, especially within Operations Management (Cauchick-Miguel, 2007; Cauchick-Miguel et al., 2023a; Voss et al., 2002), but clarity on how methodological rigour is consistently integrated into such studies is lacking. Moreover, the scrutiny of case study quality, particularly in the context of emerging economies, is notably absent, leaving a gap in the literature regarding the challenges faced in these environments (Goffin et al., 2019; Abreu et al., 2022).

One of the concerns of Production Engineering and Operations Management is the methodological approaches used in the development of scientific research, of which the case study is one of the most widely adopted (Cauchick-Miguel, 2007). Case studies have been one of the most powerful research methods in Operations Management, especially for developing new theories (Voss, Tsikriktsis and Frohlich, 2002; Zomer *et al.*, 2022), stimulating understanding, and deepening theory (Cauchick-Miguel, 2007). However, although the

use of this method has been growing, there are limitations to its applicability due to issues related to methodological rigour (Goffin et al., 2019).

While flaws in any research methodology are problematic, the lack of rigour in case studies is particularly elusive (Gibbert, Ruigrok and Wicki, 2008). Case studies are usually used in the early stages of theory development when key variables and relationships are being explored. A problematic approach in these early stages would imply cascading effects in later stages when relationships between variables are elaborated and tested (Eisenhardt and Graebner, 2007). Thus, there have been calls to increase the rigour of qualitative research (Grodal, Anteby and Holm, 2021). Previous studies have focused on discussing how case studies should be developed (e.g. Cauchick-Miguel, 2007; Cauchick-Miguel et al., 2023a; Voss et al., 2002), with a special focus on Operations Management (e.g. Cauchick-Miguel et al., 2023a; Craighead & Meredith, 2008). However, it is still unclear how methodological rigour is being addressed in these articles, as well as what systematic trends may interfere with the rigour and quality of the case studies (Abreu *et al.*, 2022). In addition, no articles were identified that analyze the quality of case studies in emerging economies, highlighting their challenges. As such, this research method has been questioned more than other methods commonly used in Production Engineering and Operations Management, especially since case studies are more prone to questions regarding methodological rigour (Stuart *et al.*, 2002).

Given the above, this research aims to analyze the quality and methodological rigour of case studies in the field of Production Engineering, considering the context of an emerging economy. To this end, a literature review was conducted using a Brazilian database (Scielo). In this way, an overview is provided of the quality and methodological rigour being addressed in Production Engineering, setting a precedent for future research efforts in a relevant region of Latin America. This paper is structured as follows: section 2 briefly describes the adopted research methods to achieve the results presented in section 3 and discussed in section 4. Finally, section 5 draws some concluding remarks on this work in progress.

2. Research Methods

This research includes an analysis of case study papers published in the past two years in Brazil in the field of Production Engineering. Figure 1 illustrates the stages for conducting the literature review.

Figure 1 illustrates the selection process used to identify relevant articles from Scielo, an electronic repository of Brazilian scientific journals (Scielo, 1998). The initial criterion for selection was the presence of any of these keywords in the abstract: "case study," "case-based research," or "estudo de caso" (the latter in Portuguese). This preliminary search yielded a total of 5642 publications. The focus was on analyzing case studies within the field of Production Engineering, which led to a refined search within the database categories of Engineering and Social Sciences. The inclusion of Social Sciences was justified by the existence of management-related journals that intersect with Production Engineering, such as *RAUSP Management Journal*, and *Revista de Administração de Empresas*. Further narrowing the scope to publications from the last two years (2022 and 2023) and those issued in Brazil resulted in a more targeted set of 283 articles.

Finally, articles published only in journals related to Production Engineering were selected, such as *Production*, *Gestão & Produção*, among others (a full list of selected journals is shown in Figure 1). Fifty-four articles were filtered out at this stage. One article (Cauchick-Miguel, Sousa-Zomer and Tortorella, 2023) was excluded, as the authors conduct a literature review to analyze the quality of case studies, considering the area of operations management. Thus, this research selected 53 articles to be analyzed.

2.1 Publications Analysis

The articles were then coded, and it was analysed how case studies are being applied in Production Engineering. To analyse methodological rigour, the stages of planning and conducting case study research were considered, as illustrated in Figure 2. This work focused on the data analysis stage. In addition, the quality of the case studies was also analysed, considering the criteria proposed by Zomer et al. (2022), as in Table 1.

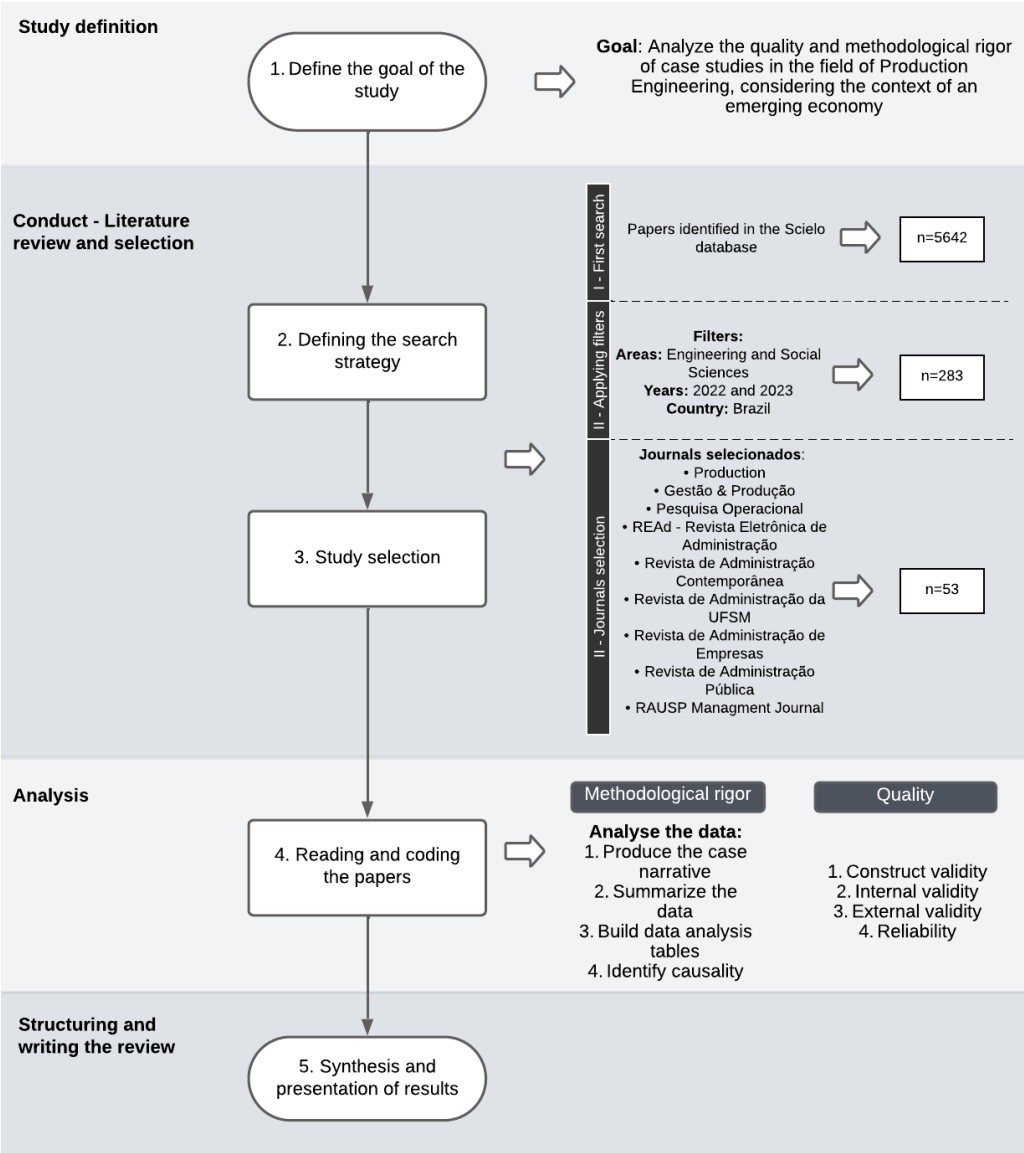

Figure 1: Literature review stages (adapted from Snyder, 2019)

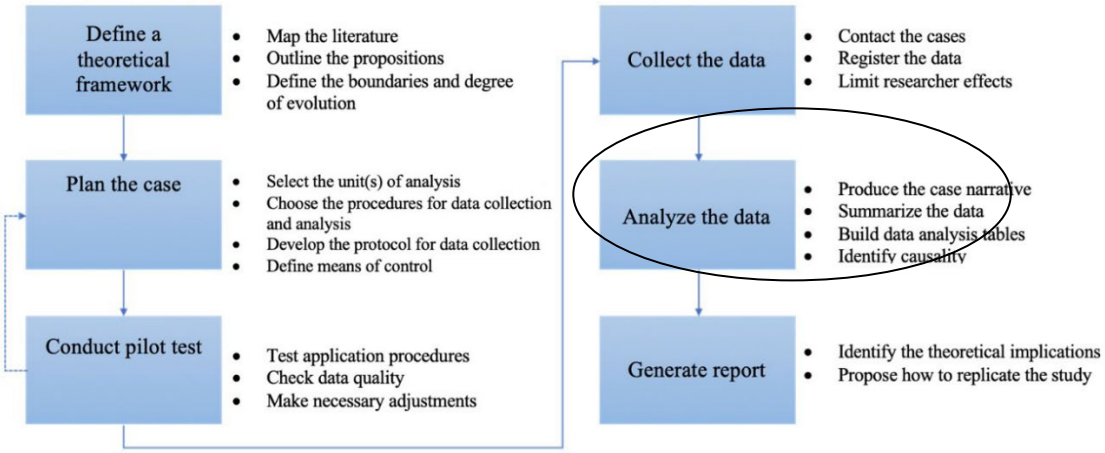

Figure 2: Stages for case-based research (Cauchick-Miguel, 2007; Cauchick-Miguel et al., 2023b)

Table 1: Quality criteria - case study (Zomer et al., 2022)

Quality criteria	Description	Analyzed points
Construct validity	It refers to the quality of the conceptualization or operationalization of a concept. Analyzes whether the study investigates what it claims to investigate	Clear chain of evidence - Does the article provide clear evidence that makes it possible to reconstruct how the researcher went from the initial research questions to the conclusions? Data triangulation - Does the paper take different angles to analyze the same phenomenon, use different data collection strategies and sources?
Internal validity	It refers to the causal relationships between variables and results. It analyzes whether the researcher provides a plausible causal argument and logical reasoning that is strong and convincing enough to defend the conclusions of the research	Research structure - Does the paper formulate a clear research structure that demonstrates that variable x leads to outcome y, and that y was not caused by a third variable? Pattern matching - Does the paper compare empirically observed patterns with predicted patterns or patterns established in previous studies and in different contexts? Theoretical triangulation - Does the paper address theoretical triangulation and verify the results by adopting multiple perspectives?
External validity	It is based on the fact that it must be demonstrated that theories serve to explain phenomena not only in the context in which they are studied, but also in other contexts	Cross-case analysis - Does the paper adopt multiple case studies (case studies from different organizations) or different case studies within one organization? Rationale for case study selection - Does the paper explain why the specific case study is appropriate based on the research question? Context of the case study - Does the article provide details about the context of the case study?
Reliability	It refers to the absence of random error, allowing other researchers to arrive at the same insights by following the methodological procedure adopted	Case study protocol - Does the article report on a research protocol? Case study database - Does the article provide evidence of a case study database with available documents, transcripts, archive data, etc.?

Finally, the results are presented next.

3. Findings

The results are firstly presented about the verification of the data analysis phase of the selected publications. Secondly, it is followed by the analysis of the quality of the papers and then discussion.

3.1 Verification of Data Analysis Phase

The data analysis stage includes four main steps: producing a narrative, reducing the data, building a panel, and identifying causality. As for producing the narrative and reducing the data, most of the papers analyzed carried out these steps. However, in articles where interviews are carried out, many papers comment that transcripts have been made, but these are not presented as a source of evidence (for example, in the Appendix section). In the case of coding interview data, some authors comment on this in the methods section, for instance by using Bardin (1977) - but coding is not presented in the results section. The data reduction stage must take place, but the data must be synthesized without failing to present the results and evidence of everything described in the methods section.

As for multiple case analysis, this is limited in the sample (13%). In addition, the articles that do carry it out fail to build a panel for each case, to cross-analyze the cases identified, analyzing convergence and divergence between the sources of evidence. The lack of this cross-checking affects the chain of evidence, limits generalization, generates a risk of confirmation bias, and makes conclusions fragile.

Finally, about causality, few articles present the results compared to the theory. This raises the need to answer the question: can the theory explain the phenomenon analyzed in different contexts? (Cauchick-Miguel, 2007).

This and the other limitations presented can significantly affect the quality of the papers. This gave rise to the need to analyze the quality of case studies in greater depth, which is presented in the following section.

3.2 Quality of the case studies

3.2.1 Construct validity

Figure 3 shows the analysis of the construct validity of the sample of papers analyzed.

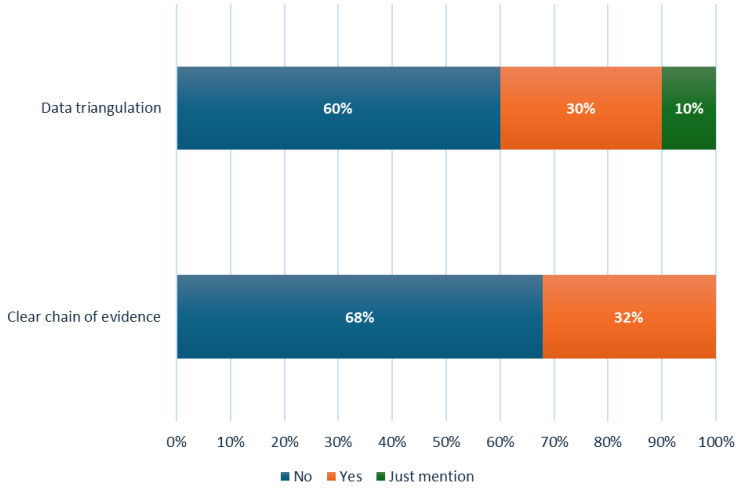

Figure 3: Construct validity

Triangulation is recommended as a good practice when conducting case studies and offers validity through the convergence of results, sources, or methods (Farquhar, Michels and Robson, 2020). However, a number of articles mention multiple sources of evidence and their triangulation, but do not describe how the sources were triangulated and what their purpose was. Furthermore, the lack of triangulation can lead to a distorted or limited understanding of the phenomenon studied, leaving gaps in the analysis and interpretation of the results. Some papers only carry out interviews (or comment on triangulation in the methods section, thus only discuss interview data in the results), which undermines the credibility of the information, as there is no proof of the veracity of the information reported by the interviewees.

Regarding clarity in the chain of evidence, it was observed that several publications do not provide details about the study protocol. In addition, 28% of the articles analyzed do not have a methods section, and the case study is only described in the results section. This information presentation results in a lack of context about how the data was obtained, a lack of transparency in the methods, and difficulty in replicating the research.

3.2.2 Internal validity

Figure 4 shows the analysis of the internal validity of the sample of papers analyzed. The figure shows that there is weak theoretical triangulation. This implies a possible difficulty in identifying biases or biased interpretations, weakening the robustness and reliability of the analysis. In addition, it can result in a limited understanding of the phenomenon studied, since by approaching the problem from only one theoretical perspective, there is a risk of missing important details and other interpretations of the results. The publications analyzed usually only discuss the main findings, and the evidence and theories that support these results are rarely presented.

As for pattern matching, the papers do not usually present empirical confirmation of the phenomenon analyzed, which may suggest that the patterns identified are not generalizable or consistent for different contexts. As for the research structure, the articles analyzed did not clearly explain how the research was conducted, which can lead to difficulties in interpreting and replicating the study.

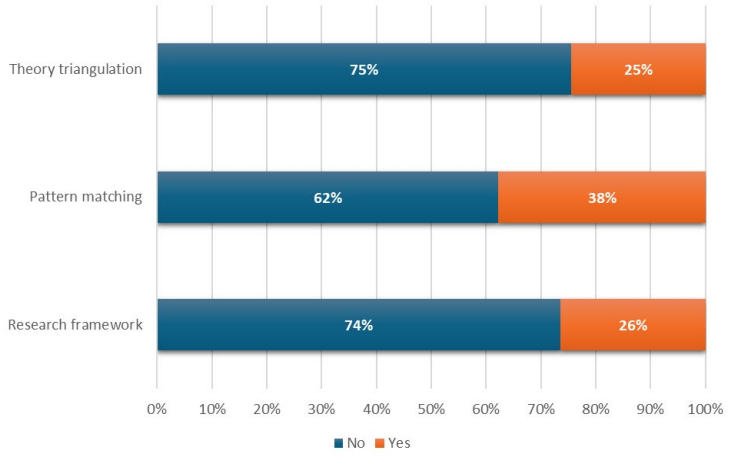

Figure 4: Internal validity

3.2.3 External validity

Figure 5 shows the analysis of the external validity of the sample of papers analyzed.

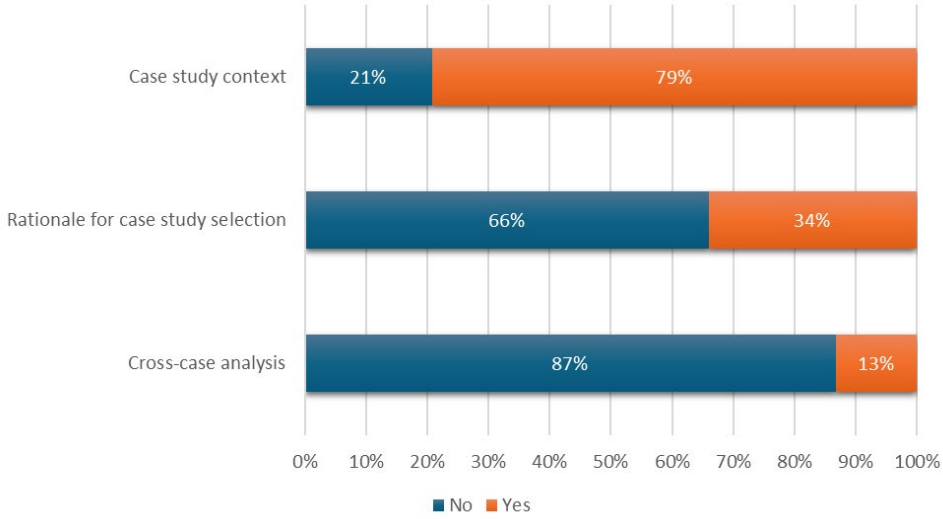

Figure 5: External validity

Most of the papers analyzed present the context to be analyzed, but don't explain why the case was selected. There are papers in which the study was conducted for the convenience of the researchers due to their links with the case being analyzed, because they work at the selected institution, which demonstrates a lack of methodological rigour. This lack of justification for the selection of cases can lead to selection bias, and the cases selected may not be representative of the phenomenon analyzed, compromising the external validity of the study's results.

In addition, only a small number of studies (13%) carry out cross-case analysis, i.e. analyzing multiple cases. Single case studies can provide important insights into a specific phenomenon but limit the applicability and relevance of the study's findings since comparing multiple cases allows trends, patterns, and variations in the phenomenon studied to be identified.

3.2.4 Reliability

Figure 6 shows the analysis of the reliability of the sample of papers analyzed.

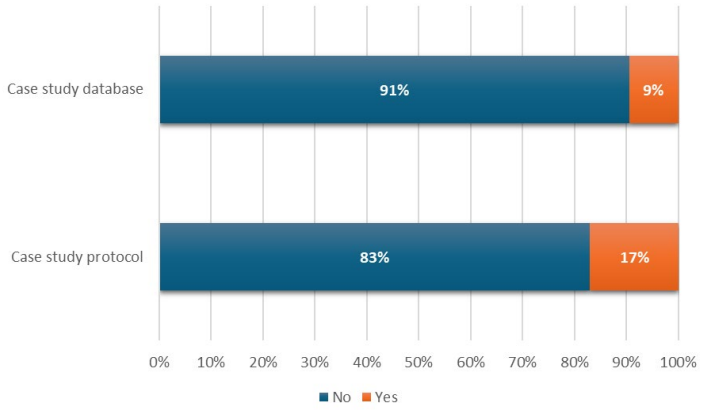

Figure 6: Reliability analysis

The Figure 6 reveals that most papers do not provide evidence of a case study database with available documents, transcripts, archive data, etc. To increase the credibility of the information presented, this data could be presented in the appendix section, which is done by few papers in the sample analyzed. This lack of evidence raises concerns about the integrity of the data used in the research, since there is no evidence to confirm the existence and quality of the database. In addition, most of the peers do not present a protocol for data collection, which may result in reviewers and readers having difficulty determining whether the methods used were rigorous and appropriate.

3.3 Discussion

The results revealed some difficulties in the development of case studies, which can compromise the quality of the research carried out. These include: (i) lack of data triangulation; (ii) lack of clarity regarding the methodological procedures; (iii) few papers used multiple sources of evidence, and many of those that did, focused on single case; and (iv) lack of interrelationship between the case and the literature. The fact that Brazil is an emerging economy can contribute to this context since domestic journals - although some of the then in the Scielo database are indexed at Scopus - tend to have lower visibility and influence. Thus, researchers may prefer to publish their outlets in case studies in international journals, which can be a source of failure, since the rigour must be higher in overseas journals. These difficulties can result in lower quality publications nationally and the need for improvement to have publications abroad. In this context, Table 2 offers recommendations for conducting case-based research to enhance the quality of Brazilian publications.

Table 2: Recommendations for improving the quality of case-based research

Quality criteria		Recommendations
Construct validity	Clear chain of evidence	Describe in detail the methods used to collect data, including theoretical and empirical data sources, the collection instruments used, sampling procedures, and inclusion/exclusion criteria
		Critically analyze the results about the theoretical and practical context of the study
		Consider obtaining feedback from co-authors or external experts to ensure that the study narrative is understandable and convincing
	Data triangulation	Use a variety of approaches, such as interviews, documentary analysis, observations, literature review, questionnaires, among others
		Compare data from different periods and contexts, since phenomena can evolve or change over time or in different regions
		Check the consistency of the data, looking for convergences or divergences in the data

to be continued

Table 2: Recommendations for improving the quality of case-based research - continued.

Quality criteria		Recommendations
Internal validity	Research structure	Evidence of the protocol for data collection and analysis, to provide a clear chain of evidence
	Pattern matching	Review the literature to identify patterns and trends from previous studies related to your research topic
		Collect comparative data from other relevant research, contexts, or periods
		Interpret the results of the case study in the light of relevant theory and patterns identified in the literature
	Theoretical triangulation	Compare the data collected with theories or models presented in the literature, analyzing them under different theoretical lenses
External validity	Cross-case analysis	Include multiple cases to allow comparison and cross-analysis of data and identification of patterns, trends, and variations
		Compare cases over time to analyze how the phenomenon evolves over time
	Justification for selecting case studies	Provide a clear and relevant justification for the selection of cases and analysis methods, using robust criteria to justify their choice
	Context of the case study	Describe in detail the context of the case study, such as information about the environment, the participants, the culture, and the organizational context
Reliability	Case study protocol	Develop a case study protocol, describing the research objectives, data collection and analysis methods, case selection criteria, among others
		Present the case study protocol in an Appendix or a supplementary document to the paper
	Case study database	Describe the documents and the data set in detail. This data can be made available in the paper's Appendix

4. Conclusions

The results of this work present the limitations in case-based research adopted in Brazilian publications, which put the quality of the work at risk. By providing researchers with opportunities to increase the rigour of case-based research, this work contributes to the development of achieving greater practical relevance. In this way, this research complements previous ones by providing guidelines for increasing the methodological rigour of Production Engineering, in the light of an emerging economy, which presents specific challenges. However, this research has limitations, including the examination of only one Latin American context and the timeframe of the search. Thus, future studies could focus on extending this research to mitigate the barriers and difficulties faced in the country.

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A Mixed-Methods Strategy for Small Samples in Ill-Structured Literature

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Abstract: This paper contributes to general research by providing a tested protocol to extract structured information with analytical and statistical significance from an exploratory context, despite small samples. Exploring new trends in business and management can be challenging. Sometimes the singularity of the phenomenon observed, or its novelty, offers small samples. The research protocol was developed to study social business models, providing understanding of differences between profiles of a taxonomy. Results were consistent when applied to other samples. The research protocol relies on a mixed method based on pattern identification through qualitative and quantitative analysis. Detailed methodological decisions and procedures offer a guide for dealing with ill-structured literature lacking consensus and empirical studies, addressing emergent phenomena. The theoretical background is developed in two parts: first, by contextualizing the literature where the mixed-method protocol was developed, and second, by referencing various business and management studies that informed the protocol. The research evaluated significant differences in social business models dimensions and profiles, aiming to classify them and understand how these differences influence social value creation. In the absence of theoretical definitions, social investment and award criteria were researched. The research context, including its strengths and constraints, is explained to assist researchers facing similar challenges. Online data and interviews underwent content and pattern-matching analysis to fill a model selected from the literature. This exploratory research helped overcome theoretical limitations and incorporated diverse perspectives needed to understand social entrepreneurship. The mixed-method strategy identified profiles and classified business models, proposing a taxonomy. The resulting taxonomy is supported by the literature and consistent with the contexts where it has emerged. All procedures are described with examples from the research project to enhance understanding and usage. This comprehensive approach allows researchers to navigate the complexities of social entrepreneurial literature, contributing to a more nuanced understanding of the field.

Keywords: Mixed-method Research, Small Sample, Social Entrepreneurship, Research Strategy, Mixed-method Protocol

1. Introduction

Exploring new trends in business and management can be challenging. Sometimes the singularity of the phenomenon observed, or its novelty, offers small samples. Small sample sizes are common in exploratory research, where the goal is to identify potential relationships and patterns rather than confirm hypotheses with large datasets. It can happen due to the nature of the study or the specific population being studied. For instance, if the phenomena are recent, there will be no historical data for comparison, and the population will be small (Hair et al., 2017). Moreover, surveys aimed at large samples are time-consuming and can be expensive. Due to these constraints and limited access to organizations, students often rely on small samples (Ball, 2019; Remenyi et al., 1998).

A small dataset contains a limited number of cases, typically with high-dimensional features. It means that each case highlights a few patterns, and the recurring patterns have many characteristics or descriptors mixed inside them. Therefore, the number of latent patterns is much larger than the number of cases in the samples, leading to weak statistical models. Additionally, outliers, or unusual data points, can severely affect the model's performance by distorting the learned distribution. To solve this problem, it is paramount to establish an effective feature selection to reduce the redundancy in the high-dimensional feature space, ensuring that only the most relevant features are considered (Zhou et al., 2022).

There is no silver bullet in the literature to guide how to develop more robust classifiers that can handle the variability and noise in small datasets, ensuring reliable predictions even with limited data (Ball, 2019; Zhou et al., 2022). And it is not claimed that the protocol presented in this study is applicable in any context. However, by explaining and detailing the steps necessary to approach the literature in a pre-paradigmatic state and presenting the results obtained with the protocol, we hope to offer a replicable structure that helps to deal with this challenge.

In line with the issues addressed in exploratory studies (Hair et al., 2017), building taxonomies offers a viable approach for managing the multitude of predictors and dimensions involved (Carneiro et al., 1991; Ciccarino

et al., 2022a; Peixoto et al., 2022). This method can reduce the extensive array of potential combinations to a more manageable set (Humbrick, 1980) effectively representing the simultaneous and conjoint interactions that occur (Venkatraman & Prescott, 1990).

This paper is drawn from social entrepreneurial literature. Social entrepreneurship (SE) is of paramount importance due to its unique focus on addressing social, environmental, and economic challenges through innovative and sustainable business models (Ciccarino, 2023; Sampaio & Sebastião, 2024). These ventures integrate the pursuit of social impact supported by financial viability. This dual objective is crucial for tackling complex global issues such as poverty, inequality, and environmental degradation, which often cannot be effectively addressed by either the public sector or traditional business practices alone (Kamaludin et al., 2024; Stephan et al., 2015).

By leveraging entrepreneurial principles and market-based strategies, social entrepreneurs create scalable solutions that empower communities, promote social inclusion, and drive systemic change. Furthermore, SE fosters a culture of innovation and resilience, encouraging the development of new approaches to persistent problems (Kamaludin et al., 2024; Seelos & Mair, 2005; Tate & Bals, 2018). The study of SE enriches our understanding of how business can be a force for good, offering insights into the mechanisms through which entrepreneurial activities can generate social value. It challenges traditional paradigms. This, in turn, informs policymaking, supports the development of supportive ecosystems, and inspires future generations of entrepreneurs (Hossain et al., 2017; Kamaludin et al., 2024).

Additionally, when social sciences fail to challenge their paradigms, there is a serious risk of losing critical insight, leading to a crisis in the validity of their constructs (Churchill Jr, 1979; Miller, 2011). SE offers a unique opportunity for the recombination of meanings and multidisciplinary synthesis, primarily by expanding the boundaries between the public and private sectors and creating synergies that surpass the capabilities of non-profit organizations (Es-seqally & El Adnani, 2024; Tate & Bals, 2018; van der Have & Rubalcaba, 2016). The choice of SE literature to develop a mixed-method research protocol is particularly justified given the complex and emergent nature of this field, which often involves small sample sizes and ill-structured phenomena (Es-seqally & El Adnani, 2024; Kamaludin et al., 2024).

2. Theoretical Background

Social entrepreneurship (SE) represents a distinct domain within entrepreneurship literature (Dacin et al., 2010), aimed at understanding new business models that efficiently address fundamental human needs unmet by conventional structures (Seelos & Mair, 2005; Stephan et al., 2015). The primary distinction between conventional and SE lies in the prioritization of social objectives in decision-making and strategic formulation (Austin et al., 2006; Dees, 1998).

From an evolutionary perspective, current SE literature has developed from two main strands(Defourny & Nyssens, 2010). Both strands emerged in the 1980s and matured between 2001 and 2010 (Hossain et al., 2017). The first strand involves non-profit organizations adapting more efficient methods to better fulfill their missions, driven by the adoption of sophisticated management practices by governments, which subsequently demanded similar efficiency from supported organizations (Dees, 1998). This shift was also motivated by the need for financial alternatives in response to reduced social investments due to political decisions or crises (Harvie & Ogman, 2019; Ramos & Martín, 2001). Consequently, social organizations have been pressured to develop financial autonomy from traditional revenue sources like donations and public funds, necessitating sustainable integration of social and economic outcomes (Kamaludin et al., 2024; Zahra et al., 2009).

This challenging socioeconomic context also incentivized entrepreneurs focused on social impact to explore economically viable opportunities arising from social problems (Austin et al., 2006; Peredo & McLean, 2006; Sampaio & Sebastião, 2024). However, many such entrepreneurs discovered their identity after receiving some prize. They did the job without a concept to guide them (Ciccarino, 2020; Seelos & Mair, 2005).

Despite being a popular and rapidly growing research field (Es-seqally & El Adnani, 2024), the literature on SE still lacks a universally agreed-upon definition (Kamaludin et al., 2024; Lee et al., 2014). This ambiguity can be attributed to its two-strand evolution (Defourny & Nyssens, 2010) or to this literature's unique feature of connecting different approaches and disciplines, promoting academic diversity (van der Have & Rubalcaba, 2016).

What we can conclude is that SE literature is still in a pre-paradigmatic state, offering little guidance to organize and accumulate knowledge in its fragmented concepts (Hossain et al., 2017; Kamaludin et al., 2024;

Lee et al., 2014). The major theoretical limitation of this state is the widely dispersed knowledge that requires synthesis and consolidation to balance multidimensionality and achieve progress (Macke et al., 2018). The problem is that merely having and prioritizing social goals is insufficient to define what constitutes a social entrepreneurship initiative (SEI), even though these are common and generally accepted characteristics (Austin et al., 2006; Peredo & McLean, 2006). Scholars frequently highlight the challenge of identifying which organizations fit within the SE domain due to criteria that are either too broad or too narrow (Dacin et al., 2010; Sampaio & Sebastião, 2024). The available classifications are, in general, conceptual and lack empirical tests (Bignotti & Myres, 2022; Erpf et al., 2019).

This methodological issue hampers literature development, as broad constructs create measurement issues and narrow constructs test fewer hypotheses. The interplay between theory and constructs must be balanced to avoid excessive variation in results and ensure knowledge accumulation (Hamann et al., 2013; Richard et al., 2009). This aspect can also derail supportive structures and the provision of managerial tools adequate to the SE context (European-Commission, 2016; Lee et al., 2014; Seelos & Mair, 2005). Consequently, many social enterprises struggle with financial sustainability, with a high rate of failures reported, especially within the first few years of operation (Kamaludin et al., 2024).

Another key aspect is the focus on 'corporate social responsibility' and 'business models' (Sampaio & Sebastião, 2024), indicating that research remains centered at the organizational level (Erpf et al., 2019; Lee et al., 2014). Consequently, significant links between analysis levels such as ecosystems, countries, or public policy are often overlooked (Johnson and Schaltegger, 2020). Although these themes appear in the literature, they are not thoroughly developed (Kamaludin et al., 2024; Sampaio & Sebastião, 2024). Theoretical studies, reviews, and case studies dominate literature, reinforcing the focus on the organizational level (Lee et al., 2014; Sottini et al., 2024).

Strategic management theory has faced similar challenges in evaluating the performance construct (Hamann et al., 2013; Richard et al., 2009; Venkatraman & Ramanujam, 1986). Literature suggest that building taxonomies offers a way to manage numerous concepts by reducing possible combinations to a manageable set through identifying latent profiles that represent complex phenomena. These profiles, contingent on context and circumstances, capture simultaneous interactions (Carneiro et al., 1991; Humbrick, 1980; Venkatraman & Prescott, 1990). This approach recognizes that organizational results are multidimensional constructs needing literature-specific measures (Hamann et al., 2013; Venkatraman & Ramanujam, 1986). A problem widely reported in SE is the lack of measures, tool and techniques developed within this literature to fit SEI's context (Kamaludin et al., 2024; Lee et al., 2014).

Building a taxonomy requires identifying patterns to differentiate groups, explaining result differences while maintaining multidimensionality. Factors should create internally homogeneous and externally heterogeneous groups, making the classification process relevant and stable, thus necessitating study replications (Carneiro et al., 1991). Constructing taxonomies organizes dispersed knowledge and provides a framework for theoretical consolidation (Venkatraman & Prescott, 1990). The proposed mixed-method protocol, applied in strategic management (Carneiro et al., 1991; Peixoto et al., 2022), uses pattern-matching in qualitative and quantitative studies to address small samples in ill-structured literature.

3. Research Protocol

3.1 Mixed-Methods Protocol

Mackenzie and House (1978) warn of the need to employ a research strategy appropriate to the literature studied, corroborating the call from SE scholars and practitioners (Ciccarino et al., 2022b; Kamaludin et al., 2024; Lee et al., 2014). This basic mixed-methods approach was selected to provide a way to deal with SE literature, recognizing its pre-paradigmatic state (Hossain et al., 2017; Kamaludin et al., 2024; Lee et al., 2014). It integrates both qualitative and quantitative techniques, allowing a more comprehensive exploration and understanding of multifaceted domain (Krivokapic-skoko & O'Neill, 2011), as pointed out in the previous sections (Macke et al., 2018; Zhou et al., 2022). The basic mixed-method approach proved to be critical when dealing with small sample sizes, as it enables the triangulation of data to enhance validity and reliability, producing balanced syntheses between literature and practice. The qualitative components can provide in-depth insights into contextual factors and underlying mechanisms, while the quantitative aspects can offer measurable and generalizable findings. This protocol meets the need to explore multi-method strategies that are not essentially guided by quantitative analyses (Krivokapic-skoko & O'Neill, 2011).

To screen fragmented literature, the study followed the model of systematic review literature, as proposed by Remenyi et al. (1998). This model seeks to delineate the underlying narrative to allow the identification of important dimensions that should guide the subsequent data collection and analysis. It consists of five steps: 1) Primary narrative; 2) higher-order narrative; 3) theoretical background; 4) hypotheses; 5) scientific confirmation. Each level accomplished leads to a deeper understanding of the topic. Therefore, the study started with qualitative exploratory research. Table 1 summarizes the research protocol that will be described in the following sections.

Table 1: Taxonomy Framework

Type of study	Method	Stage of narrative		Research question / goal	Data	Result
Qualitative exploratory study	Systematic literature reviews		1) Primary narrative	What is social entrepreneurship?	Literature reviews and bibliometric studies were consulted to identify the seminal papers, keywords and important themes.	The acknowledgement of different definitions, pattern identification and the selection of constructs to work on.
	Systematic literature reviews		2) Higher order narrative	Search for auxiliary concepts in more mature literature.	Literature	- Theoretical frameworks that helped to organize the information. - Methodology application examples
Qualitative descriptive study	- Content analysis - Case study - Pattern matching		3) Theoretical background	- Identify distinctive events such as prizes and investments. - what elements of a social entrepreneurial business model is considered in an investment selection?	- Secondary data from web sites, public reports, case studies, social media. - Interviews / snowball	- Definition of unit of analysis - Study delimitation - Case(s) selection - Semi-structured interview protocol - Online Questionnaires - Population and sample definition
Quantitative descriptive study	- Descriptive statistics - Exploratory factor analysis using principal component analysis and varimax rotation. - Cronbach's Alpha - Cluster Analysis (hierarchical algorithm and K-means algorithm)		4) Hypotheses	- How SEIs and investors can analyze social business models in order to achieve better results?	Online survey	- Relevant features and dimensions - Underlining data infrastructure - Hypotheses' formulation - Case(s) description(s) - Sample description
Quantitative explanatory study	- One-way ANOVA - Pearson Correlation 2-tailed test - MANOVA - Bonferroni's post hoc test		5) Scientific confirmation	- Discern and categorize Social Economy Initiatives (SEIs) based on significant differences in their business model factors and value creation capacity. - What are the profiles that classify cases? - What is the relationship between profiles and the creation of results? - How do the dimensions that characterize the different profiles influence the creation of results?		- Structure for classification and information organization
	Quantitative study replication			Test results' validation and reliability.		

Source: Authors

3.2 Qualitative Study

The systematic review literature departed from a primary narrative (1) that is still fuzzy and widely dispersed (Remenyi et al., 1998). The question that guided the research was: What is social entrepreneurship? It implies the acknowledgement of different definitions, pattern identification and the selection of constructs to work on. Literature reviews and bibliometric studies were consulted to identify the seminal papers, keywords and significant themes. The result was still vague, with much variance. But it highlighted that the most critical characteristic of the topic was the prioritization of social value creation and the need for auxiliary concepts to enable delimitation.

The search for auxiliary concepts proceeded as follows: Firstly, value creation was identified in the more mature literature on strategy. The insights from this literature provided theoretical frameworks that helped organize the information from SE, such as the business model Canvas (Osterwalder & Pigneur, 2011) and the generic strategies (Teece, 2010; Zott & Amit, 2007). It also provided the methodology for the quantitative stage of the mixed-method. Therefore, the lesson learned was that the answer to how to approach ill-structuredliterature can be found in a similar literature and the search should be guided by the primary narrative found in reviews and bibliometric studies. This reflection helped to achieve a higher-order narrative (2) consolidating the literature review (Remenyi et al., 1998).

Lee et al. (2014) discussed that a way to approach SE literature is following prizes and investments received by social entrepreneurial initiatives (SEI). And Martin (2016) used online secondary data to describe value creation in the sharing economy. Combining both guidances, a second question emerged to set up a research infrastructure to form the theoretical background (3) - what elements of a SE business model are considered in an investment selection? The public information of global social investors that provide support to SEI was analyzed by thematic content analysis (Bardin, 1977). The Results highlighted their investment thesis and selection criteria (Ciccarino & Rodrigues, 2020), marking the transition to a descriptive study (Remenyi et al., 1998).

At this point, the SEI's definition was chosen. SE is a business model or project developed by for-profit or non-profit organizations. Organizations that develop SEIs should be private and have management autonomy. SEIs are stable and sustainable operations with the explicit objective of creating social value through collective interest in utilizing production factors such as wage labor, capital, and resources (European-Commission, 2016). Clearly defining the unit of analysis concept is fundamental for a consolidation strategy in the research field because it informs future researchers, preventing misunderstandings. Explicitly reporting this definition aids in interpreting results and facilitating comparisons between studies. However, this step is usually overlooked (European-Commission, 2016; Lee et al., 2014; Richard et al., 2009; Venkatraman & Ramanujam, 1986).

Still exploring the theoretical background (3) the *'Portugal Social Innovation'* (PIS) public policy was identified, providing a delimitation for the study and deepening the understanding of this aspect of SE (Johnson and Schaltegger, 2020). PIS was selected due to its uniqueness and relevance, capable of confronting the theory and developing it through a case-oriented study (Eisenhardt, 1989; Ghauri, 2004). PIS allowed the observation of SE from the perspective of public policy and its agents (i.e., investors and entrepreneurs)(Ciccarino & Nogueira, 2020), enlarging the discussion in SE literature to a multilevel perspective (Kamaludin et al., 2024; Lee et al., 2014; Sottini et al., 2024).

Ensuring that the data comes from consistent experimental environments is essential to avoid conflicts and maintain data reliability, which is often overlooked in small dataset research. PIS also optimized the selection criteria to balance between too many and too few features, as redundant information can lead to high costs in analysis, while too few features may not provide meaningful insights (Zhou et al., 2022).

Once settled the theoretical background (3) and the research delimitation (i.e. SEI invested by PIS) an interview protocol was developed. Interviews aimed to validating and better understand concepts and constructs identified in the previous steps to underline hypotheses (4) (Remenyi et al., 1998). Data was collected by in-depth, semi-structured interviews with Portuguese investors and social entrepreneurs using snowballing. Results were analysed by pattern matching. A pattern is something recurring that appears systematically both in the literature and in the data collected (Eisenhardt, 1989; Ghauri, 2004).

The quantitative descriptive and explanatory study relied on the results of these interviews in line with the first step in building a context-based taxonomy (Humbrick, 1980). Additionally, by the end of the quantitative study, interviews also helped to perform comparative case studies applying the taxonomy (Ciccarino, 2023) and answering a need that still exists in SE literature (Sottini et al., 2024).

3.3 Quantitative Study

The quantitative study aims to answer how SEIs and investors can analyze social business models to achieve better results. Results should enable improvements in funding access and a better understanding between these two agents. It also aimed to provide a structure for classification and information organization (Humbrick, 1980; Venkatraman & Ramanujam, 1986), balancing the constructs to avoid measurement problems and narrow hypotheses (Hamann et al., 2013; Richard et al., 2009). A taxonomy is the tool chosen because 1) it allows contextual analysis by questions and indicators that compose it; 2) it supports classification and comparison, highlighting generic features; 3) a taxonomy is a statistical-based classification, then it allows generalizations favoring replication (Carneiro et al., 1991; Venkatraman & Prescott, 1990). A taxonomy is a context-based classification structure based on patterns (Humbrick, 1980), consistent with the qualitative study. Additional hypothesis tests should be done to make the taxonomy generalizable (Carneiro et al., 1991; Peixoto et al., 2022)

An online survey was based on previously tested and published scales related to the SE research field and framed in the Osterwalder and Pigneur (2011) business model analyses. The SE literature did not offer well-tested correlated scales on clearly established dimensions, so a wide range of variables was selected. Social

value measures were also identified in the literature review to establish a process-result dynamic important for a correct evaluation, considering their temporality (Richard et al., 2009).

The questionnaire relied on the qualitative study results following the last steps proposed by Remenyi et al. (1998). The survey targeted social entrepreneurs or SEI's managers and the database followed the selection criteria of SEIs that received prizes or investment in the past five years (Lee et al., 2014). It helped to evaluate the population and ensure that only SEIs appropriate to the study would be selected. Online data and snowballing were used to send the survey. The taxonomy and its contextual analysis were possible due to the study delimitation in Portugal. This added cohesion to commonly dispersed variables because Portugal has a pioneering public policy toward innovation and social value creation (Humbrick, 1980; Zhou et al., 2022). It highlights the importance of the mix-method's qualitative stage.

The study aims to discern and categorize Social Economy Initiatives (SEIs) based on significant differences in their business model factors and value creation capacity. The first step was verifying latent dimensions and summarizing variables, highlighting the most important ones. An exploratory factor analysis (EFA) was performed using principal component analysis as the extraction method. The dimensions should be mutually excluding (Rotation Method Varimax with Kaiser Normalization - superior to 0.6, and Bartlett's Test $\alpha < 0.05$; factor load > 0.6). The dimension's reliability will be tested using Cronbach's Alpha ($\alpha > 0.6$) (Hair Jr et al., 2010). The issues concerning common method bias (CMB) were addressed using the Harman's single factor test through exploratory factor analysis (EFA) (Podsakoff et al, 2003).

Variables that do not form factors improve the description of the taxonomy's profiles in the Portuguese instance. In this sense, they were subjected to One-way ANOVA to observe individual differences between variable means and descriptive statistics. However, the conclusions from this analysis are only context descriptions (Carneiro et al, 2011).

Then statistical methodology for taxonomy development was performed to a test hypothesis framed according to the method constraints (Carneiro, 2011). The anticipation is that by amalgamating business model elements with contextual factors, SEIs can be classified and grouped based on their resemblances, thus reflecting multivariate profiles (Humbrick, 1980). However, the emergence of such profiles cannot be predetermined, leading to the formulation of the first hypothesis (H_1): there exist at least two distinct profiles of SEIs shaped by business model factors (H_{1a}) and funding accessibility (H_{1b}).

Classifications within a taxonomy are deduced from pattern observation (Venkatraman & Prescott, 1990) and are contingent upon contextual nuances (Humbrick, 1980), their generalizability resting on statistically sound testing methods (Carneiro, 2011). Consequently, the second hypothesis (H_2) posits that the means of at least two profiles exhibit significant disparities.

The hierarchical algorithm determined the number of clusters through the Euclidean quadratic distance to guarantee the maximum separation between each group. Then, cases were classified using the K-means algorithm (Carneiro et al, 2011). As the classification in clusters emerges from the data, MANOVA validated the classification (Carneiro et al, 2011). This technique is appropriate when there is more than one evaluation measure for the same objective and improves the control of type I experimental error. As the measures were created orthogonally, the classification in each cluster provides the basic premise of the independence of observations required (Hair Jr. et al, 2010).

The internal homogeneity of the clusters was tested together by Box's M test ($\alpha > 0.05$) and Levene's test ($\alpha > 0.05$) to gauge each measure individually. The suitability of the clusters was assessed using Pillai's Trace and Wilks Lambda tests ($\alpha < 0.05$) and determined whether the clusters are different (Hair Jr. et al, 2010; Carneiro et al, 2011). These differences were described using the cluster's centroid analysis and Bonferroni's post hoc test ($\alpha < 0.05$). This test points out significant differences among groups and ranks their effects (Carneiro et al, 2011).

Once the taxonomy with its different profiles (i.e. 3 profiles were identified) was developed, the study followed to understand how different SEI create value. To achieve this goal, value measures identified in the literature at the second step of this study were tested in relation to the taxonomy. Three more hypotheses were tested.

The third hypothesis (H_3) verifies if the variables selected to describe subjective and objective social value (i.e., results from business models) are significant to explain the samples' variation, grouping according to the literature. Therefore, it states that (H_3) exist distinct underlying factors that explain the covariance among

variables related to objective social value (H_{3a}) and subjective social value (H_{3b}). This hypothesis is tested by verifying if the variables are grouped according to the literature and according to the previous study using an EFA.

The fourth and fifth hypotheses aims to analyze the relationship between the social value measures and taxonomy, underscoring the characteristics of social dynamics. The fourth hypothesis aims to validate the differences between taxonomy' profiles in creating social value. In this sense, the means of at least two profiles must exhibit significant disparities (H_4) considering objective social value (H_{4a}) and subjective social value (H_{4b}). MANOVA assess the influence of dimensions and variable in SEI classification in each profile.

Thus, the fifth hypothesis (H_5) states that there is a positive correlation between social value creation and the taxonomy's dimensions. To validate, it is necessary to have at least one positive correlation between objective social value and the business model dimensions (H_{5a}) and at least one positive correlation between subjective social value and the business model dimensions (H_{5b}). This hypothesis is tested by descriptive analysis using the parameter and correlation analysis (Pearson Correlation 2-tailed test and descriptive analysis $\alpha < 0.05$). The parameter of the correlation coefficient is below 0.5 in low correlation, between 0.5 and 0.7 in moderate correlation, and above 0.7 high (Remenyi et al., 1998).

This protocol's resulting database corresponds to 40.45% of the population of Portuguese SEIs. The sample also represents 43.63% of the response rate, which is higher than the 30.36% reported in benchmarking studies (Kuratko et al., 2017). At the end of sample treatment, there were 88 valid cases. Due to the complexity of the study, this sample is considered small (i.e., 50 to 100 cases) (Hair Jr et al, 2010). It was possible to know the population because of the qualitative study. Results were consistent when the entire quantitative study was replicated in a smaller sample of 21 Brazilian cases and in a larger one with 285 cases from the United Kingdom. These findings validate the taxonomy and the measures to evaluate results, suggesting reliability.

4. Conclusion

This paper makes a contribution to research by providing a tested protocol for extracting structured information with analytical and statistical significance from exploratory contexts, even with small samples. It effectively handled the emergent phenomena studied. The methodological decisions and procedures are meticulously documented, serving as a guide for navigating ill-structured literature lacking consensus and empirical studies.

Developed to study social and innovative business models, this research protocol facilitates understanding differences between groups and proposes a taxonomy that proves consistent when the protocol was applied to other samples. Combining literature from strategic management helped overcome the challenges of dealing with SE's ill-structured literature. The taxonomy enables contextual analysis by considering specific indicators relevant to the SEI while supporting classification and comparison, highlighting generic features that can be generalized across different settings.

The relevant and stable classification process suggests this taxonomy is a tool for organizing dispersed knowledge, providing a structure for theoretical consolidation. The profiles and dimensions highlighted by the taxonomy balance the interplay between theory and constructs, avoiding excessive variation in results to enable knowledge accumulation, as recommended in the literature (Hamann et al., 2013; Richard et al., 2009). (Hamann et al., 2013; Richard et al., 2009). These multidimensional findings can build supportive structures and provide managerial tools suitable for the SE context, improving financial sustainability and ensuring the continuity of a positive social impact (European-Commission, 2016; Kamaludin et al., 2024; Lee et al., 2014; Seelos & Mair, 2005; Sottini et al., 2024).

By considering different stakeholders and contexts, the qualitative methods employed expand the SE literature discussion to a multilevel perspective that is still often overlooked (Kamaludin et al., 2024; Lee et al., 2014; Sottini et al., 2024). The mixed-method approach, integrating qualitative and quantitative techniques, allows a comprehensive exploration and understanding of this multifaceted domain (Krivokapic-skoko & O'Neill, 2011), suitable to SE needs (Macke et al., 2018; Zhou et al., 2022). The protocol produced research tools useful to explore other research aspects in SE, delivering balanced syntheses between literature and practice. Additionally, the quantitative aspect of the mixed-method did not guide the study, what is an underdeveloped feature(Krivokapic-skoko & O'Neill, 2011).

While the study's focused scope allowed for a deeper discussion and more comprehensive descriptions, it also represents a research limitation. We encourage the replication of this protocol in other contexts to enhance its validity, enabling comparison and refinements. Further discussion is necessary regarding the sustainability and real-world application of the proposed protocol in solving practical problems. The tools presented can help identify underlying patterns, structuring the knowledge needed for a deeper understanding of social strategies.

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Econometric Advances in the Estimation of Housing Price Determinants

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Abstract: This paper aims to help improve the estimations produced by researchers who rely on conventional housing market pricing models to determine housing prices. The widespread use of panel data in estimating housing prices is justified by the richness of cross-sectional regional or metropolitan data analysed over several periods. Unfortunately, panel data has slope coefficient heterogeneity and cross-sectional dependence, producing inconsistent and misleading estimates of the coefficients using the Ordinary Least Squares (OLS) estimator. Recent advances in econometrics address these panel data limitations, producing better estimates. We analysed the empirical application of these new estimators on housing market panel data, showing that the Fully Modified Ordinary Least Squares Augmented Mean Group (FMOLS-MG) estimator produces the best estimates of the long-term housing market equilibrium and that the Dynamic Common Correlated Effects Mean Group (DCCE-MG) estimator produces the best estimates of the housing market's short-term dynamics. Adopting a trending methodology like Difference-in-Differences (DID) in housing market research to explain the effects of policy decisions on housing prices also has complications related to using the OLS estimator with fixed effects when the data has serial correlation. We show these problems can be overcome using the Feasible Generalised Least Squares estimator in a Seemingly Unrelated Regression Equations (FGLS-SURE) system. Recent econometric developments produce more accurate housing price determinant estimates than conventional econometric methods. These new methodologies can help researchers better estimate the effects of fundamental economic changes and policy decisions on housing prices, which can, in turn, support policymakers in implementing better housing policies.

Keywords: Econometric advances, Housing price determinants, Augmented mean group, Difference-in-differences

1. Introduction

Over the last decade, the housing price increases in several Western countries have forced policymakers and academics to analyse and address the root causes to make housing more affordable. The fact that housing prices continued to rise even during the Covid-19 pandemic, despite significant drops in gross domestic product, and that local and national measures banning the shift of apartments from housing to tourism (e.g., Airbnb) did not stop price increases indicates that policymakers and academics need to understand better how real estate market prices are determined.

Real estate pricing models are based on general equilibrium under adaptive expectations, where the market does not reach equilibrium in the short term, and supply and demand players develop expectations according to past price changes. Long-term housing price estimates are formed on supply and demand equilibrium. In contrast, short-term house price returns are influenced by lagged changes in fundamentals and an error correction model that accounts for the slow adjustment of short-term price changes to long-term equilibrium.

These asset pricing models estimate housing price determinants using panel data due to the richness of cross-sectional regional or metropolitan data analysed over several periods. The problem is that most of these data sets exhibit slope coefficient heterogeneity and cross-section dependence. Heterogeneity causes the pooled Ordinary Least Squares (OLS) estimator to create a correlation between the regressors and the error term, resulting in serially correlated disturbances and producing inconsistent and misleading estimates of the coefficients. Moreover, under cross-section dependence, the pooled OLS estimator provides little gain in precision compared with time series OLS. Recent advances in econometrics, such as the Mean Group (MG) estimator, the Fully Modified Ordinary Least Squares (FMOLS), and the Common Correlated Effects (CCE), address these panel data limitations, improving the precision of estimates.

Moreover, asset pricing models often fail to estimate the effects of policy decisions that impact housing use, such as the liberalisation of short-term rentals. New methodologies developed to measure policy decisions, such as the Difference-in-Differences (DID) approach, can also be applied to the housing market to assess the effects of short-term rental liberalisation on housing prices. However, the OLS with Fixed Effects (OLS-FE) estimator, commonly used in the DID methodology, is prone to serial correlation and biased estimates. Recent research suggests that using the Feasible Generalised Least Squares estimator in a Seemingly Unrelated Regression Equation system (FGLS-SURE) could address these issues.

We analysed an empirical study that tested several of these new estimators on a sample of housing market data. The study showed that the Fully Modified Ordinary Least Squares Mean Group (FMOLS-MG) estimator is the best solution for estimating long-term equilibriums in the housing market, as it allows for slope heterogeneity and controls for cross-sectional dependence. For short-term dynamics, the estimator that provides the best estimates is the Dynamic Common Correlated Effects Mean Group (DCCE-MG) estimator. Regarding the Difference-in-Differences (DID) methodology, we analysed a study that shows the Feasible Generalised Least Squares Seemingly Unrelated Regression (FGLS-SUR) estimator has much higher power than the OLS with Fixed Effects (OLS-FE) estimator, leading to more precise estimates and more valid results.

The paper is organised as follows: section 2 reviews the literature, section 3 explains the methodology, section 4 presents and discusses the results, and section 5 concludes.

2. Literature Review

2.1 Housing Prices

The first academic approach to real estate prices (or housing prices) was developed by David Ricardo (1817) with the Ricardian Rent Theory, which posits that population and the location of economic activities are the main determinants of real estate prices. In the late 20th century, the advent of computerised databases made it possible to combine time-series data with cross-sectional data to produce longitudinal information (Hsiao, 1985) and thus develop econometric estimators for panel data. Unlike time series data, panel data contain information regarding inter-individual differences, allowing for estimating parameters that depend on various socio-demographic or geographic factors, which are important determinants of real estate prices. While cross-sectional data include variations in these variables, they cannot be used to model dynamics such as housing price growth. The estimated coefficient of a cross-sectional database would reflect the differences between housing locations but not the evolution of housing prices in a specific location.

The term "panel" refers to a two-dimensional board with variable X having two subscripts. One dimension is an individual index (i), representing the cross-sections, and the other is time (t), representing the time series. In macroeconomics, the time dimension is usually larger than the number of individuals. In contrast, in microeconomics, such as in real estate pricing models, the number of individuals is typically larger than the number of periods. Due to these characteristics of panel data, along with the Ricardian Rent Theory's concept of location as a fundamental determinant of real estate prices, most real estate price models have been developed under the assumption that panel data can reflect the different price conditions of various locations (Case and Shiller, 1990; Poterba, 1991). By the end of the 1990s, it became widely accepted that real estate prices should be studied using panel data from metropolitan statistical areas (DiPasquale & Wheaton, 1996; Quigley, 1999). In Europe, these areas are known as the Nomenclature of Territorial Units for Statistics (NUTS 3).

Although the use of panel data has become widely accepted, the debate about which fundamentals explain real estate prices remains open. Ricardo (1817) argued that population growth and location would determine real estate price growth. However, several studies based on this assumption have been proven wrong (Mankiw & Weil, 1989; Bakshi & Chen, 1994). DiPasquale and Wheaton addressed this shortfall by developing a stock-flow equilibrium model (DiPasquale & Wheaton, 1992) to explain housing price equilibrium. This model was later developed into a structural model (DiPasquale & Wheaton, 1994) by incorporating the dynamic process of prices increasing or decreasing until a new equilibrium is reached, based on Case and Shiller's findings about market inefficiency (1988). This model considers the main determinants of housing prices to be aggregate income (measured by gross domestic product, GDP), construction costs, and interest rates. Since the housing market is inefficient and does not reach equilibrium in the short term, two additional variables are included in the model to explain housing prices: last-period price change (momentum, also known as lagged price) and mean reversion (to the equilibrium price). This model has been used extensively since then (Malpezzi, 1999; Green et al., 2005).

2.2 Equilibrium and Dynamic Econometric Models

Using panel data brought new challenges to the econometric field, as Pesaran and Smith (1995) showed. When there is a dynamic model, as is often the case in the housing market, the conventional pooled regression imposes common slopes on all regressors, although allowing for fixed or random intercepts. This slope homogeneity across all housing locations seems highly unlikely. When the regressors are serially correlated (as with lagged prices), ignoring coefficient heterogeneity induces serial correlation in the disturbance, leading to biased estimates. Pesaran and Smith (1995) addressed this problem by estimating separate time series regressions for each cross-section and averaging the coefficients over cross-sections (also known as groups). This is the Mean

Group estimator, which produced consistent, unbiased estimates in the presence of large groups and periods, thus solving one of the problems in estimating housing price determinants.

A second problem associated with dynamic panels is endogeneity. The ordinary least squares (OLS) estimator assumes that regressors are exogenous, but in a dynamic process, there is endogenous feedback from the regressors, creating bias. Pedroni (2001) developed a Fully Modified OLS Mean Group (FMOLS-MG) estimator that introduces a semi-parametric correction to the OLS estimator, eliminating the bias induced by the endogeneity of regressors, in addition to the MG estimator feature that allows for slope heterogeneity.

Another problem associated with panel data is cross-section dependence. In housing markets, spatial correlation is prevalent and intuitive, as Ricardo (1817) explains: the economic distance to activities determines real estate prices. In panel data models where the number of cross sections is small and the time series dimension is large, the standard approach is to treat the equations from the different cross sections as a system of seemingly unrelated regression equations (SURE) and then estimate the system using the Generalised Least Squares (GLS) technique (Pesaran, 2006). This approach allows for general (time-invariant) correlation patterns across the errors in the different cross-section equations.

To address the cross-sectional dependence problem, Eberhardt and Teal (2010) extended the FMOLS-MG by adding a dynamic process to the regression that controls cross-section dependence. They extracted the process from the year dummy coefficients of a pooled regression in first differences, representing the level-equivalent mean evolution of unobserved common factors across all panel sections. Afterward, these estimates are augmented in each of the cross-sectional regressions, including linear trend terms to capture omitted idiosyncratic processes, with estimates averaged across sections, as done by Pesaran and Smith (1995). This estimator is called the Fully Modified OLS Augmented Mean Group (FMOLS-AMG) and holds in the case of slope heterogeneity and cross-section dependence.

Regarding cross-sectional dependence, Pesaran (2006) had already developed an estimator where the observed regressors are augmented by cross-section weighted averages of the dependent variable and the individual-specific regressors, calling this the Common Correlated Effects Mean Group (CCE-MG) estimator. This estimator is unbiased in regressions with slope heterogeneity and cross-sectional dependence. However, it is unsuitable for dynamic panels where the lagged dependent variable is one of the regressors.

Chudik and Pesaran (2015) extended the Pesaran (2006) CCE-MG to dynamic panel data models with weakly exogenous regressors to address the CCE-MG shortfall in terms of dynamic panels. This new estimator is considered for panel data autoregressive distributed lag (ARDL) models where the dependent variable of a cross-section is explained by its lagged values, current and lagged values of weakly exogenous regressors, unobserved serially correlated common factors, and serially uncorrelated idiosyncratic error. This new estimator performs well as long as the time series dimension of the panel is sufficiently large.

2.3 Difference-in-Differences Model

The equilibrium and dynamic econometric models should be able to explain housing prices in the long term (equilibrium) and the short term (dynamic) based on observed economic fundamentals. However, unobserved policy decisions or external factors might affect the housing market beyond the economic fundamentals. The seminal work of Ashenfelter and Card (1985), where an unobserved effect was measured as a treatment against a control group, created the conditions for developing the Difference-in-Differences (DID) methodology. Although the model is based on the OLS estimator with fixed effects, it is a quasi-experimental methodology, as it measures whether there is a difference in an outcome due to a hypothesised treatment over a difference in time, enabling the isolation of the treatment effect above and beyond any difference that would have been expected regardless of the treatment. Because it relies on direct before-and-after measures at the same location rather than relying on modeling differences between locations, the DID approach provides a direct measure of the housing price changes attributable to policy decisions, such as the liberalisation of the transfer of houses from residential purposes to tourism purposes.

Recent studies on the effects of tourism on housing prices have employed the DID methodology (Sommerville et al., 2020; Barron et al., 2021; Franco & Santos, 2021), yielding promising results. However, econometricians have criticised the methodology, arguing that the fixed effects OLS estimator underestimates standard deviations due to serial correlation (Bertrand et al., 2004), as seen in the previous section. Parks (1967) had already developed a Feasible Generalised Least Squares (FGLS) estimator that allowed for serial correlation in seemingly unrelated regression equation systems (Zellner, 1962). Hansen (2007) proposed using FGLS in the Difference-in-Differences methodology, concluding that it would result in a more efficient estimator. Hausman

and Kuersteiner (2008) showed that when there is serial correlation in the data, FGLS produces better estimates than OLS with fixed effects, especially in the case of long-period datasets, a result later confirmed by Brewer et al. (2017), who recommended the use of FGLS with cluster-robust residuals in DID.

These theoretical models have yet to be widely validated, as they are recent econometric findings. We are interested in reviewing the empirical testing of the panel dynamic models and the DID to discuss the results against the reviewed theoretical models.

3. Methodology

This section presents part of the methodology of two recent research studies about housing prices where recent econometric advances mentioned in the previous section were applied to empirical data. The first study, focusing on dynamic panel models, was conducted in Spain's and Portugal's metropolitan areas (Cunha & Lobão, 2022a). These two countries have synchronised economic fundamentals (GDP, interest rates, construction costs), so the long-term housing market equilibrium should be similar, but they might show different short-term dynamics. In subsection 3.1 below, we demonstrate how recent econometric advances mentioned in the literature review can be used to estimate the dynamic model. The second study focuses on Portugal's two largest metropolitan areas. Over the last decade, Portugal reported housing price growth above the European Union average, making it one of the world's most unaffordable housing markets (price to income). Portugal's government banned new tourism short-term rental registrations, alleging that this activity transferred residential apartments to tourism activities. This second study used a Difference-in-Differences methodology to measure the effect of these short-term rentals (Airbnb tourism) on housing prices (Cunha & Lobão, 2022b). Section 3.2 below demonstrates how recent econometric advances mentioned in the literature can be used to improve the estimations.

3.1 Panel Dynamic Model

The variables used for estimating the house price equilibrium by Cunha & Lobão (2022a) were based on DiPasquale and Wheaton's (1992, 1994) equations: House Price (P), Gross Domestic Product (GDP), Construction costs (C), and Interest rates (R). Data series from Spain's 52 metropolitan statistical areas (MSA) were collected from Statistics and Spain's Ministry of Transportation between 2011Q1 and 2021Q2. Portugal's 25 MSA data series were collected from Portuguese Statistics for the same period. House Price is the median price in euros per square meter of housing. GDP is seasonally smoothed, in millions of euros, based on annual values with quarterly values interpolated based on quarterly national GDP values. Construction cost is an index with a base of 100 in 2015, with the same quarterly value for all MSA within the same country. Interest rates are the implicit national mortgage interest rate, with the same value for all MSA within the same country. All variables are in natural logarithms. The data for Iberia is the merge of the two datasets, with 77 MSA (i) and 42 quarters (t), resulting in 3,234 observations per variable and a total sample of 12,936 observations.

Long-term equilibrium

Following DiPasquale and Wheaton (1992), The long-term equilibrium equation is:

$$P^*_{i,t} = \beta_{0i} + \beta_{1i}GDP_{i,t} + \beta_{2i}C_{i,t} - \beta_{3i}R_{i,t} + \varepsilon_{i,t} \quad (1)$$

Where P^* is the log of the house price level, representing the long-term equilibrium price of Metropolitan Statistical Area *i* at quarter *t*, *GDP* represents aggregate income (using Gross Domestic Product as proxy), *C* is the construction cost, which is the same for all MSA within the same country, *R* is the mortgage interest rate, which is also the same for all MSA within the same country and ε is white noise and has zero mean. All variables are expressed in the logarithmic form.

Cunha and Lobão (2022a) employed five different estimation methods, each with distinct stationarity, slope coefficient heterogeneity, and cross-section dependence features. First, they used Pesaran and Smith's (1995) Mean Group (MG) estimator, which allows for slope coefficient heterogeneity and non-stationary but cointegrated data, but does not control for cross-sectional dependence. Second, they utilised Pedroni's (2001) Fully Modified Ordinary Least Squares Mean Group (FMOLS-MG) estimator, which controls for endogeneity and includes MG features. Third, they applied Eberhardt and Teal's (2010) Fully Modified Ordinary Least Squares Augmented Mean Group (FMOLS-AMG) estimator, which controls for cross-sectional dependence and includes FMOLS-MG features. Fourth, they employed Pesaran's (2006) Common Correlated Effects Mean Group (CCEMG) estimator, which also controls for cross-sectional dependence in addition to the characteristics of MG. Fifth, they utilised Chudik and Pesaran's (2015) Dynamic Common Correlated Effects Mean Group (DCCEMG), which

shares the features of CCEMG but includes lagged cross-sectional means of variables to remove bias caused by weakly exogenous regressors.

Short-term dynamics

After selecting the best estimator for the house price's long-term equilibrium level, they proceeded to estimate the equation for short-term dynamics, where the long-term price is used in the error-correction term to compute the deviations from observed house price levels, following the specification below, as per DiPasquale and Wheaton (1994):

$$\Delta P_{i,t} = \beta_{0i} + \beta_{1i}\Delta P_{i,t-1} + \beta_{2i}\Delta C_{i,t-1} - \beta_{3i}\Delta R_{i,t-1} + \beta_{4i}\Delta GDP_{i,t-1} - \beta_{5i}(P-P^*)_{i,t-1} + \varepsilon_{i,t} \qquad (2)$$

Where the current period and MSA price change ($\Delta P_{i,t}$) is determined by the lagged price change ($\Delta P_{i,t-1}$), by the lagged changes (*t-1*) in market fundamentals (the same as in the long-term equation), and by the previous period deviation of the house price level from its long-term equilibrium level $(P\text{-}P^*)_{i,t-1}$ (the error-correction term), all variables are expressed in the logarithmic form.

They ran the equation with the conventional OLS Fixed Effects and Random Effects estimators and with MG, CCEMG, and DCCEMG.

Difference-in-differences

The short-term rental activity was fully liberalised in Portugal in August 2014. It became possible to transfer houses and apartments from housing to tourism without political or administrative opposition. The most affected areas were the two largest metropolitan statistical areas (MSA), Lisbon and Porto, composed of several municipalities, each with its short-term rental registry and housing prices.

This dated event allowed Cunha and Lobão (2022b) to apply the Ashenfelter and Card (1985) Difference-in-Differences model, dividing the municipalities into two groups and measuring the effects of this political decision on the housing prices of the most affected group (the treated group). They created a treated group of municipalities for each MSA, comprising the municipalities in the upper quartile of short-term intensity as a percentage of the total housing stock, and a control group with the municipalities in the lower quartile of short-term intensity as a percentage of the total housing stock. Each MSA's treated and control groups are not geographically close, thus validating the stable unit treatment value assumption.

The dependent variable (Price) is the monthly median price per square meter of bank housing valuation in the municipalities within both MSA. This data was obtained from the Statistics Portugal website for all municipalities of the Lisbon MSA and the Porto MSA from January 2011 to December 2019. In the Lisbon MSA, there is data on 17 out of 18 municipalities, and in the Porto MSA, there is data on 12 out of 17 municipalities. There are 108 price observations for each of the 29 municipalities, which gives a total of 3,132 observations. They included two control variables (Density and Salaries) known in the literature to determine housing price increases. The data for these control variables were also obtained from the Statistics Portugal website. The DID specification is as follows:

$$\text{Log}(P_{ijt}) = \beta_{0j} + \beta_1 . T_{ij}.L_t + \beta_2.\text{Log}(D_{ijt}) + \beta_3.\text{Log}(S_{ijt}) + \varepsilon_{i,t}, \qquad (3)$$

$\text{Log}(P_{ijt})$ is the log price of housing in municipality *i* from MSA *j* in month *t*, $T_{ij}.L_t$ is a dummy variable set to one if the group of municipalities *i* is in the upper quartile of the MSA *j* (Treated) and the month *t* is post-liberalisation (Liberalisation), or zero otherwise, $\text{Log}(D_{ijt})$ is the number of residents per square kilometer of the municipalities *i* from MSA *j* in month *t* (annual data repeated monthly); $\text{Log}(S_{ijt})$ is the mean salary of municipality *i* form MSA *j* in month *t* (annual data repeated monthly); ε is white noise and has zero mean.

First, they estimate Equation 3 with the conventional OLS-FE estimator. Following the recommendation of Hansen (2007) for the DID methodology, they also use a Feasible Generalised Least Squares (FGLS) estimator in a Seemingly Unrelated Regression Equation (SURE) system (Zellner, 1962), thus correcting for heteroscedasticity and serial and contemporaneous correlation in the residuals, clustering standard errors by municipality.

Results

In the following subsections, we will present the estimates of equations 1, 2, and 3 obtained from sections of the two research papers (Cunha & Lobão, 2022a, 2022b). We will compare the results using conventional econometric methodologies to those obtained with recent advances. We will not present descriptive statistics because the purpose of this study is to compare econometric estimates, not to study housing price determinants.

3.2 Long-Term Equilibrium Results

The estimates of Equation 1 can be found in Table 1 below. MG, CCE-MG, and DCCE-MG results were estimated with Stata command xtdcce2, FMOLS-MG with Eviews, and FMOLS-AMG with Stata command xtmg. The data series are stationary, as shown by the unit root tests in Table 1.

Table 1: Estimates of Equation 1

Estimation method:	MG	FMOLS-MG	FMOLS-AMG	CCE-MG	DCCE-MG
GDPit	0.272***	0.250**	0.227***	0.350***	0.348***
	(0.028)	(0.01)	(0.017)	(0.086)	(0.091)
Cit	1.145***	1.160**	0.033	0.072	0.119
	(0.148)	(0.020)	(0.094)	(0.074)	(0.0767)
Rit	0.246***	0.240***	0.101***	0.108***	0.113***
	(0.020)	(0.003)	(0.021)	(0.021)	(0.020)
CIPS unit root test statistics					
1 lag	-3.986***	-1.569	-20.836***	-23.890***	-25.541***
2 lags	-3.991***	-1.520	-18.160***	-20.189***	-22.510***
3 lags	-4.001***	-1.488	-16.481***	-17.050***	-21.282***
4 lags	-3.920***	-1.448	-15.450***	-15.438***	-17.672***
R^2 (MG)	0.640	0.570		0.920	0.910
F-test / Wald test / statistic	159568***	n.a.	233***	37***	7***
Root Mean Square Error	0.060	n.a.	0.027	0.030	0.030
Slope homogeneity tests (a)	0.000***	n.a.	n.a.	0.000***	0.000***
Mean cross-correlations	0.560***	0.320***	0.080***	0.060***	0.060***

Notes: The dependent variable is *Pit. Pit*, *GDPit, Cit,* and *Rit* represent, respectively, House Price, Gross Domestic Product, Construction Cost, and Mortgage Interest rates of MSA *i* at quarter *t*. In models CCEMG and DCCEMG, Construction costs and Interest rates are not added as cross-sectional averages because they are constant in all cross-sections within the same country. The number of cross-section lags in DCCEMG is set to 3 (the cubic root of the number of periods). (a) The slope homogeneity test is the Pesaran and Yamagata (2008). ∗∗ and ∗∗∗ denote statistical significance at the 5% and 1% levels, respectively. Standard errors in parentheses.

The results of the CIPS tests indicate that except for FMOLS-MG, all four other estimates are cointegrated in levels, meaning that the estimated relations are long-term equilibrium equations. We can observe that the methods that do not control for cross-section dependence (MG and FMOLS-MG) produce similar estimates for construction cost and interest rate coefficients. In contrast, methods controlling for cross-section dependence produce different estimates of these coefficients but are similar among themselves. This was expected, as construction costs and interest rates are included in the model as control variables.

As expected, the mean cross-section correlation is high in the MG and FMOLS-MG estimates and small in the other three models that control for cross-section dependence, and the hypothesis of slope homogeneity is rejected. The FMOLS-AMG estimator combines a small cross-sectional dependence with minor standard errors and produces the smallest root mean square error. This method best estimates the error-correction term incorporated in Equation 2.

Short-term dynamics

The estimates of Equation 2 can be found in Table 2 below. OLS-FE and OLS-RE results were estimated with Eviews.

Table 2: Estimates of Equation 2

Estimation method:	OLS-FE	OLS-RE	MG	CCE-MG	DCCE-MG
ΔPi,t −1	-0.244***	-0.238***	-0.131***	-0.240***	-0.238***
	(0.018)	(0.018)	(0.029)	(0.022)	(0.024)

Estimation method:	OLS-FE	OLS-RE	MG	CCE-MG	DCCE-MG
ΔGDPi,t−1	0.043***	0.056***	0.021	-0.008	0.119
	(0.136)	(0.014)	(0.014)	(0.013)	(0.093)
ΔCi,t−1	0.142**	0.186***	0.223**	-0.081	0.123
	(0.056)	(0.056)	(0.101)	(0.089)	(0.103)
ΔRi,t−1	-0.017	-0.043***	-0.007	-0.014	0.003
	(0.013)	(0.013)	(0.012)	(0.013)	(0.018)
(P−P*)i,t−1	-0.039***	-0.001	-0.077***	-0.099***	-0.198***
	(0.008)	(0.002)	(0.011)	(0.016)	(0.024)
R2	0.030	0.070	0.110	0.180	0.330
F-test / Wald / statistic	56***	219***	1***	1***	1***
Root Mean Square Error			0.030	0.030	0.030
Slope homogeneity tests (a)	0.000***	0.000***	0.000***	0.849	0.849
Mean cross-correlations	0.210***	0.260***	0.120***	0.080***	0.020***

Notes: *Pit*, *GDPit, Cit,* and *Rit* represent, respectively, House Price, Gross Domestic Product, Construction Cost, and Mortgage Interest rates of MSA *i* at quarter *t*. *P** was estimated by the FMOLS-AMG of Table 1. In models CCEMG and DCCEMG, Construction costs and Interest rates are not added as cross-sectional averages because they are constant in all cross-sections within the same country. The number of cross-section lags in DCCEMG is set to 3 (the cubic root of the number of periods). (a) The slope homogeneity test is the Pesaran and Yamagata (2008). ∗∗ and ∗∗∗ denote statistical significance at the 5% and 1% levels, respectively. Standard errors in parentheses.

In Table 2, we can observe that the mean cross-correlations are smaller compared to Table 1, even when comparing the OLS-FE method (in Table 2) to MG in Table 1, suggesting that the use of FMOLS-AMG as the estimator for long-term equilibrium price is controlling some of the cross-section dependence in the housing returns estimates. While in conventional estimation methods (OLS-FE and OLS-RE), the theoretical house price determinants (aggregate income, construction costs lagged changes) are significant (except for lagged interest rates changes in OLS-FE), there is slope heterogeneity, and the cross-section dependence is high. When we allow for slope heterogeneity (MG), lagged changes in GDP lose statistical significance. When we control cross-section dependence (CCE-MG), lagged changes in construction costs also become non-significant. This result shows that conventional panel estimation methodologies that ignore slope heterogeneity and cross-section dependence produce inconsistent parameter estimates. CCE-MG and DCCE-MG produce estimates where we cannot reject that the slope coefficients are homogeneous. In the DCCE-MG method estimation, where the cross-section lags are added, we can obtain the most negligible cross-sectional dependence (0.02), although still significant, meaning that there are unobserved factors determining house prices beyond the variables included in the model (for instance, spill-over effects).

House price dynamics indicators are negative and significant (momentum and adjustment speed towards long-term equilibrium) in all the estimation methods except for OLS-RE. In CCE-MG and DCCE-MG estimations, the house price equilibrium fundamentals are not significant. Only momentum and adjustment speed explain housing returns in the short term. Moreover, the R-squared of these two estimation methods is much lower in the short-term equation (0.19; 0.33) than in the long-term equation (0.91; 0.90), suggesting a worse model fit to the data, even considering the significant momentum and adjustment speed.

The DCCE-MG estimate combines low cross-section dependence, slope coefficient homogeneity, and significant coefficients with lower standard errors.

Difference-in-differences

There is a parallel trend regarding the treated and control groups in both MSA before the August 2014 policy decision. The relevance of Density and Salaries in the regression was tested with the Likelihood ratio, rejecting the hypothesis that these two variables do not contribute to the model. The estimates of Equation 3 can be found in Table 3 below. The results were estimated with Eviews.

Table 3: Estimates of Equation 3

	Panel A - Lisbon MSA			Panel B - Porto MSA		
Specifications	**Equation 3**	**Equation 3**		**Equation 3**	**Equation 3**	
Estimator	**OLS-FE**	**FGLS-SURE**		**OLS-FE**	**FGLS-SURE**	
Intercept	14.173***	0.063		23.236***	2.490***	
	(0.955)	(0.081)		(2.075)	(0.162)	
Treated x Liberalisation	0.056***	0.274***		0.0355***	0.161***	
	(0.009)	(0.011)		(0.013)	(0.006)	
Density	-0.343***	0.096***		-1.157***	0.113***	
	(0.047)	(0.002)		(0.171)	(0.005)	
Salaries	-0.691***	0.872***		-1.216***	0.482***	
	(0.141)	(0.011)		(0.240)	(0.025)	
R^2 Adjusted	0.971	0.960		0.944	0.826	
F statistic	236.934***	181.053***		485.537***	1000.363***	
Observations	864	864		635	635	

Notes: The table reports the estimated coefficients from Equation 3 with the observations from the upper and lower quartiles of the sample. The dependent variable is the natural logarithm of housing prices. The independent variable is the interaction between Tourism and Liberalisation, a dummy variable with the value of one if the municipality is in the upper quartile of short-term rental intensity at the end of 2019 and if the month of observation is after August 2014 and otherwise zero. Density is the natural logarithm of the municipality density, and Salaries is the natural logarithm of the municipality mean gross monthly salary. OLS-FE is the Ordinary Least Square estimator with Fixed Effects both at the cross-section and period. FGLS-SUR is the Feasible Least Squares Estimator in a Seemingly Unrelated Regressions Equation system. Robust standard errors clustered at the municipality level are reported in parentheses. *** indicates significance at the 1% level. Standard errors in parentheses.

As expected, the estimated coefficients of the interaction terms are smaller with the OLS-FE estimator (5.6% in Panel A, 3.55% in Panel B) than with the FGLS-SUR (27.4% for Panel A, 16.1% for Panel B), with similar or smaller standard errors. With the OLS-FE as an estimator, the coefficients of the covariates have inverted signs, suggesting less precision in the estimates, as Hausman and Kuersteiner (2008) predicted. With the FGLS SUR estimator, the estimated coefficients of the covariates no longer have inverted signs, and their standard errors are much smaller than with the OLS-FE estimator. The F statistic is also much more significant with FGLS-SUR and confirms the findings of Brewer et al. (2017) regarding higher power tests when using FGLS-SUR.

Since the liberalisation of short-term rental registration in August 2014, housing prices have increased by 108% in the Lisbon municipality and 98% in the Porto municipality (as of December 2019). These municipalities have the largest shares of housing transferred to short-term rentals (over 5%) of the sample. We believe that the coefficients estimated in Equation 3 with the FGLS SUR estimator reflect more precisely the impact of a supply shock on housing prices.

4. Conclusions

In this study, we examined the outcomes of modelling house price dynamics utilising recent advances in econometric methods that permit heterogeneity and control for cross-sectional dependence. Additionally, we explored the application of a Difference-in-Differences methodology with innovative econometric estimators to gauge the impact of a policy decision on housing prices. Our study contributes to the literature by confirming that these new estimators yield higher power estimates by addressing traditional panel data issues such as serial correlation, slope heterogeneity, endogeneity, and cross-sectional dependence.

We conclude that conventional panel models, which assume homogeneous dynamics across sections and neglect cross-section dependence, such as OLS-FE and OLS-RE, yield significantly biased coefficient estimates that may result in erroneous conclusions. We demonstrate that the most effective econometric tool for estimating house prices' long-term equilibrium is the FMOLS-AMG, while for short-term dynamics, the DCCE-

MG proves to be optimal. Additionally, due to serial correlation in panel data, we illustrate that using the OLS-FE estimator in DID leads to biased estimates, whereas the FGLS-SUR estimator yields higher power estimates in this methodology.

These findings are crucial for researchers, housing market investors, and political decision-makers. This knowledge will facilitate a better understanding of the effects of policy decisions on housing prices, the determination of these prices in the short-term dynamics, and the factors influencing the housing market's long-term equilibrium.

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Design Science for Networks Designing: A Service-Dominant Logic Approach

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Abstract: This research explores the dynamics of coopetition among Small and Medium Enterprises (SMEs) during digital transformation, using Design Science Research (DSR) anchored in Service-Dominant (S-D) Logic. It examines the integration challenges of manufacturing SMEs into digital supply chains, highlighting the critical role of coopetition—a blend of competition and collaboration—in driving sustainable growth in this essential sector. Prompted by a consensus on reducing SME vulnerabilities, the study underscores the need for a resilient framework, especially given an 85% attrition rate in digital networks where only a minority, often supported by giants like Amazon and Microsoft, succeeds long-term. The proposed framework focuses on leveraging technology to enhance SMEs' competitiveness, innovation, and growth. This study contributes to academic discourse by suggesting future research directions, such as defining value creation in coopetition networks and assessing the impact of innovative artefacts, but also reveals the potential of coopetition networks as platforms for mutual value creation. This research enriches scholarly discussions on coopetition in the digital age and offers strategic guidance for SMEs navigating digital transformation, aiming to prepare European SMEs for upcoming challenges and opportunities.

Keywords*:* Coopetition, Networks, Small and medium enterprises, Design science research, Service-Dominant logic

1. Introduction

In the digital transformation era, the rapid pace of technological evolution has launched the global economy into a new epoch and fundamentally altered the fabric of business operations (Hernandez *et al.*, 2017). This transformative shift, driven by digital innovation, carries significant repercussions for procurement practices, revolutionizing traditional business methodologies. Within this evolving landscape, Small and Medium Enterprises (SMEs) play an indispensable role; they are the cornerstone of the European economy. European Commission (Di Bella *et al.*, 2023) reported that the EU27 saw over twenty million SMEs operational within the non-financial business sector in 2020, accounting for 99.8% of all businesses and generating upwards of 65% of total employment. This highlights their critical role in bolstering employment and fostering wealth creation, especially within the manufacturing sector—a key component of developed economies (Radicic, Pugh and Douglas, 2020).

However, as SMEs strive to integrate into global digital supply chains, they encounter substantial challenges and opportunities crucial for economic robustness. Scholarly research and policy analysis reveal that optimal integration is achieved within networks that promote cooperation—a synergy of competition and collaboration (Borchert and Bonefeld-Dahl, 2018).

Despite the consensus in business literature and official strategies aimed at mitigating SME vulnerabilities through the generalization of coopetition networks, the BCG Henderson Institute's research, published in the MIT Sloan Management Review (Reeves *et al.*, 2019), reveals concerning trends regarding the "rise and often fall" of these ecosystems. Analysing multiple cases across eleven different sectors, the study uncovered a staggering short-term death rate of over 85%, with less than 15% achieving their long-term goals. The outcomes were categorized as follows: (1) ecosystems that failed at inception, (2) those that quickly gained but then lost market share, (3) ones that saw a gradual decline to non-viability, and (4) a mere 15% that sustained long-term success. In this successful minority, large corporations like Microsoft and Amazon played pivotal roles, securing dominant positions and profit margins exceeding 29%. These thriving ecosystems largely depended on the central, keystone companies, with secondary participants relying more on these leaders than the ecosystem itself.

This study aims to fill a critical void in the existing research on coopetition among SMEs, focusing on the challenges posed by the lack of keystone entities in these networks - a known determinant of network dissolution (Iansiti and Levien, 2004). A question guides this research: How can methodologies be developed to enrich knowledge and fortify coopetition networks among manufacturing SMEs?

Through a comprehensive review of both product-centric and service-centric network theories (Moore, 1998) (Peltoniemi and Vuori, 2004) (Jabbour *et al.*, 2018), alongside empirical insights into the successes and failures of digital networks (Reeves *et al.*, 2019), this paper endeavours to provide an exploration of SMEs' navigation through the intricate dynamics of coopetition technology-enabled networks. Grounded in Design Science Research (Patkar, 2018) and Service-Dominant (S-D) Logic foundations (Vargo and Lusch, 2017), it seeks to establish a structured methodology for designing and validating coopetition networks, thereby informing the development of research proposals.

2. Enhancing Methodologies for Coopetition Networks

As Peffers et al. (2007) defined, a methodology provides a comprehensive framework comprising principles, practices, and procedures meticulously crafted for a specific knowledge domain. It is thoughtfully designed to steer the development and execution of varied research initiatives, representing a disciplined approach anchored in research design logic (Patkar, 2018). Such a structured foundation ensures the diligent application of academic methods, promoting the pursuit of knowledge and fostering scholarly advancement within distinct areas of inquiry.

Coopetition is often addressed through Game Theory (Devece, Ribeiro-Soriano and Palacios-Marqués, 2019), which delineates the strategic decision-making dynamics when enterprises engage in simultaneous cooperation and competition (Dagnino and Padula, 2002). Complementing this, the resource-based view (Barney, Wright and Ketchen, 2001) posits that coopetition facilitates firms' access to and sharing of unique resources, securing a competitive advantage (Crick, 2019). The Dynamic Capabilities Framework broadens this perspective (Prasertsakul, 2013), highlighting firms' capacity to adapt resources in response to the evolving market demands swiftly, a critical aspect in the agile digital ecosystem (Teece, Pisano and Shuen, 1997).

Network theory illuminates the strategic significance of inter-firm relationships and connections, particularly for SMEs (Tsujimoto *et al.*, 2018). It suggests that networks are instrumental in granting access to otherwise inaccessible resources, information, and markets (Granovetter, 1990). Within these networks, keystone firms are indispensable, establishing standards and nurturing an environment conducive to innovation and growth for smaller entities (Iansiti and Levien, 2004). The emphasis on network positioning and the exploitation of social capital underscores the potential for achieving competitive superiority.

The discourse on networks has evolved, revealing a dichotomy between tangible, product-focused views and intangible, service-oriented perspectives (Vargo, 2011). The traditional view of equating value with physical goods is increasingly seen as inadequate for encapsulating the complexities of modern economic exchanges (Vargo, Wieland and Akaka, 2015). This critique has paved the path for the S-D Logic, which revolutionizes the marketing and business strategy landscape by positioning service, not goods, as the essence of economic exchange. S-D Logic community argues that goods serve merely as conduits for service delivery (Edvardsson and Tronvoll, 2013), spotlighting the application of specialized competencies for the benefit of others (Matthies *et al.*, 2016). This paradigm shift redirects focus towards the processes and performances that foster mutual value creation, challenging the conventional goods-centric economic classification (Lusch and Vargo, 2007). It elevates customers to active participants in value co-creation, fundamentally altering traditional consumer behaviour and business strategy perceptions (Joiner and Lusch, 2016; Vargo, Wieland and O'Brien, 2023).

S-D Logic's foundations resonate with a range of theoretical frameworks, including resource-based theory and the dynamic capabilities concept, highlighting its efficacy in elucidating how evolving competencies contribute to value proposition delivery (Akwei, Peppard and Hughes, 2010) (Lindström *et al.*, 2016). Additionally, S-D Logic introduces the notion of service ecosystems, environments where actors create mutual value through service exchange (Bettencourt, Lusch and Vargo, 2014). Drawing inspiration from biological ecosystems, S-D Logic emphasizes the interplay of competitive and cooperative dynamics essential for survival and growth (Peltoniemi and Vuori, 2004) (Vargo and Lusch, 2017).

In the context of SMEs striving for integration into digital supply chains, S-D Logic offers a promising avenue to overcome historical collaboration barriers, thus enhancing digital engagement (Appian, 2021). By adopting a coopetition strategy that harmonizes competition with cooperation, SMEs can more effectively traverse the complexities of digital supply chains, leveraging the foundational principle of mutual value creation to foster innovation, resilience, and growth.

This nuanced approach to understanding and refining coopetition networks among SMEs suggests a departure from the traditional goods versus services dichotomy, advocating for a richer engagement with the intricacies of service exchange and value co-creation. It positions SMEs to unlock innovative pathways for development

and expansion in the digital era, underscoring the transformative potential of embracing service-oriented strategies within coopetition frameworks.

3. Navigating Coopetition in SMEs through DSR

Inspired by Herbert Simon's (1988) vision of a predominantly artificial world, DSR champions a proactive stance towards comprehending and sculpting the constructed environments (Simon, 1988). In addressing the intricate dynamics of SMEs' digital transformation and their engagement in coopetition, Design Science Research (DSR) stands out as a critical methodological approach (Hevner *et al.*, 2004). DSR transcends conventional research paradigms by marrying artefact creation and analytical examination to resolve practical dilemmas and enrich theoretical insights (Peffers *et al.*, 2007).

3.1 DSR's Role in Service Ecosystems and Coopetition Dynamics

DSR's foundational belief is that progress in knowledge is optimally achieved via the design, crafting, and analytical assessment of artefacts aimed at tackling precise challenges (vom Brocke, Hevner and Maedche, 2020). Its application spans various disciplines, such as engineering, computing, and education, highlighting its adaptability and relevance to a broad spectrum of research inquiries. By prioritizing artefact creation - from constructs and models to methods and implementations - DSR offers a concrete research strategy, empowering scholars to address real-world issues while contributing to academic discourse (March and Smith, 1995). The methodology integrates design science and research design principles, advocating for iterative solution development that bridges the existing state with preferred outcomes (Sun, 2020). Within a triadic cycle of relevance, rigour, and design (Hevner, 2007), DSR ensures that research is anchored in tangible problems, leverages existing knowledge, and persistently seeks innovative solutions. This approach solves immediate challenges, stimulates innovation, and enriches scholarly discussions (Peffers *et al.*, 2007).

DSR is especially pertinent in the realms of networks and SME coopetition. Viewing technology as a dynamic asset and business models as established solutions (Peffers *et al.*, 2007), DSR lays the groundwork for discovering novel paths for value co-creation within intricate networks (Arthur, 2009) (Lusch and Vargo, 2013). This perspective is vital for unravelling the complexities of coopetition, where competitive and cooperative interactions coalesce to drive growth and innovation.

3.2 Technological Artifacts and Institutional Integration in DSR

Within DSR, technology surpasses its conventional role, emerging as a crucial ecosystem element enabling actor interactions and guiding market institutions' evolution (March and Smith, 1995). As both artefact and value creation catalysts, this expanded interpretation of technology accentuates DSR's significance in exploring the intricacies of coopetition networks and service ecosystems (Akaka, Vargo and Schau, 2015).

Building on Morgan and Hunt's 1994 framework, institutions are portrayed as composites of organizations and regulatory frameworks, which are crucial in shaping the architectures of business models within ecosystems (Morgan and Hunt, 1994). This view emphasizes the importance of dynamic resources and collaborative value generation, suggesting ecosystem interactions mirror and actively sculpt market institutions (Akaka, Vargo and Schau, 2015). Furthermore, the tangible manifestation of intelligence in tools and artefacts (March and Smith, 1995) underscores technology's critical role in the ongoing dialogue on value creation and DSR, affirming DSR's utility in examining coopetition ecosystems for collaborative innovation (vom Brocke, Hevner and Maedche, 2020).

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Moreover, recognizing technology as pivotal artefacts that integrate ecosystems aligns with the institutional perspective on value creation within the DSR framework (Kaartemo, Akaka and Vargo, 2017). This viewpoint highlights a self-regulating system of resource-integrating actors united by shared institutional logic and facilitating mutual value creation through service exchange (Lusch, Vargo and Gustafsson, 2016). Thus, DSR emerges as an appropriate methodology to confront the challenges highlighted (Figure 1).

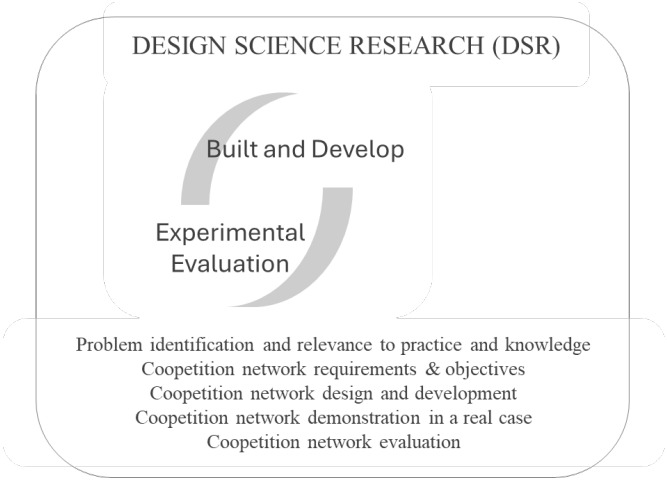

Figure 1: Design Science Research process (adapted from Peffers, 2007)

By spotlighting the critical contribution of manufacturing SMEs to Europe's employment and economic prosperity and underscoring their digital adaptability as essential for survival, the DSR view presents itself as a promising strategy to deepen the understanding and spur innovation within coopetition networks. This structured approach addresses the challenges manufacturing SMEs face in the digital realm. It promotes the development of tangible, inventive solutions to enhance their competitive edge and ensure their long-term viability.

4. Leveraging Design Science Research to Design and Evaluate Coopetition Networks

Drawing from Peffers et al.'s (2007) foundational insights in DSR, and acknowledging the critical role of digital supply chain integration in sustaining manufacturing SMEs as noted by Haleem et al. (2018), this paper introduces a comprehensive framework (Haleem *et al.*, 2018).

This framework is designed to steer academic inquiries within coopetition networks, laying down robust principles and practices. The imperative to consistently exceed customer expectations highlights the risk of providers being rapidly marginalized or excluded from the digital supply chain at the slightest indication of dissatisfaction. This critical requirement resonates with the tenets of Service-Dominant Logic, which posits that value is co-created through persistent service exchanges within ecosystems, fostering innovation as an inherent outcome of these co-creation processes (Akter *et al.*, 2020). The objective is to address the complexities of manufacturing SMEs as they integrate into coopetition networks by (1) Identifying Solutions - exploring knowledge-driven models or constructs to enhance the robustness of manufacturing SME networks. This strategy advocates for a harmonious blend of collaboration and competition, eliminating dependence on any dominant entity; (2) Evaluating Feasibility - conducting thorough assessments of these solutions' practicality and impact within real-world contexts to verify their effectiveness in facilitating manufacturing SMEs' smooth transition into digital supply chains.

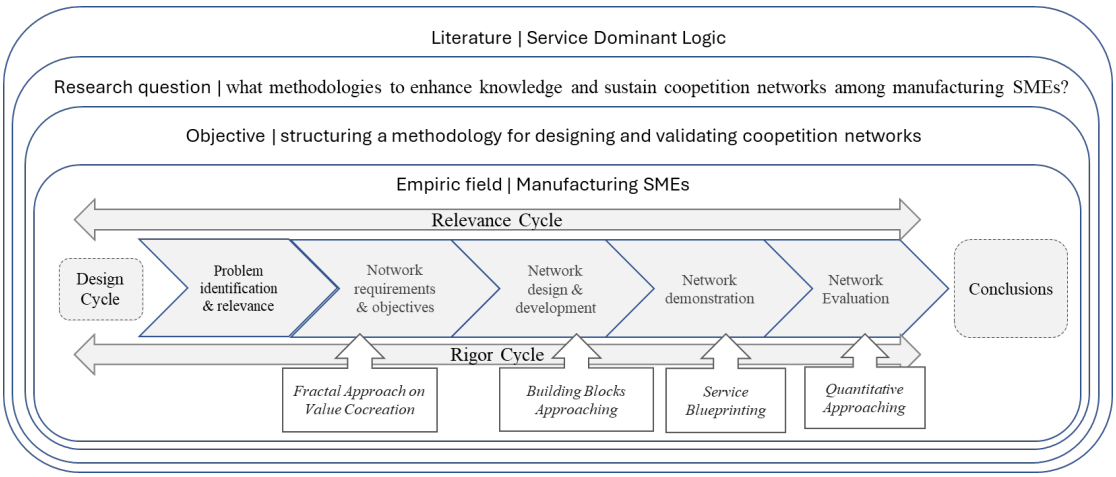

Figure 2: Strategic Framework for Academic Exploration in Coopetition Networks

As represented in Figure 2, the Design Science Research, articulated by Peffers (2007), underscores the importance of engaging in relevance, rigour, and design cycles within research endeavours. This methodological approach demands a comprehensive strategy that includes: (1) defining value creation objectives by pinpointing the necessary advancements within service ecosystems to promote coopetition and value cocreation; (2) tailoring a framework that maximizes value creation opportunities for manufacturing SMEs; (3) validating the framework's applicability and effectiveness by demonstrating practical utility employing case studies focused on manufacturing SMEs; and (4) evaluating impact by assessing the framework's capacity to address and alleviate the digital supply chain vulnerabilities faced by manufacturing SMEs.

This methodical approach aims to systematically cultivate and scrutinise coopetition networks dedicated to value creation, ensuring the strategic development of manufacturing SME resilience and operational efficiency in the digital landscape.

4.1 Research Priority 1

Building upon the methodological insights of Peffers (2007) and the strategic importance of digital supply chain integration identified by Haleem et al. (2018), a structured framework was proposed. This framework is poised to direct the scholarly investigation within coopetition networks, establishing a robust suite of principles and practices. The imperative of surpassing customer expectations underscores the risk providers face of being rapidly sidelined from the digital supply chain due to dissatisfaction. This underscores the alignment with S-D Logic, which posits value as cocreated through persistent service exchanges within ecosystems, fostering innovation as an intrinsic result of these co-creation activities (Gummesson, Mele and Polese, 2014). The objectives are to address the integration challenges of manufacturing SMEs into coopetition networks by (1) identifying solutions - and exploring knowledge-driven models or constructs to enhance the resilience of manufacturing SME networks. It includes fostering a balance of collaboration and competition, independent of a leading entity; and (2) evaluating feasibility - assessing the practicality and impact of these solutions in real-world scenarios, ensuring they effectively support manufacturing SMEs' integration into digital supply chains. These considerations lead to essential research questions aimed at (1) articulating the performative framework for a coopetition network for value creation, (2) delineating the technical requirements for a system that enables competition in SME networks, and (3) identifying the expected improvements for manufacturing SMEs from a Coopetition network.

4.2 Research Priority 2

Peffers (2007) emphasizes the design and development phase as critical for defining the desired functionalities, architecture, and artefact creation. Innovative and valuable artefacts must contribute to research, with resources bridging objectives to design and development encompassing relevant theoretical knowledge (Hevner, 2007). Among the DSR methodology's artefact types, models serve as utilities, elucidating processes and outcomes related to focal constructs (MacInnis, 2011). Key inquiries include the design of coopetition technology-enabled network models for value cocreation and the technological artefacts necessary for enabling coopetition in SME networks. Leveraging S-D logic, a foundational approach includes (1) identifying actors involved in resource integration, (2) detailing resource integration and service exchange processes, (3) understanding institutions and institutional arrangements within ecosystems, and (4) developing a technological system to facilitate Coopetition throughout the service process.

4.3 Research Priority 3

A proof of concept for coopetition networks for value cocreation is paramount (Hevner *et al.*, 2004). It involves demonstrating the coopetition technology-enabled network viability for value creation, particularly its capacity to foster coopetition interactions among manufacturing rivals SMEs. Essential questions include identifying instances where coopetition is enabled by technology within networks. To execute this priority, a proof of concept involves utilizing a technological artefact in manufacturing SMEs, employing service blueprinting to document coopetition interactions, and comparing Coopetition dynamics before and after technology enablement.

4.4 Research Priority 4

This priority focuses on observing and quantifying the artefact's effectiveness in addressing identified problems (Peffers *et al.*, 2007). The evaluation phase is crucial for assessing the benefits of Coopetition networks for value cocreation concerning manufacturing SMEs' digital supply chain vulnerabilities. The goal is to utilize the developed technological artefact in a specific manufacturing SME case, evaluating their operational

improvements when transitioning to coopetition technology-enabled networks. Research questions revolve around the innovation outcomes attributable to a coopetition network. It involves conceptualizing a framework for assessing manufacturing SMEs' performance improvements, benchmarking quantitative KPIs, collecting data from SMEs transitioning to technology-enabled networks, and evaluating the impact on innovation outcomes. Should the coopetition network not yield expected improvements, a redesign will be considered, adhering to DSR guidelines (Peffers *et al.*, 2007).

5. Conclusions

Guided by the research question, "How can methodologies be developed to enrich knowledge and fortify cooperation networks among manufacturing SMEs?", this study systematically addresses the complexities of cooperation in the digital transformation era. Utilizing DSR and the foundational principles of S-D Logic, a comprehensive framework has been developed to enhance the understanding and effectiveness of cooperation networks. These conclusions underscore the necessity for resilient methodologies that foster knowledge enrichment and strengthen the structural and operational aspects of coopetition among SMEs. The proposed framework highlights the indispensable role of technology as both a facilitator and a critical component of these networks, enabling SMEs to achieve competitive advantages, drive innovation, and sustain economic growth.

Furthermore, the research revealed a significant attrition rate within digital networks, indicating a stark survival challenge for SMEs not backed by industry leaders. This finding emphasizes the urgent need for methodologies that promote equitable benefits and ensure the long-term sustainability of coopetition networks.

Looking forward, future research must continue exploring innovative approaches that define value creation, develop and test new artefacts, and assess their practical applications within the ecosystem. Such efforts will advance theoretical understandings and provide actionable strategies for SMEs to navigate and thrive in the evolving digital landscape. Finally, this research contributes to the strategic discourse on cooperation, offering SMEs a pathway to effectively harness the potential of digital transformation and cooperation strategies.

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A Bidirectional Research Method to Design a Smart City Evaluation System

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Abstract: This paper develops a two-way research method – both top-down and bottom-up – to define a "standard but tailored" assessment framework for smart cities, based on shared smart city concepts, but designed to respond to different needs of each city. The method aims not to design a measurement standard, but to define a process able to create the best smart city measurement system. It is based on a standard framework but tailored on each city – with its own features, problems, values, and ideas about the quality of life. This method overcomes the limitations of using standard framework, as it links smart city assessment tools to local policies but giving to the tool the authoritativeness deriving from the scientific literature and the robustness acquired from international nest practices. An empirical implementation supports the theoretical background and allows to validate the method, as it has been successfully implemented in Genoa, a medium-sized city in Italy looking for its own performance measurement system that allows comparison with other smart cities at the same time. The bidirectional method is designed by the authors of this paper, and it is a novelty in the international literature about research methodology for business and management studies.

Keywords: Research method, Smart city, Performance, Indicators, Evaluation, Assessment

1. Introduction

During the latest 15 years, smart cities have been spreading all over the world (Dameri, 2013), starting from the largest and most important metropolis (Mora and Bolici, 2017) and involving an even higher number of cities, especially in Europe and North America (Martin et al., 2018).

In the meantime, many measurement systems flourished, aiming at assessing the smart city implementation (Brorström et al., 2018). These measurement systems are based on a set of indicators, collected at the international level, able to compare all the smart cities each other (Sharifi, 2020).

However, these measurement systems share the same weaknesses: they are composed by a set - sometimes very confined - of indicators, chosen arbitrarily or without specifying the underlying theoretical model; they can measure the smartness only of the largest cities in the world, and are opaque, lacking clarity and transparency about the data sources (Gazzeh, 2023).

These aspects imply that such measurement systems are not useful to manage and govern the smart city implementation by the local government. Indeed, these indicators are too general and inadequate to understand the specific situation of each city, as well as not linked with the local policies (Dameri and Rosenthal-Sabroux, 2014).

Given this situation, two research questions arise. The first question regards the dilemma between standard and tailored tools: how to link the smart city measurement tool to local specificities and at the same time allow for comparison with other cities? The second question concerns the quality of the tool: how to define a personalized tool that is robust and authoritative?

The present paper addresses both these research questions. It develops a bidirectional research method to design standard but tailored smart city evaluation systems, including the indicators useful to both assess and communicate the smartness and to support the political decisions of the local government aiming at improving the smart city (Dameri, 2017). Being rooted into the scientific literature and the best international practices, the tool is robust and authoritative and allow the comparison; being developed accordingly to the needs of the city and the feedback of the stakeholders and community, the tool can support local policies and decisions.

The research is based on a case study, investigated through the interventionist approach, as the authors have overseen the implementation of the smart city measurement system in a medium Italian city.

The paper continues as follows. Section 2. examines the extant literature and Section 3 explains the research methodology, Section 4. analyses the case study, Section 5. discusses the findings and Section 6. concludes.

2. Literature Review

Since the beginning of the smart city era, academicians, local governors, and companies tried to define this phenomenon (Dameri and Cocchia, 2013). Even if several different definitions are available, three concepts are at the core of a smart city: the territorial and political aspect, referring to the urban area (Nam and Pardo, 2011); the role of the most innovative technologies (Lee et al., 2013); and the aim of the smart city to improve the quality of life in city (Silva et al., 2018). Given these concepts, it is necessary to align the smart city measurement and assessment system to the smart city aim, that is, the improvement of the quality of life (Lombardi et al., 2012). However, this doesn't always happen.

Performance measurement in smart city is a difficult task, considering the multidimensionality of the smart city and the ambiguous concept of quality of life (Karal & Soyer, 2024). Respect to the first point, smart city measurement systems have often been designed considering multiple values and evaluation dimensions (Albino et al., 2015). Akburak et al. (2023) attempt to reorder all the indicators, after a very thorough investigation of the most popular evaluation models developed to measure the performance of smart cities. They note that there is an open question on how to select and use the right indicators in such a vast context. Recently, Fang & Shang (2024) suggested organizing the dimensions and indicators into two pillars, where the capacity pillar focuses on infrastructure readiness and the performance pillar evaluates the quality of various urban services.

However, the technical aspect of a smart city often prevails respect to the human aspect, and indicators are especially focused on the technological equipment of the city; but to measure the technology means to measure the tools, not the outcomes (Nam and Pardo, 2011). Moreover, the quality of life is not easy to define, and it varies from one city to another. Therefore, a smart city measurement standard is not the best solution to evaluate the smart city performance (White, 2018).

Respect to the link between quality of life and smart city, several academic papers suggest linking the idea of smart city perceived by citizens with the indicators, to individuate smartness drivers and link them with the desired outcomes (Yigitcanlar et al., 2018). Tu (2018) suggests designing subjective scores derived from the experiences and feelings of citizens' insight into their true perceptions of smart cities. However, such a way to work creates bias: these indicators are not immune to contextual factors affecting cities and citizens (deOliveira et al., 2024).

Another problem arising from several works regards how to choose between the huge number of standard tools for smart city measurement. The international literature about smart city assessment tools includes a very high number of so-called standards; Sharifi (2019) selects the most relevant ones: they are 34. Excluding 5 of them, because regarding only a specific aspect of a smart city, the remaining 29 ones are suggested as standard tools, to be applied to all the smart cities. Several tools are not global ones but designed to be applied in a well-defined geographical area. However, smart cities are not the same all over the world, and to apply a standard smart city assessment tool totally neglects the geographical differences and specificities.

Moreover, standard smart city assessment tools are generally addressed to large cities; indeed, Berksova et al (2018) find that there is a relation between the city dimension and the most suitable indicators to measure its smartness; therefore, indicators selected for large metropolis fit badly with medium cities.

Standard smart city assessment tools are generally theoretically designed, starting from the theoretical definitions of smart city. They are defined by a top-down process and appear like a list of indicators, completely disconnected with the local policies and initiatives (White, 2018). On the contrary, effective smart city assessment tools should be conceived not merely like a measurement system, but as a decision-support system. However, smart city assessment is rarely applied to evaluate urban policies, leading to unjustified decisions and unnecessary investments (Fang & Shan, 2024).

Indeed, the city smartness does not increase by itself: as stated by Yandri et al. (2020), city smartness needs a set of well-defined local policies, linking governance to smart projects and expected results. Moreover, if the smart city assessment system is designed to link policies and city smartness, it allows also to focus the smart policies on citizens' needs and expectations and to use the smart city assessment system as an accountability tool (Picioroagă et al., 2018).

Finally, the literature analysis discloses that both scholars and institutions design smart city measurement tools, therefore there are a lot of such frameworks available (Sharifi, 2019). However, these tools have often been designed to compare smart cities each other, and not to define a decision support system for local smart

policies (Borsekova et al., 2018). The suggested tools are generally designed starting from a strong literature analysis and therefore they are theoretically affordable and robust. However, there are no ways to assert that a tool is better than another and no ways also to choose the better tool for a certain smart city (Huovila et al., 2019). Such tools are like a black box for a local government, unable to choose the better one and to link the measurement tool to the local smart initiatives. Such measurement tools remain as superstructures totally separated from local policies (Praharaj et al., 2018).

3. Methodology

The research methodology supporting this paper is a case study investigated though interventionist approach (Roberts et al., 2010). In this case, the researchers are also the persons charged to design and implement the smart city measurement system in Genoa, a medium city in Northern Italy (Dameri, 2014, Bruzzone, 2021).

The longitudinal case study has been starting in 2020, when the Municipality decided to develop a system to measure the smart city performance, tailored on the specific needs of Genoa, but also able to compare the city's results with similar cities in Italy and Europe.

The researchers played two roles concurrently: from the one side, they drove the path to design and implement the smart city measurement system; from the other side, they collected the materials to study the case and generalize the findings.

During the design and implementation phases, the researchers collected materials, especially minutes from the several panels and meetings involving municipal politicians and officials, experts, and citizens. These materials have been manually coded and are the basis for the discussion. The interventionist approach allows the authors to be involved in the case study, to directly observe the behaviours of all the actors, and to collect materials otherwise not available.

4. Implementing a Smart City Measurement System: A Bidirectional Approach

4.1 The Requirements

Genoa is one of the most important cities in Italy, counting around 600.000 inhabitants. Moreover, starting from 2009, Genoa launched a program to become smarter (Grossi and Pianezzi, 2017). Ten years later, despite the high number of projects implemented by the Municipality together with a large set of partners, nothing had been done to measure if and how these projects and efforts created quality of life for citizens.

At the beginning of 2020, the Municipality asked to the University of Genoa, Department of Economics, to start a program to define and implement a performance measurement system, able to respond to several requirements.

- The first requirement was to create a system tailored on the specific needs and problems of Genoa, instead of being the uncritical adoption of a standard method.
- The second requirement was to link the measurement system to the political decisions of the local administrators; the mayor had the specific need to monitor the smart Action Plan designed by the city council and under implementation.
- The third requirement was to design a system able to support the comparison between Genoa and other similar cities in Italy and Europe, as well as able to communicate to the citizens the outcomes of the smart projects implemented in Genoa.
- Moreover, the mayor of Genoa asked to define the measurement system so that it could include data from the latest five years: therefore, data should already exist and not to be collected specifically for the project.

It was immediately clear that the standard measurement systems known worldwide were not suitable. First, they were designed for large cities, and not able to catch the problems and features of a medium city such Genoa is. Moreover, the indicators are not linked with the political goals of the local government, therefore not able to support the political decisions. Finally, they are not clear respect to data sources and the calculation methods, and impossible to replicate at the local level (Patrão et al., 2020).

The decision was to study how to design and implement a system with these features: tailored on the features of Genoa, linked to the local policies, able to compare Genoa with similar cities, and based on existing data.

4.2 The Bidirectional Approach: Top-Down and Bottom-Up

The requirements about the smart city measurement system to be designed were opposite: from one side, a tailored system is required, from the other side, the same system should be enough standard to compare Genoa with other smart cities.

To build such a system, a bidirectional approach has been conceived. From top down, a literature review helped to study standard smart city measurement systems worldwide. From bottom up, smart city local aims, ideas, and priorities have been collected, and finally the two streams of knowledge merged (Dameri, 2015).

The literature survey investigated both academic papers and professional reports regarding tools and frameworks to measure smart city performance. The investigation is based on Sharifi (2019), collecting 34 smart city assessment tools. From these 34 ones, 5 have been excluded from this analysis, as regarding only one aspect of a smart city (for example, IoT, digitalization, and so on). The remaining 29 tools have been analysed and compared each other; indicators have been compared and listed; the same or similar ones have been listed only one time. The resulting list includes 176 indicators and is the basis for the design of the smart city measurement system for Genoa.

In the meantime, a bottom-up approach was followed, involving both policy makers and technicians from the municipality and panels of experts. The panels were three, each of them was organized to face a specific smart theme: environment, infrastructure, and socio-economic aspects.

The panels were conducted in two steps. The first step was based on a brainstorming approach: experts were free to speak about what a smart city is, which its aims are, how these aims really impact on the life of the citizens or on the quality of the city itself. After the first step, the minutes of the panels were manually coded to extract the recurrent keywords; these keywords were used to define the most important smart city themes as they arose from the experts.

During the second step, the keywords were shared with the experts, and they were stimulated to better analyse these keywords respect to Genoa smart city, its dimensions, its goals, and the way to reach them, the benefits for the citizens. At the end of these two phases, the researchers had at their disposal a list of themes, the most important to define a smart city really pursuing the quality of life for its citizens. Each theme included several aspects to be pursued and all the aspects are listed respect to their importance and priority for Genoa.

At the end of the bidirectional approach, the researchers had therefore a list of 176 standard indicators, and a list of themes for Genoa smart city. The smart city assessment tool has been built from the merging of these two aspects.

4.3 The Data

Another important requirement for the smart city measurement system was to have the data to fill in it. This aspect is of capital importance, as several good smart city measurement systems have been well defined on paper, but never implemented owing to the lack of data (Putra et al., 2018).

To solve this problem, the researchers worked as follows. First, all the indicators included into the standard list were analysed; values to fill in these indicators have been searched on authoritative and reliable sources, such as ISTAT (The Italian Statistical Institution), Eurostat and so on. For each indicator, we had three different results:

- We found the data to fill in the indicator.
- We did not find the data to fill in the indicator, but we found data to fill in a proxy of the indicator: the indicator is replaced by its proxy.
- We found neither the data to fill in the indicator, nor proxy data, therefore we cancelled the indicator.

At the end of this process, the smart city measurement system included 160 indicators, filled in with affordable data. 16 indicators have been cancelled as the data for their completion was missing. Comparing with the 29 smart city assessment tools investigated (Sharifi, 2019), 160 indicators are a very high number, therefore, to cancel 16 of them do not affect the quality of the measurement system.

As data have been collected from open databases, it is possible to fill in them for all the 117 Italian provincial capitals and to obtain the comparison requested by one of the requirements.

4.4 The Standard-But-Tailored System

The list of themes and indicators defined in the previous steps can ensure the benchmarking, but not the tailored analysis for Genoa smart city (Brorström et al., 2018; Lombardi et al., 2012). To build a tailored system from the standard data, the aims and priorities should be considered. These priorities define the main aims that Genoa smart city should reach respect to its strengths, weaknesses, and the political direction chosen by the mayor and the municipal council.

For each theme, a subset of the standard indicators has been selected, composing a dynamic and customized aggregation of data about the city smartness. This aggregation can be applied to each of the 117 Italian provincial capitals, ensuring the benchmarking, but the most important result is that such subsets of indicators are the one responding to the city needs and to the political priorities of the local government. It permits to link the local policies with measured performance and to drive the political choice to prioritize the smart city goals more important for Genoa (Dameri, 2014).

For example, Genoa is a city especially weak respect to floods, and resilience priority could address political decisions towards some smart city initiatives, such as to reduce soil consumption and waterproofing (Grossi and Pianezzi, 2017). In the meantime, such indicators can be used to communicate to the citizens both the political choices and the obtained outcomes, and to gain consensus (Grossi et al., 2020). Such a smart city measurement system is therefore also an accountability system because it permits to evaluate the returns on public investments (White, 2018).

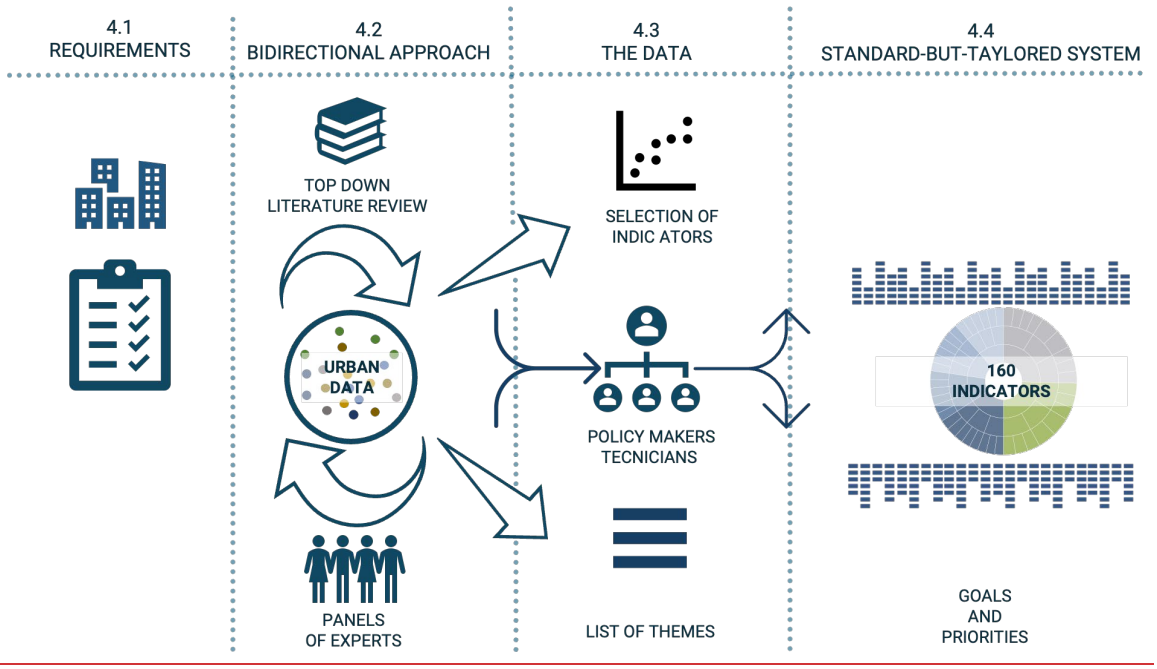

Figure 1: The Smart city measurement system (source: elaboration by the authors)

5. Findings and Discussion

5.1 A Four-Phases Process

The theoretical research linked with the empirical case helped to obtain important findings about how to implement an effective smart city evaluation system. The most important aspect is that the research activity suggested a process instead of a measurement framework. Indeed, both the scientific literature and the empirical implementations offer several examples of smart city measurement systems; however, to adopt a standard method was in contrast with the requirements of the mayor, as a standard measurement system responds to the need to measure a generic smart city and it is not ever suitable with the need of a certain city. And even more, a standard system is rarely conceived to support the local policies of the same city. However, to develop ex-novo a measurement system poses the problem of choosing the indicators.

The answers to these questions are therefore in a process able to start from a standard method but driving the city to adapt it to its own features and needs, through several phases addressed to safeguarding the integrity

of the obtained system. The process arising from this research is composed by four phases, as showed in Figure 1.

1. Requirements: during this phase, then policy makers define the requirements they ask for the system; it is of capital importance, as in this way the system is designed accordingly with the need of the policy makers and it prevents they do not use the tool. This problem is frequent for standard systems, that are not aligned neither with the requirements, nor with the political needs.
2. Bidirectional approach: all the stakeholders are grouped in panels of experts and cooperate to define the features of the measurement system but starting from a proposal made by the researchers and derived from the scientific literature. In this way, the system is authoritative and tailored concurrently.
3. Data selection: given the directions from the panels of experts and seen the scientific literature, is now possible to select data for the measurement system; data should be chosen granting soundness and neutrality, extracting them from authoritative sources able also to deliver data continuously in time.
4. Standard but tailored: the resulting measurement system is designed referring to standards arising from the scientific literature, but tailored respect to the requirements of the policy makers, the prior themes of the city and the availability and soundness of the data. It allows to use the system to support political decisions, to measure the performance of just such decisions, to communicate the results to the citizens accordingly with their expectations linked with the city priorities, and to pursue accountability of the politicians towards their electors.

The four-phases process answer to both the research questions. The first RQ regards how to overcome the dilemma between standard and tailored measurement system. The solution is a process that allows to tailor the systems starting from a standard, giving to the system enough personalization but maintaining the essential forms and features of the starting model. The second RQ regards how to assure enough quality to a tailored system; the answer derives from the method adopted to implement the system, based on three authoritative sources: the scientific literature, that deliver the basis for designing the measurement system; the participation of both the policy makers and the stakeholders, that grant the alignment of the system to the requirements and the priorities of the city; and the authoritativeness of the data sources, that prevent from self-referentiality and bias.

6. Conclusions

Several smart city assessment tools are available in literature, designed by both scholars and institutions. These tools are often conceived to measure the city smartness to create rankings and compare smart cities all over the world, individuating the smarter one. For this reason, they are suitable to large cities and difficult to apply to medium or small cities (Borsekova et al., 2019). Moreover, these tools are often opaque, it is not possible fond the data spurces and to understand why some indicators have been included (and some others not); and it is also impossible to understand the formulas used to calculate the rankings (Sharifi, 2019). For all these reasons, it is very difficult to implement such measurement tools at the local level.

Facing such difficulties in adopting and implementing a smart city assessment tool, several smart cities do not measure their performance (Picioroagă et al., 2018). Consequently, smart policies are not evaluated, political choices are not supported, citizens are not aware about the impact of smart city initiatives on their daily life.

To overcome these problems, the present paper suggests a process that permits to each smart city to develop its own measurement system, starting from a standard set of indicators, but selecting subsets of indicators linked with the specific city needs, priorities, problems, ambitions. The suggested process permits to pursue two aims concurrently: from one side, the assessment tool is robust, because built on the literature and the best practices about smart city measurement tools; from the other side, the assessment tool is customized and flexible, able to support the local policies, to measure the performance, and to communicate to the citizens.

The bottom-up approach permits to involve policymakers, stakeholders, citizens in defining their own smart city assessment system: this system will be something in which all the actors can recognize themselves and not a superstructure. To select specific subsets of indicators is a way to link smart initiatives to expected outcomes and the smart city measurement system also becomes an accountability tool. Such subsets can be further re-selected, accordingly with new priorities or political aims (Silva et al., 2021).

This process has been successfully implemented in Genoa, a medium city in Italy looking for its own smart city measurement system and the comparison with other smart cities concurrently. To better validate the process, further implementations are needed, and the authors are already working for this aim.

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Rational Thinking in Complex Qualitative Business and Management Research Using Systems Methodologies

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Abstract: This paper describes the application of Systems Methodologies when dealing with complex qualitative business and management research studies, when seen in their true light, as "wicked projects". It will demonstrate the power, flexibility and effectiveness of these approaches. This paper focuses on studies undertaken by mostly part-time postgraduate students on Business and Management related degrees who are managers in their full-time roles. Such research studies in the "messy" real world often deal with complex, difficult, unstructured and ill-defined problematic situations, with many stakeholders, multi-perspectives, uncertainties, soft factors. Hence "wicked projects". Systems methodologies and Soft OR (Operational Research) are very suitable approaches for structuring the research project, gathering data, carrying out rigorous analysis, and enabling clear, unbiased and rational thinking. They provide the researcher with a fully informed holistic approach. They have been employed successfully by the author, when supervising, or in collaboration with students undertaking research studies or dissertations. Soft systems methodologies are not mainstream, and thus are often ignored in university research methods courses, and rarely mentioned in business research methods books. Yet they help the student design the project, help the supervisor guide the project, enable clear communications between the participants in the research, and aid collaboration. They are highly efficient and effective, and will deliver "joined-up thinking!" The paper will describe the studies carried out, and methods and techniques chosen. They have proved of real value to the students, not only in their degrees but also in the learning and development needed for their ongoing managerial roles, to the organisations in question, and to advance knowledge in the particular field.

Keywords: Systems thinking, Holistic integrity, Problem structuring methods, Soft OR, Applied business research, Dissertations

1. Introduction

I have taught Soft Systems Thinking for more than 20 years to British university postgraduates and undergraduates on Business School degrees. Soft systems thinking overlaps Soft OR (Operational Research) and Problem Structuring Methods (PSMs). It adds rigour and rationality to a holistic, pluralist approach in practical interventions, in order to tackle challenging, strategic level problems in the always complicated, difficult real world. Ackoff (1979) coined the term "mess" for these systems of changing, interconnected problems. Rittel and Webber (1973) called them "wicked problems".

Operational Research (OR) overall comprises a range of powerful approaches to support people taking difficult decisions or solving complex problems. These approaches can be split between i) traditional "hard", quantitative methods, and ii) "soft", qualitative methods.

After a few years, it became clear to me that soft methodologies ought to be equally useful for high quality Business and Management applied research studies. The researcher could be an academic or a student, but equally might be a manager carrying out a research project, or taking important decisions within their organisational role. Soft OR-research-based "interventions" pursue action, organisational change and improvement. Equally, they pursue practical knowledge, of area and of method. Thus, I equate the goals of OR with those of Applied Business Research.

But, as business research methods, soft systems /soft OR methodologies are anything but mainstream. They are ignored in typical university business school research methods courses, and almost never mentioned in the most referenced business research methods books. Very occasionally they appear at Business Research conferences!

Yet I have used these methods or encouraged the use of them, as the main research methodology, for around 20 years, when supervising, guiding, and working with managers and professionals, carrying out dissertation projects as part of their professional Business-related degrees at the University of Hertfordshire's Business School. These wide-ranging projects have been highly successful.

The paper describes what is a de facto Action Research programme, made up of these studies over the years, and will aim to show how valuable soft systemic approaches and techniques are for effective applied Business and Management research of all kinds and scales. We will make use of Checkland's FMA schema that can represent any research, and the learning gained, given a declared framework of ideas (Checkland and Scholes 1999). ***See Figure 1.***

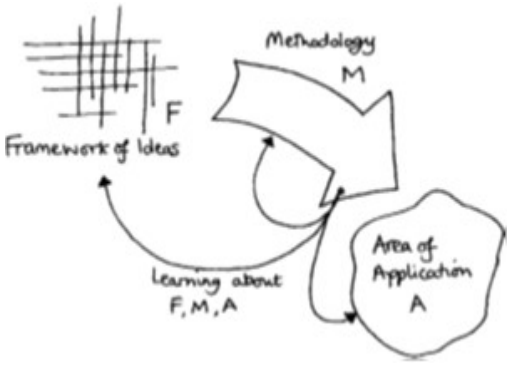


Figure 1: Checkland's view of "any research"

2. Applied Business and Management Research and its Challenges

Given the particular situation, many choices must be made in the course of Business Research, and these *are major challenges facing the researcher* (Saunders et al 2019, Alvesson and Sandberg 2021). The researcher's own values, beliefs, experiences, training and research community determine paradigm choice, which in turn influences theory building, and the research methods chosen - the "research strategy," and then research design or the framework for data collection and analysis techniques, and hence interpretation of results, findings and conclusions (Bryman and Bell 2015).

Mantere and Ketokivi (2013) stress the importance of creative, cognitive reasoning and the role of abduction in Management research, rather than computation and deduction, and that human rationality in computational reasoning is inevitably limited. It is *cognitively idiosyncratic*, and depends on the researcher (Mintzberg 2005). The academic researcher's thinking thus shares many features with that of the manager; it cannot be invariantly objectively rational. But "scholars" are trained to be methodologically rigorous and thus their role should be to help practitioners / managers in the process of gathering, and interpreting evidence, rather than providing evidence on which managers should act (Mantere and Ketokivi 2013). Eden (1982) argues for researcher or consultant to aid the manager or client with *problem construction*, rather than problem solving

I will argue that we must then provide this idiosyncratic, interpretivist and imaginative research with a rational base, and thus bring intellectual rigour to the subjective.

It is clear that Business and Management research is messy! (Saunders et al 2019). First, in terms of the *subject matter*, as the real world of business is often chaotic, turbulent, confusing, (Mitchell and Rich 2020), and full of "wicked problems" (Brown and Rich 2020).

Second, the *research process itself* is complex and not linear, involving many conceptually different steps that require a variety of skills, including a high level of creativity *(*Rich, Brown and Banerjee 2019). It is messy. There are many things that can go wrong with research projects (Bryman and Bell 2015). We need awareness of the "complexities involved in conducting high-quality qualitative research" especially, (Cassell et al 2009).

Business and Management Research must have both theoretical and methodological rigour and practical relevance, to be pragmatic science, and thus valuable knowledge to managers (Saunders 2019, Mingers 2015). Bateson (1980) argues for a balance between rigour and imagination, Pidd (2003) for both analysis and insight. The author argues for a transparent clear basis, or representation of complex problem situations, in order to achieve imaginative, insightful but rational thinking.

Thus, for success in complex applied business research, we need both procedural rationality (Pidd 2004) and procedural justice (Eden and Ackermann 2004). Why? They are the essential elements if we are to achieve any degree of what I have called *"holistic integrity"* (de Villez 2021).

Pursuing holistic integrity means explicitly and in practice, pursuing the best result possible overall, an outcome with the fullest integrity, for the whole problem or wider situation in all its dimensions. Hence it will have a holistic and not just a partial integrity, whether it is research, a project, a dissertation, important decision, or problem resolution; so, really, anywhere where effective, rational thinking matters. Yet we are usually happy with an outcome that has only partial integrity, something that can prove very unsatisfactory and risky, and even disastrous, in a mess!

3. The Masters / Professional Degree Dissertation

The Dissertation is the research component of postgraduate or undergraduate degrees. With Management Masters or MBA degrees, Fisher et al (2004) see it as a major project where the student identifies an issue of managerial / organisational or business concern, and researches it. It contains a thesis, an argument supported by evidence and literature. Usually done in the latter half of a one-year full time degree, or in the second year if on a part time basis, most work is done in concentrated periods and over a few months. Much of the author's experience is with mature students taking degrees on a part time basis, who are managers in full time roles, and for their dissertations are tackling problems they face in their current roles within their own organisations.

Writing about students doing Business /Management Research projects, Cassell (2018) identifies a need to "manage the complexity as associated with the current managerial climate", and Mitchell and Rich (2020) speak of " a chaotic and demanding Business environment". The Business or Management dissertation process is bound to be a complex, "messy" activity, especially the intellectual part of it (Riley et al 2000). It must be tackled systematically. It has a basic logic, a certain number of steps, but these don't constitute a linear process (Rich, Brown et al 2019). Vos et al (2019) identify the challenges facing the Business postgrad student and supervisor engaged in a dissertation.

Qualitative analytical processes can be messy and ambiguous. Accepting and dealing with this is similar to the creativity needed for managing complexity, strategy, and innovation. Cassell et al (2009), and Cassell (2018) argue that the experience of carrying out research, and especially qualitative research, as a student, can be seen as essential for a manager's development in a wide range of different skills and capabilities.

For Grant (2003), dissertation supervision is a complicated, uncertain practice, which involves an unpredictable pedagogy. Macfadyen et al (2019) identify the functions required of the supervisor: to challenge, nurture and maintain standards, thus a three-sided holistic model of supervision. There is a need to tailor the approach to each student's motivation, readiness and situation.

4. Business Research Seen as Wicked Projects

Real-world issues of any importance are "wicked problems". There is always a tangle of issues and no consensual problem formulation, giving rise to complexity. Within the field of project management, a *"wicked project"* is a project which tackles a wicked problem, and therefore the project process and activities will have some or all of the characteristics of a wicked problem (Finegan 2010). Thus, any Applied Business and Management Research, including dissertations in this field, can usefully be viewed as wicked projects! To be successful, the project's context, purpose and desired outcome must be fully understood, and the researcher's capabilities and those of any facilitator / supervisor and participants taken account of. Then it can be tackled in the right manner, using the right approach and methods.

5. Research Approach and Researcher Capabilities Needed

We have identified the key elements needed for a high quality, messy real-world applied business research project: holism, pluralism, rationality, relevance and imagination, thus giving to the overall project outcome a degree of *"holistic integrity."* We need a research philosophy, an approach, methods and techniques that can cope with the content, the complex real-world issues, and that will best support the difficult, challenging messy research process.

The researcher must also have the required skills, knowledge and capabilities, as identified above. This applies to all types of researchers: the academic or scholar, managers in their roles, managers as students, and academics guiding / collaborating with managers.

We need methods that will give procedural rationality (Pidd 2004) and procedural justice (Eden and Ackermann 2004), if we want buy-in by managers or clients, acceptance of recommendations, their implementation and tangible change. Methods must accept that the researcher is engaged in a cognitive and creative activity rather than a computational one (Mantere and Ketoviki 2013), and so help the researcher in this endeavour, by being transparent, recoverable and defensible, and matching appropriate qualitative research criteria.

We want methods that enhance our research, that can handle dynamic complexity, the connections / relationships, so crucial within any problem situation. And we need a range of methods to work well in different phases of an applied, intervention type research project (Mingers and Brocklesby 1997), and approaches that will get us to do more interesting and imaginative research, as advocated by Alvesson and Sandberg (2021). For

successful interventions, the involvement of participants /stakeholders is essential, and facilitation skills from within the researcher team are a must therefore, to manage the process as a well as the content.

With the *dissertation* form of applied Business Research, especially, we need methods that will help communication between all the parties involved, and I would argue, via model use, to ensure clarity and transparency, and enable us to be efficient and effective. This is because of the limits and difficulties peculiar to the dissertation: the constraints on time, access to participants and information on the situation, and less likelihood of a take-up of recommendations.

High quality qualitative research requires sensitivity to context, commitment, rigour, transparency and coherence (Cassell and Symon 2004). We have seen also how the experience of doing research, and teaching the right research methods can develop the very capabilities in Business students that they will need in their future roles (Cassell 2018, Mitchell and Rich 2020, Brown and Rich 2020.)

The outstanding candidate for research methods to employ in applied business research is the powerful range of methodologies known as soft OR (Operational Research), or PSMs (Problem Structuring Methods). They have been developed to explicitly tackle real-world wicked problems and messes, and carry out action research type interventions of all kinds, that conventional research methods / hard OR methods are so ill-equipped to do.

6. Soft Systems Thinking / Soft OR

Soft OR comprises methods for representing problem situations in ways very suited to effective analysis and manipulation and thus to explore, understand and address important, complex matters of concern. The term "soft" here means taking a qualitative or interpretive but powerful, flexible and effective stance. A soft model is a tool to support clear, unbiased and effective thinking and the basis for coherent discussion or debate (Pidd 2003), as it represents the different views about the world, rather than a single assumed "objective" reality. Soft methods and techniques are often more clearly defined, made more explicit and employed more rigorously, and certainly with greater transparency, than mainstream, conventional, hard approaches.

Thus, the soft OR approach is very suited to the individual researcher or research team working in difficult, messy multi-perspective situations, where the outcome, the research or dissertation success or failure emerges from the complex whole. "[The methods] ……provide the researcher with a fully informed holistic approach that can be used flexibly and indeed tailored to the problem situation at hand" (de Villez 2016).

Smith and Shaw (2019) argue that studies using PSMs can meet the tests of validity for qualitative or mixed methods research. Welch (2012) maintains that a holistic stance for effective research in Business and Management fields is needed.

Soft systems approaches typically used in the studies in question are Soft Systems Methodology (SSM) (Checkland and Scholes 1999), SODA (Eden and Ackermann 2001), and qualitative System Dynamics (Sterman 2000). Soft OR techniques and models such as cognitive and causal mapping (from SODA), root definitions and conceptual models (from SSM,) and causal loop diagrams (from SD), must be used correctly to ensure a rigorous and so effective process. Other techniques include rich pictures, semi-structured interviews, and comparison tables.

Different soft OR methodologies can be used together, thus "mixed methods". They can be used with quite different and more mainstream research methods such as Lean, or statistical analysis. Good examples of successful PSM/ soft OR-based applied mixed methods research are the studies of Hindle and Franco (2009), Holm et al (2013), Ufua et al (2018).

The use of soft models is one essential element of Soft OR and PSMs. Another key ingredient is facilitation. With models, facilitators and stakeholders, we can determine coherent strategies and ways to problem resolution.

6.1 Soft OR Methodologies and Techniques

6.1.1 The soft systems methodology

The soft systems methodology approach is illustrated in the diagram in ***Figure 2.*** It is a structured, pluralist approach to organise our thinking and make us rational. Building systemic activity models of imaginary or wished for activities, with the stakeholders, stops us focusing on and trying to solve what we think the problem is! Instead, each model gives us the *right* questions to ask in the situation, and forces us to explore and discover the real problems. We can then use stakeholder experience and knowledge to negotiate what can be done to improve or resolve the complex issue.

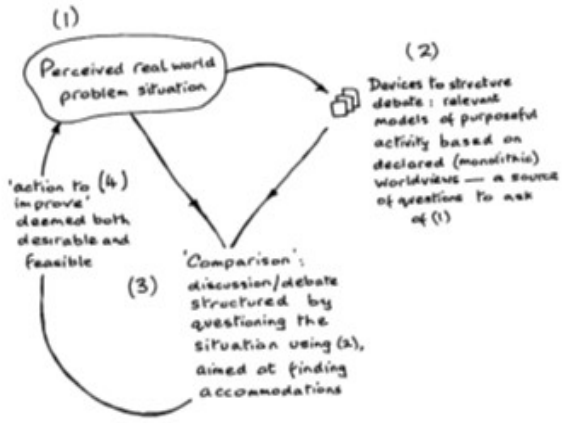


Figure 2: From Checkland and Poulter (2006). The Stages in SSM. Approach

Rich pictures capture, pictorially, in a single snapshot the main entities, viewpoints, structures and relationships in a situation, the main activities, current recognised issues / concerns and potential ones, as in ***Figure 3.***

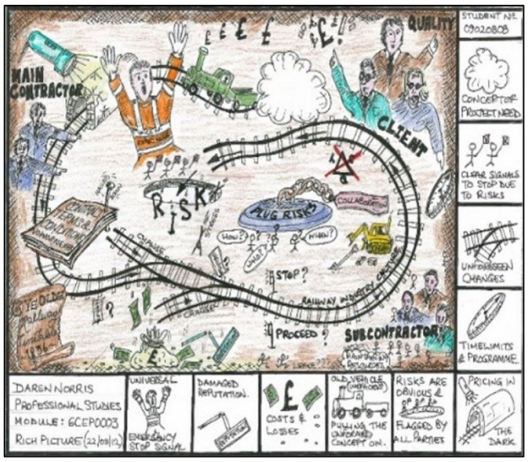


Figure 3: Rich Picture Example (SSM). Norris (2012)

The SSM purposeful activity model, is first fully defined in words in the "root definition", and then as a diagram, in the systemic, structured "conceptual model", that contains all the logically necessary linked steps. ***See example in Figure 4.*** This becomes the sound basis for checking on the real world, and taking a holistic approach, so, not leaving this to the inherently fallible, biased and parochial human being. By creating models for different stakeholder views, we gain pluralism also, the other main ingredient of a systems approach (Reynolds and Holwell 2010).

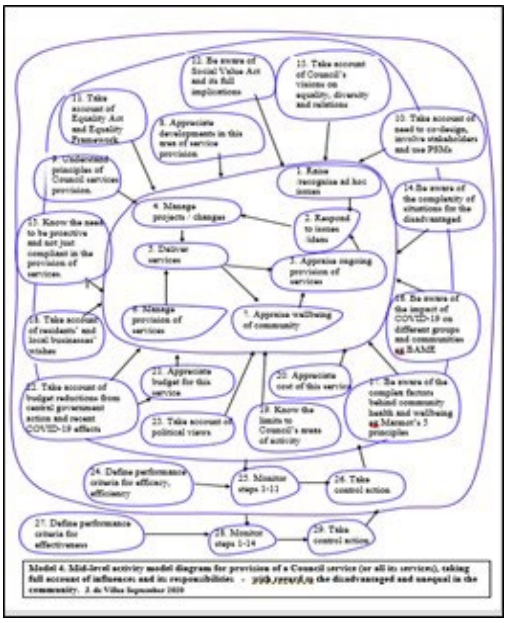
A system to recognise matters of unequal opportunity, discrimination and diversity, understand them and resolve them to the benefit of residents, families, diverse groups and communities of all kinds. This is done by raising issues of all types with regard to inequality and disadvantage and access to services, and by gathering information, carrying out monitoring, holistic analysis and clear thinking, effective decision making, and the implementation of projects designed with service users for change and improvement.

All of these are guided by an understanding of equality laws, regulations and wider Council responsibilities, and knowledge of diverse communities and of different types of inequality, disadvantage, lack of equal opportunity and discrimination. This is in order to achieve a just and efficient provision of services to all groups and communities, and a high level of wellbeing for all.

The system is owned by the community and the council and is staffed or operated by residents, representatives of groups, councillors, council officers, service providers and partners within the limits of reduced budgets, competing demands, communities' and groups' perspectives, and current political views.

It is needed because we must guarantee the wellbeing of the whole community, and make sure issues of inequality and disadvantage are understood, acknowledged and resolved

EXAMPLE ROOT DEFINITION



THE MATCHING CONCEPTUAL MODEL

Figure 4: SSM activity model to understand and tackle Inequality and Disadvantage among Ethnic Minorities during the COVID pandemic - Created August 2020 by the author for a UK county council

6.1.2 The SODA methodology

The SODA methodology employs cognitive mapping, following strict rules and guidelines, to capture and structure individual or group ideas on an issue or a problem situation, and their causal logic - how all these ideas are causally linked together. Individual or team / group semi-structured interviews are the usual means of gathering ideas from stakeholders. This *causal map* becomes a very effective tool for clear, creative and rational thinking by a group or team. ***See Figure 5.***

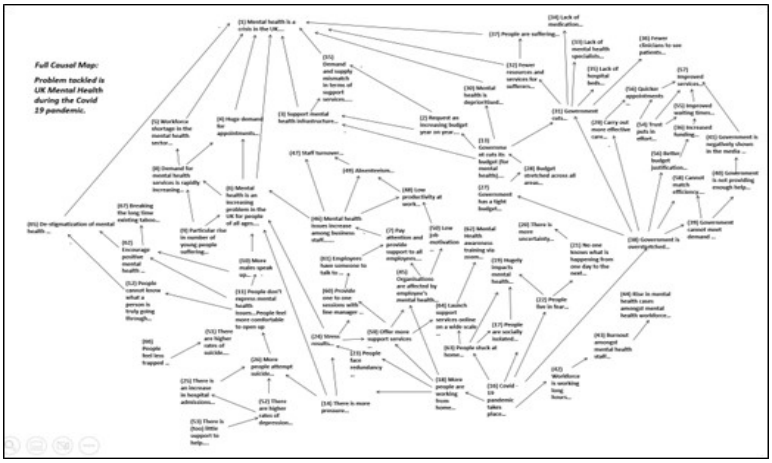


Figure 5: A Causal Map (SODA)

6.1.3 Qualitative system dynamics

Qualitative System Dynamics uses the Causal Loop Diagram to model loops of causality. Made up of connected variables, it demonstrates how the variables interact. Thus, a systemic view rather than our usual blinkered, linear view of complex situations. ***See Figure 6 below.*** It enables "a shift of mind", to an understanding of system behaviour, and that way we can shape / determine a wished-for future.

All soft OR can be used in two ways. *"Mode 1"* use is where the researcher is following a clear methodological framework, and stages; whereas "*Mode 2*" is a more flexible, more internalised use - to tackle a particular task,

when faced by the researcher in the research project. We should see both modes in use by any "serious researcher" in an intervention type project! (Checkland and Scholes 1999).

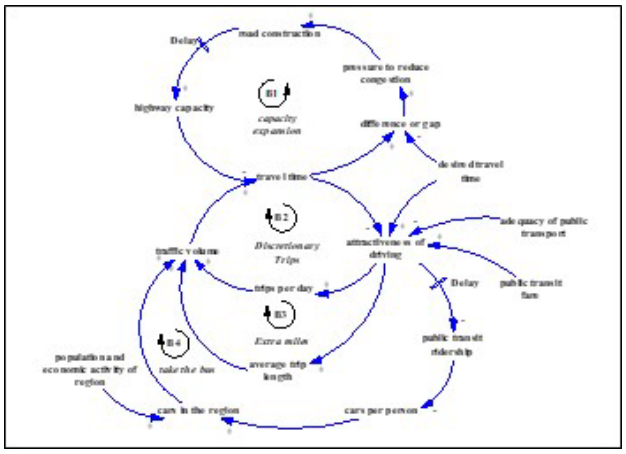


Figure 6: A Causal Loop Diagram (System Dynamics). Adapted from Sterman (2000)

7. Analysis of the Dissertation Projects

Taking up again Checkland's FMA view of any research, from section 1, for the studies under examination here:

The ***F or Framework of ideas*** or paradigm /philosophy is pragmatic, but will include soft systems ideas /systemic thinking.

The ***M or Methodologies*** embodying the framework of ideas, and their associated techniques. These are essentially Soft OR methodologies, so, SSM, SODA, qualitative SD, and CSH (Critical System Heuristics), but also hard OR and other methods combined with these eg statistical or Lean approaches.

One third of the 32 dissertation projects carried out between 2005 and 2020, and examined here, use one Soft OR approach, but two thirds use several different approaches, so are "multi-methodology". Of these, some use several soft OR approaches, some soft OR / hard OR, some soft OR and other Business / Management /Organisational Research methods ie. statistical analysis or Lean. See ***Table 1*** below for the number of times each approach, and each technique is used.

Table 1: Methodology and technique use in the 32 Dissertation sample

Methodology/ Methodologies	Number	Techniques	Number
Soft Systems Methodology (SSM)	11	SSM: Rich Picture	18
SODA	4	Root Definition	25
SODA / SSM	8	Conceptual Model	25
SODA /System Dynamics	1	Comparison Table	24
Statistical Analysis /SSM	4	SODA: Cognitive Maps	16
Statistical Analysis /SODA /SSM	2	SYSTEM DYNAMICS: Causal Loop Diagrams	1
Heuristic Inquiry Diary, /Statistical Analysis / SSM	1	PEST analysis	1
Lean /PEST /SODA /SSM	1	Lean: Value Stream, Flow Analysis	1
		Semi-structured Interviews	27
		Surveys / Questionnaires	5
		Statistical Analysis	5
		Heuristic Inquiry Diary	1

Lastly, we have ***the A or Areas of concern /studied/investigated***. The research carried out in these projects is Business or Management-related, and in most cases, is into problems directly facing the researcher, as manager or professional, at the time.

Projects range widely over messy problem situations of all kinds: from Three-way Collaboration in the Railway Construction Industry to Training Teachers to Cope with Autism, from Leadership in Fire and Rescue Services to Fraud and Corruption in Saudi Arabia Mega–Projects, from Access to Child and Adolescent Mental Health Services to Tackling the Black Student Attainment Gap in post 1992 UK Universities.

The Researchers involved. Most of the researchers are mature postgraduates or undergraduates in current or very recent middle or senior managerial, or other professional roles. Most are part-time students.

Dissertation Activities. To analyse what typically goes on within the above studies, we can divide up the sample's Soft OR-based intervention-type research projects into four phases, following Mingers and Brocklesby (1997). The four phases comprise *Appreciation, Analysis, Assessment and Action.* ***See Table 2 below.***

Table 2: Drawn by author. Traditional dissertation project stages contrasted with the sample's Soft OR-based dissertations viewed as 4 phases (after Mingers and Brocklesby 1997) **32**

TRADITIONAL DISSERTATION – STAGES – (iterative)	***SOFT OR - based intervention dissertation project - PHASES - (iterative)***
FEBRUARY - *choose area / submission of information on Area for Dissertation; Allocation of Supervisor – so pre-start.*	***APPRECIATION:*** *Declare Framework of Ideas and Method; Design Study / Approach Gather information / Data Secondary Data collection - Literature Review Primary Data Collection*
MARCH: Complete ethics application + start 1. Introduction.	
APRIL: *Finish* ***1. -*** *Introduction;* ***2.*** *Do* ***Literature Review.***	
MAY: *Finish Literature review;* ***4a.*** *start* ***Data Collection.***	
JUNE: 3. Complete Methodology.	
4b. *Carry out* ***Data Analysis.***	***ANALYSIS: of data =*** *findings/ results and make sense of situation*
JULY: Complete Data Analysis and 5. present Results/ Findings.	
6. Discuss Findings and write 7. Conclusions.	***ASSESSMENT:*** *discuss findings + results; Assessment = discuss conclusions /what changes to make*
AUG: Complete Conclusions.	
SEPT: 8. Make Recommendations. + References, Abstract, Complete Project and Submit.	***ACTION*** *= recommendations; implement changes; study outcomes.*

The Dissertation Activities in practice:

1. Appreciation of the situation. *So, what is happening?* There is initial identification of the problem to be tackled by the student researcher, plus design of the dissertation study eg using SSM. We discuss and agree how to work together! The input needed from myself, as supervisor, will differ with each project and student, but the approach is very much a collaborative one.

A comprehensive literature review is done. Primary data collection aims to capture the "situation as experienced by practitioners and expressed by actors in the situation" (Mingers and Brocklesby 1997). Semi-structured interviews are always most effective for this, but sometimes it is done in these projects via survey and questionnaire. The concerns are discovered in this way, together with those raised by the literature, and the researcher / student in their role or organisation. The students use rich pictures and relevant systems, and cognitive mapping, from SSM and SODA respectively, to represent participant stakeholder views, ideas, the perceived situation, the concerns.

2. Analysis of the information to understand why the situation is, the causal mechanisms and underlying relations that maintain it, and the history that has generated it. *Why is it happening?* (Rosenhead and Mingers 2001). I would see this as "constructing" the problem, thus making it clear (Eden 1982). We create *intellectual devices (soft OR models),* to enable analysis or explanation of the phenomena. These are boundary objects, thus clear, transparent tools to create good communications, and a common understanding between people from different backgrounds.

In these projects, SSM's relevant systems and comparison tables, and SODA's maps, have most often been the basis for analysis, but causal loop diagrams (from system dynamics) have been used too. They all work very well. SSM has proved especially good at integrating very different kinds of information, (as Cassell and Symon 2004).

3. Assessment of possible explanations. *How can it be different?* We now interpret the results of the above analysis. Here student and supervisor discuss possible resolutions to the problems, using the agenda created in the analysis stage via mapping or SSM comparison tables, hence the changes needed, and what is desirable, feasible, and can be agreed.

Our models enable a clear view of the whole situation, the connected features, the different aspects, or problems. They provide the basis for structured, rational, and informed thinking.

4. Action - outcomes /actions, changes if needed. *What shall we do?* At the end of the study, we have the dissertation outcomes, the changes, any actions. Recommendations go to the client or interested parties. The dissertation is submitted and is assessed / marked by academics. Marks are perhaps the primary goal or outcome for the student researcher!

See Table 3 *below, for what takes place, and what methods have been used and for what purpose, in each phase of this set of Soft-OR based dissertation projects.*

Table 3: The range of methods typically used in each phase plus any actions /outcomes/ changes

1. APPRECIATION	2. ANALYSIS	3. ASSESSMENT	4. ACTION / OUTCOMES
Use Activity Model (SSM) to design the study. Literature Review; existing documents/ data review. Informal discussions/ conversations. Survey / questionnaire. Semi-structured interviews. Cognitive Mapping (SODA). Rich Pictures (SSM). Heuristic Inquiry Diary.	Statistical Analysis of Primary Data. CATWOE Analysis, Root Definition, Conceptual Model, Comparison Table (SSM). Rich Picture Analysis (SSM). Cognitive Map Analysis (SODA). Causal Loop Diagrams (System Dynamics). PEST analysis. Value Stream /Flow Analysis (Lean).	SSM model / Comparison Table-based Integrated and structured Discussion of Findings/ Results / Changes. Cognitive Map-based Discussion of Findings / Results / Changes. Causal Loop Diagrams-based Discussion of Findings / Results / Changes. Statistical Analysis- based Discussion of Results.	Submission of Dissertation report. Make evidence- based / Soft OR Model-based Recommendations. Disseminate findings / recommendations. Changes / Improvements to an organisation's goals, its approaches, and processes. Researcher skills and other skills and capabilities enhanced for professional role / career. Improved shared understanding and insight among study participants and colleagues within organisation in question. Increased academic and practitioner knowledge and understanding of Study Area, the power of / limits of Soft OR Methods and other approaches, and the suitability of a Soft Systems / PSM Research Framework. Use knowledge gained in university learning and teaching.

8. Evaluation

Here I evaluate the dissertations making up this overall body of work, and thus what has been achieved using such methods over time, and what has been learned.

The framework for this is based on that of Midgeley et al (2013). They argue that we cannot evaluate *research method* (M) independently from the *purpose* (P) it is put to, the realised *outcomes* (O) *or* the *context* (C). Therefore, these are four necessary foci to *evaluate any inquiry or research project*.

The researcher's role, or whole research team role, must be included here too as a key element to project outcome or success. The researcher's identity, relationships, characteristics and abilities can all significantly affect the "trajectory of an intervention" (Checkland and Scholes 1999).

8.1 The Context

Every one of these dissertations has a different context, as each student is tackling a different real-world issue facing them in their current roles and of immediate concern. Always the context will both enable and constrain. Time often becomes a limiting factor, as does access to participants for the study, and where "buy-in" by organisational decision-makers / senior staff has not been achieved.

Student inexperience in applied business research and using research methods is usually the case, but these particular mature students, in professional roles, have demonstrated a range of other very valuable attributes and skills, that have proved essential for project success. These include motivation, a professional approach to their work, inside knowledge of their organisation, who to recruit and then how to work with the study's participants, plus ability in interviewing, coherent thinking and writing etc.

In a few projects, where students were weaker, less mature or without work experience, and not in full time roles and thus researching unknown areas or organisations, the outcomes were less successful.

The supervisor has always played a crucial part, as guide and collaborator, in determining research question, philosophy, methods, process and outcome. The supervisor brings to the party soft systems / OR expertise, and experience of facilitating dissertation projects using these Soft OR methods. Supervisor knowledge of, approach to, and experience with methods and supervision, have been key factors.

These projects do need a collaborative approach within the research team to work well. Equally, they are ideal where a collaborative approach is needed! Sometimes, as above, with weaker students, or with stronger students researching from the outside a new organisation or industry, projects can require a lot of input from the supervisor e.g. help with modelling.

8.2 Purpose

Meet ethical criteria, and deadlines; and deliver a high-quality dissertation that matches the stated objectives, satisfies the immediate academic audience of first and second markers, and mark criteria.

Get as close to ideal research as we can, given the context, via procedurally rational and fair research processes, in order to achieve as high a degree of ***holistic integrity*** as is possible.

Deliver both applied business research aims: to engage with the theoretical and practical. Give real value for knowledge and learning. Move towards situation improvement or problem resolution.

8.3 Methods

Given the time constraints, we are looking for efficacy, efficiency and effectiveness of method in what are important, complex, real-world problem situations. We must see situations clearly in order to understand fully what is going on, before identifying what constitutes the problem or problems. We conclude that the soft systems approaches, and rigorous soft model-based analysis used in these studies, give us all of these. We have used them to design the project, as well as handle the content. They have structured our thinking, the problem, the project. They have always added clarity, especially at the project front end, and so speeded up projects, and often delivered exceptional outcomes.

The strengths and abilities of each student researcher have determined the degree of support and collaboration needed from the supervisor in the use of these particular research methods. But these projects have shown there is always a need for an informed outside view with Soft OR approaches and soft systems thinking. The supervisor, experienced in these methodologies, facilitates the overall project, the stages and the student researcher's progress, whilst the student directly works with participants within these stages eg interviews, modelling etc.

Soft systems methods have proved very suitable for these dissertation research projects, when used in both Modes 1 and 2 by student and supervisor, and with other methods, as above. Students have easily mastered their basic principles, and often for more than just one soft OR method, and then used them very effectively. We tailor these adaptable and flexible methods to fit the problem. Often, the more imaginative, confident, and motivated students have hit on innovative uses of these techniques and tools, eg a series of rich pictures to capture data from individual interviews.

8.4 Realised Outcomes

The desired outcomes of applied Business dissertation projects are these:

i) valuable theoretical learning, practical knowledge; **ii)** evidence-based recommendations that can lead to improvements or changes; **iii)** achieving appropriate *holistic integrity* via approaches delivering procedural rationality and justice; **iv)** development of skills and capabilities for students as managers; **v)** successfully meeting the university or academic requirements, thus gaining high marks towards their degrees.

These projects demonstrate that the use of Soft Systems Thinking / Soft OR methodologies, techniques and tools can go a long way to help us achieve all these outcomes, in a wide range of challenging, time-constrained situations. Marks are usually very good! And, clearly, these mostly successful dissertations, with their findings, outcomes and reflection, have impacted each researcher's knowledge and skills, and contributed to organisational clarity, shared vision, insight and understanding of the particular area of concern. Some projects have delivered significant, tangible changes or improvements within the life of the project or soon after.

9. Conclusions

Following Checkland's FMA schema, what has been learned from this programme of dissertation studies stretching from 2005 until 2020?

About the A, these very different areas of application: we have learned much and understood more fully, on a rational, holistic, pluralist basis.

About the M, soft methodologies and associated techniques: they have proved their worth and appropriateness for these studies, and for this messy real world.

About the F, the soft systemic thinking ideas: this is a very suitable framework, with which to both tackle real world issues, and deliver knowledge in business and management related spheres.

***Possible improvements**:* More time for projects; more buy-in from decision makers in researched organisations; more potential supervisors with Soft OR experience and skills.

It is possible to generalise these findings overall not only to all Applied Business Dissertations but to all Applied Business / Management/ Organisational Research. Indeed, I would argue they apply to all real-world projects, decision making and problem solving.

Soft systems thinking via soft OR is needed, if relevant research, research that leads to real-world recommendations, project outcomes, solutions and decisions, is to be fully ethical. If it is to have what I have called "holistic integrity". Human beings cannot be rational in a computational sense. In unaided research, whether it's a formal declared project, or a manager in their everyday roles, we cannot know the "unknown unknowns" or the real problems, and often we tackle the wrong problem, and then our project or decision outcome has little value.

10. Recommendations

Applied Business and Management Researchers, from dissertation student, through academic to manager in their everyday role, should discover, learn and adopt these methods, where valuable, in their thinking, researching and decision-making activities. They work well with and thus complement existing, more traditional Business Research tools and ways of thinking. They will deliver improved project /research outcomes, decisions, and solutions that have the highest level of *holistic integrity* possible for the particular situation. Let's see them included much more in Business Research Methods books and Business School Research methods courses.

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Reimagining how the Critical Realist Ways of Methodological Triangulation Might Allow for Resolving Paradigm In/Commensurability in Research Methodologies

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Abstract: For a long time research methodology scholars have tended to adopt the diverse and non-convergent positions when it comes to the possibility of the paradigm in/commensurability. However, not much is well researched and thus evidenced in practice, about the potential ways of addressing the binaries. This paper will report on the recently completed project where the reviewers seemed to take contrasting positions on the particular case of research methods. While in practice, the research could have been declared as anchored on mixed methods and the power of methodological triangulation, it seemed that the positionality of the reviewers conditioned the ways they would assess the final research report and thus make them differ in ways that would call for the external assessor/adjudicator beyond the review stage. The case, as it were, seemed to pose risk to the project itself. This would be the case of a raw deal for the project and from the reviewers comments, which indicated their limited understanding about the philosophical or social basis for one's work. Based on this experience, the paper then suggests how engaging research as the idea of being/ontology and becoming/epistemology might allow for the potential resolution points about research especially from the perspective of educational management and development fields of study and of practice.

Keywords: Meta-research/theory, Multidisciplinary scholarship, Methodological triangulation, Paradigm in/commensurability, Retroductive reasoning

1. Introduction

> *"Human society has not developed in accordance with a prearranged plan, but empirically, in the course of a long, complicated and contradictory struggle" (Trotsky, 1986, pp.24)*

To scholars of humanities and social sciences, in particular, also to those of business and management studies (BMS), perhaps, what can be declared as science in research needs to be a subject of whether such a science can withstand immanent critiques. That means, the question of whether such a science can be questioned as non-propaganda, as the default position in not answering such a question could be declared as pseudoscience! The claim about "propaganda" arises when the power relations and materialist interests about the subject of inquiry might already be delineated, or still remain complex, and thus constituting pseudoscience. In social science, Chris Argyris (year) refers to the latter as the challenge about the espoused values and the values of use. In more of the social realist scientists, namely, Margaret Archer, 1995, Dwayi, 2022, 2023, who draw on Rhoy Bhaskar, (1975) critical realist philosophy, the values laden concerns, claims and issues about social practices need to be delineated into the nexus of theory-practice, the theory-research, the research-development if any scholarly endeavour is to reach maturity. It is, therefore, the latter point that the axioms and postulations in this paper emerge as the main arguments for paradigm in/commensurability in research methodology (the philosophy about research, expressed in the research design, events and processes) and in research methods (the tools and techniques). In any watertight case about a social practice and its powerful explanations, perhaps the question about the methods (the meta-theory) needs to be foregrounded even in such fields of study as BMS. Such a question needs to have debates and conversations about the pursuit of ontology. The latter refers to how the matter of meta-methods needs to be foregrounded towards the required understanding of, and for the powerful explanation about, the philosophy/-ies of use. Some scholars have been grappling with this matter as the challenge of knowledge wars (Clegg, 2005), and of paradigm in/commensurability (Guba and Lincoln, 1994), which, for the critical realist philosophers (Bhaskar *ibid,* Archer *ibid,* Dwayi *ibid*) all such arguments point to the challenges of surface versus deep ontology, of epistemic relativism versus fallacy, and of judgemental rationality versus the actual collapse of the natural necessity (in the subsequent part of this paper, I try to explain what I mean by these concepts as forms of methods about methods, that is, as the meta-theory, in research).

In light of the observations about human development and as briefly alluded to by Trotsky (1986)'s assertions about the dialectical materialism and science, for example, while the plans about human development are always necessary, their limitations become emergent at the point of situational logics. Such can be the incompatibilities of the choices to be made against the original plan. Any research endeavour, therefore, needs to problematise the taken for granted claims about the application of research, when such claims can appear to

be drawing more from the de-ontological positions and the self-referential explanations about the subject of inquiry. This paper cites the case study, only for illustration purposes, by making theory and research practice as analytically distinct, only where research methodology, on one hand, is a structural system/arrangement, and the theory, thereof, on the other, is a cultural system of beliefs, norms, values and standards about the structure. The complexity then become more expressed when each of the two is enacted by agency (a human system of choices or none choices, projects or the absence of). Therefore, the value of the expositions from this paper are not only about the first two elements of the reproduction and understanding about the subject of inquiry, but about what might be the broadening and advancement of research in the BMS field, and thereby ensuring alignment in the Theory-Methodology-Practical Program chain!

In the rest of the paper, I, therefore, explain and discuss the reimagining the research methodologies in the critical realist ways of methodological triangulation, as structured below,

- The conceptual framework and context profiling from which the case emerges. This section refers to What-How-Why of research methodologies as the subject of contestation in contemporary times.
- The Case, an assessment practice that could be understood and explained as the case of knowledge wars, and thus a potential illustration of how to manage assessment by resolving paradigm in/commensurability. Part of this is to foreground how the critical realist perspective allows for the better understanding and explanation about of research methodology as constitutive of surface and deep ontology. The main argument and the main thesis emerges at this point, which allows for the value of meta-theory beyond the limitations of the inductive and deductive logic.
- The social realist explanation about the case where the dimensions of methodological triangulation (completion, confirmation and retroductive reasoning) are made explicit in order to explain the value of meta-theory (methods about methods).
- The call for transformative agency as the advancement of research about research methodology (the philosophy about methods), including why a focus on ontological realism as the idea of being and becoming ought to constitute progressive choices and the socially emancipatory and reconstructive projects, even for such research projects that focus on the BMS fields.

2. Surfacing the Ontological Assumptions About the Nexus of Theory and Research Practice

In the global space, what is central and peripheral about research, and thus of practice, and vice versa, has received much attention in recent years (cf. Harney, Hanlon and Mandarin, 2020; Gendron & Rodrigue, 2021). As such, the concerns, claims and issues about the dangers of tight boundary objects (Harney et al., *ibid*), and of tight boundary gatekeeping (Gendron et al., *ibid*) are not new to scholars who deal with the social world as the case of power relations and the materialist interests. These observations point to the rapidly-evolving interdisciplinary field of meta-research, the contestations about research methods as the subject of immanent critiques. The philosophy of research (research methodology) no longer needs to be understood as the uncontested truth. The need for scholarship which can foreground the cutting-edge multidisciplinary approaches in world that is fast becoming more complex and crisis prone is urgent. This is the world that public life needs to be understood and explained by means of not just clear policy and governance strategies and tactics, but also by agile and adaptive research leadership practices. The value for the advancement of knowledge ought to be beyond the straight bullet approach, the ability to manage the nexus of research and practice, engaging the power and knowledge dynamics, whose roots are the inherent contestations of research cultures and careers.

The concerns, claims and issues about the use of methods or limited use thereof in research practices are not new but as old as the research profession itself. The spread of use is not just research, as expressed in the daily research practices in the hallowed walls of university education, but also as evidenced in journal editing, in the journal editorial boards and by the reviewers. It is, therefore, quite imperative to recall why Kuhn (1970) popularised the matter of paradigm in/commensurability by claiming that science guided by one paradigm would be incommensurable with science developed under a different paradigm. By this statement he meant that there is no common measure for assessing the different scientific theories. However, the matter of paradigm in/commensurability becomes problematised in contemporary philosophies, namely, critical realist philosophy (to be described in the subsequent sections,) as the challenge of conflation and reification.

- Firstly, as the conflation challenge, the assumption that methods and methodology are mutually constitutive. Calling on the body of work by Huisman, (2024: 260), notes that methods are tools,

processes or used in research while methodology, the research designs, is about the overall strategy, guide or plan to arrive at the answer to the research question(s). The challenge of conflation emerges, then, when the two are understood and used interchangeably. Research methods don't necessarily equate to the methodology which need to serve as the basis of the former, as the base structure.

- Secondly, the failure to distinguish the methods from the methodology is to assume that methods constitute the answer to the methodology, which can then be the challenge of reification. Delineating the two as analytically distinct in ways that the methodology, or the philosophy of methods, upon which the research is designed, ought to be beyond the immanent critique, otherwise the exercise will be about debasing the structure.

These two point then to the value of the third layer about the scholarship about methods and methodology. The first, is the matters of the inability to understand the dichotomous nature of subject and objects. Contemporary scholarship in the latter, for example, Teddlie & Tashakkori (2009), and quite recently, Huisman (2024) argue about what they regard as the tight boundary objects and the tight boundary gatekeeping in research practice and determines what is to be treated as peripheral or as central. Of great interest, therefore, and for the purpose of the discussion in this paper, the second point, is what can be the default position and the faulty consciousness of being and becoming. That is, what can appear as de-ontological position and the self-referential explanations about research methods and thus its methodology.

2.1 The Reference Case About Knowledge Contestations

The case as briefly described below, was not only about the Research Methodology as the assessment and evaluation aspects, but the crisis moments which would be experienced at the levels of Doctoral Program Coordinator, the PhD Supervisor, and worse still by the PhD candidate.

Table 1: The Examiners concerns on the use of mixed methods and the challenge of paradigm in/commensurability in research methodology/philosophy

Does the project show that the candidate is sufficiently acquainted with the appropriate methods and techniques of research for the award of a degree?			
Examiner 1 **(15/05/2022)**	**Examiner 2** **(15/05/2023)**	**Examiner 2** **(11/10/2023)**	**Examiner 4** **(20/11/2023)**
This remains the area of strength of the project. The student displays a clear understanding of Critical Realism (Bhaskar) and Social Realism (Archer). Critical Realism acknowledges the challenges to the achievement of social justice. Adequate and extensive references are made to historical powers in the generation of events and experiences in a historically black South African university. I also recognise the tensions and inconsistencies in understanding of experiences.	This is an important chapter that addresses the research design and methodology, therefore, it should provide clear methodology and data collection and analysis techniques use in the study to address the research questions. Inability to articulate the research methodology and techniques negatively impact the interpretation of the findings.	The candidate seems fixated on defending that this is 'not a mixed methods study', but then failing to provide the reader with evidence on what it is then? The candidate mentions the study being a 'single case study', but in the report itself this aspect is not adequately forthcoming, discussed and defended. Even though case studies are essentially interpretive in nature, the case study methodology broadly has proven to be quite flexible and can be used in somewhat pliable paradigmatic permutations.	In my assessment, I worked from the premise that there is no such thing as 'the perfect thesis'. Would I have approached this study/Report differently? Probably. Would I have responded differently to the examiners initial reports? Yes. But this is not my thesis and not my research journey. Doctoral work is a form of researcher education that is (hopefully) ongoing even beyond the doctorate itself.

The contents of Table 1 do not form the main focus of the discussion in this paper, except that they serve as reference in order to surface the main concerns, claims and issues about the methods about methods (meta-theory) in a social sciences oriented scholarship project. For example, in this case of examining a Doctoral Thesis, Examiner 2 (15/05/2022) seemed to maintain his/her standpoint in both cases of 15/05/2022 and 11/10/2022, by rejecting the corrections twice. which then invoked the arbitration process where Examiner 4 (20/11/2024) had to be called upon. The case for analysis, which is at the core of the main argument in this paper, refers to the problematics of measurements per Examiner 2, compared to Examiner 1 (15/05/2022) and Examiner 4

(11/10/2023). (Examiner 3 does not constitute part of the Table as the Report thereof concurred with Examiner 2).

As part of the arbitration process, Examiner 4 provided the context on what seemed to be the major concerns, claims and issues about the examination process, as indicated in the following extract (direct source about the extract is not provided in order to protect the researcher and examiner's identity),

> *"The study had been examined twice before by a constituted examination panel consisting of three examiners in the first round and two in the second round. Based on my understanding of the examination outcome and the information provided to me, the examiners could not reach consensus in either of the rounds of examination, which is why I was asked to provide an assessment based on a holistic understanding of the thesis work presented (both in the original and the reworked formats), the candidate's response to the initial examiner reports, and all the examination reports that were submitted in both rounds of examination (all of which were provided to me)".*

The issue that then ensues is whether there could have been a resolution point between Examiners 4 and 1 at the point about the logic, the power matrix and the ontology about assessment process. To scholars of critical realist philosophy, such can be the case about methodological triangulation, that is, beyond the confirmation and completion of the concerns, claims and issues about the social practice at the point of research, which would constitute both the inductive and deductive logics), but the questions about the idea of being, which can be embedded in power dynamics. The immanent critique of the examiners' points then lead the critical realist researcher to the value of retroductive reasoning, which can therefore help unlock the tight boundary objects and gatekeeping about the assessment/evaluation process.

The Case is constitutive of the conversation about the examiners, with specific reference about the methodology (the philosophy of methods as the meta-theory). The hard data (about Examiner 2, on two cycles of assessment, and also as arbitrated by Examiner 4, can be argued as reflecting on the practice of science and the epistemic status of the knowledge it produces (Blackie 2022). This case allows for the potential understanding both of critical realism or social realism as the lenses from which to think about the social phenomenon as the subject of inquiry. Such a lens, preoccupies itself with the notion of a social practice, and thus as a subject of critical realist oriented research, as beyond what works and doesn't, but about the conditions of constraints and enablement in ways that can be delineating as the interplays of structural, cultural and human systems. A study that draws on the critical realist philosophy is there anchored on the transcendental question/argument,

> *What conditions must have influenced the Examiner/s to assess/evaluate the project in the way that they did?*

In critical realist terms, such a question, and for making the transcendental argument, then seek to address beyond-ness as deep ontology, as against surface ontology, epistemic fallacy as against epistemic relativism, and judgemental rationality as against the actual collapse of the natural necessity. Beyond-ness in this case refers to engaging the default position and the self-referential explanations that can arise from being preoccupied with the methods at the risk of understanding the philosophy behind the methods. In that situation, while the claims by Examiner 2 would be necessary their logic, and thus the point about incompatibilities, is when such a logic is debased from Examiner 1 positionality about the value of meta-theory, and hence the potential resolution point by Examiner 4. The purpose of the analysis/description and discussion/developed insights for such a study is therefore, to challenge the mainstreamed ways of thinking-making-doing about research, and therefore, practice.

3. The Critical Realism Philosophy and Paradigm In/Commensurability

The main axiom about measurement, and thus assessment and evaluation of a social practice, which is drawn predominantly from the mainstreamed ways of thinking-making-doing about the idea of being is that whatever is measured improves, when it is reported it improves more! However, what if the measurement itself is problematised and let alone the object of measure?

For example, Kuhn's (1970) pioneering work on the notion of paradigm indicates intra-community rivalry when anomalies (i.e., empirical results that are not consistent with prevailing theories) take place on a growing frequency. This has been an interesting question for scholars of social; realist explanatory program who draw on critical realist philosophy. For them, the main issue around paradigm in/commensurability. The critical realist philosophers challenge the view that, "It should be obvious when we can see it!" But what if it's there but can't be seen? For example, the case of what can happen in the forest and the trees, when the tree can fall and one

can't hear about such an act? For critical realist philosophers, this ontological question is the matter of the transitive objects (those objects that, by their very nature, are available for our understanding and explanations) and the intransitive objects (the opposite, and thus the challenge in the idea of being and becoming).

As I explain elsewhere (Dwayi *ibid*), the three domains of reality are delineated in terms of the surface (the domain of the empirical and of the actual) versus deep ontology (the domain of the real). As also supported in the contemporary body of knowledge, for example by Boughey & McKenna, 2021, in critical realist studies the distinction between qualitative and quantitative approaches falls away as researchers begin by using data that is empirical in nature to move to the level of the Real, the deepest layer of reality at which the mechanisms they are interested in are located. Data can be qualitative in that it consists of a record of observations and experiences obtained through, for example, interviews or it can be quantitative in that, for example, it describes the frequency at which events occur. Historically, quantitative studies have attempted to prove the existence of an ultimate reality through inferential statistics. Qualitative studies usually draw on relativism and thus acknowledge the existence of ultimate realities. Since Bhaskar's (1978, 1989) critical realism combines a relativist epistemology in the sense that it acknowledges we can all experience and observe the world in different ways with the existence of an absolute reality which can be reached using inference via empirical data. The empirical data used in a critical realist study can be qualitative or quantitative. The following brief description of the basic three basic tenets of critical realism, therefore, point to what can be the assessors or evaluators or examiners identity and their tight boundary positions about knowledge, with Table 1 as the frame of reference. With this introductory point as granted, I then move on to discuss the three points about the case above as deep ontology versus surface, as judgemental rationality versus the actual collapse of the natural necessity and as epistemic relativism versus fallacy in the dialectics of the Being and Becoming! Bhaskar *ibid,* argues for how the three holy sins about the idea of being (ontology) need to be understood against what he argues as the unholy trinity.

3.1.1 Judgemental Rationality, as opposed to the actual collapse of the natural necessity

Judgemental Rationality, as opposed to the actual collapse of the natural necessity, refers to the realisation that epistemological relativism does not preclude deciding "rationality" between rival theories about what is happening and why. Judgemental Rationality in this context (Table 1), refers to a form of assessment, which couldn't resolve the dichotomy of subject and object as the challenge of conflation and reification. In both cases, Examiner 2's views seemed to be falling into this trap of the default position and the faulty consciousness of being and becoming about the project. While the claims at this point could be described as the empirical data as the domain of reality, calling on the power of trans-factuality, cross checking Examiners 1 and 2 claims already pointed to what are the discrepancies of the examination processes, albeit as surface ontology. For Examiner 2, in both cases of 15/05/2022 and 10/11/2023, the balance between 'making a theoretical case' and 'making an empirical case' seemed to be the major challenge and hence the resolution point by Examiner 4. This point then take the discussion to the next two axioms out of the three un/holy sins as Bhaskar *ibid* postulates.

3.2 Epistemic Relativism, as opposed to Epistemic Fallacy

Epistemic Relativism as opposed to Epistemic Fallacy refers to the acceptance that what we know is bounded by time and place. Epistemology/Epistemic Relativism, the recognition of the constructed and partial nature of people's interpretation of the world. The Actual Domain at this level of reality point to the assessment process and events, where the Examiner 2 seemed to remain located, and hence epistemic fallacy. The challenge of the default position and the faulty consciousness of Being and Becoming. The de-ontological positions and the self-referential explanations about the subject, therefore, become more expressed at this level, which then challenges both the deductive and inductive logics at the points of surface ontology.

3.3 Ontological Realism/Deep Reality, as Opposed to Ontological Monovalence

Ontological realism refers to the recognition of the independent, material reality of the world! Ontological realism/deep reality as opposed to ontological monovalence is about the acknowledgement of an independent, multi-level and complex "reality" irreducible to human attempts to capture it in once-and-for-all discourses. The case therefore refers to what can be argued as the misses in the perspective of the impossible Examiner 2! This is the realist level in the domain of reality, and thus of meta-theory, where Examiner 2 is "missing the sound of a fallen tree in the forest" because there seems to be no evidence (the empirical and actual domains) thereof.

4. The Power of a Social Realist Explanatory Program Allows for Methodological Triangulation

The reality about the Case points to the possibility that there is hardly any singular approach or method, either rooted in theory or practice, to solving the current problems about research. It is a matter of reaching consensus, the logic about the case at the point of judgemental rationality. However, such rationality remains inadequate until it is aligned with epistemic relativism and with ontological realism. About the Assessor 2 case, such a situation, for a period of almost two years post submission, attests to the legacy of class, power and privilege in the age of the decoloniality. Solutions ought to be a combination of options, beyond the necessary (confirmation and completion phases), which can always, unfortunately, falter at the point of the inadequacies. This is the major point about dialectical relationship of a cultural and human systems, where research, as a practice, is thus values laden, is not neutral, apolitical and asocial. Therefore, an important point emerges about the contestations of research methodology and paradigm in/commensurability, how the matter of metatheory was being innovative and developmental about the project.

4.1 Abducting the Assessor Claims, a Deconstruction Exercise About the Methods About Methods

In order to move from the analysis of data that allowed me to identify observations and experiences at the level of the Empirical, and events at the level of the actual to identify mechanisms at play at the level of the Real, I used the inferential processes of retroduction and abduction. In response to a statement to the Assessor Report, for example, that, *"The candidate seems fixated on defending that this is 'not a mixed methods study', but then failing to provide the reader with evidence on what it is then?*", led me to the use of retroduction involved asking the question,

> *'What must the world be really like for the Assessor as the social actor to identify the student's theses and its* 'claims' as problematic?

In order to respond to this question, I needed to problematise the notion of 'the claims' as a social construct and acknowledge that 'the claims' could be understood and expressed differently by the three assessors. The identification of the claims as 'problematic' could simply be one reading of the assessors belief systems and norms about the project, which ought to be understood and explained as not neutral, value free, and detached from the power dynamics about knowledge as contested. Further to Palmer et al., (2018) and (Blackie 2019) about the authenticity and validity of assessment tasks, the challenge about the latter positions are always at the points, not just of judgemental rationality and epistemic relativism (surface ontology or de-ontological positions and their self-referential explanations), but of ontological realism (deep ontology as stratified, causally efficacious and emergent, read, Dwayi *ibid*). Based on Table 1 as the empirical data, there remained a disjuncture between Assessor 1 and 2 and (judgemental rationality at the domain of the empirical data) and further per the same position by Assessor 2 (epistemic relativism at the domain of the actual events and processes about the examination). Therefore, questioning the authenticity in assessment/examination/evaluation practices, can be the fallacy in the field (namely, the BMS field), the fallacy in the research procedure (Research) and thus surfacing the extent of unfairness (to the client) on the basis of assessment evidence which seem to feed into the de-ontological position about assessment and their related self-referential explanations!

4.2 Engaging Intellectual Laziness is to Question What Appears as Surface Ontology

The points about the necessary (methods in research and thus in any practice) and what can be the incompatibilities of the related claims as logic (judgemental rationality) thus ought to be at the core of any discussions about the problematics of methodological triangulation (confirmation, completion and retroductive reasoning). Such should be the call academic integrity as the point of the cultural capital in any scholarship project. Therefore, beyond deductive and inductive logics, both abduction and retroductive reasoning allow for new spaces that can question the validity of knowledge claims, the methods against methods, as engaging the epistemological positions which can easily play out as intellectual laziness. Therefore, Methodological Triangulation as the means to surface what is behind the silences and superficialities about the subject of inquiry as confirmation and completion through mixed methods (deduction and inductive logics). The main concern for social realist researcher and practitioner is to provide the compelling accounts for ontological realism (the realms of new possibility in what is always the nature of open, dynamic, complex social systems), as against epistemological relativism (time and space about the social world as a paradigm), and further to being /emergence and becoming/change over time.

Abduction involved using theory, mostly from the assessment and evaluation practices in higher education to 'see' the statements in the reports differently and, thus, identify mechanisms that might not otherwise have been apparent. Comments about the learner's engagement of methodology, for example, allowed me to use theory on evaluation in program/project management in order to identify mechanisms that contributed to the emergence of the statements themselves. In identifying mechanisms at the level of the Real, I was alert to the existence of structures (both macro and micro) and discourses. A statement such as, *"the candidate seems fixated on defending that this is 'not a mixed methods study', but then failing to provide the reader with evidence on what it is then"* allowed me to identify such a statement as informed by a structure, the tight boundary objects and gatekeeping tendencies about the examination practices, which could be "judged" as subscribing to the black box and its pragmatic logic. This then called for arbitration by Examiner 4, point to the credibility or the potency of retroductive reasoning (an account for the conditions of assessment) versus inductive and deductive inferences about the case.

4.3 The Power of Retroductive Reasoning and the Domain of the Real

As explained elsewhere, namely, Maya Lambovska (2023), the major concerns about research methodology, the critical realist perspective allows for surfacing what is behind the shine, as the silences and superficialities, as the dark side of program assessment and evaluation. Deep ontology/ontological realism allows for the notion of methodology as stratified, causally efficacious (that is, the weighted ways of the Thesis as a structure, its examination as contested in value systems, and the Agency both of the Examiner and the student with regard to the latter two points), and as emergent (PhD not only as the events and process, and how observed and experienced, but also as the product of the structural generative mechanisms, over time).

5. Surfacing Meta-Theory Allows for Resolving Paradigm In/Commensurability in Research Methodologies

Transformative agency in research methodology ought to concern itself with the value of research methods beyond what works and doesn't, which would be judgemental and thus a cul de sac, but consciousness about the conditions of enablement and of constraints. Improvement as the purpose of examination process ought to take place in ways that can resolve the nexus of theory and practice, of research and development, and thus of (assessment) policy and implementation. In this regard, the Examiner 2 must have been constrained at the points of the two domains and also at how thinking of realist reality can open up the new realms of possibilities. Therefore, such should be the value of Agency that seeks to question the tight boundary objects about assessment and thus the gatekeeping tendencies. Transformative and reflexive praxis in research methodology therefore ought to be about unlocking the boundary objects and the gatekeeping tendencies through what can be the iterative processes which are emergent about the domains of reality and in ways that can translate the unholy to holy trinity. Such processes ought to lead to researchers' increased consciousness about the trappings of research and practices, based on the questionable ontological assumptions about the idea of Being and of Becoming.

5.1 Advanced Scholarship In Research Methods Ought to Resolve the Current Concerns About Paradigm Incommensurability

While the dangers of tight boundary objects, and of tight boundary gatekeeping are acknowledged, the immanent critique thereof calling on the critical realist oriented techniques of abduction and of retroductive reasoning (beyond the deductive and inductive reasoning). The critical realist ways as reimagined is when such ways are anchored on the three basic tenets of ontological realism beyond the limitations of epistemic relativism and judgemental rationality, and without being too prescriptive and deterministic! Such holy trinity allows the analyst to engage the tranquilised obviousness (the tight boundary objects, the tight boundary gatekeeping) about assessment, which always derive from the mainstreamed ways of thinking-making-doing. While the dangers of tight boundary objects, and of tight boundary gatekeeping are acknowledged, the immanent critique thereof calls on the critical realist techniques of abduction and of retroductive reasoning (beyond the deductive and inductive reasoning).

6. Integration, Reflections and Conclusion

In this paper, I discussed what can be the challenges of research methodology and methods in the social worlds when the positionality of the examiner can derive from the de-ontological positions and the self-referential explanations. Such can be the case of the default-positions and the faulty consciousness of being and becoming in the social world, with research practices and the assessment thereof as the case in point. At the core of

university education, assessment becomes the currency for/of quality, and the assessors/examiners, as actors, the arbiters of quality. However, there needs to be initiatives that seek to problematise the taken for granted claims about the application of research, when such claims can appear to draw more from surface ontology than deep and ontological realism, For the latter to be effectively possible, there seems to be the need for abduction and retroductive reasoning beyond the mainstreamed ways of thinking-making-doing as deductive and inductive logics.

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Pragmatism as a Research Paradigm

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Abstract: A paradigm is a worldview, a set of beliefs, values, traditions, and conventions that shape our understanding of how we know what we know and what knowing is. With this definition in mind, the purpose of this paper is to point out the added value of articulating the research paradigm of a mixed methods case study that examined the preparedness of university graduates for today's job market. The paper intends to examine how the exploration of participants' worldviews of the phenomena under inquiry lends itself to pragmatism, a paradigm that underpins the philosophical premise of mixed methods research (MMR). The discussion demonstrates (1) how pragmatism as a research paradigm informs the chosen mixed methods design, and (2) how the chosen research paradigm, pragmatism, values multiplicity of worldviews that enrich the development of viable solutions for the problem under inquiry. Articulating the research paradigm that informs the overall design of a study is oftentimes marginalized especially in case studies. This paper intends to explain the value for highlighting the philosophical paradigm of case studies.

Keywords: Pragmatism, Mixed methods research, Paradigm, Methodological pluralism, Case study

1. Introduction

A paradigm is a set of conventions that profile our understanding of how we acquire knowing. Articulating the research paradigm that guides a study explains the rationale that supports its chosen methodology. What derives a research paradigm is the theoretical/conceptual framework of the study. Therefore, there should be consistency between the conceptual framework and research paradigm.

2. Types of Research Paradigms

2.1 Positivism

Positivism emphasizes that we know what we want to know through objective and empirical observation. Investigating problems requires the analysis of observable facts to generate objective knowledge. Positivists value quantitative analysis of observable data that depend on testing hypotheses and identification of causal relationship between variables (Park, et al., 2020).

2.2 Constructivism/Interpretivism

This school of thought emphasizes that we understand the world and its problems through the subjective and socially constructed nature of knowledge. Constructivists view the researcher as an active participant in interpreting the constructed knowledge of participants. That is, knowledge is not to be discovered but individually constructed. Each individual constructs and reconstructs his own views in accordance with his/her own background knowledge and experience (Elander and Cronje, 2016). Constructivists believe that it is important to contextually understand a research phenomenon through the perspectives and experiences of its stakeholders who construct their meaning within specific contexts. Constructivist researchers normally value qualitative research methods (Lee, 2012).

2.3 Pragmatism

Knowledge, according to pragmatists such as John Dewey, is to be acquired by the action that takes place between man and his environment. This type of knowledge is changing, dynamic, developing, and oriented toward its consequences in human nature. Maintaining that all our human experiences, such as fears, hopes, and etc, are deeply rooted in nature, Dewey asserts that both nature and experience are intertwined and reflect each other.

2.3.1 Pragmatism as a research paradigm

As a research approach, pragmatism emphasizes that we understand the world and solve its problems through the application of subjective and objective methods. Pragmatist researchers are flexible and practical in finding viable solutions to the phenomenon under inquiry. They recognize the importance of having multiplicity of perspectives and worldviews in solving research problems. Pragmatism derives pluralistic mixed methods research (MMR). Also, pragmatists value both the objective quantitative worldview and the subjective experience of stakeholders. They situate the research problem within its specific context (Foster, 2024).

2.3.2 Pragmatism and mixed methods research

It is important to note that what derives a research paradigm is the nature of the research objectives and questions. For example, if the research question centralizes the perceptions and lived experiences of your participants in assessing and addressing the problem under inquiry, pragmatism in this case would be appropriate (Liu, 2022). A pragmatist view would provide you with the opportunity to gather both subjective qualitative data and objective quantitative data. Pragmatism supports the mixing of research methods to get an in-depth understanding of the research problem and its solution. Pragmatism values individuals' views and life experiences (Kaushik and Walsh 2019).

The nature of the research questions with a focus on methodological pluralism would match a pragmatic view of the world which "… is typically associated with mixed methods research. The focus is on the consequences of research, on the primary importance of the question asked rather than the methods, and multiple methods of data collection inform the problem under study" (Creswell and Plano Clark, 2007, p.23).

From a pragmatic viewpoint, the nature of the research questions derives the research methods. For example, if the research questions of the study put a premium on the constructed lived experiences of the research participants in addressing the problem under study, pragmatism would be suitable. The suitability of pragmatism as a guiding philosophical research paradigm in this case is significant as it "places high regard for the reality of and influence of inner world of human experience in action (and where) knowledge is viewed as being both constructed and based on the reality of the world we experience and live in" (Johnson and J. Onwighbuzie, 2004, p.18).

2.3.3 Priority of the pragmatic researcher

A pragmatic researcher prioritizes the practical implications of the research outcomes in solving the problem under investigation. Combining quantitative and qualitative approaches provides pragmatist researchers with a comprehensive understanding of the problem within its context. The focus of a pragmatist is to come up with actionable knowledge that addresses the problem and provides guidance to decision makers. The main aim is to generate practical knowledge that is actionable, viable and relevant to real world challenges (Turyahikayo, 2021).

As a philosophy, pragmatism centralizes contextual, actionable knowledge, and the intersection between knowing, experiencing, and acting. For pragmatists, to know is to inquire and learn through an experiential process. As a philosophy, pragmatism facilitates the methodological pluralism of MMR. It informs the design of the MM study and guides an integrative approach that combines survey data with qualitative interviews (Creswell, 2003). The integration of both types of data, guided by the principles of pragmatism, enriches our understanding of the phenomenon under inquiry. Pragmatism, as such, positively impacts the MMR design where different methods complement and enhance each other conclusion (Shan, 2021).

3. Wy do we Need Knowledge of the Research Paradigm?

Knowledge of the research paradigm is indispensable for the development of a well-thought-out research. The knowledge of the conventions of a research paradigm makes the process of knowledge production and interpretations of the analyzed data meaningful. The process of meaning making that research produces requires a solid philosophical understanding of its discourse. We do require knowledge of the research paradigm that underpins a study to understand how a solution is being shaped and constructed (Feilzer, 2010).

Form a philosophical pragmatic perspective, our understanding of the phenomenon under inquiry can be facilitated through methodological pluralism and multiplicity of perspectives. The discourse of pragmatism makes it easy for us to be open to multiplicity of interpretations. The philosophical paradigm of the research is an enlightening force that comes into play and acts from behind, while we produce and interpret the MM discourse (Johnson and Onwuegbuzie 2004). Often, the more we experience multiplicity of views related to a specific issue, the more our worldviews expand. We are, then, always already developing, constructing, and reconstructing horizons of understanding the phenomenon under inquiry.

4. The Methodological Pluralism of MMR

Pragmatism, as a research paradigm, deepens our understanding of three types of knowledge: knowledge of ourselves, knowledge of others and knowledge of experiences in the world. From a pragmatic perspective, the three types of knowledge are interrelated and interdependent and contribute to our constructed beliefs and horizons of understanding. The methodological pluralism that MMR embraces allows us to be exposed to diverse

worldviews, while enriching our understanding of the act of discourse interpretation (Bibi, H., Khan, S. and Shabir, M. 2022).

Pragmatism allows Mixed Methods researchers to reflectively think about their biased interpretation and understanding of other people and the world at large. The pragmatic researcher is always open to experience various worldviews related to the phenomenon under investigation. This openness allows the interpretation of the quantitative data to be cross checked with the interpretation of qualitative data. It also allows the pragmatic researcher to reconsider the interpretation of both data sets thoughtfully and attentively. Pragmatic MM researchers hold themselves open, while discursive discourse goes back and forth between the two types of data. An in-depth understanding of the phenomenon under inquiry require es an exploration of the two horizons (the quantitative and the qualitative).

5. Pragmatism and the Fusion of Horizons

For a pragmatic researcher, the point of understanding is a point where the quantitative horizon fuses with the qualitative one. It is a point where interpretation and understanding of one horizon yields a concurrent consideration of the other. As such, both horizons (the quantitative and the qualitative) co-exist in relation to each other. These divergent research horizons never erode one another. The pragmatist Mixed Methods researcher believes in the inevitable existence of both horizons. In fact, you can not erode, uproot or throw away one horizon for the sake of the other. Rather, pragmatism deepens the rationality of each horizon, making it worth taking into consideration.

6. Key Takeaways

The gain we get from the pragmatic philosophy is that our constructed quantitative understanding of a phenomenon cannot be isolated from our constructed qualitative one. All in all, this paper endorses the vision that the philosophical understanding of pragmatism as a research paradigm yields a stance that honors exploring multiplicity of world views in solving problems. The pragmatic discourse of the research paradigm demonstrates that our understanding of the nature of research, in terms of theory and practice, has a lot to do with the process we follow in making sense of the world with its concerns and problems.

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Natural Experiments and Causation in Strategy Research

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Abstract: Research to inform organizational strategy decisions studies the impact of specific managerial decisions on performance. While links from decisions to outcomes can be convincingly identified in individual, specific circumstances, trying to do the same with a larger set of decisions and outcomes can be problematic. In a situation with a substantive sample, relying on standard metrics such as financial statements, the link to particular outcomes can be difficult to establish. Especially when trying to choose metrics not already correlated in some way. Our research is generally in the field of knowledge management (KM). The discipline has an extensive history of attempts to link better management of knowledge and other intangibles to performance outcomes. While the performance outcomes are fairly straightforward (financial success such as profitability or return on investment, innovation success, etc.), the metric for knowledge management is harder to pin down. The literature shows dozens of approaches. Some are for single firms or a small sample, but even if focusing only on metrics for a larger sample of firms, disagreement exists. But even when a KM metric is chosen for a larger sample, there is often a direct tie between input and output measures, making correlation difficult to establish, let alone causation. If profitability is part of both the input and output measures, of course they are correlated. The most advanced statistical techniques don't establish anything more than what the researcher should already know from a cursory look at the logic of the study and the specifics of the variables. As a result, whether KM actually results in better organizational performance is still an open and much debated question in the field. One research approach that can get around this issue is the natural experiment. Pioneered by Nobel winner David Card and others, the natural experiment uses two measurements with a clear, consequential event separating the two—minimizing the impact of samples that might otherwise be connected contemporaneously. The event, such as a change in law, provides a change in circumstances delinking the measures. Whether structured as a pre/post experiment (measuring before or after the intervening event) or control/experimental group experiment (one group exposed to the event, the other not), the outcome can provide convincing results and can even suggest causation. This paper will cover our work with natural experiments in relation to KM and performance outcomes for merger and acquisition (M&A) activity. Can KM metrics before an M&A event predict the success of the event? Success can be defined by the change in financial performance after the event takes place.

Keywords: Knowledge management, Financial performance, Tobin's q, Merger and acquisition, Natural experiments

1. Background

Knowledge management (KM) as a discipline, and the companion field of intellectual capital (IC) are founded on the belief that better management of intangibles such as knowledge assets can lead to superior organizational performance. According to the resource-based view of the firm, defensible competitive advantage comes from singular, hard-to-copy resources (Barney, 1991; Wernerfelt, 1984), and the unique knowledge held by organizational members is particularly distinctive and appropriable. If it can be managed more effectively, organizations can benefit (Zack, 1999; Grant, 1996). Superior KM should lead to superior organizational performance (Chan, 2009).

But one of the ongoing issues in the field is an inability to convincingly demonstrate the link between better management of knowledge or intellectual capital (call them knowledge assets for this paper). Multiple attempts have been made. Many current studies, especially those using structural equation modelling rely on self-report surveys (e.g. Kucharska & Erickson, 2023). While valid and reliable, as far as they go, these methods generally include a sample of respondents from a limited number of organizations, and they report on their perception of knowledge management and organizational performance (financial, innovation, sustainability). As with case studies, these subjective approaches are hard to extend to a wider population—even given broad claims concerning variable significance and model fit.

More objective measures exist, of course, focusing on financial statements and similar reports filed by firms Sveiby, 2010). These measures also have the advantage of allowing sizable samples and straightforward comparisons across organizations in the samples. As such they are reliable, valid, and can be statistically extendable to a wider population. The Sveiby compilation points out the range of methods for measuring knowledge assets, and Tan, et. al. (2003) had earlier noted the lack of agreement over which should be the independent variable representing knowledge when trying to establish a relationship to financial performance in particular.

One tool employed in a number of these types of studies over the past twenty years is Pulic's (2000) Value-Added Intellectual Coefficient (VAIC). The Tan, Plowman and Hancock (2003) just mentioned used it after reviewing the available options. Other important work (Chen, Cheng & Hwang, 2005; Firer & Williams, 2003) also applied VAIC. The metric is readily available from financial statements, is objective, and is easy compare across firms, industries, and regions. VAIC looks at the value-added to a firm compared to its concrete physical assets. As investments in human resources are added to the calculations, the specific value-added from human capital can be inferred, with the remaining value-added attributed to structural capital. As the conceptual framework of intellectual capital (knowledge assets) includes human capital (what employees know about their job), structural capital (knowledge embedded in the firm itself), and relational capital (knowledge about customers) (Bontis, 1999; Edvinsson & Malone, 1997), VAIC is able to separate out an estimate of human and structural capital as well as the overall value of knowledge assets. As such, it has been a popular methodology for studies evaluating the relationship between intellectual capital/knowledge assets and financial performance (Maditinous, et. al., 2011; Smith & Das, 2018; Bayraktaroglu, Calisir & Baskak, 2019).

Besides not including the relational capital aspect (increasingly important in an age when customer data and relationships are ever more prevalent), VAIC has come in for some pointed critiques concerning the makeup of the other individual components and issues such as whether time lags should be included (Andriessen 2004; Ståhle, Ståhle & Aho, 2011, Marzo, 2021). But the technique continues to be used when researchers in the field want a broad, objective sample, and recent enhancements in the approach (defining the components more precisely and employing as a strategy aid rather than a performance p) allow it to continue to maintain its position as a popular option (Nadeem, Dumay & Massaro, 2019; Nazari & Herremans, 2007).

A related option is Tobin's q (Tobin & Brainard, 1977), also assessing value added but without the individual components. It simply looks at the value of the firm compared to the value of its physical assets. The difference or ratio is inferred to be the value of intangible knowledge assets. Any issues with component estimation are removed though the results are, therefore, more general. But a rough estimate of a firm's efficiency in employing physical estimates does allow direct, objective comparisons across industries and across organizations (Erickson & Rothberg, 2017; 2016; 2012).

2. Methodological Issues

Even given the relative advantages of applying such methodologies (objective data rather than subjective perceptions, easy application across a broad sample), important questions remain when trying to use them in establishing a link between better management of knowledge assets and organizational performance. Initially, even with better data, comparing the independent knowledge assets variable with the dependent performance outcome variable is only a statistical technique. Correlation can be inferred but not causation. And even correlation is an iffy prospect given the lack of uniformity in results across the key studies noted (and others). Sometimes the relationship appears clear and sometimes it doesn't.

But even if one buys a relationship has been established, a very basic problem remains with the definitions of the input and output variables. The time lag arguments start to get to it—when does improved performance in managing knowledge assets have an impact on organizational performance, particularly financial results? Immediately? In a year? Two years? One can run different lags and look for the best model results, but that needs some support in theory. And a "definitive" lag has yet to be established (Goebel, 2015).

Needing to clarify lags and whether the input variable has an impact on the outcome variable is necessary because of that variable definition conundrum. Consider the case of Tobin's q (VAIC is similar). The Tobin's q measure of intangible/knowledge assets is some variation of market capitalization to physical assets (book, replacement value, etc.). Market capitalization is the firm's value, (stock price) x (# shares), but stock price comes from the market's assessment of the firm's future potential based on available information such as profitability, ROI/ROE/ROA, and other data used by analysts and stock buyers in making investment decisions. Financial performance can be measured in multiple ways as well, but generally comes down to much of the same data: profitability, ROI/ROE/ROA, etc. In a nutshell, the equation can be represented as:

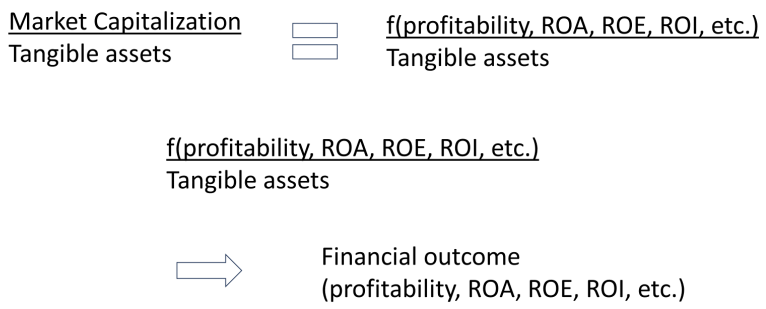

Figure 1: Tautology of many approaches

The result is that the same term or something closely related to it is present in the numerator on both sides of the equation. That makes all attempts at correlation somewhat questionable as the independent and dependent variables are related by definition. The suggested correlation is tautological. Lagging properly can somewhat help as the two terms come from different times but depending on circumstances (and lacking any substantive change in circumstances), the definitional problem may persist. And, in the end, a statistical relationship would never establish causation, that the knowledge metric actually leads to the superior financial performance.

One solution to this conundrum is to formalize the lag by ensuring a change in circumstances, then measuring before and after financial performance results. This approach represents experimentation, where a single identified variable is changed, then its impact on a different variable can be inferred and measured, provided other potential explanatory variables remain constant. Experiments remain the only way to truly establish causation (Campbell & Stanley, 1963; Hair, et al., 2010). While experiments can be difficult in the real world, especially for complex systems like competitive industries and resident firms, newer methods are available, and researchers in business can apply them.

Natural experiments are field experiments conducted against the backdrop of some demonstrable change in circumstances. David Card's 2021 Nobel Prize chiefly related to his work with natural experiments. In his case, he often looked at environmental changes in laws (minimum wage law enacted in New Jersey but not Pennsylvania (Card & Krueger, 1993), life choices like education (Card, 1999), social phenomena such as immigration (Card, 2001). The impact of such changes on wages, income, and other such economic outcomes could be tracked by taking measures in the experimental group (e.g. New Jersey) and the control group (Pennsylvania) and then comparing. Or by taking pre/post measures and assessing the differences.

Classic experiments work because the investigator can control all variables except one, change that variable, and then the only possible inference for any changes in an outcome variable will be that single alteration. In the laboratory, such procedures are fairly straightforward, with conditions carefully controlled and the experimental variable manipulated as desired. Lab experiments tend to have high internal validity (confidence in how the variables are handled and measured) but lower external validity, as results may be hard to extend to messier, real-world conditions outside the laboratory. Field experiments, on the other hand, are generally based on the experimenter manipulating some real-world variable (e.g. exposing individuals to some prompt), then observing the results. All other variables are not carefully controlled, there can be an assumption they remain roughly stable, so internal validity is less. But the external validity is higher as these are obviously real-world conditions. And if repeated in multiple scenarios, field experiments tend to wash out any particular issues with the impact of the uncontrolled circumstantial variables (Erickson, 2017).

Natural experiments have evolved into an important tool for studying large-scale impacts of real-world variables such as policy changes, public health interventions, or other key events. Critically, the quasi-experimental framework allows attribution of causality. The researcher does not have control over the intervention or the circumstances, but is an outside observer (Craig, et. al., 2012). Based on the data available, the researcher can apply a natural experiment methodology, evaluating the impact of the intervention. A wealth of experimental design options is available, depending on when data are available, when the intervention occurs, and other considerations (Leatherdale, 2019). Pre-measures, post-measures, multiple longitudinal measures, multiple groups, and similar options can work with a properly constructed quasi-experimental design.

How knowledge is related to performance outcomes remains a critical aspect of the work everyone in KM and IC does. If managing knowledge better doesn't matter, why invest in doing it? A gap remains in the literature concerning the knowledge/performance relationship. Metrics have been established but continue to have issues with definition and independence (tautology). Studies conducted across industries have also tended to include contemporaneous variables, are often subjective self-reports, and are analysed only by statistical means. They are limited to showing a statistical relationship between knowledge and performance. And results from key studies have been varied. Some show a relationship, some not (Mention, 2012). An opportunity remains to establish the knowledge/performance outcome relationship more convincingly. Especially if some degree of causality can be attached.

3. Natural Experiments and Knowledge Management

In applying a natural experiment methodology to knowledge management outcomes, we identified a key event that can change the prospects of a firm, a merger and acquisition (M&A) action. M&A financial results are famously hard to predict with an overwhelming majority *not* contributing to shareholder value (Marks, Mirvis & Ashkenas, 2017; Christensen, et. al., 2011). Many, many studies, principally in the finance literature have looked to find ways to identify before the fact the M&As that would engender positive outcomes rather than negative (Marks, Mirvis & Ashkenas, 2017; Christensen, et. al., 2011). One review identified 48 studies totalling 46 outcome metrics and 125 possible predictor variables (Das & Kapil, 2012). Finding an accurate predictor of M&A success is something of a holy grail in investing circles (Langford & Brown, 2004).

Attempting to predict a post-M&A outcome with an identifiable variable is an attractive scenario for a natural experiment approach. And knowledge asset level might be an appropriate predictor variable. Both tangible and intangible variables have been identified as drivers of M&A actions (Lev, 2004), but intangibles are more likely to be the more critical and less easy to explain in terms of impact (Sullivan & Sullivan, 2000; Lemieux & Banks, 2007). Tangible assets can be obtained in a number of ways not requiring M&A, but intangibles or knowledge assets are unique and likely to be of high value if related to competitive advantage, and so of interest in a merger or acquisition. Further, given the high aspirations and expense of many M&A events, they are often related to competitive advantage and top-level results (Marks & Mirvis, 2011; Papadakis, 2005) and so acquired assets, tangible and intangible, have a conceptual basis for being considered a potential factor in the financial outcome.

More specifically, if the target in an M&A action has unique, valuable knowledge assets, the acquirer will have intentions to combine it with its own knowledge and grow it. In fact, one could suggest that successful M&A comes from the combined entity better managing the combined knowledge—that one of the parties knows something that will improve the application of knowledge. And given prior metrics on which entity better manages knowledge, how the knowledge is employed and by whom is predictable.

From this perspective, a natural experiment can be constructed. The structure is a pre/post experimental design, recognized in the traditional literature (Campbell & Stanley,1962) and the natural experiment literature (Leatherdale, 2019). Here, knowledge asset efficiency is calculated for acquirer and target at announcement of the M&A (most recent financial reports), using a form of Tobin's q (Tq), market capitalization to tangible assets. Knowledge asset efficiency is also calculated for the combined entity as the M&A is completed. These metrics are used to predict the financial outcome as combined Tq > previous averaged Tq shows the market expects improved financial performance. Stock value at M&A completion vs. stock value at some future time (e.g. 1 year) would show whether the knowledge metric can accurately predict an increase. Or, in the language of Figure 2, the Tq (knowledge assets) metric assigns each M&A announcement to a group: invest or not. Each is judged by data collection (stock price) pre- and post-merger completion (both actually have an intervention). The intervention group is expected to see superior financial returns compared to the control group. Further, one could also posit a control group with no M&A action (no intervention) and track market returns over the relevant period for comparison.

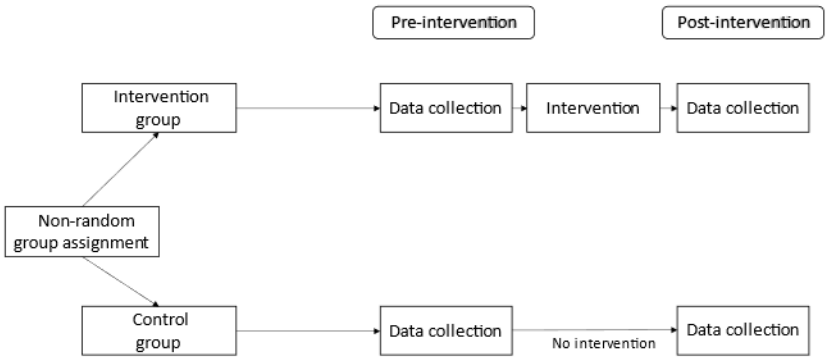

Figure 2: Natural Experiment Design (from Leatherdale, 2019)

Using this basic format, we collected data on multiple experiments, a backstudy, a forward study, and then from a startup investment firm trying the strategy with real capital.

- The backstudy, of almost 2,000 M&A actions on North American exchanges from 2003-2013, showed convincingly superior results for M&A events meeting the criteria. The intervention group predicting the acquirer would improve the knowledge metric of the combined firm showed a 19.5% return. The intervention group not predicting combined improvement had a loss of -0.02%. The non-intervention group, the broader Russell 3000 exchange without M&A provided an 11%) return (Erickson & Rothberg 2023).
- The forward study looked at five chosen M&A events in real time in 2014/2015. Four of the five showed a positive return, much better than the traditional success seen in M&A investments.
- Results from the investment startup are still being processed, but over five years, full capital investments were returned to all participants, showing the strategy more than broke even (after subtracting costs and taxes), again a superior result to what is typically found with M&A actions.

In short, knowledge asset levels in acquirer and target provide some guidance as to the likely intentions of the M&A action. When the acquirer is higher and expected to improve the knowledge performance of the target, good things are expected and can be tested post-merger. Our initial results substantiate this expectation, better knowledge management can raise combined organizational performance. When the combination is not necessarily expected to increase combined performance (the target manages knowledge better), that can also be tested. And our initial results bear that conclusion out. Further, M&A results may be able to be more accurately predicted than generic full-market performance results such as the Russell.

The methodology, of course, is easily replicated with readily available financial reports. Any number of variations, including time periods, targeted industries, other countries, and others could be used in similar studies. But as we seek to better establish if and how knowledge management and intellectual capital might be more convincingly tied to financial outcomes, natural experiments provide one interesting path forward.

4. Conclusions

As noted initially, convincingly establishing a link between better management of knowledge assets and organizational performance, especially financial performance, has proved difficult. Even making a case that the two are correlated has had hits and misses, and the methodologies can sometimes leave one wondering if anything is shown beyond what was already known about definitionally related variables.

Applying a different methodology, one that at least infers causality, is a way around this conundrum. Further, multiple applications of the methodology could firmly establish causality as the possible influence of circumstantial variables is eliminated in different analyses. Natural experiments have potential to fill this role.

By identifying a knowledge management metric as a predictor for the outcome of an experiment, it removes the tautological problem of both an independent and dependent variable being related by definition. As the KM

metric assigns M&A actions to groups, predictions are made, and the predictions are then tested with financial performance results based on objective measures at two different points in time with the M&A completion as the natural event changing the operating conditions of the companies. While not a controllable variable as in a true experiment, it is something that identifiably happens to all sample members, providing much the same outcome. As it happens in the field, the natural experiments have strong external validity, made even stronger by repeated applications in different real-world circumstances. Success in different environments also addresses some of the weaknesses about internal validity, either identifying or removing any other potentially biasing variables.

What this approach has done, then, is establish that knowledge management does have a relationship with positive financial outcomes. The first intervention group, with combined knowledge assets expected to grow post-merger, performs better than the second intervention group without the same expectations. The first intervention group also performs better than the wider market, financial returns from all the cases without any intervention at all. If pursued in other applications, confirmation of this outcome would be an important finding for the KM and IC disciplines.

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Advancements in Bankruptcy Prediction Models and Bibliometric Analysis

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Abstract: Since the economic downturn of the 1930s, there has been a growing interest in predicting company bankruptcies. Though not a new topic, the prospect of business bankruptcy has gained increasing relevance due to globalisation. This study explores various methodologies employed in predicting bankruptcy. Preventing bankruptcies also bolsters economic stability by averting the adverse effects of insolvency on the community. Companies with a solid and flexible economic foundation are more likely to succeed. This article reviews existing literature, discusses prevalent predictive models, and presents a statistical analysis of bibliometric data associated with bankruptcy prediction. This work aims to answer the research question of identifying the trends over time in the econometric models used to predict bankruptcy. This article may be useful for finance and business students in providing an overview of the subject and for business managers to identify the key determinants of financial distress. Exploring the R package, *Bibliometrix®* demonstrates its efficacy as a powerful tool for science mapping.

Keywords: Bankruptcy prediction, Predictive models, Financial distress, Bibliometric analysis, Risk

1. Introduction

Bankruptcy prediction models have been a subject of significant interest in financial literature, especially in the fields of business management and finance. This paper presents a literature review of bankruptcy prediction models from 1966 until 2024 that intends to identify trends in the most used methods and give a panorama of how this subject has been dealt with in literature. Bankruptcy prediction relies on analysing key financial indicators through various statistical and machine-learning methods, reflecting the evolution of techniques in this field. Complementary, a bibliometric analysis is presented regarding documents published in this field that are indexed in the Web of Science. The research for the bibliometric analysis was done with a set of keywords, namely Bankruptcy Prediction, Bankruptcy Prediction Models, and Financial Distress for the same period used in the literature review. It is highlighted that for the years 1966 to 1970, there are no documents with the keywords analysed. For this reason, the bibliometric analysis was conducted since 1971 until 2024.

As noted by White et al (1998), the risk of bankruptcy represents the uncertainty regarding a company's ability to sustain operations should its financial state reach a critical point. Argenti (1976) underscores the importance of examining the root causes of bankruptcy to anticipate similar drawbacks in the future. Moreover, Barros (2008) elucidates that business failure encompasses numerous factors, including deficient management practices, shortcomings in accounting systems, resistance to change, involvement in overly ambitious ventures, over-reliance on financing, and inherent risks inherent to the business landscape.

Sousa and Oliveira (2014) delineate that the causes precipitating bankruptcy proceed from both internal and external origins, classifiable as endogenous and exogenous variables. Ferreira (2016) further explains that those external factors may stem from macroeconomic influences, intense market competition, or shifts in consumer behaviour. In contrast, internal factors are linked to a company's strategic resource allocation, adaptability to market dynamics, managerial efficacy, debt burden, and operational inefficiencies. Bankruptcy causes are diverse and frequently influenced by factors such as economic crises or the volatility of the business environment (Almeida, 2010).

In the banking sector, stress tests conducted by institutions like the European Central Bank (ECB) serve as risk assessment measures, particularly in adverse scenarios. These tests measure a bank's resilience against crises, credit deterioration, and economic contractions. Thereby aiding in the evaluation of asset quality and systemic stability. This analogy underscores the significance of predictive models in averting bankruptcy and enhancing decision-making processes. Consequently, an abundance of models has been devised utilizing statistical data analysis techniques to forecast companies' susceptibility to failure or financial distress (Yang, You, and Ji, 2011).

The paper contributes to the literature review analysis from 1966 to 2024, providing insights into the evolution of bankruptcy prediction models over nearly six decades. The methodologies used in the paper offer insight into how the discourse surrounding bankruptcy prediction has evolved within the academic literature. Additionally,

it demonstrates the reliance of bankruptcy prediction on key financial indicators, elucidating the transition from traditional statistical methods to the contemporary utilization of machine learning techniques. This holistic examination enhances the understanding of the prevailing approaches to bankruptcy prediction and informs future research directions in financial analysis and risk management.

2. Methodology

The methodological approach chosen for this article was a literature review emphasising the bankruptcy models. This includes describing available knowledge for professional practice and identifying experts within a specific field (Fink, 2005). The data repository for the literature review was extracted from Elsevier, Science Direct, Springer and Web of Science (WoS).

The selection of the Clarivate database (WoS, Web of Science) for the bibliometric analysis in 2024 was made deliberately to ensure the validity and reliability of the data. Web of Science is renowned for its coverage and rigorous standards, providing Impact Factor (IF) metrics and enhancing the credibility of the analysis (Roldan-Valadez et al, 2018). The keywords utilized in the search were "Bankruptcy Prediction", "Bankruptcy Prediction Models", and "Financial Distress". The retrieved data included scientific articles, proceedings papers, review articles, book chapters, and early access publications from 1971 to 2024, focusing specifically on publications in finance, economics, and related fields. The search yielded 6,805 outcomes, with no language restrictions applied. Full papers were included in the review to ensure a thorough evaluation of the literature on bankruptcy prediction models. Subsequently, a bibliometric analysis was performed using the program R Studio® and the *Bibliometrix®* package. Seven papers were excluded from the analysis due to their retracted status.

3. Bankruptcy Prediction Models

The introduction of financial ratios, initiated by Beaver (1966) and his seminal univariate analysis, marked a pivotal moment in corporate bankruptcy prediction. These ratios remain important in assessing companies' financial challenges, with the Cash-flow/Total Liabilities ratio emerging as particularly insightful. Altman (1968) advanced this approach by categorising ratios into five distinct groups: liquidity, profitability, indebtedness, coverage, and activity. Altman (1968) also formulated the Z Score Model, utilising Multivariate Discriminant Analysis (MDA) to evaluate the company's characteristics.

Kanitz (1974) introduced a model for predicting insolvency based on multivariate discriminant analysis (MDA), known as the Insolvency Factor. The author developed an "Insolvency Thermometer" based on the following principle: if the result of the corresponding discriminant function is between -7 and -3, there is a risk of insolvency; between 0 and -3, there is uncertainty; and if it is greater than 0, there is no risk of insolvency.

Subsequently, Ohlson (1980) and Zavgren (1985) introduced the logit regression econometric model to enhance bankruptcy prediction. While Ohlson emphasised the logistic regression model's utility in quantifying the probability of bankruptcy compared to discriminant analysis, Zavgren used a sample of solvent and insolvent companies to estimate the probability of bankruptcy. On the contrary, Platt (1985) suggested that external agents have various resources to identify signs of bankruptcy in companies. These sources can be categorised into three distinct groups: common sense, analysis of companies' published accounting statements (when available), and statistical tools. In efforts to predict bankruptcy amidst high volatility and unpredictability, Pascal (1988), in collaboration with Altman, developed a multivariate discriminant analysis model, which demonstrated reasonable effectiveness in predictions. According to the model, if Z is greater than 0.4, there is no risk of insolvency, while if Z is lower than -1.05, there is a high possibility of insolvency.

Peres (2014) underlined conditional probability models, namely Logit and Probit, as alternatives to more resource-intensive models in bankruptcy prediction. In the Logit Model, calculations involve financial ratios multiplied by coefficients resulting from estimation. Assuming bankruptcy is indicated by 0, the higher the resulting decimal is above 0.5, the less likely the company will go bankrupt. Similar conclusions to Logit are obtained with the Probit model, although the coefficients are more challenging to interpret, and a larger sample is needed for better performance. Furthermore, Logit and Probit are relatively more complex in terms of calculation compared to MDA.

The Gompertz distribution is an important growth model and has numerous applications in actuarial studies (Adham and Walker, 2001). Similar to Logit and Probit, the Gompit model employs the maximum likelihood method for estimation, generating estimated probabilities within the interval 0,1. Consequently, the Gompit model is deemed the most suitable for investigating the bankruptcy of SMEs compared to the Logit and Probit models. According to Laitinen (1991), companies do not follow a uniform pattern of behaviour. In some cases,

the deterioration of indicators is not continuous, reflecting cyclical movements that may eventually lead to bankruptcy. Additionally, Laitinen (1991) points out that the various indicators used can fluctuate over time.

By introducing the non-parametric method known as data envelopment analysis (DEA) in conjunction with mathematical programming, Paradi et al (2004) demonstrated the feasibility of comparing pairs of companies, evaluating their relative efficiencies regarding financial bankruptcy by measuring the distance to the efficient frontier. The authors noted that bankrupt companies exhibit significantly lower average efficiency scores than non-bankrupt companies. Hence, low-efficiency scores in the worst practice models indicate that companies excel at being inefficient.

Du Jardin (2015) employed financial ratios encompassing key dimensions influencing bankruptcy, including liquidity, solvency, profitability, financial structure, activity, and turnover. The pioneering use of neural networks was conducted by Odom and Shard (1990); Tam and Kiang (1990), that used this model to predict bank failure. Similarly, Du Jardin (2015) utilised neural networks to forecast company bankruptcy, employing financial data as input and a Z-score to determine the probability of bankruptcy. The network adjusts its weights through training to minimise the disparity between predictions and actual outcomes. Despite the utility of Artificial Neural Networks highlighted in various studies, Peres (2014) emphasised their limitations, including the challenge of identifying the optimal model amidst diverse network topologies, methods, and learning parameters.

Du Jardin (2015) explains a limitation in traditional failure modelling methods, where each company is represented by variables measured only once, thus excluding time as an explanatory factor. However, it was noted that survival analysis allows for incorporating time by employing longitudinal data. The author further explained that the Cox model estimates the risk function based on explanatory variables as an example of survival analysis, assuming proportional hazards where the relationship between risk rates remains constant over time. First introduced by Cox in 1972 for measuring bank failures, this model is known for predicting proportional risks using failure rates, employing a semi-parametric approach that does not necessitate specifying the data distribution (Andersen, 1982).

Cortes and Vapnik (1995) proposed the concept of support-vector networks, which operate on the following principle: it transforms the input vectors into a high-dimensional feature space Z via a predetermined non-linear mapping. Within this space, a linear decision surface is crafted, possessing unique characteristics that guarantee the network's strong generalisation capability. Wang et al (2005) inspired by the technique named Support Vector Machine (SVM), grounded on the principle of minimising structural risk as opposed to empirical risk. SVM is acknowledged as a potent and promising tool for data classification and function estimation, even with limited samples.

Coad et al (2013) argue that firm performance is more appropriately modelled as a random walk process, while survival is determined non-randomly and depends mainly on the stock of accumulated resources. The Gambler's Ruin theory is applied, combining two elements: random company growth and survival (Akhundjanov and Toda, 2019). Inspired by Wilcoxon (1971), this approach uses the metaphor of a group of players gathered around a gaming table, each with a set of resources. Like business people, players in this game of chance tend to be optimistic about their chances of winning, although they have little or no control over the outcome.

The Kaplan-Meier method serves as a non-parametric estimator of the survival function, analysing the time elapsed from the beginning of a study to a specific event. According to Correia (2016), this estimator has gained increasing reliability. However, the model needs to be revised to handle multiple covariates, requiring the creation of several strata, which may lead to small sample sizes and hinder comparison. Nevertheless, the Kaplan curve remains a viable tool for analysing company survival (Gonçalves et al, 2017).

Kaski et al (2001) devised a method based on Fisher's information matrix to derive a metric in the data space, employing the Self-Organising Map (SOM) to explore companies' financial statements. This metric evaluates local distances considering changes in the distribution of an auxiliary random variable, reflecting data significance. Chen et al (2013) described the Self-Organising Map as a non-parametric neural network used for visual clustering in various applications. The authors' studies analysed changes in companies' financial situations and trajectory patterns through a clustering process with the self-organising map, evaluating potential bankruptcy scenarios by examining temporal changes in financial indicators. Initially, the Self-Organising Map characterises bankruptcy risk, followed by projecting instantaneous observations onto the map to form a trajectory vector.

Advancing on the models, Chen (2011) reported that Decision Tree is a standard data mining methodology that simultaneously offers classification and prediction functions. Analysing the provided data constructs a tree-like structure model through inductive reasoning. This technique is systematically employed, constructing the tree from a training sample until the terminal nodes. It exclusively contains companies of two specific types: bankrupt or non-bankrupt. New entities are classified based on the terminal node in which they fall in the tree, identifying the group to which they belong and the associated probability. However, this progressive selection approach can expose the tree to the problem of overfitting since it requires reconsidering the analysed variable later. Peres (2014) explored the use of Decision Trees in the context of corporate bankruptcy, emphasising their effectiveness in classifying companies based on financial data. Additionally, Peres implies that using Genetic Algorithms in corporate bankruptcy research aims to enhance this process by extracting a set of rules or conditions for classification. These conditions, which are linked to specific cut-off points, enable the model to more accurately predict whether a company is likely to fail or not.

Another approach is the Rough Set, developed to generate rules distinguishing between healthy and failing companies, aiming to predict corporate bankruptcy. Dimitras et al (1999) applied the Rough Set theory to construct bankruptcy prediction models in Greece. It observed many advantages, including comprehensible decision rules and integrating qualitative and quantitative variables. However, challenges such as variability in rule sets and redundancies were noted. The method underscored the significance of financial profitability, liquidity, debt capacity, and working capital ratios without necessitating prior assumptions. Moreover, the Rough Set method can analyse new datasets and generate suitable rules as needed, representing the requisite expertise.

Tian, Shi, and Liu (2012) accentuate that machine learning represents one of the most important and impactful advancements. Barboza et al (2017) conducted a study employing machine learning to differentiate between bankrupt and non-bankrupt companies, focusing on business characteristics like profitability, liquidity, leverage, size, and growth measures. The authors exploited potential discriminant variables and identified weights or coefficients applicable in mathematical functions to separate groups, such as bad borrower vs. good borrower or bankrupt company vs. non-bankrupt company.

Computational methods handle imprecise problems, incomplete data, and uncertainty, which are common traits in predicting corporate bankruptcies. According to Korol (2013), while statistical models prioritise accuracy and reliability, artificial intelligence models thrive on the premise that accuracies enable the management of imprecise data and uncertainty, distinguishing them from statistical models. The integration of these models has been instrumental in advancing bankruptcy prediction, offering significant insights into corporate risk mitigation. From the early contributions of Altman to contemporary methods like neural networks and genetic algorithms, this synergy has continuously underscored the importance of this interdisciplinary approach.

4. Bibliometric Analysis

According to Craine (1972), bibliometrics studies provide a more objective and reliable analysis. The vast volume of thematic research, conceptual developments, and data form the milieu in which bibliometrics becomes useful by providing structured analysis to a large body of information, allowing inference of trends over time. Aria and Cuccurullo (2017) argue that science mapping nowadays is indispensable for scholars in every scientific field. With the rapid growth of publications and the fragmented development of knowledge, accumulating and organizing information becomes ever more challenging.

Designed by Aria and Cuccurullo in 2017, the *Bibliometrix®* package is known for conducting inclusive science mapping and bibliometric analyses. Programmed in R, the proposed tool is flexible and can be promptly updated and integrated with other statistical R packages. Therefore, it proves useful in a constantly evolving science such as bibliometrics.

5. Results

This section presents the findings of the bibliometric analysis conducted on the dataset obtained from the Clarivate database (WoS), using statistical techniques in R Studio® and the *Bibliometrix®* package. The aim is to uncover significant trends and patterns in the research landscape surrounding the articles analysed. It provides an overview of the scholarly activity in this domain over the past decades with results from computing key metrics, such as publication trends, most productive countries, and keyword co-occurrences, among other topics. These results offer insights into the evolution, impact, and direction of research in the field of financial distress and bankruptcy prediction.

The analysis covered the temporal range from 1971 to 2024, incorporating diverse sources, including journals, book chapters, proceeding papers and early access. A dataset of 6,805 documents revealed an annual growth rate of 10,05%. The average document age is 8,47 years, suggesting a continuous influx of recent research. Each document received an average of 25.86 citations, emphasising its impact and relevance. Moreover, considering citations per year, an average of 2.318 citations were observed, indicating the continuing influence of the research. These findings emphasise the depth and breadth of scholarly contributions in the field, reflecting a rich landscape of research and knowledge dissemination.

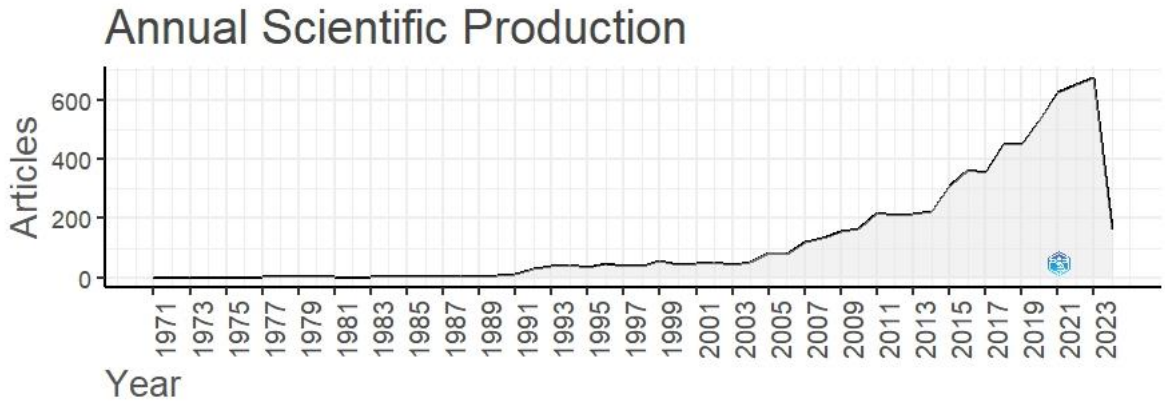

Figure 1: Annual Articles Scientific Production

The Annual Scientific Production chart shown in Figure 1 informs us about the tendency of publication spread through the years and reflects a steady and remarkable growth over time. It started gradually increasing, with occasional fluctuations, until the late 1990s. From the turn of the millennium onwards, there has been a noticeable flow, indicating an increasing interest and investment in scientific research. 2024 shows a notable decrease compared to the previous year, but this could be attributed to various factors such as shifts in research priorities, external circumstances, methodological changes in data collection, or the fact that it is still only the first semester of the year. This trend underscores the enduring commitment to advancing knowledge and innovation in the scientific community.

Table 1: Top 10 Sources Publication with the Highest Number of Articles in this Field

Top 10	Most Relevant Sources	Articles
1	Expert Systems with Applications	182
2	Journal of Banking & Finance	145
3	Journal of Financial Economics	104
4	Journal of Corporate Finance	88
5	European Journal of Operational Research	82
6	Sustainability	77
7	Review of Financial Studies	74
8	Journal of Finance	70
9	International Review of Financial Analysis	51
10	Applied Economics	48

Table 1 presents the top 10 most relevant publication sources based on the number of articles contributed to this topic, their respective scientific areas, and their quality indicators. "Expert Systems with Applications" leads with 182 articles, followed by "Journal of Banking & Finance" with 145, and "Journal of Financial Economics" with 104. Other significant sources include "Journal of Corporate Finance" (88 articles), "European Journal of Operational Research" (82 articles), and "Sustainability" (77 articles). Rounding out the list are "Review of Financial Studies" (74 articles), "Journal of Finance" (70 articles), "International Review of Financial Analysis" (51 articles), and "Applied Economics" (48 articles). These sources collectively represent a significant body of literature in finance, economics, and related fields.

Table 1: Top 10 most relevant keywords in the articles analysed.

Top 10	Most Relevant Keywords	Articles
1	Financial Distress	729
2	Bankruptcy	627
3	Bankruptcy Prediction	253
4	Credit Risk	163
5	Financial	150
6	Capital Structure	147
7	Machine Learning	140
8	Corporate Governance	139
9	Covid 19	106
10	Prediction	106

Table 2 presents the top 10 most relevant keywords in articles analysed in the bibliometric study. These keywords are "Financial Distress", "Bankruptcy", "Bankruptcy Prediction", "Credit Risk", "Financial", "Capital Structure", "Machine Learning", "Corporate Governance", "Covid 19" and "Prediction". These keywords indicate a focus on understanding and predicting financial distress and bankruptcy, assessing credit risk, optimizing capital structure, applying machine learning techniques in finance, examining corporate governance practices, and studying the impact of events like COVID-19 on financial markets and predictive models. The table provides insights into the trends and areas of interest within the academic community, but it might also assist researchers in directing their studies towards relevant topics.

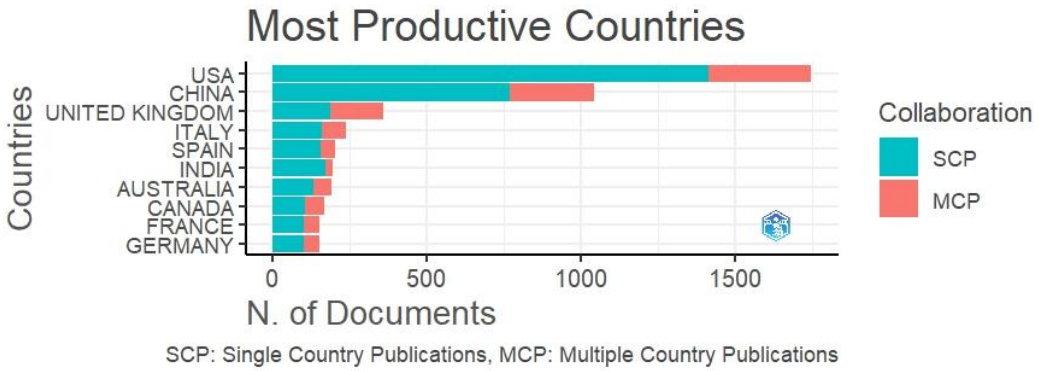

Figure 2: The Most Productive Countries

The Most Productive Countries chart, shown in Figure 2, demonstrates that the USA, China, and the United Kingdom, respectively, have the highest number of single and multiple-country publications in scientific articles addressing bankruptcy prediction. This indicates that these countries are prolific in publishing articles independently and collaborating internationally on scientific research. The countries were selected by the analysis using the R Studio® program based on their number of contributions to the literature on the topic. It was determined by assessing the number of publications retrieved in the WoS search originating from each country. This chart contributes to indicate each country's geographical distribution and scholarly activity. The visual representation enhances the understanding of the global research landscape and the importance of international collaboration in advancing knowledge and addressing complex issues in the field.

Figure 3 illustrates the frequency and distribution of specific keywords within the analysed articles and the prevalence of certain terms in the literature. A keyword occurrence map enables researchers to identify important terms, trends, and their relationships in bibliometric analysis. The green cluster contains statistical terms commonly used in the field, such as "ratios", "discriminant analysis", “neural networks”, "bankruptcy prediction", and "models." The blue cluster focuses on financial terms, such as "bankruptcy", "risk", and "performance." The red cluster emphasises the frequent occurrences in the economic field, including "financial distress", "information", "debt", and "firms". The keyword co-occurrence analysis discloses a network comprising 6.081 nodes with a connection density of 0.004, which indicates relatively few connections between the nodes and suggests that the keywords are not strongly interconnected. Despite this, there is a moderate

clustering (transitivity of 0.117), implying that some keywords are more closely connected than the rest of the network. The network's diameter is 6, indicating relatively short maximum distances between nodes, and the degree centralization is 0.278, showing moderate inequality in some keywords that may be more central or influential than others.

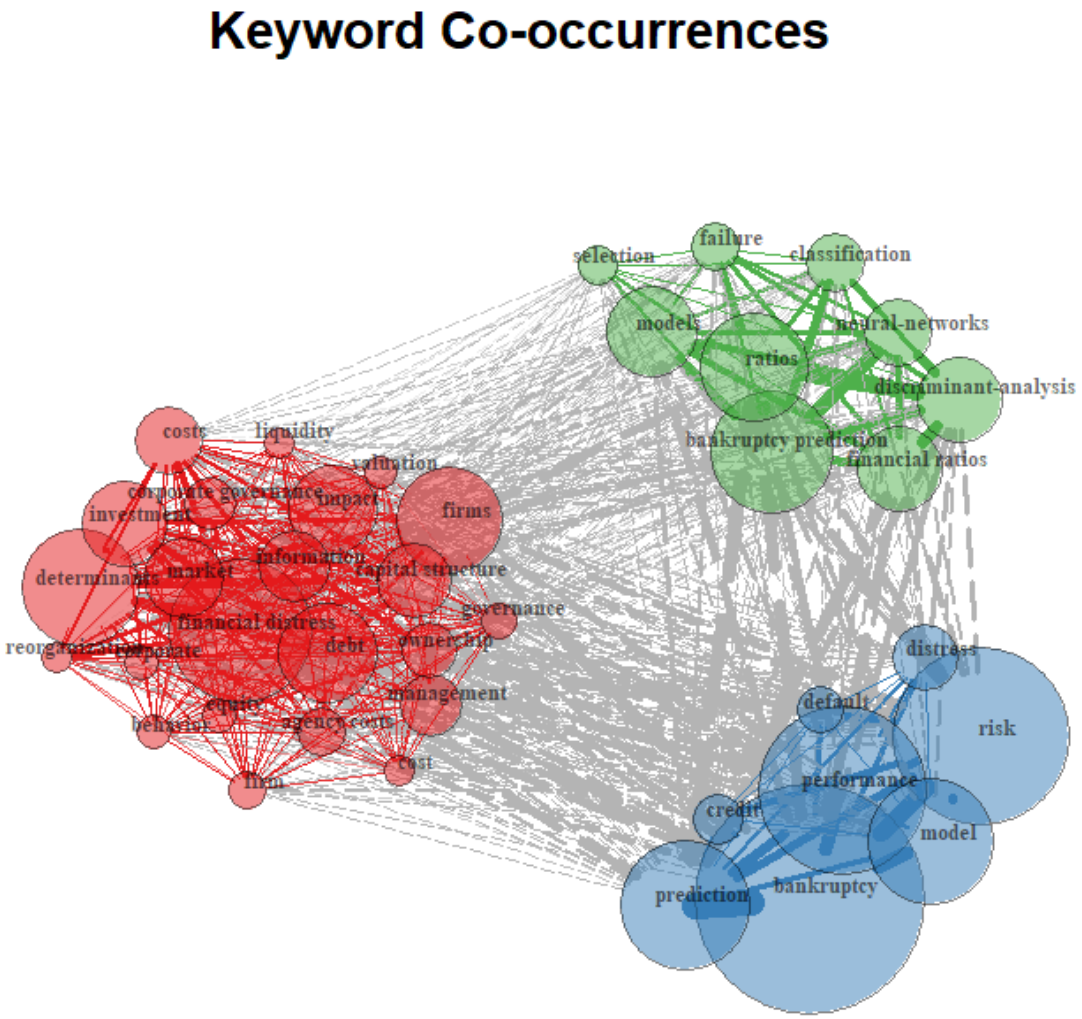

Figure 3: Co-word Analysis through Keyword Co-occurrences

Nonetheless, the average path length between nodes is relatively low at 2.664, facilitating efficient information flow within the network. This visualization is relevant as it enhances the most common keywords used in the analysed articles, showing how the network is interconnected and focusing on key research areas. Although the keyword network is not densely connected, important clusters and central keywords play a crucial role in the research landscape. These clusters indicate focal points and potential areas for further investigation.

Figure 4 is a Tree Map Chart retrieved from WoS, showing ten diverse research areas and disciplines, offering insights for bankruptcy prediction across relevant fields of study. The categorization includes Business Economics and Computer Science as the research areas most connected with the topic of bankruptcy prediction. Other research areas connected with the topic are Operations Research Management Science for organizational optimization; Engineering for technological development; Mathematics for numerical relationships; Government Law for legal systems; Mathematical Methods in Social Sciences for mathematical applications in social phenomena; Environmental Sciences Ecology; Science Technology - Other topics for diverse scientific studies; and Sciences Service for scientific knowledge delivery. The analysis aids researchers, policymakers, and stakeholders in understanding academic research and innovation.

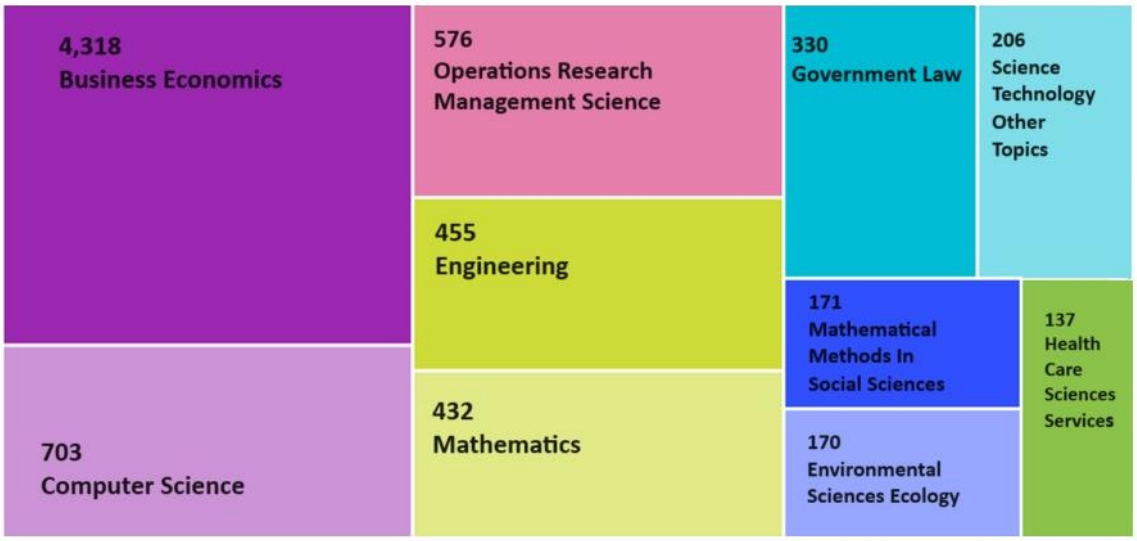

Figure 4: The Main Research Areas (WoS)

The Tree Map Chart shown in Figure 5 demonstrates the ten critical importance of Sustainable Development Goals (SDGs) in contemporary research and academic discussion. Through the analysis, valuable insights were uncovered into how researchers are addressing and contributing to attaining SDGs towards a more sustainable future. The figure reveals that the majority of papers in the field of bankruptcy prediction (2836 papers) are related to SDG 08, "Decent Work and Economic Growth", as expected. However, predicting bankruptcy can also help in achieving other sustainable development goals, such as SGD03 "Good health and well-being", SDG01 "No poverty", SDG10 "Reduced inequality" and SDG09 "Industry innovation and infrastructure".

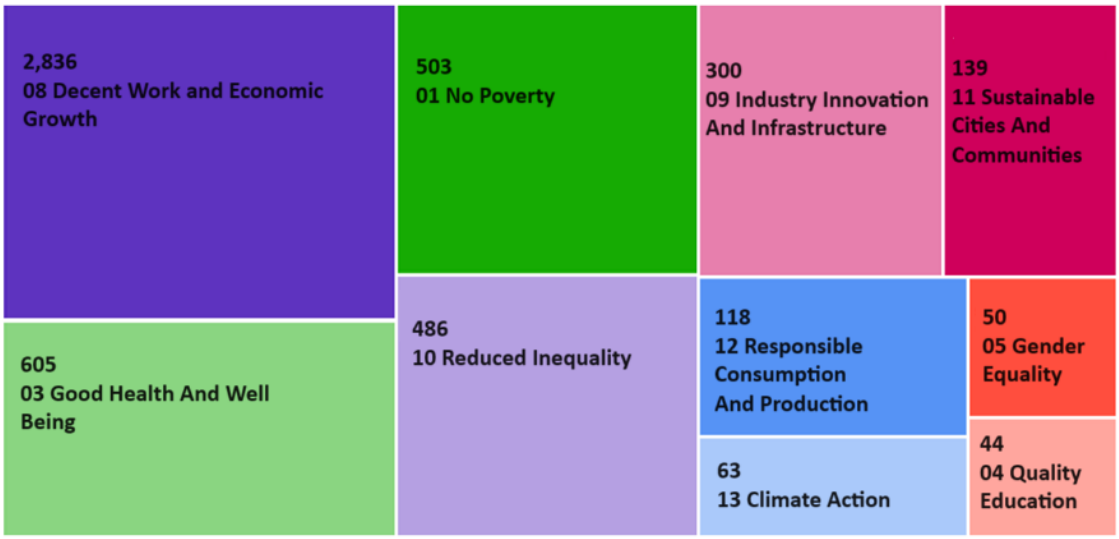

Figure 5: Sustainable Development Goals (WoS)

6. Limitations

Firstly, due to restricted database access from our institute, data extraction for the bibliometric analysis was limited to the Web of Science (WoS) database. Therefore, while it is acknowledged that other databases are valuable, the lack of access led us to make this decision. Consequently, selecting articles for bibliometric analysis only partially represents all research conducted in the bankruptcy field regarding the keywords added. Additionally, the temporal scope of the study, covering bankruptcy prediction models from 1971 to 2024, must consider the advancing economic and financial conditions over time. Furthermore, the generalizability of the findings and conclusions drawn from the literature review and bibliometric analysis may be limited, as it may only be universally applicable to some industries, sectors, or regions. Finally, challenges related to data availability, model complexity, and interpretability may need to be improved to ensure the use of these models in real-world business settings.

7. Conclusion

The article overviews bankruptcy prediction models, tracing their evolution from classical statistical methods to more advanced techniques, such as artificial neural networks and genetic algorithms. While traditional models such as multivariate discriminant analysis and logistic regression remain popular due to their effectiveness, there is a growing trend towards more complex approaches like artificial neural networks and genetic algorithms. The continuous improvement of these models is crucial to providing practical tools to companies to identify and mitigate financial risks, thus contributing to their long-term sustainability. However, challenges persist, including the complexity of models and imprecise data. Nevertheless, these tools offer a promising path to strengthen management in the face of a dynamic and competitive business environment.

The results of the bibliometric analysis indicate that the field of bankruptcy prediction is constantly progressing, with a substantial increase in the number of publications over the decades. This reflects the growing academic interest in understanding corporate financial difficulties. However, despite the progress, there are opportunities for more thorough longitudinal studies to fully capture the evolution of the field over time. In summary, the findings of bibliometric analysis offer perceptions for researchers and professionals interested in mitigating financial risks and promoting the financial health of organisations.

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Applicability of Both/and Thinking in International Sustainable Business Studies

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Abstract: The purpose of this article is to provide a methodological demonstration making use of the both/and thinking (BAT) framework to perform analysis of intertemporal tensions. The BAT framework as an analytical tool is able to holistically examine complex multi-level business problems that involve tensions, contradictions and paradox that could be useful to others. Engaging the BAT framework in international sustainable business studies can be a challenging choice as it requires holistic understanding of the affects in the separation of contradictory elements across time and distance to shape research inquiry and direction. The approach considers that while paradoxes deal with contradictions, as a methodological process it enables a strategy for juxtaposing apparent opposites using an integrative lens embedded in BAT. As such, the use of BAT is discussed using a constructionist approach to gain insight and understanding on surfacing intertemporal tensions exemplified by the socio-business case study that is situated in the chocolate industry. The article draws on BAT primary and sub-themes and discusses implications and applications as a technique to frame the grappling of tensions. The findings are guided by the existing literature and the analysis from the empirical case study providing contributions in practice to further support the use of the BAT framework. Paradoxes examined in this article are based on affects for the themes of organizing, belonging, performing and learning. This article provides understanding of the findings to gain insight from an empirical and theoretical perspective to illustrate the practical implications of the methodological approach. As such, the principles of paradox theory are placed in the context of the BAT framework which are exemplified by making use of the empirical case study data to surface the potential applicability of the approach for future research. This article aims to contribute to the business and management methodological literature by demonstrating the use of the BAT approach and contributes with specificity in relation to the paradox taxonomy and the use of the BAT framework. Despite certain limitations, the BAT framework can be an excellent choice for qualitative sustainable business research that deals with contradictory demands.

Keywords: Both/and, Business, Methodology, Paradoxes, Sustainability

1. Introduction

Organizations experience tensions arising from managing business priorities and socio-environmental interests in flux with one another. Balancing the contradictions shapes the dynamics of the both/and thinking (BAT) approach from Smith and Lewis (2022: 39). We demonstrate its use to gain understanding of intertemporal tensions situated in a case study of the chocolate industry (Gómez, 2023), emphasising the performance and effectiveness of the approach. The insights gained demonstrate practical implications for business practitioners and provide guidance for managers and policymakers grappling with the management of tensions and addressing real-world problems. Our demonstrative case study followed a complex and rigorous research process with some ethnographic elements having unusual access to field data from Costa Rica and Ecuador. The case study enabled understanding of how sustainable business priorities shape social and business case logics surfacing the trade-based tensions in the chocolate industry. As such, the main line of argument rests on how monetary gains in conventional trade treats cocoa as a commodity, affecting the livelihood of the actors in the producing-south nations. Chocolate as a popular and luxury product has over utilized and exploited resources (such as, ecosystems, communities and economic systems). A market-driven decline in resources led by global commodity price setting has expanded the economic divide between the consuming-north and the producing-south nations facilitating neglect of social needs at local levels. Consequent short-term pressures surface tensions for the actors across the chocolate chain making it hard to satisfy both present and future needs of all actors. While some studies have examined paradoxical tensions in practice (e.g., Lewis, 2000; Reinecke and Ansari, 2015; Sharma and Bansal, 2017), we depart slightly to exemplify tensions that arise from actors being in a trade relationship, having a certain role while adopting multiple roles at different levels of primary business activities. We offer methodological insights into the dynamics that actors experience when entangled in a system of paradoxes including, shaping the intertemporal tensions and how these interactions fit within a BAT framework.

2. Methodology

We adopt a constructionist paradigm as in most paradox research, primarily since paradoxes arise when they become salient to those involved in social interactions where contradictions are weighted against one another. Methodologically, the demonstrative case study offers a social construction in the sustainable business trade relationships. As such, we engage the BAT framework developed by Smith and Lewis (2022) and contribute to the use of the framework in such a way that the case study' findings provide early evidence of the way the framework can be applied to evaluate the performance on the use of its components. Making use of the BAT framework and in relation to the case findings and theory, the discussion and analysis outlines the position of: structuring of boundaries to contain the tensions; enabling dynamics to unleash and surface the unknown tensions; shifting to both/and assumptions from the traditional trade-off approach; and, accepting and embracing of the paradoxical tensions. The discussion enables understanding and meaning of a workable strategy in organization (Smith and Lewis, 2011) to value competing demands within sustainable business while honouring their independence (Lewis, 2000).

3. Discussion: BAT Action System

The BAT framework are tools as described by Smith and Lewis that support contribution to theory answering the questions of what, how, why, and who, when, where (Whetten, 1989). These tools include two axes, *context* that deals with the situation of the business case balancing the short-term versus long-term or past, present and future (Jarzabkowski et al., 2022; Slawinski and Bansal, 2017), and, *people* that enable sensemaking as process to obtain alignment by scanning, interpreting and responding to situations (Hahn et al., 2014). These two axes are divided into two areas each with opposing poles, for a total of four areas. The axis of *context* runs vertically and embraces boundaries and dynamics where the opposing forces of stability and change foster synergies, while the axis of *people* runs horizontally and embraces assumptions and comfort, engaging conflicting poles such as emotions and knowledge. As a system, the axes support a paradoxical BAT approach to manage contradictory yet interrelated objectives that are guided by the context areas of boundaries on how actors approach situations (such as, structuring) and containing the tensions (*see Section 3.1*), across dynamics related to how actors enable and adapt to practice (such as, experimenting and learning; *see Section 3.2*), and, assumptions that deal with shifts on how actors think and adopt a both/and approach (such as, knowledge and priorities; *see Section 3.3*), across comfort, based on how actors feel (such as, discomfort and perspective; *see Section 3.4*). Following, we make use of the four BAT areas allowing the empirical case findings to emerge and obtain fit within the BAT system through a set of leadership tasks that embeds *context* and *people.*

3.1 Boundaries to Contain Tensions

Business leaders grapple with managing challenges that are inherent of interrelated and contradictory objectives (Smith and Lewis, 2022). A classic example of businesses exploring and exploiting is presented by O'Reilly and Tushman (2008); they investigate the consequences of unique capabilities and the ability of businesses to explore and exploit opportunities at the same time. In our case study, actors made use of exploring and exploiting opportunities to improve products (such as, yield), processes (land management), technologies (payment methods) and systems (pension systems). Informants created boundaries (Jarzabkowski et al., 2022; Smith and Lewis, 2022) to ensure a balance between the opposing poles is maintained while navigating the tensions. Guardrails allow separation of the interrelated objectives without going too far against one pole or the other. Producers explored increasing tree yield by applying changes to soil management but the experiment was limited to certain trees. While poles can be separated temporarily, tensions were persistent and the contradictions remained since the limited exploration did not allow for exploiting of the resources.

3.1.1 Connecting tensions

Smith and Lewis (2022) suggest connecting the tension of the business by giving individuals a higher-purpose with holistic strategies and creating synergies for linking people and the business case (Smith and Tushman, 2005). In our case study, an informant was grappling with the business case but also the personal case, in that the future success of the plantation was based on the wishes of a close family member that had recently passed away. The informant insisted that enabling success in the business meant keeping the wishes of the family member alive. The informant demonstrated a deep level of personal grief while being content with his business (social-commercial logics). Establishing purpose assists in navigating paradoxes by: providing stimulus for striving with competing demands (Smith and Lewis, 2011), enabling a process of interpreting contradictions

as being interrelated such as "to effectively embrace, rather than avoid, contradictions" (Smith and Tushman, 2005: 533), and providing future orientation to align short-term decisions towards long-term outcomes (Maitlis and Christianson, 2014) such as those of society and financial business needs.

3.1.2 Separating and connecting interrelated and contradictory objectives

Embracing contradictions requires separating and connecting interrelated poles in tensions (Smith and Tushman, 2005). This allows a paradoxical frame that treats tensions with acceptance in the business case (Hahn et al., 2014), linking context and people (Smith and Lewis, 2022). In the most challenging situations separation of practices, exploration of independent goals and allowing for different decision processes enabled informants to deal with tensions that were intertwined and at first appeared difficult to separate. Most informants assumed multiple trade roles (such as, being a producer and a chocolate maker). By adopting multiple roles, informants made sense and understood complexity in the value chain to better deal with the tensions and shift from a trade-off approach to attaining balance between multiple objectives. For example, a chocolate maker and a producer negotiated the terms of cacao processing and the quality expected, the chocolate maker was able to communicate expectations to the producer using experience; this enabled her to make sense of the situation by framing the producer's resources while recasting the methods and obtaining alignment to the expectations as a chocolate maker. This reframing and shift from individual effort to collective problem solving (Smith, 2014) effort allowed satisfying a negotiation agreement in the trade relationship. Adopting multiple positions along the value chain enables actors to embrace and transcend problem solving tensions.

3.1.3 Establishing guardrails

While embracing contradictions requires separating and connecting of contradictory poles, tasks may introduce separation and isolation; pulling the poles apart too far leads to isolating one pole over another. This isolation creates implications that hide "synergies and connections" (Smith and Lewis, 2022: 143) and disables transcending as a process between the imbalances of the polarities (Jarzabkowski et al., 2022) such as, iterations of alternatives of short-term versus long-term objectives (Slawinski and Bansal, 2017) to enable unification of opposites (Smith and Lewis, 2011). Sharma and Bansal (2017) demonstrate a successful approach of integrating opposing poles simultaneously as both/and by exploring the paradox of the business case and social value. In our case study the involvement of children in cacao plantations was of concern. It was admitted that logistic providers require producers to sign a document to participate in the trade process. The logistic provider uses a guardrail to satisfy chocolate makers by having producers sign documents against the use of children working on plantations. The guardrail is a mechanism, in physical form it is the document that contains the attestation text and is signed and dated by the producers. This mechanism, allows logistic providers to purchase cacao from producers with sourcing guarantees to chocolate makers while at the same time reducing the liability and increasing their ethical commitments. However, the guardrail may prove to be intermittent as logistic providers do not, in practice, persistently examine the producers' practices, rendering the process unenforceable most of the time. In their study, Wilhelm et al. (2016: 43) problematize this practice as "merely ceremonial compliance" since upstream actors may defy the agreed terms of engagement in the relationship. While this guardrail provides a temporary means to manage the tension that is salient, it raises a latent tension, as providing sourcing guarantees for multiple producers, across multiple countries becomes a challenge since the logistic provider is unable to monitor practices in space and time as the number of producers expands in the trade process. Smith and Lewis (2022) suggest engaging stakeholders while setting goals that are relevant to the role of the actors. Theoretically, the diverse actors working together are better at meeting all the sustainable business objectives and avoiding neglecting ones that have future implications.

3.2 Enabling Dynamics

Businesses need tools that create dynamism to unleash the tensions (Smith and Lewis, 2022). Dynamism includes actions that leads businesses towards advantages (O'Reilly and Tushman, 2008) that propels learning (Lewis, 2000) by reducing ambiguity (Maitlis and Christianson, 2014; O'Reilly and Tushman, 2008), enables adaptation (O'Reilly and Tushman, 2008; Reinecke and Ansari, 2015; Smith and Lewis, 2011), and encourages oscillation between the competing demands (Hahn et al., 2014; Smith and Lewis, 2011). Hahn et al. (2014) argue that rather than accepting competing demands; the interplay between actors that pivots on awareness of the tensions appears to be of importance, as actors navigate known and unknown tensions to solve conflict between sub-systems, such as lack of economic resources in the present and pension systems for the future of producers. Chocolate makers interplayed salient and latent tensions during experimentation for the creation

of new products (Hahn et al., 2015) reinforcing learning (Lewis; Lewis and Smith, 2000; 2014) in exploring and exploiting opportunities.

3.2.1 Experimenting

Lewis and Smith (2014: 131) suggest that "learning involves experimenting" in a quest to find novelty and capabilities. Engaging current skills in the present while acquiring new skills for the future was challenging for some producers since they sought information from other competing producers. Smith and Lewis (2022) suggest breaking larger steps into smaller and more achievable objectives (such as, learning to make chocolate paste), testing new ideas with low-cost initiatives (such as, testing organic fertilization) and obtaining feedback from others allows actors to move forward from a position of uncertainty towards certainty. Producers and consolidators were observed collaborating on experimenting with tree growth and flowering density patterns. The consolidator provided exploring by researching and sourcing available options that adhered to organic requirements and being of relative low cost, while the producer used his land by segregating a row of trees to apply the compound and monitor patterns with minimal cost. While the tension of exploring and exploiting was active, both informants engaged by up-taking a role in the relationship and the experimentation and managing each opposing end of the tension *(see section 3.1, Boundaries to Contain Tensions)*. This experimental activity allowed them to leap from practice and process to learning and adaption, moving towards a stage of preparing for serendipity.

3.2.2 Preparing for serendipity

Smith and Lewis (2022) posit that being open to engage new opportunities unlocks potential for innovation and change through purposeful exploration. Producers grappled with tensions such as finding new ways to improve livelihood to bring back how 'life used to be' and trying new ways to derive value from raw material to reduce market pricing dependency. This included driving solutions that involved practice and process while being able to apply learning and adaption. A technical expert recalled the case of a producer unwilling to take advice to improve production yields, yet there is greater emphasis on producing cacao than increasing value-add opportunities for other products that are derived from cacao. Some producers held back while others admitted to be in the process of experimenting to make cacao paste – waiting for serendipity, lacking the practice-process knowledge of a chocolate maker to elaborate a cacao paste. She was engaging the process of learning-to-unlearn by tracing back her steps and recasting the steps over again (Smith and Lewis, 2011) but with a different process formulation. Learning encourages business towards sustainable business as the processes reshapes and enhances understanding by embracing a learning paradox that aims for a better future.

3.2.3 Learning to unlearn

Learning to unlearn is "findings ways to let go of our old mental models to make space for new ones, allowing us more flexibility in navigating paradoxes" (Smith and Lewis, 2022: 191). This allows balancing the acceptance of uncertainties, discarding certainties by making sense of the situation (Smith and Lewis, 2011). Informants' decisions were made purposefully such as through experimentation and obtaining feedback. Informants were willing to learn and adapt the process to get it right as she stated 'this is my first attempt, it's not what I prefer but it's an opportunity for us to stop working only with the cacao beans'. The informant's expectations were not met and were realigned and reformulated (Schad et al., 2016). Learning and adapting prepares actors for serendipity. Smith and Lewis (2022) suggest encouraging experimentation by having low-cost experiments, decisions that are based on desired results, and being able to shut-down failure.

3.3 Shifting to Both/and Assumptions

Problems need to be reframed to question the underlying assumptions of how to manage the tensions (Smith and Lewis, 2022), moving from dichotomous thinking (such as, narrow or binary choices) towards integrative approaches that allow both/and thinking (such as, appreciation of contradictions and mutual reinforcement; Smith and Tushman, 2005). These approaches are affected by the extent of the tensions experienced and the extent of adoption of a paradox mindset. Smith and Lewis (2022) suggest that increased tensions are experienced in settings that have faster rather than slower change, higher rather than lower plurality, and faster rather than slower scarcity.

3.3.1 Accepting knowledge as containing multiple truths

Lewis (2000) posits that paradoxical tensions are constructions from actors that are subject to biases. Informants attempted to deal with ambiguities by framing contradictions through a process of alignment of logic that is bounded by knowledge (Smith and Tushman, 2005; Tushman et al., 2011). Chocolate makers were inclined to pay higher premiums to producers if the quality of the cacao was better as it decreases sorting cost and wastage. Producers were not willing to receive feedback from chocolate makers, so while producers want to earn more, the increase in premiums is conditional on the level of satisfaction from the chocolate maker that is willing to provide feedback. This tension exemplifies differences in perceptions and while both producers and chocolate makers may argue to be right about product characteristics, the informants operate with different truths. This suggests that the framing may have inconsistencies and the saliency of contradictions may differ across informants based on different experiences and knowledge. Actors' cognitive frames undergo a process of filtering and explanations of truth are based on experiences as actors attempt to obtain fit when reconciling differences (Smith and Tushman, 2005; Tushman et al., 2011).

3.3.2 Framing resources as abundant

A paradox mindsets view resources in abundance rather than as being scarce by seeking value and opportunity (Smith and Lewis, 2022). Informants grapple with the tension of introducing bioengineered varieties or keeping ancestral trees. Informants considered future yields, however, while weighting the differences in years to come on which tree provides a higher yield, informants came to the conclusion that ancestral tree are healthy and cloning was a proposed solution to resolve the tension, effectively keeping both types of trees – without having to sacrifice the genetic material of one or the other. The tension was temporarily solved by prospectively grafting as a technique; however, while informants attempt to balance certainty against uncertainty, the tension remains persistent without resolve. While scarcity enables triggers that surface latent paradoxical tensions as salient due to resource limitations (Smith and Lewis, 2011); framing resources as abundant rather than scarce, enables possibilities to manage demands in novel ways by redefining resource value (Gladwin et al., 1995; Sharma and Bansal, 2017), including: natural, financial, social, and cultural.

3.3.3 Problem solving as coping

A paradox mindset shifts the approach for the treatment of tensions from a position of controlling to coping (Smith and Lewis, 2022). Controlling implies favouring one pole of the tension over another; while, the other pole is unattended leading to loss of control. This approach is closely related to reduction of uncertainty (Hahn et al., 2015; Slawinski and Bansal, 2017) as actors attempt to gain an understanding of what is going on (Maitlis and Christianson, 2014); however, it is not synonymous with acceptance of unresolvable tensions. Research conducted by Reinecke and Ansari (2015) on temporal brokerage surfaces the tensions from informants of increasing certainty while grappling with unresolved tensions when evaluating suppliers. Informants described feeling a responsibility guided by 'control' to change the conditions of how opportunistic actors operate in the market that pays producers extremely low premiums – polarizing livelihood (Gladwin et al., 1995) and hence contributing to economic exploitation (Crane, 2012). The conventional trade system has allowed for this unresolvable tension to persist over time and control appears to be less than more of an option. Surfacing the tension is the first step to finding balance between the opposing poles Consolidators want closer relationships with producers that do not want intermediaries to retain premiums; when orders are large, they struggle to find product to fill an order, when orders are small, they struggle with the investment to maintain the relationship. As these two tensions are intertwined, tensions are unable to balance. As such, enabling capacity and financial resources will provide balance from decisions that contribute to market practice and premiums benefiting producers.

3.4 Comfort in Discomfort

Smith and Lewis (2022) suggest that finding comfort in being open to tensions also means accepting the discomfort that arises from uncertainty. Informants grappled with the discomfort of price guarantees that spiral from market uncertainty and very low premiums. Producers have switched to growing other crops; yet, producers are not willing to give up cacao since some chocolate makers pay triple the market premiums. This tension creates uncertainty for livelihoods as managing resources to cultivate in the present may not hold value in the future. Acceptance of emotions in dealing with uncertainty by the informants has led towards finding comfort in discomfort in order to accept and respond to competing demands. Smith and Lewis (2022) suggest three tools to address uncertainty and discomfort through acceptance and finding comfort: building in a pause, accepting discomfort, and broadening perspective.

3.4.1 Building in a pause

While a pause enabled informants a moment to reflect and digest the situation at hand, a pause may be triggered by making sense of the situation (Maitlis and Christianson, 2014) and attaining meaning. Some producers have found comfort by evaluating options. Producer decided not to give up cacao but rather to reduce the uncertainty by becoming consolidators. When faced with discomfort, a pause allows for evaluating a situation and making sense at the individual level while enabling a process to move from individual towards collective perspectives. A producer searching for an export market is collectively inclined to provide benefits for the local community, rather than individual self. Comfort comes from collectively addressing the tensions.

3.4.2 Accepting discomfort

Reconsidering the underlying assumptions by building a pause enables acceptance of discomfort while allowing emotions to subside over time. The acceptance of emotions is easier to accomplish with others rather than oneself (Smith and Lewis, 2022). Accepting the discomfort led producers to new ways of thinking. A chocolate maker led a private pension system for workers using natural resources. The informants projected into the future knowing that the government pension would not maintain livelihood. Therefore, the chocolate maker engaged in a project where the financial proceeds are invested in the workers' private pension. The initiative was possible by broadening the perspective and accepting alternative solutions to current economic challenges. Addressing sustainable business trade-based tensions can be done with creative future thinking ideas that use short term gains for different purposes by broadening the perspective and making sense of a possible future.

3.4.3 Broadening perspective

Accepting the discomfort enables shifting from a trade-off approach to achieving multiple objectives through the generation of ideas and alternatives. A chocolate maker described that one of the main concerns of producers is a mindset change, allowing options for the producers to forge a new future. Smith and Lewis (2022) suggest honoring the discomfort by welcoming vulnerability and inviting workers to contribute with solutions to reduce fear, discomfort and uncertainty, and, training leaders with the skills to harness benefits from conflict. The chocolate maker coached to balance the tensions, not by eliminating the conflict, by introducing boundaries to contain the tensions projecting onto a possible future by making sense of past situations in the present.

4. Conclusion

We engaged Smith and Lewis (2022) BAT framework to provide synthesis while adding richness with further support of the literature, and using the system as a technique to frame the grappling of the tensions found in the sustainable business case study of the chocolate industry in hopes to surface greater future research potential. By making use of empirical findings in relation to the BAT system, we contribute to the call for research on naming the tensions and the useful engagement of social-business tensions that deal with institutional logics, as requested by Margolis and Walsh (2003). Having parsed the empirical findings, we offer key observations: guardrails acted as a mechanism that while dealing with salient tensions raised latent tensions in space and time that may be unable to transcend in the longer-term; salient tensions were interplayed to unleash and balance sustainable demands in the business case; latent tensions may become salient by using prospective sensemaking to ground a future that can be lived in the present, yet distant at the moment of reframing; and, accepting comfort in discomfort may lead to reduction of uncertainty, however, broadening the perspective avoids stagnation in the future and encourages the transcending of tensions.

5. Directions for Future Research

From a methodological stance, opportunities exist to better understand trade-based tensions that are specific to sub-systems and shed light on the transition of latency to saliency of tensions and the exploration of models influencing collective approaches to balance the tensions.

6. Limitations and Implications

While our methods use a constructionist approach, this relies on the interpretation of the findings and researcher bias cannot be ignored. The empirical case data originates from a broad and complex multidisciplinary study, much of the data collected took considerable time to process; however, the data was

fact-checked between the informants and were given meaning, increasing trustworthiness by using a rigorous and logical process.

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Experimental Designs in Management Studies for Bias Assessment: Setting and Stimulus Material

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Abstract: This manuscript stems from an ongoing research project on gender inequality in Portuguese businesses, particularly concerning access to leadership positions. It aims to provide new insights into the constraints that limit women's access to managerial roles – both from the worker/employee's perspective, by exploring expectations, aspirations, and perceived barriers, and from the employer/hierarchy's perspective, by analysing which biases in recruitment and promotion processes are likely to limit women's rise to top management positions. Against this analytical background, this paper aims to provide a reflection on the inquiry protocol developed within the project, with particular emphasis on the quantitative approach based on an experimental design. A survey has been developed targeting professionals and directors of large, listed companies and large/medium unlisted companies, where the respondents are given the framework of hiring hypothetical applicants for a management position. The methodological protocol involves elaborating different fictitious CV profiles, representing hypothetical candidates. These profiles are constructed by varying attributes according to various dimensions, specifically gender, combined with educational and professional characteristics. Based on the process of designing the experimental setting, the aim is to reflect on the nuances, obstacles, and limitations in constructing a set of stimulus materials and manipulating the experimental conditions regarding the fictitious applicants' characteristics (including gender), vertical segregation ('glass ceiling' in access to top management positions), horizontal segregation (i.e., associating candidates with typically female or male occupations) and measurement items/scales for assessing the applicants in different dimensions (e.g., perceived competence, job fit, promotion recommendation, etc.). Therefore, this paper aims to reflect on the methodological challenges and advantages of an experimental research design and data analysis strategy to address gender bias in hiring contexts and capable of sustaining an ongoing data observatory to support the definition of public policies and organisational practices aimed at promoting gender equality in top positions.

Keywords: Quantitative methodology, Management studies, Experimental survey, Bias assessment

1. Introduction

The issue of women's inequality in businesses, particularly in top management positions, has been a topic of interest among scholars, practitioners, policymakers, and the media (Terjesen et al., 2009). The debate is mainly centred on utility arguments (based on business cases) and justice rationales (Seierstad, 2006; Terjesen & Sealy, 2016).

In the specific case of Portugal, new legislation introduced in 2017 established that the management and supervisory bodies of public sector companies and listed companies should meet a 33% threshold for the underrepresented gender. Notwithstanding this legislative effort, statistics confirm the inequalities persist, with women receiving, on average, less 14.4% than men for each month of work. This number is further aggravated to 17.8% if one includes other forms of remuneration, such as bonuses or other discretionary compensation items. Furthermore, the average proportion of women on the boards of directors in the listed firms is only 22% (Casaca et al., 2020). The causes of this inequality have yet to be fully explored.

This is a fertile research field, and several advances have been made. One stream of studies focuses on the impact of the presence of women in companies concerning outcomes such as performance, innovation capabilities, etc. (e.g., Adams et al., 2012). Another research group focuses on the factors that explain the differences in representation between men and women in companies, specifically in top management positions (e.g., Eagly et al., 2019).

Along with the different theoretical perspectives, different methodological strategies have been developed. Particularly, research on gender-related topics and boardrooms is based on cross-section secondary data (Malik & Makhdoom, 2016) and scarcely on longitudinal data on firms (Dezsö & Ross, 2012). Using longitudinal data helps address some of the existing research gaps. However, as databases are not specific to address gender research questions, there will always be several unanswered research gaps.

This manuscript is part of a research project whose methodological protocol departs from the more conventional approaches to gender inequality based on secondary data and longitudinal data obtained from companies, but not specifically geared towards the gender issue, i.e., not having the heuristic potential associated with data

collection that is specifically oriented towards the subject in question. In particular, the objective is to apply a survey of experimental type, aiming to address the existing data needs while simultaneously contributing to answer some of the most common criticisms of academic research (Gastaldi & Corso, 2014), including the insufficient knowledge about the reality (from the practitioners' perspective) of the subject under analysis and not being able to transform the knowledge in real benefits for organizations (knowledge transfer).

Experimental studies, with a particular focus on identifying biases in organizational and hiring contexts, can be divided into two main types: *field experiments*, where bias is assessed in real-world hiring decisions involving responding to job vacancies (e.g., Birkelund et al., 2022) and *laboratory experiments*, where participants evaluate hypothetical/fictitious candidates within a setting previous defined in terms of hiring context, job position, etc. (e.g., Carlsson et al., 2021; Dutz et al., 2023; Kessler et al., 2019). It is precisely in the field of laboratory experiments that the survey was developed within this research project focusing on gender bias. The theoretical framework and research hypotheses guiding the methodological protocol and the experimental setting are presented below.

2. Theoretical Background and Research Hypotheses

The extensive scientific covers different disciplinary areas exploring the inequality and discrimination against women in the workplace. The *glass ceiling* consists of a dynamic of *vertical segregation* that hinders women from reaching top management positions and taking higher responsibilities in the corporations/organisations' hierarchy (Eagly et al., 2019). The first barrier identified in women's access to top management positions in organisations concerns family responsibilities, namely the reconciliation of personal and professional life. Indeed, a family project can be a stigmatising factor, associated with less commitment to the professional career and consequent loss of opportunities for advancement. Furthermore, this circumstance can be exacerbated by the lack of flexible working policies in companies/organisations – like flexible working hours, part-time schedules, and telework (Munsch, 2016).

Another central factor is associated with socially constructed gender stereotypes, which have an impact on the attribution of leadership characteristics and competencies. Men can be perceived as having professional and social skills more suited to the role of leader, namely *agentic characteristics*, seen as assertiveness, forcefulness, and ambition – unlike women, who are ascribed *communal characteristics*, such as sensitivity, caring, kindness, etc. (Tremmel & Wahl, 2023). These gender roles socially constructed can favour the undervaluation of women when it comes to accessing top management positions, as well as negative reactions when it comes to exercising leadership positions (Dutz et al., 2023).

In addition to *vertical segregation*, *horizontal segregation* occurs when gender distribution is disproportionate to job functions, i.e., when one gender prevails over the other in a particular job (Eagly et al., 2019). To that extent, women's status in the labour market can be an advantage or disadvantage, depending on the dominant occupational stereotype – male or female. However, the literature suggests that discrimination against women is accentuated when they apply for typically male professions, which is related to the socially prescribed stereotypes (MacNell et al., 2014).

Considering this theoretical framework on gender bias, we aim to ascertain the existence of discrimination based on gender through an experimental survey focused on controlled manipulation of the content of fictitious professional CVs – as the primary mean for employers to infer qualities and competencies of applicants for hiring purposes – in a context of hiring for a management position (in this case, middle management). Based on the literature on gender stereotyping, as well as vertical and horizontal segregation, the following research hypotheses were formulated:

A) Sex effect

> *H1: Women are evaluated as less competent and less hireable, for management positions, compared to male candidates with the same qualifications and professional experience;*
>
> *H2: Women are more overlooked when it comes to hiring for a management position than equally qualified male candidates.*

B) Sex effect and horizontal segregation:

> *H3: Female candidates are evaluated as less hireable to management positions in dominant male professions/areas than equally qualified male applicants;*

H4: Female candidates are evaluated as more promotable to senior management positions in typically female areas than equally qualified male applicants;

H5: Female candidates are evaluated as less promotable to senior management positions in typically male areas than equally qualified male applicants.

C) Sex effect and vertical segregation:

H6: Female candidates are evaluated as less promotable to senior management positions than male candidates with the same qualifications and professional experience.

Based on the assumption that, in the absence of discrimination, qualified people with the same qualifications can be expected to have the same evaluations and proportion of favourable hiring decisions, regardless of their sex, the experimental setup was developed to test the hypotheses listed.

3. Methods

3.1 Experimental Setting

The present research aims to analyse the circumstances/dimensions under which discrimination against women in access to leadership positions may occur: (i) whether bias occurs in the assessment of competence and hireability between equally qualified job applicants of different sexes in access to management/leadership positions; (ii) whether discrimination is exacerbated in the transition between access to middle management positions and top management positions; (iii) whether discrimination against women intensifies in typically male positions/areas.

Stemming from the guiding research question and the set of hypotheses structuring it, a laboratory-type survey was developed. In laboratory experiments, the methodological design can, firstly, be divided into *within-subjects manipulation*, where participants form a unique group and are subjected to a test with the same content (Dutz et al., 2023; Erlandsson et al., 2023; Barron et al., 2022), and *between-subjects manipulation*, in which participants are distributed between different groups according to controlling variables (Friedmann & Efrat-Treister, 2023; Ramos & Félix, 2019; Hoover et al., 2018). This experimental study is based on the latter, with each participant having access to different combinations of the stimulus material (randomly assigned) to compare responses across different experimental conditions.

The experimental survey encompasses two stages, with different experimental designs that offer laboratory-like controlled conditions. The first stage uses an *unmatched pair-testing* design (Bendick & Nunes, 2012) presenting pairs of CVs of applicants for the same hypothetical job vacancy. Applicants' characteristics – e.g., education, work experience, technical skills, etc. – are differentiated within each pair. These characteristics are experimentally manipulated to detect which features trigger different evaluations from respondents (Bendick & Nunes, 2012). In the second stage, we resort to an *unpaired testing* design (Carlsson et al., 2021), where each respondent is presented with a single CV.

In the first stage of the survey, the setup consists of five experimental conditions. For each experimental condition, two CVs were constructed and set against each other in pairs. These fictitious CVs were structured to ensure the variability of the candidates' attributes in 4 dimensions:

- *Age*. For this parameter, the fictitious candidates vary between three categories: *24/25 years old*, *28/29 years old,* and *41 to 44 years old*;
- *Academic qualifications*. Includes three levels: *low* (Bachelor's degree), *medium* (Bachelor's and Master's degree), and *high* (Bachelor's, Master's and Postgraduate degrees);
- *Type of academic path*. Fictitious applicants with training entirely in the field of *Management* or combining different fields. The latter is divided into two paths: initial training in *Humanities* or *Engineering*, followed in both cases by a Master's in *Management*;
- *Professional experience*. The CVs were built according to four categories: *no experience* (limited to consultancy work in non-profit organisations run by university students); *low* (1-2 internships and 1-2 professional experiences in the labour market over 5 years); *medium* (1-2 internships and 1-2 professional experiences in the labour market over 9-10 years) and *high* (3-4 professional experiences in the labour market over 19-20 years);
- *Marital status*. This includes marital status (married or single) and the number of children (divided into *no children* or *2 children*).

Based on these pre-defined conditions, 10 CVs were created from scratch. With the variation in gender (male vs. female), a total of 20 CVs can be evaluated by the respondents. Moreover, in building the setting for the survey, the position of *Project Manager* was selected as the recruitment context. No reference is made to a specific sector of activity. The aim was not to introduce additional complexity to the setup (i.e., multiplying the experimental conditions) concerning typically male or female areas and its effects on evaluating applicants. Thus, the setup consists of five experimental conditions in which different pairs of CVs are presented sequentially for a comparative evaluation. It should be noted that a randomisation system was also introduced into the questionnaire in each setup. In particular, the gender attached to each fictitious CV varies between respondents.

We proceed with a description of the five experimental conditions presented sequentially to each respondent:

1. The first condition compares CVs with equivalent academic qualifications. Considering the age difference of profile B, the professional experience (*medium*) is slightly higher compared to profile A (a recent graduate with no professional experience);
2. In the second condition, CVs with contrasting qualifications and experience are compared: on the one hand, a CV with high academic qualifications and low experience (profile C); on the other, a CV with a degree but high experience (profile D);
3. In the third setup, the first profile (E) is characterised by a bachelor's degree in Engineering and a Master's in Management. In contrast, profile F corresponds to a candidate with a more *conventional* academic path of a project manager, in the sense that it is entirely in the field of Management (Bachelor's and Master's degree). The professional experience is equivalent – both in the number of internships and labour contracts;
4. In the fourth setup, a comparison is made between a first profile (G) characterised by a bachelor's degree in Engineering and a master's in Management and a second profile (H) characterised by a degree in *Humanities* (Languages, Literature and Culture course), followed by a master's degree, also in Management. Their professional experience is equivalent;
5. Finally, in the last setup, controlling the candidates' attributes focuses on their family situation. With equivalent academic qualifications and professional experience, the first candidate is single, while the second is married with 2 children.

The following figure summarises the five experimental conditions described (Figure 1).

Experimental condition (nº)	CV (Code)	Age	Civil status	Education	Experience	Setup
1	A	24	Single	Bachelor's and Master's in Management	None	Setup "Age"
	B	29	Single	Bachelor's and Master's in Management	Low	
2	C	25	Single	Bachelor's, Master's and Postgraduate Degrees in Management	Medium	Setup "Academic qualifications vs Experience"
	D	41	Married	Bachelor's in Management	High	
3	E	30	Married	Bachelor's in Engineering and Master's in Management	Medium	Setup "Conventional path v non-conventional path"
	F	29	Single	Bachelor's and Master's in Management	Medium	
4	G	29	Married	Bachelor's in Engineering and Master's in Management	Medium	Setup "Engineering vs Humanities"
	H	30	Single	Bachelor's in Humanities e Master's in Management	Medium	
5	I	45	Single	Bachelor's, Master's and Postgraduate Degrees in Management	High	Setup "Children vs childless"
	J	43	Married, 2 children	Bachelor's, Master's and Postgraduate Degrees in Management	High	

Source: Own elaboration.

Figure 1: Experimental conditions

The aim of this experimental setup is to allow for a comparison of respondents' evaluations, mapping out how the different variables being analysed – *gender*, *academic qualifications*, *type of training*, *level of professional experience*, etc. – impact the judgements made about the candidates. The purpose is, thus, to identify possible statistically significant discrepancies in the assessment of the same pair of CVs depending on whether the candidate is male or female.

The second stage of the experimental survey is characterised by an *unmatched design*. One of the 20 constructed CVs is randomly distributed among the respondents for a singularised assessment of this fictitious candidate. This different methodological design aims to obtain a comparison of the respondents' assessment of the different profiles built (from A to J), determining whether the evaluations vary according to the sex of the fictitious applicant – as well as according to variables characterising the respondents (sex, age, etc.). Through this overall setup that makes up the experimental enquiry, the aim is to map the types of biases that weigh on the curriculum evaluations made:

- *Gender bias* (i.e., whether women are penalising in the evaluation compared to equally qualified men);
- *Gender bias associated with age* (i.e., whether the level of professional experience is a more penalising factor for women compared to men);
- *Gender bias associated with academic qualifications* (i.e., whether the level of academic qualifications is a more penalising factor for women compared to men);
- *Gender bias associated with the type of academic path* (i.e., whether a conventional/unconventional academic path is a more penalising factor for women compared to men);
- *Gender bias associated with marital status* (i.e., whether the family situation – in particular, parental responsibilities – is a more penalising factor for women compared to men).

Finally, the overall experimental setup is subdivided into different variants that should be distinguished. "Study 1" refers to the survey specifically aimed at university students, with its distinct (and simplified) experimental features. To explore the research hypotheses associated with gender bias (and possible links with the other variables), an additional survey variant was constructed from the more complex experimental setup described. Namely, if the described five experimental conditions compose "Study 2", in a supplementary survey, the candidates present the same profile, but the sex is the same in each pair. This variant, called "Study 3", does not include the component relating to isolated CVs. For space reasons of space constraints, the present text focuses on the results from "Study 2" and "Study 3".

Stimulus Material

The fictitious CVs for the experimental study were created by researching professional profiles and job postings on the professional social network *LinkedIn*. The aim was to achieve verisimilitude in terms of the academic and professional backgrounds of project managers, as well as in the descriptions of professional experience, tasks/responsibilities held, skills, etc. Once the collection of curricular elements was built, these were then used to construct the fictitious CVs according to the described setup parameters.

Before presenting the paired CVs, the same framing text is presented to each respondent:

> *A multinational consultancy company is looking to recruit professionals for the position of Project Manager to join its expanding team. By the deadline for replying to the job offer, 10 applications have been received.*
>
> *Imagine that you are a member of the recruitment team at that company. Please consider the paired CVs and for each pair indicate which candidate you would hire as Project Manager.*

The presentation of the paired CVs follows this introduction. To ensure effort saving for respondents, a summary version of each CV is presented at this stage, including date of birth, marital status, academic qualifications (years and training institutions) and professional experience (years and companies/organisations).

As for the second stage of the survey, the full version of each CV (with a detailed description of the tasks performed in each work experience, skills, etc.) is randomly assigned. Respondents are presented with the following framing text:

> *On a scale of 1 to 10, please rate the following full CV of one of the 10 applicants.*

3.2 Measures – Outcomes and Other Variables

In the first stage of the experimental survey, three dependent variables are used to evaluate several pairs of fictitious CVs. The first set consists of two items, taken from another experimental survey focusing on gender biases in the hiring process (Kessler et al., 2019): the first measures the respondents' interest in hiring each applicant ("*How interested would you be in hiring the applicants for the position?"*); the second, the perceived likelihood of candidates accepting a position in the respondents' respective company/organisation ("*How likely do you think candidates are to accept a position in your company/organisation?"*). Both variables use 10-point

Likert scales. A third variable concerns choosing which, of the two hypothetical applicants, the respondent would hire for the job (*"Which one of these two people would you hire for the job in question?"*).

In the second stage of the experimental survey, one of the 20 CVs is randomly assigned to each respondent. The evaluation is made using a specific set of dependent variables. Firstly, two indexes are used, both taken from a study on gender bias in recruitment in the academic context (Carlsson et al., 2021).

a) Competence index, made up of three items ("To what extent do you consider the candidate to be competent for the position?"; "To what extent do you consider the candidate to have the necessary qualifications for the position?"; "How qualified do you consider the candidate to be?");

b) Hireability index, made of three items ("How do you assess the probability of the candidate being selected for the position in question?"; "How likely would you invite the candidate for a job interview?"; "Would you hire the candidate in question?").

An additional variable concerns the perception of the likelihood of reaching a top leadership position (in this case, in the company in question) – therefore, gender bias in terms of *vertical segregation*, particularly access to top management positions (*"How likely do you think it is that the applicant will, one day, become the head of the multinational company?"*).

In the case of the survey aimed at students, a set of additional variables was added to assess the phenomena of *horizontal segregation* combined with *vertical segregation*. In other words, the perceived likelihood of an applicant reaching top management positions according to different corporate areas (Chief Financial Officer, Human Resources Director, etc.) – therefore, according to areas characterised by male and female dominance and with possible implications in terms of the privileging of *agentic* or *communal* characteristics in the exercise of leadership (Tremmel & Wahl, 2023).

Finally, the respondents were asked a series of questions for socio-demographic -characterisation:

a) Socio-demographic characterisation: Sex (binary variable, Woman or Man); Age (metric variable); Nationality (binary variable; Portuguese or Other); Marital status (nominal variable); Number of children (if applicable); Academic degree (nominal variable); Years of professional experience (metric variable); Sector of activity (nominal variable with multiple categories, constructed from the CAE, Portuguese Classification of Economic Activities)[1];

b) Structure of daily activities: metric variables to describe the percentage of average daily time spent on each activity (paid work, domestic work, unpaid philanthropic work and leisure activities/hobbies) – both on a typical working day and on a typical weekend day. As gender inequalities in terms of housework and family responsibilities are a factor associated with vertical segregation (Munsch, 2016), these variables are relevant for assessing inequalities in the sample according to gender;

c) Corporate/organisational context: sex of the top manager (binary variable – woman or man); size of the company/organisation (categorical variable); if the respondent has direct responsibilities in terms of human resources in the company/organisation (i.e., recruitment, promotion, etc.).

Other measures were used for three additional dimensions: *professional experience* (e.g., aspirations to access senior managerial positions, expectations concerning career progression, etc.), *gender stereotypes* (concerning leadership skills of men and women), and *political positioning* (namely, about legislative measures to ensure balanced representation between men and women in top management positions).

3.3 Sampling and Data Collection Procedure

The target population of this experimental survey encompasses two main groups: professionals working in organisations in Portugal and university students.

In the case of professionals, while the primary focus is on middle and senior managers, the sample also includes non-managerial employees. In each company/organisation there is the possibility of non-management professionals answering the survey (e.g., a member of a manager's secretarial team). Notwithstanding this methodological obstacle to accessing the primary survey targets (i.e. middle and top managers), respondents in

[1] In the specific case of the survey aimed at students, respondents are also asked about the course they are enrolled in or the higher education institution that they attend.

other positions are also considered, given the analytical relevance of comparing the perspectives of professionals at different levels of the corporate/organisational hierarchy. Regarding the second contingent, we considered the student population from all cycles – Undergraduate, Postgraduate/MBAs, Master and PhD. On a contingency basis, students (from any Portuguese higher education institution) with access to the questionnaire for professionals are redirected to the students' version.

The sampling is *non-probabilistic*, combining the *purposive* and *snowball* methods. A list of companies and email addresses was used to reach the professionals target population. In addition, the professional social network LinkedIn was used as a platform to disseminate the survey. For students, the survey was distributed through the institutional channels of electronic communication between faculty and students – including institutional student email lists and newsletters. As an incentive for participation, respondents are informed at the beginning of the questionnaire that a donation (of €0.5) will be made to a charity for each completed survey. Each respondent chooses the beneficiary institution from a list provided at the end of the survey.

The survey was built, distributed, and administered to participants using the Qualtrics online survey software (www.qualtrics.com).

3.4 Data analysis

Considering the research hypotheses described, the data analysis focuses on identifying discrepancies that indicate gender bias in evaluating CVs. In this context, inferential statistics play a key role in the hypothesis testing. We use independent t-test for dichotomous independent variables (e.g., sex, experience in human resources, etc.) and ANOVA for independent variables with more than two categories (e.g., age categories, academic qualifications, etc.). The main objective is to identify statistically significant differences in the way fictitious applicants are evaluated according to the various parameters defined: existence of gender segregation (*vertical* and *horizontal*), relationships between types of segregation and socio-demographic variables of the respondents, etc.

The inferential statistics are preceded by the validation of the indexes and descriptive statistics – both for the control variables and socio-demographic characterisation, and for the dependent variables. The survey was pre-tested with students to evaluate the construction of the experimental setting and the dependent variables in their effectiveness in identifying significant differences in evaluating candidates.

4. Discussion

Due to space constraints, we focus on the central tendencies, particularly concerning the general values obtained in the different experimental settings for detecting gender bias. Considering the "Study 2", in the survey block with the direct comparison between CVs of opposite sexes, we observed a tendency to favour the female applicant in all the experimental setups. Namely, across all five arrangements there was a statistically significant increase in the interest in hiring and in the percentage of the decision to hire the female candidate compared to the experimental group in which the same profile (i.e., with exactly the same CV) presents a male applicant. These results are comparable to those obtained in other experimental surveys (Carlsson, 2021; Erlandsson et al., 2023), where there was no evidence of a bias against female applicants. On the contrary, female candidates are perceived as more *competent* and *hireable* than equally qualified male candidates. Furthermore, there was no evidence of a child penalty for either male or female applicants (*Idem*). Other previous studies present statistical patterns that reveal a strong asymmetry in employers' treatment of male and female candidates (e.g., Barron et al., 2022). Namely, when one candidate is more qualified, employers do not display a gender bias in hiring decisions. Still, when CVs are identical, there is a significant gender bias against women in hiring. In the present study, the identification of the project at the beginning of the survey may have played a central role, given that the gender of the candidate was a central variable being analysed.

On the other hand, in "Study 3", with same-sex pairs of applicants, the results are discrepant. In fact, there is no longer a situation of generalized evidence of gender bias in the form of statistically significant differences in the mean scores for interest in hiring and in the percentages for the hiring decision. The exception is setup 3, where the same female CV ("CV F") is significantly favoured over the male counterpart when it comes to interest in hiring ($\alpha = 0.025$). However, the same significant differences do not occur in the item concerning the hiring decision ($\alpha = 0.875$).

In the case of the survey block with isolated CVs (thus, a methodologically *unmatched experimental design*), the overall scenario is a more composite one. Particularly, the significant differences are concentrated in the two profiles: the CV characterised by no professional experience and a bachelor's and master's degree in

management (coded "CV A"), and the CV exhibiting the highest academic qualifications (postgraduate degree in addition to a bachelor's and master's degrees), extensive work experience, and a marital status indicating that the applicant is *married, with 2 children* (coded "CV J"). Nevertheless, the results diverge on the favoured gender in the items used to assess *competence* and *hireability*.

With regard to the first CV ("CV A"), there are three items in which the difference in the mean scores has a significance level equal to or below 0.05: *How qualified do you think the applicant is* ($\alpha = 0.002$), *How interested would you be in hiring the applicant for the position?* ($\alpha = 0.022$) and *How likely do you think it is that the applicant will be selected for the job?* ($\alpha = 0.003$). In all cases, the male version of the CV obtains the highest values. Moreover, previous studies relying on un-matched design have also identified significant gender differences in the likelihood of being hired favouring male candidates and better assessed for a leadership position in terms of *competence* (Ramos & Félix, 2018).

In the case of the second curriculum ("CV J"), significant differences occur in three items: *To what extent do you consider the applicant competent for the position?* ($\alpha = 0.049$), *How likely do you think it is that the candidate will be selected for the job?* ($\alpha = 0.051$) and *How likely do you think it is that the applicant will one day become the head of the multinational company?* ($\alpha = 0.041$). However, the significant differences in this case favour the female version of the same CV. To this extent, marital status seems to be a more favourable factor in the evaluation of the female CV. This tendency follows previous research valuing the existence of children as a positive element in terms of leadership skills (Erlandsson et al., 2023).

5. Conclusions

The experimental survey presents itself as an alternative to the *field experiment* as a data collection tool for identifying gender bias in organisational contexts. Indeed, measuring unequal treatments in laboratory studies can pose obstacles due to the difficulty in creating realistic situations, as well as assessing whether answers reflect real discrimination and whether employers' answers are consistent with their behaviour (Birkelund et al., 2022). In turn, the controlled laboratory experiment allows for a more effective systematic variation of environmental aspects while holding others constant (Kessler et al., 2019), thereby opening up opportunities to develop and test different theories concerning the organisational context.

In addition to these advantages in corroborating and refuting research hypotheses and the inherent limitations of this research instrument, it is important to identify specific limitations of the survey developed – concerning precisely the challenge of isolating contributing factors impacting CVs' assessment. Firstly, concerning the knowledge of the central variable being tested (the applicants' gender), it is important to consider that the respondents were presented with the title of the project and a brief description. The research team made a methodological decision to adopt a policy of transparency regarding the purposes of the research. In turn, this option may have favoured women candidates more in the block relating to the direct comparison between CVs. Notwithstanding, the isolated CVs, as a supplementary experimental configuration integrating the survey, allowed for a comparison between the mean scores for each profile according to the gender associated. This complex experimental configuration, combining different methodological designs, aimed to neutralise the limitations associated with each type of experimental setup as far as possible – i.e. direct comparison (*matched design*) and isolated assessment (*unmatched design*).

In addition, other potential sources of bias, whose control is challenging, can concern particularly the design of the CVs'. This is the case with different higher education institutions, in the case of academic training, or the greater or lesser reputation of companies composing work experience. The plausibility of the hypothetical CVs forced the diversity of training paths and professional experiences in different organisations. However, the intention to convey realism through this plurality can also result in a lack of control over the influence of contingent factors in how profiles are assessed. An alternative approach adopted in other research consists of more abstract descriptions of qualifications, such as ratings given to applicants' different types of knowledge (e.g., Barron et al., 2022). However, this methodological option may reinforce the laboratory nature of a survey, thereby compromising the intended immersion of the respondents in a realistic exercise of evaluating job applicants – as closely as possible to a *field experiment*.

Thus, among the multiplicity of methodological options, the present survey sought to differentiate from previous research through an experimental design that combines different modalities. The experimental survey is a fruitful instrument for testing different dimensions of how organisations function as complex systems – such as gender bias in the hiring process or within horizontal mobility (between different departments/areas) or vertical mobility (in the organisational hierarchy). However, the difficulty in controlling all contributing factors that can

weigh on respondents' response patterns also recommends the triangulation with other methodologies (Dutz et al., 2023).

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Effects of Action Learning Strategies and Reflection in Teaching Business Research Methods in Business and Management Education

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Abstract: In a rapidly changing business world, Research Methods (RM) and their application to real-world problems are becoming skills that equip students for the rest of their lives. Thus, there are ongoing debates about several practical and pedagogical challenges to teaching research methods. One of the questions to address challenges is how to make RM interesting to Business and Management (B&M) students. Addressing this issue becomes even more debatable for the large class seatings in an increasingly internationalised context. Arguably, to remain relevant, Management Education (ME) must reflect the realities that influence its subject matter, while at the same time addressing social needs and expectations. Therefore, introducing innovative and inclusive methods for learning, teaching and assessment is becoming undoubtedly important for shaping the future of ME. This article presents a reflective analysis of introduced innovative learning, teaching and assessment methods for teaching RM on one of the largest PG taught courses in one of the UK's higher education institutions. In this course, students learn and develop a research proposal for the final PG project. The innovative methods employed in this course were to address the above-mentioned challenge, making RM more interesting for B&M students by improving an engagement. This was achieved by incorporating an active and action learning strategies in flipped classroom settings. The idea was to create an interactive environment where students could master technical information through Learning Set Conversation (LSC), Reflection, and Critical Analysis. Having, LSC about the Case Study, which was linked to research process, helped students to adopt multicultural environment and have a great experience while they were learning and developing their Research Proposal. In addition, introducing the weekly Reflective Work/Reflective Diaries submission as a form of assessment, helped students to keep Reflective Diaries, which allowed them to observe their own research practice and the lessons they have learnt. Effectiveness of the introduced methods and recommendations are based on the Mid-module feedback data which was taken form 3 different intakes between 2021-2023.

Keywords: Business education, Management education, Action & active learning, Innovation in teaching research methods, Reflective diaries in research

1. Introduction

There is no doubt that the contemporary transitions in the business world are triggering new trends for ME. To stay relevant, ME must reflect the realities that shape the business world and meet the requirements and expectations of the corporate world and society (Arain and Tipu, 2019). Thus Postgraduate (PG) courses need to be transformational in nature, with its core values focusing on research, collaboration with the industry, and have an international perspective. Wilson (2015) argues that the challenge for Business Schools is to offer a balanced education encouraging students to research and address real live issue to contribute to their companies, their communities, and their countries. Teaching of RM is therefore central to preparing B&M students to meet this challenge. However, teaching RM is complicated because students often come from a wide range of disciplines, with different prior knowledge, diverse interests, and expectations, as such, employing a pedagogical approach that appeals to all students is difficult to achieve. Thus, there are ongoing debates (Earley, 2014, Rich, 2014, Rich et al, 2019, Saeed et al, 2020) about several practical and pedagogical challenges to teaching RM. One of the questions to address challenges is how to make RM interesting to B&M students. Addressing this issue becomes even more debatable for the large class seatings in an increasingly internationalised context. One way to support students in research is to engage them in research-related tasks in research method courses. Such tasks play an important role in developing students' learning of and interests in conducting research (Healey and Jenkins, 2009, Lundahl, 2008, Vandiver and Walsh, 2010).

This article presents a reflective analysis of introduced innovative teaching, learning and assessment methods for teaching RM on one of the largest PG taught courses in one of the UK's higher education institutions. The discussion is based on the author's personal reflection and experience, mainly in the context of postgraduate B&M degrees, within which students are required to carry out a single substantial piece of individual research in their final year. In this course, students learn and develop a research proposal for the final B&M PG project. The innovative methods employed in this course were to address the above-mentioned challenge, making RM more interesting for B&M students by improving an engagement.

2. Literature Review

2.1 Current B&M PG Courses' Landscape in UK

Challenging issues in teaching RM

The master's degrees that broadly can be organised into three categories - 'research', 'specialised/advanced study' and 'professional/practice', is one of the most well-known and well-established postgraduate qualifications in UK higher education (QAA, 2023). Although there are a wide variety of master's degrees on offer all conform to a common threshold standard, which is set out in the Qualifications Frameworks (QAA, 2023). Teaching, learning, and assessment methods used in master's degrees are diverse and vary significantly depending upon the overall aims of a particular course (QAA, 2023). The teaching of RM is a part of the curriculum in most of those courses as most master's degrees include a research project, leading to the production of a dissertation. However, Saeed et al, (2020) observed that many postgraduates joining master programmes do not have sufficient experience in writing a sound research proposal though they join RM courses as compulsory courses at universities. B&M postgraduates are challenged by selecting their research topics, formulating their research aim, objectives, and potential research questions, writing the literature review, and selecting appropriate research design for their proposals and final projects (Wang and Li, 2008; Nielsen, 2016; Saeed et al, 2020). Earley (2014) also found that majority of students joining RM courses are often found anxious, rigid to the courses and hold negative attitudes towards RM learning. Similarly, Howard and Brady (2015) reported about students' concern and their inability to understand difficult and abstract concepts related to RM. These issues and challenges are becoming more an intimidating task for international postgraduates with insufficient experience in academic writing in English (Wang and Yang, 2012).

It must acknowledge that according to the Higher Education Statistics Agency (HESA) UK, (HESA, 2023), while EU and domestic enrolment numbers saw a decrease in 2021/22, non-EU first year enrolments rose by 32% in HE. This increase was driven by a large increase in the number of first year students from non-EU countries enrolling onto postgraduate taught courses. B&M is one of the most popular degree choices among these postgraduate taught courses. Thus, all these issues challenge instructors how to make these courses interesting for those students, how effectively teach them, how to accommodate the diverse educational needs of students and how to articulate their knowledge of the content of the course (Barraket 2005, Nind and Lewthwaite 2018b).

2.2 Active Learning and Teaching Strategies for RM

While developing the research project that is a key component of most B&M degrees requires critical thinking, which is an important skill for B&M graduates, employers and business organisations also have increased their voice in their demands for B&M graduates to have critical thinking skills. Thus B&M research, and the way in which RM are taught and practiced will continue to make a key contribution and play a significant role in the partnership between academia and practice (Rich, 2014).

Many scholars (Earley, 2014, Engbers, 2016, Ellis and Goodyear 2016; Roman and Uttamchandani 2018, Rich et al., 2019, Saeed et al., 2020) suggest incorporating active learning strategies and real-world assignments in RM teaching rather than accumulating knowledge as it is often done in traditional courses. Active learning refers to student-centred approach that emphasises learners' engagement in active and meaningful construction of their learning (Yao and Collins 2018). The key idea behind active learning and student engagement is reflecting on the experience of learning by doing (Chickering and Gamson 1987; Gibbs 1998; Healey, et. al.,2010). Active engagement in learning may take different forms: flipped classrooms, internship, group discussions collaborative assignments and project, problem solving approach, case study, business simulations, subject-based research, and inquiry etc. All these tasks and activities are intended to engage students actively and deeply in learning about research.

Healey and Jenkins (2009. Pg. 6) proposed four principal ways of conceptualizing the research–teaching relationship in higher education: research-led teaching, where students "learn about research in their discipline"; research-tutored teaching, where students engage in research discussion; research-oriented teaching, where students develop research skills and techniques; and research-based teaching, where students undertake research and inquiry. Authors believe all four ways of engaging students with research and inquiry are valid and valuable, and curricula should contain elements of all of them. This is useful because it gives opportunity to instructors to talk about the different ways in which they may introduce their students to research and inquiry.

2.3 Action Learning and Teaching Strategies for MR

Action Learning (AL), originally introduced by Professor Reg Revans (1980,1982), has long been recognised as one of the most effective approaches for delivering ME. Action Learning in its simplest form is understood to be an experience-based approach. According to Revans (2011) Action Learning necessarily occurs in a closed group or 'set' and, while individuals in the set may each have their own unique problem to work on, learning occurs via the interaction between members of the set. That is the main differentiation to compare this approach with active learning approaches. Thus, Action Learning could be defined as a process that involves a small group working on real problems, taking action, and learning as individuals, as a team, and as an organisation. It is particularly effective for solving complex problems that may appear unsolvable. Elements of AL has been actively discussed in application of RM. Rich et al., (2019) suggest that recent discussion in higher education has focused on providing personal learning and explore a Problem Based Learning (PBL) approach to the teaching and application of RM. PBL is a student-centred method of learning in which students learn by doing. Students are presented with a real-life problem similar to those they will face in their work. They spend most of the course sessions working in small discussion groups addressing the given case questions. The key differentiator from other forms of active-based learning is the nature of the problem. This is chosen or designed to be complex. The student discussion groups, need to make up their minds about how they would manage it and what actions they would recommend.

3. Case Study

The present study used a qualitative evaluative case study with elements of reflective analyses. A case study evaluation approach is a great way to gain an in-depth understanding of a particular issue or situation. This type of approach allows the instructor to observe, analyse, and assess the effects of a particular situation on individuals or groups (Keen and Packwood, 1995). As an evaluative case study, this case focuses on a particular case of teaching and learning practices in a RM module on the B&M master's taught course.

3.1 The Study Setting and Participants

The study was carried out in one of the largest B&M master's taught courses in one of the UK's higher education institutions. The course has very complex structure with three different (one year, sandwich and advanced research) routes and multiple intakes (September and January) with approximately 2000 students for per academic year. Majority of students on the course are international students with diverse educational background. In this B&M master's course students are required to join several compulsory modules, one of which is Business Research Methods (BRM), which aims to enable students to: (1) understand relevant methodological concepts and challenges associated with business research, (2) identify relevant literature, providing critical analysis of the theories, (3) formulate an appropriate ethical research strategy to plan the gathering and analysis of appropriate data (4) formulate a research proposal on a particular topic of students' interest. In this module students are evaluated through continuous assessments which are decided by the module leader.

The module was taught by the module leader and tutors (between seven to twelve depending on intake) in approximately fifteen separate groups (depending on intake) during the first semester for each intake between 2021-2022 and 2022-2023 years. Approximate number of students for each group was between 50-60. The syllabus, course materials and tasks for assessment was same to all groups. All module related materials (PowerPoint slides, books, book chapters, case study, short videos, journal articles and assignment briefs) were uploaded and posted in the module's Canvas site.

3.2 Innovation on The Module and Reflection Analyses

The innovative methods employed in this module were to address the above-mentioned challenge, making RM more interesting for B&M students by improving an engagement. While managing large courses and modules, it emerged from the module leaders' practice who is the author of this paper, that engagement is driven through interaction and participation. Best way to remain students engaged, especially in an internationalised setting is to keep session interactive. This was achieved by incorporating active and action learning strategies in flipped classroom settings. Flipped classroom settings consistent with research-informed/led practice were deployed and flanked by a LSC and Reflection to ensure that different students' learning needs and preferences are met, regardless of their learning styles, abilities, and backgrounds.

The idea was to create an interactive environment where students could master technical and theoretical information through LSC, reflection, and critical analysis. The module delivery structure included: (1)

Preparation stage: Pre-class self-study, (2) 1 hour face to face Lecture, (3) 1 hour face to face tutorial and (4) Strech/Post-class self-study. A new innovative assessment, the Weekly Reflective Work/ Reflective Diaries submission, which was based on the LSC discussion, during the tutorials, was introduced on the module since the module leader took the module leadership from previous module leaders. Using the LSC during the tutorials and Reflective Diaries (RD) for the weekly submissions, encouraged students to share their experiences - good and bad - and reflect together to draw out the learning. The learning came not only from lecturer/tutors bringing new information or insight (which normally is done during the lecture), but from the members of the LSC sharing their experiences and reflecting on it. Having, LSC about the case study, which was linked to the week's topic/research process, helped students to adopt multicultural environment and have a great experience as an international student. In addition, introducing the Weekly Reflective Work/Reflective Diaries submission as a form of assessment, helped students to keep RD, which allowed them to observe their own research practice and the lessons they have learnt.

3.3 Data Collection and Ethical Consideration

Effectiveness of the introduced methods and recommendations are based on Mid-module feedback which was taken from 3 different intakes between 2021-2023. As this study was taken purely for the pedagogical reasons and is not conceived as pure research at this stage study didn't go through the ethical approval.

According to Universities policy "Protocol for Reflective Practitioner Work by Academic Staff" - The intention of a tutor who reflects on the curriculum, how it operates, how it matches the students' needs and expectations and the requirements of external bodies and so on, is simply to update and/or improve the curriculum in the interests of doing what the University is charged to do: providing a curriculum that is current and comparable to that offered at other institutions. This is normal professional practice and is undertaken with purely pedagogical concerns in mind. The tutor has no research agenda in mind at the time and it is important that this professional updating should proceed without any tutor thinking that it should be inhibited by ethical considerations. Assuming that what happens to the students as a result of the changes continues to be ethical in a broad sense, there is no need to apply for ethical approval for them. The distinction to be made is that that the changes were made by the tutor in the interest of improving the module and the student experience and not in the interest of carrying out a piece of research. (UPR RE01, 2021). In addition, Mid -module feedback on the module was collected anonymously online settings (via Padlet) without confirming any personal data. Questions, or any other aspect of the procedure, didn't intrude on the student's privacy, or risk upsetting or disturbing the students in any way. Innovative approach discussed above is reported at both informal and formal discussions and conferences both within and outside the university (UPR RE01, 2021).

Students were asked three questions as follow:

1. What is working well on the module (e.g. structure, module team, delivery, assessments)?
2. What could be improved (e.g. structure, module team, delivery, assessments)?
3. How module helps them to develop their research proposal?

3.4 Findings and Discussions

Majority of students reported that the BRM module had effective structure. Having flipped class settings helped students to access the module content including recorded lectures outside of face-to-face class time (during "*Preparation*" stage pre-class self-study and "*Strech*" post-class self-study). As a result, students could review case studies and other course materials in advance to tutorial then have class sessions for working together on the assignments.

The LSC during the tutorials also was acknowledged to be effective way of delivering BRM module. Having LSC during the tutorials as part of weekly assessment helped to improve an engagement and an interaction on the module. In addition, as some of the students indicated it helped them to build an interest in RM.

> *S1[2021 Sem A intake]: Having LSC in class and being more interactive has helped me build interest in BRM. This is the first time I have taken this course. So, I don't know how to do research and I was very sceptical about it.*
>
> *S2[2022 Sem B Intake]: The tutorial sessions, LSC, have been very great it is helped me understand BRM to a very large extent, weekly reflection has helped me to develop ability of critical thinking about the case study have discussed and studied.*

S3[2022 Sem A Intake]: Having this type of BRM lesson makes me very happy. It provided me with many answers to my problems, greatly aided in the advancement of my profession, and increased my understanding and comprehension of business research.

S4[2023 Sem B intake]: It is very interesting to have LSC about the case studies in tutorials. It helps to gain knowledge regarding the final project and assignments. The case studies discussions with other classmates helps to gain a lot of knowledge. Enjoying the module.

S5[2023 Sem A intake]: I was pretty scared in the first few weeks on how I can work on my research proposal. But as each week progressed, the lectures and tutorials made me feel confident that I can submit a good proposal. I like how the BRM module is designed to help the student understand research methods in a step by step manner.

Positive feedback was also about the RD submission from all cohorts. The research process is usually presented as a sequence of between seven and ten distinct stages all of which must be completed for any piece of research to be credible (Saunders et al, 2019). It is easy to get lost in necessary details, required to successfully carry out the individual steps. By taking each step separately, and design weekly units/topics and lectures based on Business Research Methods textbook (Saunders et al, 2019), weekly LSC and Reflective Work/ Reflective Diaries submission tend to support this outcome. Having RD helped students to iterate between these steps, perhaps revisiting various stages many times, as their understanding of the research problem develops and changes as a result of the findings from other steps such as literature review and research design.

S6 [2021 Sem A intake]: BRM Tutorial was very interesting and weekly reflection report helped to think critically and how apply theory to research.

S7 [2022 Sem B Intake]: weekly reflection in the module was a great idea as it helps to remember what we learnt in the lecture and tutorial.

S8 [2022 Sem A Intake]: Sessions are really good and I am able to catch what tutors are teaching in class. By the weekly reflection assignments, we could learn more deeply about the subject and it helps me to prepare a basement for my final research.

S9 [2023 Sem B intake]: This module has been helpful in many ways as a post graduate student. It helped to get back to studies as many of us were joining after a break from studies. The weekly reflection helped to get back to writing to and develop research proposal.

S10 [2023 Sem A intake]: Excellent. The Module has been helpful in giving us a clear understanding about research methods and all the processes involved in conducting a research. Weekly submissions helped us to develop our research proposal step by step.

On top of the benefits discussed above It must be acknowledged that, after implementing new innovative assessment methods for the module according to the Module Evaluation Form (MEF)s, overall failure rate on the module dropped nearly 70% and attendance and engagement improved dramatically. In addition, presented methods helped to decrease the number of the plagiarism cases which is another ongoing problem in HE. Evidence presented in this paper, which is only very small part of large data, indicates that integrating action and active learning strategies in BMR module was effective strategy which improved overall modules performance and students' perception about the RM.

4. Conclusion

The innovative methods discussed in this paper were employed to address an ongoing challenge, making RM more interesting for B&M students. The discussion is based on the author's personal reflection and experience, delivering RM module on one of the largest PG taught courses in one of the UK's higher education institutions.

Effectiveness of the introduced methods and recommendations are based on the Mid-module feedback data which was taken form 3 different intakes between 2021-2023.

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Research Methods: Is Agile Different?

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Abstract: The fourth industrial revolution was a radically new round in the evolution of many processes in society, including management processes. The digital revolution has provoked the development of new management models and concepts. Agile manufacturing is one of such managerial production concepts that meets modern challenges and requirements of the business environment. Literature review as a research method plays an important role in the studies. This paper presents a systematic literature review of the papers published in SCOPUS and Web of Science database about agile manufacturing since 2000. Specifically, we aim at analysing the research methods on this very popular topic on the economy and management. We believe that by defining the methods used in the agile field we may understand the nature of the research. It is well known that agile manufacturing methods are meant to be upfront in terms of efficiency, but in this paper we want to make a review on research methods to check how research has been made. Therefore, we believe this research is useful for scientists and practitioners.

Keywords: Agile manufacturing, Literature review, Research method, Fourth industrial revolution

1. Introduction

Nowadays the fourth industrial revolution development, dominated by digitalization and artificial intelligence (Schwab, 2017) agile manufacturing comes to the fore. Uncertainty and instability are the conductors of current business processes. In today's reality, an industrial enterprise faces a number of challenges. Along with those that have already become ordinary, which consists in achieving a high-quality indication and minimal costs, the following are becoming topical:

- reduction in time to market;
- wide variety of product range;
- increase in the rate of flow of production processes;
- accurate customer satisfaction;
- use of the latest technological advances.

So, a modern management model should satisfy these points. Agile is a strategy for achieving a sustainable development through adaptation to all challenges of the external environment.

Thus, it is very important to follow the research methods used by scientists on this very popular topic of economics and management in order to check how scientific research was conducted. That’s why literature review is becoming particularly relevant.

2. Methods

Although changes and uncertainty in the market are not new challenges, over the past decades there has been an unprecedented acceleration of the changes taking place. Thus, the speed and frequency of the appearance of new things in the field of technology increases every year, doubling, by analogy with Moore's law, every five years. Because of this, it is difficult to keep up with the times and be at the forefront of research, as well as evaluate collective data in a particular area of business research.

So, literature review as a research method plays an important role in research papers.

A literature review is a document or section of a document that collects key sources on a topic and discusses those sources in conversation with each other. It is a comprehensive summary of previous research on a topic. And due to some researchers (Baumeister and Leary, 1997; Tranfield, Denyer and Smart, 2003) it can be described as a systematic way of collecting and synthesizing previous research. Well-conducted review as a research method creates a solid foundation for facilitating theory development and advancing knowledge (Webster and Watson, 2002). There are some guidelines for conducting literature reviews that propose different types of reviews, such as narrative or integrative (Wong, Greenhalgh, Westhorp, Buckingham, and Pawson, 2013), systematic and meta-analysis (Davis, Mengersen, Bennett, and Mazerolle, 2014; Moher, Liberati, Tetzlaff, and Altman, 2009) or integrative (Torraco, 2005). In general, there are different types of review methodologies:

systematic, semi-systematic and integrative approaches and argues that depending on purpose and the quality of execution, each type of approach has advantages.

So, systematic reviews are effective in synthesizing what the collection of studies are showing in a particular question and can provide evidence of effect that can inform policy and practice. However, systematic reviews are not always the best way. Instead, when wanting to study a broader topic that has been conceptualized differently and studied within diverse spheres, this can hinder a full systematic review process. Instead, a semi-systematic review approach could be a good strategy for example map theoretical approaches as well as identifying knowledge gaps within the literature. In some cases, a research question requires a more creative collection of data, in these cases; an integrative review approach can be effective when the purpose of the review is not to cover all articles ever published on the topic but rather to combine perspectives to create new theoretical models.

Table 1: Types of review methodologies (based on Snyder, 2019)

Approach	Systematic	Semi-systematic	Integrative
Typical purpose	Synthesize and compare evidence	Overview research area and track development over time	Critique and synthesize
Research questions	Specific	Broad	Narrow or broad
Search strategy	Systematic	May or may not be systematic	Usually not systematic
Sample characteristics	Quantitative articles	Research articles	Research articles, books, and other published texts
Analysis and evaluation	Quantitative	Qualitative/quantitative	Qualitative
Examples of contribution	Evidence of effect, inform policy and practice	Themes in literature, historical overview, research agenda, theoretical model	Taxonomy or classification, theoretical model or framework

Also, there are some attempts to develop guidelines specifically for business and management research. Thus, Tranfield, Denyer and Smart (2003) in their systematic review compare management and healthcare research, highlight the challenges of conducting a systematic review in management research and provide guidelines for conducting a systematic literature review in management. The main contributions of integrative review made by Torraco (2005) are definition the integrative literature review, providing guidelines and examples for integrative literature reviews and discussing contributions of an integrative literature review. Palmatier, Houston, and Hulland (2018) provide guidelines for publishing review papers in the sphere of marketing. It is noteworthy that Davis, Mengersen, Bennett, and Mazerolle (2014) provide guidelines for conducting a systematic review and meta-analysis in social sciences.

3. Results and Discussion

Different scientists describe the agile concept in different ways. Their studies have different approaches to literature review as a research method, but do not contradict each other. There is a tendency in view of the peculiarities of the concept of agile manufacturing, expressed in the fact that it is based on other fundamental, effective and well-proven concepts. The key to understanding the construction of a study on the agile concept is the content component of this concept.

The production system of the enterprise, which supports the principles of agile manufacturing, is based on the integration of organizations, highly qualified and knowledgeable people and advanced technologies into a coordinated system to achieve a qualitative leap forward in the competition by providing abilities that exceed those obtained from the current practice of the enterprise. Such an enterprise is a dynamically developing, flexible and reliable business unit capable of rapid reconfiguration in accordance with market opportunities. According to P. Kidd (1994), the fundamental resource for an agile enterprise is "knowledge". People should be united in dynamic teams formed around well-defined market opportunities so that each other's knowledge can be used. Through this process, knowledge is transformed into new products and services.

Production has undergone many evolutionary stages and paradigm shifts - from handicraft industry to mass production; then to lean production and, further, to agile manufacturing.

According to P. Kidd (2000), the manufacturing industry may well be on the verge of a serious paradigm shift. This shift is likely to take us away from mass production, far beyond lean production, into the world of agile manufacturing. K. Prahalad (2008) is also in solidarity - "we are moving towards a world in which value is determined through the experience of co—creation with the client at any given time." A. Gunasekaran (1999) suggests that agile manufacturing is a vision of production, which is a natural development of the original lean production concept. He believes that while lean production focuses on cost reduction, the requirement for organizations to become more agile and customer-oriented has led to the formation of the concept of agile manufacturing as a differentiation from lean production. A. Nambiar (2010) provides a taxonomic comparison of modern production concepts and comes to the conclusion that each of them, although contributing to the achievement of common goals - increasing profitability and customer satisfaction, is aimed at achieving specific objectives. Accordingly, the company must make a choice in favor of a particular concept by clearly defining its specific purpose. A. Harrison (1997) highlights the main discrepancy between lean production and modern market requirements in terms of the need to build a rigid supply chain, the development of which takes years, while agile manufacturing is characterized by a higher speed. A. Gunasekaran and Y. Yusuf (2002) define quick response manufacturing (QRM) as a characteristic of an agile enterprise. S. Goldman and R. Nagel (1993) argue that agile manufacturing assimilates the entire range of flexible manufacturing technologies, as well as lessons learned from Total Quality Management (TQM), the just-in-time model and lean production. Some scientists (Van Hoek, 2000; Mason-Jones, Naylor and Towill, 2000; Matawale, Datta, and Mahapatra, 2015) are discussing a combination of lean production and agile manufacturing within the supply chain, the so-called "Leagility" concept. In particular, the team of authors examines the similarities and differences between the characteristics of lean production and agile manufacturing and puts forward a judgment on the appropriateness of when and where they should be adopted from the point of view of the best customer satisfaction. Other authors (Greene, Ellis and Waller, 2008; Prince and Kay, 2003) consider a combination of these concepts in order to help companies reduce operating costs by responding to customer requests in a timely manner. According to Luzin (2013), the main difference between the concepts of agile manufacturing, quick response manufacturing, lean production lies in the "strategic, target orientation", but at the same time they do not contradict each other, but, complementing, strengthen. The authors (Powell and Strandhagen, 2012) support combining elements of the three production concepts in a logical progression - the transition from lean production, through quick response manufacturing to agile manufacturing. This leads us to reinforce the assumption that the principles of all three paradigms should be considered by an industrial enterprise striving for operational excellence and competitive advantage in the turbulent global markets of our time. According to Oleson (1998), agile manufacturing serves as a structure that combines the principles of lean production with mass customization. Sharp and colleagues (1999) presented a theoretical model in which lean production and quick response manufacturing are uniquely identified as agile manufacturing instruments. Yanzer Cabral, Ribeiro and Noll (2014) identify and discuss the gap between knowledge management and agile methodologies. Andriyani (2017) considers knowledge management as an important aspect of one of the agile techniques – retrospective.

Developing reflections on an effective production model of modernity, it is possible to schematically present the following (fig. 1).

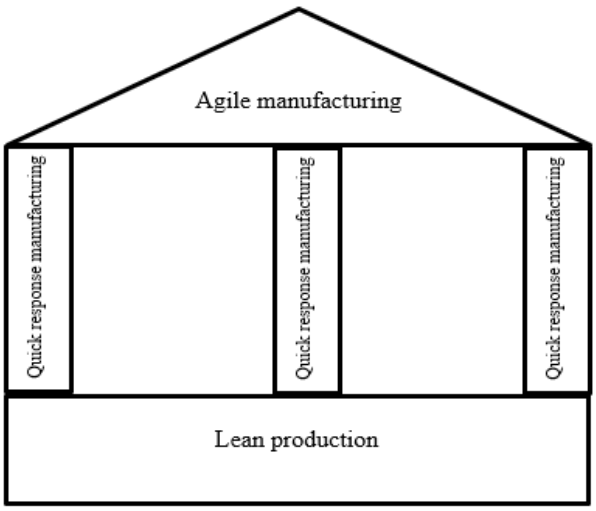

Figure 1: The model of agile manufacturing (developed by the authors)

The role of agile manufacturing (Booth, 1996; Goldman, Nagel and Preiss, 1995; Gunasekaran, 1998; Larman, 2004; Sutherland, 2014; Highsmith, 2000; Cohn and Schwaber, 2003; Schwaber, 2007; Goodpasture, 2010; Hass, 2007) is fundamental, the achievement of organizational agility serves as the main strategic guideline for the active production model, and the models of modern resource management (mainly lean production) are the foundation on which the action of active production is based – the principle of continuous improvement and reduction of production losses. Among the losses, emphasis is placed on minimizing the time aspect, which reflects the main idea of the quick response manufacturing concept, which is considered as a kind of supports.

Summarizing from the point of view of the research methods used by scientists, attention is drawn to how different authors use different approaches: systematic, semi-systematic, integrative. Thus, this fact unites the nature and structure of research, it is quite traditional. But in view of the peculiarities of the concept of agile manufacturing, expressed in the fact that it is based on other fundamental, effective and well-proven concepts. In this regard, the integrative review approach is the most widely used in this kind of research on agile manufacturing. Researchers systematically study the theories on which the concepts that are the foundation for agile are based, also study agile within various fields of activity, try to link them to modern trends in the development of production. But at the same time, they apply creativity, for example, in data collection, combining different points of view to create a new theoretical model.

Of course, the emphasis in the achieved research result will depend on the choice of approach to literature review. As noted earlier, each approach has its own vulnerabilities and advantages. And researchers face different challenges every time. Thus, the authors' theories will highlight important aspects of the study for them. But the correct highlighting of the core features of agile is the key to the success of the researcher.

The methodologies used by scientists influence the theories proposed by them. But it is important that due to the specifics of the agile concept, the fundamental thoughts are similar among all authors of research on agile manufacturing. These fundamentals are shared with the concepts underlying agile.

The agile concept is modern, rapidly developing and therefore interesting for research by scientists. Their studies have different approaches to literature review as a research method, but do not contradict each other. And in general, these studies are an extensive and large-scale work for students, scientists and practitioners to study.

4. Conclusions

Agile is an extremely popular and certainly effective management model in the realities of the development of the fourth industrial revolution. Different scientists have identified and interpreted the meaning of this concept in different ways. But because of the agile manufacturing feature, which consists in the presence of the fundamentals of other popular production management concepts, such as lean production, and quick response manufacturing. A systematic study of these concepts, each separately, becomes justified. And further, using a creative integrative approach to literary reviews for agile manufacturing is a rational solution.

Summing up, we can highlight the following conclusions.

- Agile manufacturing is a concept of production organization based on foreseeing changes in the business environment and timely responding to rapidly changing market needs through the efficient use of internal and external resources. It is based on the principles of such fundamental and well-established models as lean production, and quick response manufacturing.
- Literature review as a research method plays a fundamental role in research papers. It can serve as a basis for knowledge development, provide evidence of an effect, create guidelines for policy and practice, and in case of success, you have the ability to generate new ideas and directions for a specific area.
- The choice of approach to the literary review is important and influences the further logic of the theoretical model construction. Scientists use different approaches to literature reviews: systematic, semi-systematic, integrative. Thus, this fact unites the nature and structure of research, it is quite traditional. But in view of the peculiarities of the concept of agile manufacturing, expressed in the fact that it is based on other fundamental, effective and well-proven concepts. In this regard, the integrative review approach is the most widely used in this kind of research on agile manufacturing.

A possible continuation of this study consists in a presentation comparing the depth and quality of agile research conducted by three approaches to literature reviews.

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Developing Methods for Assessing the Social Impact of Scientific Study

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Abstract: In many countries, there is a need to introduce new or improved existing methods for evaluating the social impact of scientific study on the environment of scientific institutions and universities. It is necessary to apply complex methodological solutions that should consider using research results by the non-academic world. The results of this evaluation are often crucial for building a university's position in national and international rankings. They may influence decisions regarding the level of financing of scientific institutions and the distribution of public funds for subsidies, scholarships, and financial aid concerning research grants. The paper aims to review existing methodological solutions and identify key trends in developing methods for assessing the social impact of scientific study. In this case, the scope of the research was limited to evaluating the study conducted within the field of social sciences. Running such assessments is more complicated than for the technical domain, for which more easily measurable bibliometric indicators and patents are available. The research used quantitative bibliometric analyzes based on the Scopus citation database, supported by bibliometric network analyzes. The results enable the identification of crucial methodological trends, potential opportunities and directions for developing research conducive to improving methods for assessing the social impact of study. Providing an overview of existing knowledge in this field creates a foundation for continuing further research.

Keywords: Social impact of scientific study, Social impact assessment, Methods for assessing the social impact, Bibliometric research, Social sciences

1. Introduction

The quality of diverse scientific studies should be assessed from the point of view of achieved social benefits, contributing to the increase of competitiveness and favoring improvement of positions in international rankings regarding country excellence. It is essential to create bridges between the scientific and societal influences of study that are important for research users who are individual persons, groups of people or organizations experiencing the impact of research findings and thus achieving knowledge-driven objectives (Woolley and Molas-Gallart, 2023). In the past, there was a widespread belief that carrying out such assessments concerned only a selected type of research from the technical domain. Over time, however, a need was noticed to include other scientific disciplines in such analyzes, and to study the impact of academic communities on society and the economy. It is considered particularly important to take into account Social Sciences and Humanities (SSH) specific organizational and epistemic features and difficult to measure outcomes, which are fundamentally different from disciplines classified as the Science, Technology, Engineering, and Mathematics (STEM) (Reale *et al.*, 2018).

Developing methods for assessing the social impact of scientific research can be considered a key challenge, and in many countries public institutions encourage the introduction of new methods or improvement of existing ones as well as evaluation systems. Therefore, both simple and more complex methodological approaches are being improved, intended to support the estimation of the effects of scientific research felt by the non-academic world. The proper functioning and quality of methodological approaches is of great importance because the results of such assessments often have a decisive impact on building the position of universities in national and international rankings, as well as on decisions regarding the level of financing scientific institutions and the distribution of public funds allocated for research. The paper aims to review existing methodological solutions and identify key trends in developing methods for evaluating the social impact of scientific study.

There are significant needs to improve and develop assessment methods for social science disciplines, and therefore the research has not included relatively well-researched methods for STEM disciplines. The study is based on quantitative bibliometric analyzes carried out using the Scopus citation database, which is considered the best for publications in the social sciences. Additionally, some software was used to facilitate bibliometric network analyzes. The implementation of these analyzes allowed for the identification of key methodological trends, potential opportunities and directions of research development leading to the improvement of methods for assessing the social impact of study. Showing these trends and existing research gaps allows for a critical look at the current state of knowledge in this field and creates opportunities to develop further research enabling the improvement of methods for assessing the social impact of scientific study related to social sciences.

2. Social Impact of Scientific Study

The social impact of scientific study does not have a universally accepted definition and is understood in many ways. The most important concept associated with it is 'impact', which generally refers to beneficial changes in various socio-economic areas beyond the academic environment and analyzed for various stakeholder groups: policy makers (local, national and international), economy, industry and selected sectors of society (Dwivedi *et al.*, 2024). In practice, the levels of this impact cannot be measured fully objectively using a precise quantitative scale. Positive results of evaluations regarding the impact of research sometimes do not mean real benefits for society, but the preferences of research funders, which may be contrary to the ambitious social goals of the academic community and deepening knowledge of important scientific problems (Power, 2020). Doubts regarding the understanding of social impact result from its different views by various representatives of the academic community, such as academics or university authorities. Surveys conducted among university employees and their leaders show that there is a significant difference of opinion regarding the understanding of social impact, ways of measuring it, ways of improving impact strategies and identifying areas of conflict between academic staff and university management, which is usually less critical of the impact agenda (Newman, 2024).

There is no specific universal set of recommended methods for measuring the impact of study, and simplified measures are often used based on, e.g., bibliometric indicators such as the number of citations and impact factor of selected journals. Such indicators do not reflect the complex and subjective nature of assessments, which should enable consideration of multifaceted social benefits for various stakeholder groups. In some countries, more or less complex assessment systems are developed, which are sometimes improved over many years. Among such systems supporting the measurement of social benefits of study beyond academia, there are two leading solutions: the Research Excellence Framework (REF) from the United Kingdom and the similar Australia's Engagement and Impact Assessment. Impact assessments are carried out within various scientific fields and disciplines, including those relating to individual disciplines distinguished in the social sciences, e.g. as part of the sub-panel on business and management studies (Blackburn *et al.*, 2024).

Methods and tools for assessing the social impact of research primarily support the decision-making processes of those managing public funds intended for financing research, who not only distribute the available funds among scientific institutions, but assign them to various categories that determine the scientific position on the market. Higher-rated research means more funds for further research for the institution, as well as the awarding of a higher category resulting in opportunities for granting academic degrees, greater prestige, employing better scientists and recruiting students with better academic achievements. The results of assessments may influence not only their perception on the educational and scientific market, but also force internal changes in individual organizations, e.g. regarding organizational structures and employment in various positions, including managerial ones. The achieved values of bibliometric indicators reflecting institutional research performance are often related to administrative-structural changes, and the introduction of a network-like flexible structure instead of classic departmental structures. These radical modifications stimulate the emergence of new mechanisms of cooperation between researchers and changes within the nature of the results obtained, important from the scientometric perspective (Jiménez-Andrade *et al.*, 2024).

Assessment results regarding the social impact of scientific study are helpful when planning and implementing research because they often justify the need to conduct study that benefits the environment of scientific institutions and society. These results can support making informed decisions regarding the identification of scientific priorities and strategies and, as a result, the proper allocation of increasingly scarce resources. This is undoubtedly important for the implementation of current research projects and for attracting talent for future strategic plans. A higher evaluation of scientific institutions usually means greater recognition of the quality of study conducted and its results. It may mean measurable financial effects in the form of increased opportunities to finance grants, cooperation with other renowned institutions, as well as immeasurable benefits perceived in the long term in the form of an improved competitive position resulting from a better reputation. Clear and transparent consideration of the social impact of scientific study in decision-making processes helps to build a positive image of scientific institutions making a positive contribution to society, which are centers of creating valuable knowledge for achieving socially beneficial progress and development.

Assessment of the social impact of scientific study should involve the application of appropriate procedures, approaches and methods. It usually consists of using only expert opinion, which needs support with evaluation methods that can help consider the comprehensive nature of research impact assessment, which is essential. These methods include bibliometric analysis, based on examining citations, the network of co-authors, and the

scope of research results. Alternative indicators also available to evaluators may include measures of social media presence, press articles, policy documents, and other variables of research effects observed outside academic circles. Such indicators may involve estimating impact based on economic benefits related to creating new jobs, introduced innovations, patent applications and emerging opportunities for commercialization of research results.

During evaluation, it is worth trying to combine quantitative and qualitative methods, which in many cases may make it easier to consider the multifaceted nature of research impact. Additionally, it is essential to remember to ensure interdisciplinary aspects and transparency of evaluation criteria to achieve credibility of the obtained evaluation results. Qualitative analysis methods and case studies of in-depth analyzes of selected research projects and programs aimed at understanding their particular impact on various stakeholders, communities, or industries are therefore helpful. In assessing the social impact of scientific study one can use the results of consultations with multiple stakeholder groups, including industry representatives and selected community members who can present various points of view on the impact of research and its importance for social needs.

The processes of assessing the social impact of scientific study are specific to various scientific disciplines and their implementation poses more or less difficulties. Assessments carried out for research conducted in the SSH are often quite difficult and the results obtained are questionable. In these fields of science, there is a need to organize the state of knowledge about available indicators and evaluation criteria, as well as methodological achievements regarding universal and reliable methods and methodological frameworks useful in social impact of study assessment processes. Therefore, SSH research is being developed on the role of universities in society, various measures of academic success, systemic barriers to scientific community engagement, approaches to improving the engagement of scientists in line with social needs, desired changes in policy and the practical operation of higher education conducive to improving the beneficial social impact of scientific research (Kelly and Given, 2024).

The specificity of SSH requires the use of complex approaches in the processes of assessing scientific outputs appropriate to the researched scientific fields. The complexity of these approaches lies, e.g., in the combined use of various research methods and carrying out the assessment in several-stage processes including isolating diverse scientific achievements in a given discipline, organizing panels of experts in this area and qualitative weighing of scientific outputs, taking into account the adopted research objectives and approaches (Ebrahimi Dorcheh *et al.*, 2024). At the levels of individual scientific institutions and public organizations sponsoring research, in most cases only quantitative estimations of the impact of scientific study in SSH using bibliometric indicators are not applied. Assessment processes are based mainly on the subjective results of the work of expert panels, which are often a source of doubts, controversies and sometimes even suspicions of bias (Martin, 2011).

In the SSH scientific community, there are doubts about the possibility of objectively distinguishing the impact related to research that can be clearly attributed to a selected scientific institution. Social impacts of study often result from accumulated knowledge concerning many research processes carried out over the years by various research centers. The creation and accumulation of scientific knowledge for SSH tends to be non-linear and has less obvious, specific and quantitatively measurable impacts (Hyland and Jiang, 2024). It is therefore justified to conduct research and analyzes regarding the development of principles and criteria for conducting effective processes of conceptualization, measurement and assessment of the social impact of SSH study (Grzeszczyk, 2022). In particular, it is important to build a solid methodological basis for conducting effective and reliable assessment of the impact of scientific research. A study aimed at reviewing existing methodological solutions and identifying key trends in developing methods for evaluating the social impact of SSH study seems promising.

3. Methodology

The research is aimed at determining the state of knowledge about methods supporting the assessment of the social impact of scientific study conducted in the social sciences and identifying key trends in the development of this field. Literature research and quantitative bibliometric analysis were provided using the Scopus citation database and the VOS-viewer software tool, which was applied to illustrate the visualization of bibliometric networks. The Web of Science (WoS) database is very useful for conducting bibliometric analysis studies in many scientific fields and disciplines. However, an uneven development of some citation indexes can be noted, e.g. the Social Sciences Citation Index (SSCI) and Arts & Humanities Citation Index (A&HCI) (Liu *et al.*, 2024). WoS is well suited for conducting literature reviews regarding studies carried out in many various areas of sciences (Viana-Lora and Nel-lo-Andreu, 2021). In turn, the Google Scholar database is characterized by significant inaccuracy of bibliographic data and inconsistent parameters describing the indexed publications. For the

purposes of this research, the Scopus database was selected, which contains consistent and reliable data for social science publications.

The research scheme is largely based on the PRISMA method derived from medical science (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) (Moher *et al.*, 2010; Page *et al.*, 2021). However, this method is increasingly used not only to conduct research involving systematic reviews published in clinical journals. Research schemes based on PRISMA are accepted by the academic community and enable the achievement of research repeatability, but there is a lack of full awareness of the possibilities of applications within various scientific fields and disciplines, e.g. social science, business and management studies (Mishra and Mishra, 2023).

The following research scheme was adopted, including quantitative and qualitative (manual) analyses:

- formulation of the research question: what are the leading methodological solutions and key trends in developing methods for assessing the social impact of scientific research in the field of social sciences?
- narrowing the scope of research to data concerning scientific articles (written in English) in journals related to social science and indexed within the Scopus database (collected in May 2024), timespan 2003-2023,
- determination of search parameters for quantitative analyses,
- identification, selection, and inclusion of publications for qualitative analyses,
- qualitative meta-analysis,
- network literature analysis.

The following keywords were used in the process of identifying scientific articles: “social impact of research”, “societal impact of research”, “societal relevance of research”, “third stream activities”, “social benefits of research”, “social contribution of research”. The search included article title, abstract and keywords.

4. Results and Discussion

86 publications were identified as a result of a systematic literature search in accordance with the adopted research scheme. The number of indexed articles reflects, to some extent, the intensity of significant research conducted in the analyzed field. The numbers of papers for individual countries may indicate the advancement of research and mastery of the methodological foundations for assessing the social impact of research conducted in social sciences (Figure 1).

The results of bibliometric analyses show a more significant number of publications in countries where the methodological basis for evaluating the social impact of study is well established. The large number of publications affiliated with research centers in the UK and the presence of Australia prove the significant advancement of research and the development of similar national evaluation systems for publicly funded research. In some European countries featured in Figure 1, public institutions sponsoring research also contribute to developing inquiries into systems, methods and tools for assessing research impact. Also, in the USA, the methodological bases for evaluating the social impact of scientific research are constantly being improved. Financing scientific studies from public funds involves awarding grants whose value depends on the results of expert assessments based on multidimensional analyses (Meagher and Martin, 2017). Major challenges for multidimensional analyzes are related to conducting complex and multifaceted assessments for transdisciplinary research fields that include complex analyzes of sustainable development and climate change requiring consideration of interactions between social and natural systems (Kny *et al.*, 2023). Taking into account productive interactions (exchange of useful knowledge between researchers and interested parties) in assessments is one of the basic elements of integrating inter-and multidisciplinary projects that have a positive impact on socio-ecological systems (Díaz Mariño *et al.*, 2021).

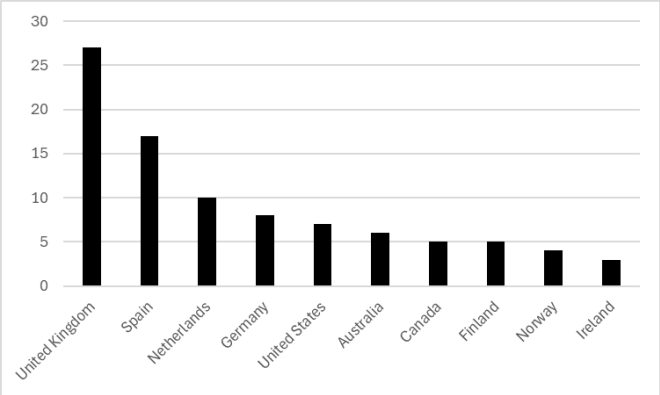

Figure 1: Number of articles for particular countries (source: own study based on Scopus)

Leading methodological solutions were identified manually after analyzing the selected articles. To assess the social impact of scientific studies, mainly methods known in social sciences are used, including the following ones: peer review, surveys of expert opinion, mixed methods and case studies, observation, interviews, bibliometrics, alternative indicators and metrics (altmetrics), document analysis and assessment reports. In addition to these typical solutions, there are also attempts to use advanced methods, e.g. text mining (Zheng *et al.*, 2021).

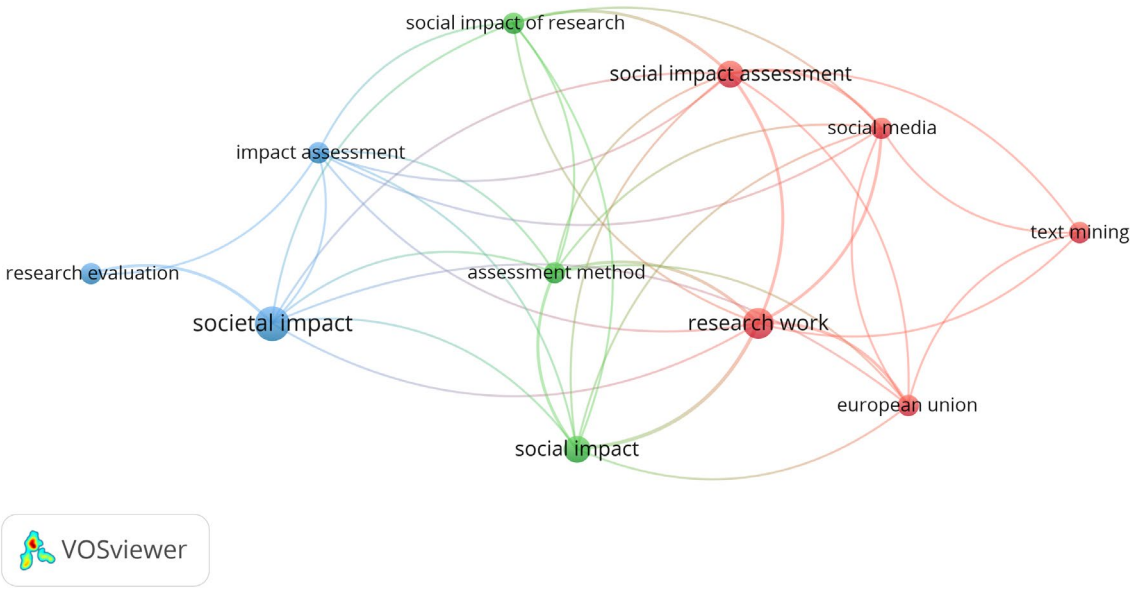

Figure 2: A fragment of a bibliometric map related to assessing the social Impact of research (source: own study)

The applications of altmetrics and web-based metrics are developed as a result of the search for effective methods of public engagement with scientific study achievements, which would constitute an important complement to classical methods based on expert opinions and bibliometrics. For this type of analysis, data from social media platforms are used. In addition to the disadvantages analogous to traditional bibliometric indicators (the number of citations does not always reflect the value of the publication), altmetrics methods have numerous advantages related to the possibility of taking into account various indicators not related to publications and the ease of conducting quick impact assessments (Bornmann, 2014). An interesting direction in the development of altmetrics is using AI-assisted models (De Winter, 2024).

A separate set of data searched in the Scopus database was prepared for bibliometric network analyses. The keyword "impact assessment" has been added to the previously mentioned search parameters. The identified

bibliometric networks (Figure 2) related to selected research areas and keywords make it possible to discover connections between them and key trends in research on methods for assessing the social impact of research conducted in the social sciences.

The research carried out has significant limitations and requires further investigation. First of all, bibliometric research should include data collected using a larger number of databases. In-depth analyzes are also necessary leading to the formulation of conclusions of key importance for the development of methods and tools for assessing the social impact resulting from conducted scientific research. It is necessary to check whether important publications were not omitted during the analyses, the importance of which results from the specific features and complexity of social research impact assessment processes. Many of this type of scientific investigations cannot be carried out as a result of quantitative analyses, but primarily require long-term and time-consuming manual qualitative analyzes involving careful reading of the content of individual scientific articles.

5. Conclusions

Identification of methods supporting the assessment of the social impact of scientific study helps determine critical trends in the development of methodological research. Understanding the state of knowledge creates appropriate conditions and the basis for improving these methods, the skillful use of which is necessary to build the competitive position of scientific institutions competing in application processes for financing scientific and research projects from public funds.

On the one hand, existing methods and tools for assessing the social impact of research are expected to be improved. On the other hand, there is a real need to develop new, advanced methods, but key challenges accompany this. These challenges include, in particular, the significant complexity and uncertainty of the assessment processes, the need to conduct transdisciplinary research and multi-aspect dependencies in R&D projects, taking into account quantitative and difficult-to-measure qualitative criteria, complications in using traditional simple assessment indicators and problems with including diverse groups of stakeholders in scientific projects.

The undertaken research requires continuation and deepening by collecting data from more databases. Improved bibliometric research can help better understand the current state of knowledge. Further improvement of work on research impact assessment methods may also result from supplementing the results of bibliometric analyzes with observations and expert opinions regarding assessment systems operating in leading research centers.

The obtained results constitute a reliable basis for continuing methodological research toward designing and implementing new approaches, methods and assessment tools. Conducting this research should consider the guidelines formulated by public sponsors of research projects and recommendations for national and international systems for evaluating the social impact of research.

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Researching the Topic of AI Data Analysis in Loyalty Programs

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Abstract: Loyalty programs have long served as valuable tools for customer engagement and retention. Today, with the increasing availability of customer data, new methods for analysis and program optimization are becoming a necessity. Artificial Intelligence (AI) has also been a topic of high relevance in recent years, and its connection with loyalty programs has not been researched and discussed enough to date. In this paper we aim to explore the emerging topic of AI data analysis in the context of loyalty programs. We examine various applications of AI data analysis in loyalty programs, including personalized rewards and incentives, customer segmentation and targeting and fraud detection and risk management. Covering these possible applications of AI data analysis provides a general understanding of AI data analysis functioning and its integration into loyalty programs. The provided information also serves as a good basis for understanding how AI data analysis functions and may be applied in various fields. In our paper we look at the outcomes of AI data analysis applications in loyalty programs from the point of view of a customer who is using those programs as well as from the point of view of the brand who manages them. By analyzing the identified points, we then highlight the benefits and challenges of using AI data analysis in loyalty programs. Key research gaps are also presented, emphasizing the need for further research on the topic, with particular attention given to problems such as ethical considerations, data privacy concerns, and the transparency of AI models. The main goal of our article is to provide readers with complex information on the topic of AI data analysis usage in loyalty programs and the ways this technology may benefit customers and the brand in the selected context. The article is theoretical-empirical and is based on external information from trustworthy sources, both digital and printed, completed with our own research outcomes.

Keywords: Loyalty programs, Artificial Intelligence, AI data analysis, Personalization, Segmentation

1. Introduction

Loyalty Programs have been an integral part of business strategies for a long time already. The primary goal of their usage is to cultivate customer engagement and increase their retention. Among the basic benefits or rewards provided in loyalty programs are exclusive discounts, gifts, benefits, or points collection with the goal of further exchange. In today's business world loyalty programs have become a common tool for building brand loyalty and are used rather commonly. This in turn led to the situation on the market, when the amount of information collected has become immense for traditional analytics tools in the way that those methods were not able to provide valuable insights and real-time data analysis results, limiting the possibilities for optimization of activities connected to loyalty programs. Since most programs are provided exclusively or non-exclusively in a digital form, online-specific metrics, like online interactions or user engagement with the content also became another point of interest.

Artificial Intelligence (AI) as a technology has become one of the solutions for analysing those giant datasets of information. Since AI models use machine learning technology, they can analyse vast amounts of data in a small amount of time and thus uncover the hidden patterns of customer behaviour. In our paper, we aim to describe the possibilities of AI data analysis and its implications in the field of loyalty programs. The information provided should explain to readers the way AI data analysis operates, what are its main advantages and limitations, and how it is used in the context of loyalty programs.

2. Theoretical Background

In order to explore the potential of AI data analysis in the context of loyalty programs we find it necessary to describe its core functionalities. As we`ve established in our previous papers, artificial intelligence as a technology can be defined as "*The machine performing in a way that imitates human behaviour*" (Kushnarevych & Kollárová, 2023). This is also valid in connection to AI data analysis, since the technology utilizes machine learning and various algorithms to be able to process those vast amounts of data, make conclusions, identify certain patterns and consequently make predictions based on the gathered data. There are a few technologies we have to define in this part in order to understand the functioning of artificial intelligence in the context of data analysis. Among them are:

- **Machine Learning:** Since AI data analysis mostly deals with giant sets of data, machine learning is one of the branches of AI that allows the technology to learn from those data sets and make better conclusions from them. For example, in the context of loyalty programs, by analysing customer behaviour, including the data about the app or web page usage, shopping history and purchasing

preferences, machine learning models can predict what specific customers would buy in the future, which rewards they would prefer and even potential churn and the ways how to avoid it (Caigny et al, 2024).

- **Data Mining:** This branch of AI makes it possible to identify specific findings from data based on patterns and trends and turn them into highly relevant insights for the brand (Witten et al, 2017). In the context of loyalty programs, this would allow to, for example, segment customers into highly relevant groups based on shared characteristics, which in turn brings brands a possibility to provide more targeted offerings and rewards.
- **Natural Language Processing (NLP):** In today's world, it has become very easy for anyone to leave their reviews or opinions about a brand, product or service anywhere and in any way possible. At the same time, feedback from reviews, surveys, social media comments and interactions are crucial for understanding the real customers` sentiment and preferences, and provide opportunities to prompt reacting to this information (Hemanth, 2024). Moreover, NLP, just like AI data analysis can be used in real-time, providing crucial data and insights for higher customer personalization and improvement of specific fields.

The functionalities stated above allow us to transform those giant, raw sets of customer data into valuable insights that bring a brand an understanding of what their customers truly feel and think in connection to the brand. If the company decides to work with those technologies, it can provide them with possibilities to move beyond the traditional one-size-fits-all approaches and rather create highly personalized, dynamic, insightful experiences that may make them stand out in customers` minds.

3. AI Data Analysis as a Research Method

Whether an AI data analysis may be considered a research method itself is a subject for discussion. However, we can state for sure that AI data analysis may serve as a powerful support tool that complements existing research methodologies (Santorsola and Lescai, 2023). If we look at traditional research methods, among which are, for example, surveys, focus groups, questionnaires, individual interviews or group interviews, it is clear that they can provide many valuable conclusions on customer attitudes and preferences. However, these methods may struggle to handle the vast and complex datasets, which are becoming more and more common in today's world. In today`s world, every click on the webpage, every depth of scroll, and every message typed can be collected as data, and since the amount and complexity of this information may be overwhelming, AI data analysis is a tool that may come in handy, or even inevitable for usage.

AI Data analysis can also be used as a good tool for evaluating research outcomes from traditional research methods. Let`s look at the example of basic surveys in the form of questionnaires. If made in an online form, it is common to expect survey platforms to provide basic data visualization. However, oftentimes those platforms would just provide basic information and visuals which are efficient for time-saving but are not very helpful in deeper data understanding. Today, this task can be fulfilled by AI data analytics tools. Such tools may not only help with data analysis and data visualization, but also with a range of activities to uncover the hidden insights of the researched dataset. Among them are:

- **Finding correlations, research questions and hypotheses:** Since AI data analysis tools are using artificial intelligence, some of them are capable of generating text output in a scientific style, which may be appropriate for usage in academia (Rossi et al, 2024). Some solutions prefer to use their own AI models, while others use the connection to external Large Language Models (LLM) – whether it is GPT, LLAMA or Claude. This feature may be useful both, before and after research. In the preparatory phase, it may serve as a great help when coming up with questions, their order and depth. But even after the dataset has been collected, AI data analysis tools may come up with new correlations, new presuppositions and new insights which were not thought about previously.
- **Uncovering Hidden Patterns:** Just like with the previous point, it is something that might be missed by traditional analysis methods but can be grasped with the help of AI. It is not always easy to gain a deeper understanding of the results, to find connections between certain questions or to make certain conclusions. And when trying to do this, those activities tend to be very time and finance-consuming. At the same time, AI data analysis tools may help to get similar results for a much smaller investment (Tamasiga et al, 2023).
- **Improved Customer Segmentation:** AI data analysis tools may also help researchers and businesses to better identify customer segments and thus create better offers for them. We are used to defining customer segments based on demographical, geographical, psychological and behavioural

characteristics. With the help of AI, such segmentation can be pushed even further, due to the ability of AI tools to analyze insights and correlations of customer behaviour to details, thus making it possible to create extremely personalized messages for customers. Such an approach has a big chance of causing increased customer engagement and thus more conversions or leads.

- **Predictive Modeling:** AI data analysis tools are also capable of predictive modeling. Among the basic examples of the technology are the possibilities to predict churn risk, return purchase probability or preferred rewards (Mantri and Mishra, 2023).
- **Real-Time Insights:** One more advantage AI tools bring to data analysis is the ability to analyze data and process conclusions and insights in real time (Oklay, 2023). While in traditional research it is possible, it would require a large amount of human resources, which is not always possible. With the help of AI, this process can be automated, so the person responsible will get only the final results without the need to process it any further. In industries where the data is very time-sensitive, it can be incredibly important to manage a product, service, or loyalty program.

As we have established, by incorporating AI data analysis researchers and businesses can get a comprehensive and insightful understanding of customer behaviour and preferences without the need to invest in the process giant amounts of resources. By saving those resources on the analytics stage, they are able to use them in other parts of their working routine, thus creating better customer experiences. In this chapter, we also want to showcase a few of the AI data analytics tools available on the market today. It is important to note that at the moment of writing this article, in the first quarter of 2024, there are already a large number of tools available, many of which bring different functionalities and possibilities. However, the field is still rapidly developing and new models and tools are appearing on a monthly, or even weekly basis, so continuous research is required for the research to stay relevant and up to date.

The first tool we find to be helpful and relevant is called Polymer and was created by Polymer Search. It enables the user to combine data from different sources, visualize anything from the dataset in various forms and interact with their AI engine, Poly-AI which may be helpful during the whole process of data analysis. It is also important to note that no coding or design skills are required to work with this tool, since one of their selling points is easiness of usage. The tool is indeed very easy and intuitive to use, the only thing required is to upload a dataset or connect a source of data, among which are Google Analytics, Google Sheets, WooCommerce data and many more. Users can work with the data themselves or use one of more than 20 templates that already have prepared graphs and tables and can be customized. Among the visualization options are the creation of:

- Column and bar chart;
- pie chart;
- time series, which shows a data trend over the period of time on the horizontal axis;
- heatmap that can serve as a useful visualization tool of two variables;
- scatter plot that uses dots to represent values of two numeric variables;
- line plot that shows data trends along one other variable;
- bubble chart which is good for visualizing three data variables from the dataset (*AI-Powered Dashboard Creator - Polymer Dashboard Maker*, n.d.).

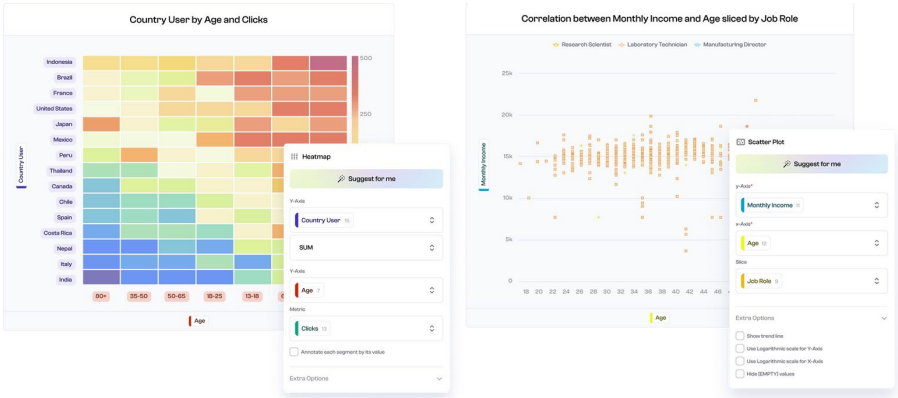

Figure 1: Heatmap and Scatter Plot in Polymer Source: "AI-Powered Dashboard Creator - Polymer Dashboard Maker." (n.d.), [online], Polymer. https://www.polymersearch.com/dashboard-creator

As we have already mentioned, there is an option to use Poly-AI, the platform`s artificial intelligence assistant. The system provides users with possible entry questions they may have, but one can ask the assistant anything and it will help with ideas, insights, and even create graphs for the user. On the bottom of the dashboard page, there are also some suggestions of interesting correlations that may be helpful for a user (*AI-Generated Dashboards & Data Visualization - Polymer AI*, n.d.). Another section in the tool connected to data visualization is data explaining, where the data is not only visualized in a table view but also certain metrics are being calculated and explained. Here the tool provides options to generate:

- Data table;
- scorecard;
- outliers, which compares three dimensions of data;
- return on Investment (ROI) calculator which may help businesses find their most profitable ads or products;
- pivot table that can be structured in any way suitable.

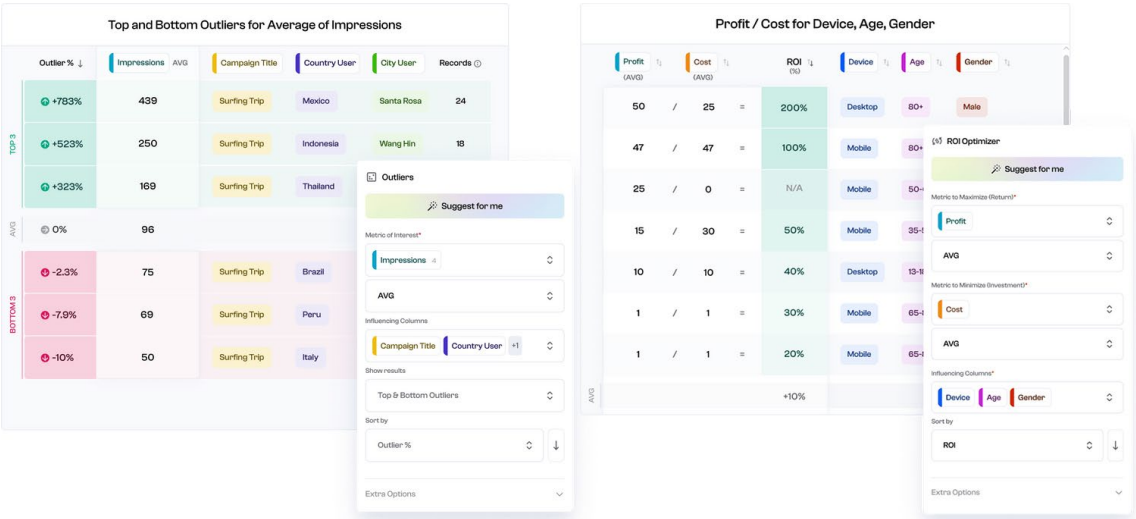

Figure 2: Outliers and ROI calculator created in Polymer Source: "*AI-Powered Dashboard Creator - Polymer Dashboard Maker*." (n.d.), [online], Polymer. https://www.polymersearch.com/dashboard-creator

Another advantage of the platform is that it provides an option to work with real-time data downloaded from selected data sources. It is possible to set up scheduled updates of the data or update it at any time with a single click. To conclude, we may state that Polymer as a tool is capable of helping researchers and businesses with many stages of data analysis. Not only it is capable of creating beautiful visualizations in seconds, but the ability of it to create insights, correlations and even hypotheses based on the provided dataset sets it apart on the market. Even though the outcomes may not be as good as the real researcher would come to, it may serve as a great starting point, saving a lot of time and money for anyone using it.

The second tool we want to mention in this part of our paper is Microsoft Power BI. At its core, it is quite similar to the previous tool mentioned, however, it has its own set of pros and cons. Starting with the latter, Power BI is not as easy and intuitive to use as Polymer and new users can be confused at first. However, on the other hand, the system brings many more opportunities for data visualization, data analysis, and interconnectivity. Power BI is also using the Artificial Intelligence model as the helping tool that may help uncover insights, find patterns, and provide answers to questions.

Another big advantage of a tool from Microsoft is that it provides the opportunity to use it as an interconnected tool with other programs that are part of Microsoft 365. It means that the capabilities of the tool may be used in applications like Microsoft Outlook, Microsoft Teams, Microsoft Excel and others (*Power BI - Data Visualization | Microsoft Power Platform*, n.d.). This also means that sharing access to the tool is extremely easy and intuitive, which helps to create cooperations, work together on projects and keep data safe inside an organization. In conclusion, Microsoft Power BI is a very complex and comprehensive tool that may help users with any type or amount of data. However, it requires a deeper understanding of what exactly one wants to find in it and use the tool for.

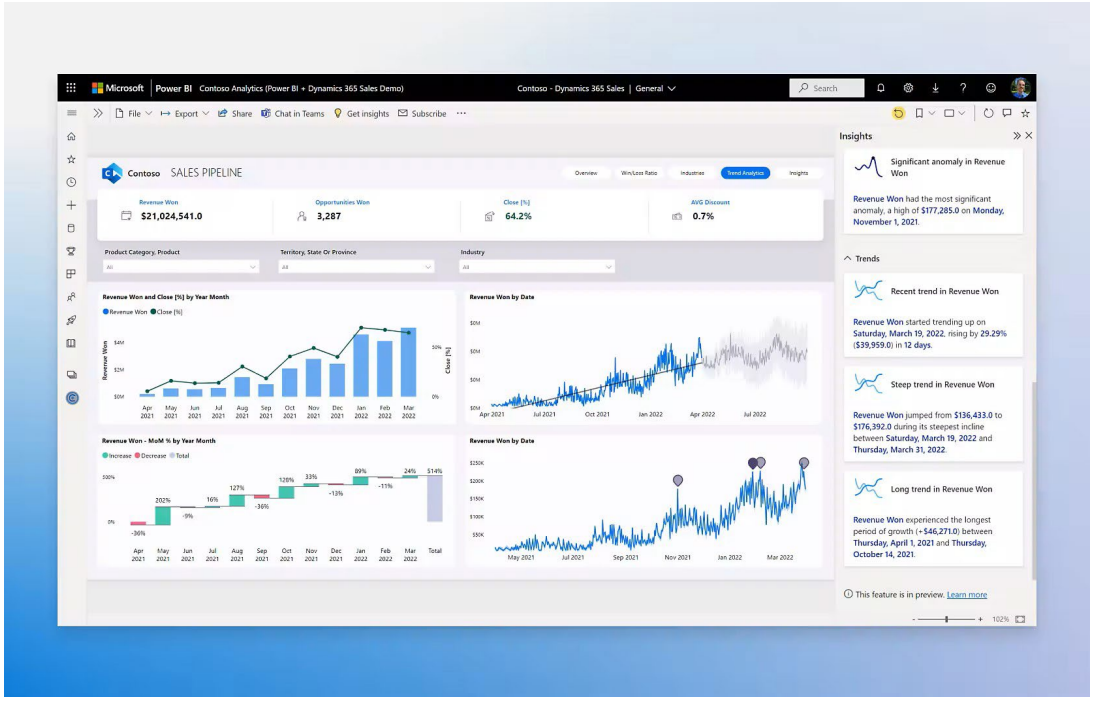

Figure 3: Data visualization in Microsoft Power BI Source: "*Power BI - Data Visualization | Microsoft Power Platform*." (n.d.), [online], Microsoft. https://www.microsoft.com/en-us/power-platform/products/power-bi#tabs-pill-bar-ocb9d418_tab0

4. AI Data Analysis in Loyalty Programs

A skyrocket in customer data in the digital age presents a new opportunity to leverage AI data analysis for a more sophisticated and impactful approach. In this section, we want to discuss specific applications of AI data analysis within loyalty programs.

- **Personalization:** Probably the most powerful application of AI in the context of loyalty programs is personalization. It can be achieved by detailed analysis of several factors that loyalty programs are capable of collecting, especially customers' purchase history, searching and decision-making behaviour, past interactions, coupons and discounts used, time and days of purchase etc (Kumar et al, 2024). With the help of AI and AI data analytics solutions, brands have an opportunity to predict the individual preferences of many customers, tailor rewards accordingly and thus build a deeper connection with them.
- **Recommending relevant products or services:** Even before purchasing, AI data analysis tools can be of great help to the brands. Since today it is common for an e-shop to have a wide range of products and brands, the choice of which one to buy may become an issue and even disrupt potential customers from purchasing. By analysing data, a brand would be able to provide customers with much more relevant suggestions and thus reduce the time required to find the product or compare it to alternatives.
- **Offering dynamic tier structures:** Even the way loyalty programs are structured doesn`t have to be the same for all the customers. For example, if some users prefer to use coupons for certain categories of products, AI may help provide them with such coupons. If other users are loyal customers of certain brands, a dynamic loyalty program may provide tailored-made benefits for everyone.
- **Providing targeted communication:** AI can help personalize emails and other communications with customers to highlight specific rewards or benefits relevant to each customer's profile. Even the way a brand communicates with its customers can be personalized in order to make customers feel more natural.

Another field AI data analysis may help with is dealing with potential fraudulent activities, misusage of loyalty programs and points manipulation from fake accounts. Since it is capable of analysing giant sets of data and making assumptions about the data collected, it may also identify suspicious patterns, like unusual spending

patterns or redemption activities and take actions to protect both, the business and the customers` side (Liu et al, 2023). Another advantage of using AI in this field is that it can make real-time risk assessments that don`t require human intervention. Thus, if necessary, AI can prevent loyalty programs' misusage or even protect customers' data depending on the activities it notices in real time.

By implementing these AI-powered applications, loyalty programs can move beyond generic rewards and create a more personalized and engaging experience for each customer, which in turn may lead to increased customer satisfaction, loyalty, and ultimately, program effectiveness.

5. Outcomes of AI Data Analysis in Loyalty Programs for Customers

- In the following chapters of our paper, we want to look at the outcomes of AI data analysis in loyalty programs may bring for both, customers and businesses if implemented into one's brand strategy. From the information provided above we can summarize, that for the customers the main outcomes are:
- **Tailored Rewards and Incentives:** Based on the analysed dataset and the information on consumer behaviour, truly personalized, tailor-made rewards may be provided. We mentioned a few examples before, but even providing a discount coupon on a birthday based on his or her personal preferences can make a big difference in building loyalty and making customers feel like the brand cares.
- **Greater Program Engagement:** If the program does not feel generic but genuine, it is realistic to expect that the customers would want to engage with it more and proactively (Chakraborty et al, 2024). It can be achieved by increasing the number of activities happening there, creating real incentives for customers to use them and communicating in a way that feels natural for the target audience.
- **Targeted Communication:** Analysed information may be used in various ways and forms, and one of them is creating personalized communication incentives. For customers, such communication may mean building a closer connection to the brand and even loyalty, since there will no longer be a wall of generic messages, but only relevant and personalized information.
- **Data Safety Improvements:** While transparency is ideal, the extent to which customers are comfortable with AI analyzing their data for personalization is a crucial consideration (Sharma, 2024). As we`ve already established, real-time AI data analysis may help identify suspicious patterns and prevent incidents from occurring. This way, the safety of customers` information can be improved.

As we can see, AI data analysis may bring plenty of potential outcomes for customers if a business decides to implement it into its strategy. In our opinion, the main benefits the customer gets from it are personalized offers, rewards and communication. However, there are different layers of personalization, and that is exactly where AI data analysis and AI as a tool may be of big help. Since the amount of information analyzed can be gigantic, the outcomes can be very specific and thus the personalization can be brought on another lever, creating a one-of-a-kind experience for a user.

6. Outcomes of AI Data Analysis in Loyalty Programs for Businesses

In this part of our paper, we want to look at the outcomes AI data analysis in loyalty programs provide for the other part of B2C business relations – the businesses themselves. Among positive outcomes, businesses can expect:

- **Increased Customer Engagement and Retention:** Just the way higher personalization and enhanced UI of loyalty programs motivates customers to engage with programs more, the same way it is beneficial to businesses. Higher engagement has a higher probability of turning into conversion for a brand, whether it is a lead, amount of time spent in the application, or purchase.
- **Improved Program Design:** By analysing details like button shape, colour, reaction to hover effects, pop-ups and other elements brands get the possibility to improve the loyalty program itself, which in turn may lead to higher customer satisfaction and engagement (Khamaj and Ali, 2024).
- **Improved Customer Lifetime Value:** Since one of the primary goals of loyalty programs is to build loyalty, better loyalty programs with highly personalized rewards and tailored design have a higher chance of building loyalty.
- **Reduced Customer Churn:** AI can predict customer churn by identifying customers at risk of disengaging with the program. With this knowledge, businesses can proactively implement retention

strategies such as exclusive offers or personalized communication to keep valuable customers engaged with the brand.

In essence, AI data analysis equips businesses with the tools to transform loyalty programs from generic reward schemes into powerful tools for customer engagement, retention, and brand advocacy. By leveraging the power of data and personalization, businesses can create a win-win situation for both themselves and their customers.

7. Research Gaps and Future Directions

In this part of our paper, we want to look into some research gaps and possible future directions of AI data analysis research. The first category we can mention here is ethical considerations. One big worry with AI data analysis is the possible harm to customer privacy. There is a valid question of how much data is appropriate to analyze and where is the line of ethically appropriate data usage. Another concern is algorithmic bias. AI algorithms can replicate biases existing in the data they learn from. In this context, research should focus on studying algorithmic bias within loyalty programs to guarantee that AI-driven personalization does not disadvantage certain customer groups. The final ethical consideration we want to mention is the explainability and transparency of AI data analysis solutions. When AI models are like a "black box," it can be hard to know how they come up with certain suggestions or choices. Studies on explainable AI might assist in establishing faith with consumers by offering clarity about the way their information is utilized within the loyalty program.

The second category, which is mostly applicable in terms of AI data analysis in the context of loyalty programs is the long-term impact on customer behavior. For example, businesses should be aware of the "Spoiled Customer" effect that may occur. There is a worry that excessive personalization with AI might create an attitude of entitlement in consumers, where they anticipate continuous benefits and price reductions.

We can`t forget that AI became widely accessible to the public less than two years ago, and many tools are still in the early stages of their life cycle. If these research holes are looked into, it will make sure that AI data analysis becomes a strong method for improving customer loyalty programs in an accountable and lasting way.

8. In Conclusion

For a very long time, loyalty programs have been crucial for maintaining customer involvement and keeping them with the company. But in this digital period where we are today, there is an abundance of customer data that brings up new difficulties and opportunities. This study looked into how AI data analysis can be used in research and the potential for its functioning in loyalty programs.

Firstly, we analyzed AI data analysis as a research method, where we included information on how it may help businesses and scientists with research, its potential usage and capabilities, among which were finding correlations, research questions and hypotheses, uncovering hidden patterns in data, improved customer segmentation, predictive modeling and real-time insights. We also included two practical examples of AI data analysis solutions – Polymer and Microsoft Power BI, along with a description of what the tools are capable of.

We looked at AI usage in loyalty programs and its outcomes such as personalization, segmentation and fraud detection. The possible advantages for customers and businesses were mentioned, like more involvement, better value and program optimization through data analysis. However, there is a need to consider ethical aspects related to the privacy of data, bias in algorithms as well as customer authority over their information.

To sum up, AI data analysis seems to be a very hopeful and powerful tool for loyalty programs in the future. By using its ability to make things more personal, improve programs with help from data understanding and take into account ethical factors, businesses can form better relationships with customers and push program success forward over coming years.

Acknowledgements

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Data Scientist Knowledge and Skills Evaluation Towards a Data-Driven Research Methodology

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Abstract: The modern business world increasingly requires a higher level of data science expertise as well as abilities in problem solving and data analytics. Data science is a broad and fast-moving field of methods, processes, algorithms and systems to extract insights from data. The University of Winchester has followed the guidance of the Institute for Apprenticeships and Technical Education (IfATE) and worked in partnership with a number of international, national and regional employers in the design and development of its Data Scientist (integrated degree) programme, which leads to a Bachelor's degree in Data Science. This degree apprenticeship supports students in gaining the knowledge and skills that are in demand by employers today and into the future, where working in multi-disciplinary teams alongside domain experts will often be the norm. IfATE specifies an End-point Assessment (EPA) plan to enable the apprenticeship to be completed in accordance with its Data Scientist degree apprenticeship standard. This paper considers professional practice and competence in data science and links the processes used in completing the EPA with domain-based knowledge and expertise. It reviews representative solution methodologies before demonstrating the applicability of a data-driven research methodology to discover insights and achieve organisational goals.

Keywords: Data science degree apprenticeship, Professional practice, Knowledge and skills, Modelling and evaluation, Research methodology

1. Introduction

Data science is an interdisciplinary subject that integrates (e.g.) data analytics, computer science, software engineering, project management and research methodology to develop intelligence with respect to real-world problems (Cao 2017). The Institute for Apprenticeships and Technical Education (IfATE) in the UK works with employers to develop, approve, review and revise apprenticeships and technical qualifications – one such apprenticeship being the Data Scientist (integrated degree). In partnership with a number of international, national and regional employers, a Data Science degree apprenticeship was designed at the University of Winchester to support companies/organisations in attracting data scientists and retaining their top digital talent. This programme provides apprentices with the opportunity to develop their knowledge, understanding, technical skills and indeed confidence to operate successfully in a globalised work environment.

IfATE has specified the areas of Knowledge data scientists must understand, the Skills they are able to deliver and the Behaviours they should demonstrate (KSBs). On the other hand, the EU-funded EDISON (Education for Data Intensive Science to Open New science frontiers) project has focused on activities to establish the new profession of Data Scientist and developed an impressive collection of documents including their Data Science Competence Framework, Data Science Body of Knowledge and Data Science Model Curriculum (EDISON 2017a). This paper starts by emphasising the importance of research methodologies for the data scientist profession based on a review of EDISON Data Science competence groups. The paper moves forward by mapping KSBs defined by the IfATE Data Scientist (integrated degree) standard with the body of knowledge and competency groups from EDISON, aiming to provide an organised and structured way to evaluate the knowledge and skills required for a Data Science apprenticeship.

The final-year End-point Assessment (EPA) represents the ultimate capstone for the Data Science programme, taking place once the apprentice has met all the KSBs in the standard and passed all the taught modules. It includes a significant work-based project, which informs a corresponding report on planning and executing the project, and a portfolio of evidence from other real-work projects to inform a professional discussion with the independent assessor. This paper compares macro-solution methodologies for data science and analytics projects before presenting a data-driven research methodology linked to skills and behaviours specified by IfATE. The paper then concludes with some examples of data science applications in the workplace, highlighting the domain-based context of apprentices.

2. Data Scientist Professional Practice/Profiles

The modern business world increasingly requires a higher level of data science expertise as well as abilities in problem solving and data analytics. Data Scientists can have an impact at strategic and operational levels by building and maintaining collaborative relationships with key stakeholders, subject experts and colleagues as

well as the wider data science community. They will often work in multi-disciplinary teams with domain experts, Data Engineers, Business Analysts and Technology Professionals for example.

The EDISON Data Science Competence Framework (CF-DS) provides a methodological basis for designing the data science curriculum in universities and professional training institutions based on their Data Science Body of Knowledge (EDISON 2017a). The CF-DS provides a platform for consistency in definitions supporting the data science profession, across five groups of competences.

Three core competence groups correspond to Data Science related professional profiles as follows:

- **Data Analytics** – applies appropriate analytical/statistical techniques on available data to discover new relations and deliver insights to support decision-making
- **Data Science Engineering** – uses engineering principles and modern computer technologies to research, design and implement new data analytics applications
- **Domain-based Business Analytics** – adopts general data science methods to specific domain data types and presentations, data and process models, organisational roles and relations

And two additional common competence groups demanded by organisations include:

- **Data Management** – develops and implements strategy for data collection, storage, preservation and availability for further processing
- **Research Methods and Project Management** – creates new understandings and capabilities to discover approaches to achieve research or organisational goals

Following the ESCO (European Skills, Competences and Occupations) taxonomy, EDISON proposed extended Data Science professional profiles – three of these roles (data scientist, data analyst, business analyst) have been selected here to showcase a mapping with each of the five Data Science competence groups above. Figure 1 demonstrates graphically the extent of competence required for each job role, using the suggested ranking from EDISON (where 5 is highest relevancy).

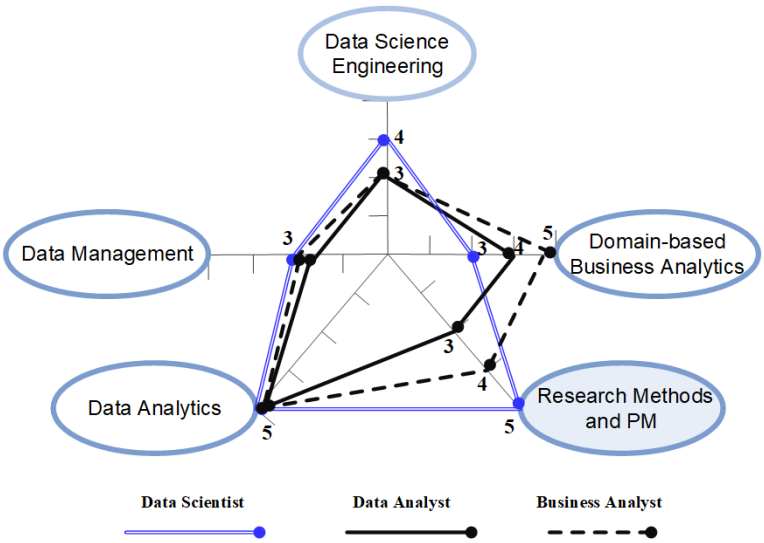

Figure 1: Mapping representative professional profiles with Data Science competence groups

No surprise to see that Data Analytics competence is essential to all three selected professionals (as shown at the bottom left of Figure 1). It is also interesting to note that Research Methods and Project Management is most relevant for Data Scientist (bottom right of Figure 1). Knowledge of research methods and techniques is especially important for data scientists and distinguishes them from other data-related professionals.

The Institute for Apprenticeships and Technical Education works with employers to shape skills training in England for the future of the workforce. An overview for Data Scientist has been described simply as “working in a team to find ways to improve an organisation's processes”. The IfATE standard has specified the areas of Knowledge data scientists must understand, the Skills they are able to deliver and the Behaviours they should demonstrate (IfATE 2018). For example, one required skill in relation to Research Methodology is defined as:

> *"S1. Identify and clarify problems an organisation faces, and reformulate them into Data Science problems. Devise solutions and make decisions in context by seeking feedback from stakeholders. Apply scientific methods through experiment design, measurement, hypothesis testing and delivery of results. Collaborate with colleagues to gather requirements."*

Not only are apprentices required to comprehend and reformulate the problems into Data Science tasks, but also apply scientific method throughout to design an experiment, test hypotheses and present results. At the highest level, data scientists are expected to put the problem in a wider context at their workplace, producing innovative methods and results that go beyond the original scope.

In terms of behaviour, apprentices must display scientific integrity and transparency, explaining the limitations of approach and results as well as the extent of their applicability to decisions in the organisation. For example: *"B5. An impartial, scientific, hypothesis-driven approach to work, rigorous data analysis methods, and integrity in presenting data and conclusions in a truthful and appropriate manner."*

The next section will illustrate the mapping of KSBs defined by the IfATE Data Scientist (integrated degree) standard with the body of knowledge and competency groups from EDISON, aiming to provide an organised and structured way to evaluate the knowledge and skills required for a Data Science apprenticeship.

3. Evaluation of KSBs with EDISON Framework

The University of Winchester has worked in collaboration with IfATE as well as a number of international, national and regional employers in the design and development of its Data Scientist (integrated degree) programme, which leads to a Bachelor's in Data Science. The BSc (Hons) Data Science degree apprenticeship supports students in gaining the knowledge and skills that are in demand by employers today and into the future, where working in multi-disciplinary teams alongside domain experts is often the norm.

The University has worked closely with its business partners to ensure that work-based training, research-informed teaching and rigorous academic study have been blended effectively to meet the needs of both the apprentice and employers (Lu 2020). This programme is built on activities which develop the different aspects of data science and leads to an Honours degree qualification that is contextualised for workplace competency as a data science professional capable of making a real contribution to their employer.

Degree apprenticeships offer employers the opportunity to develop and up-skill existing staff and to attract and train new talent. Some apprentices taking the Data Science programme are current employees already working in various roles, e.g. Business Insight Analyst, Claims Data Analyst, Commercial Pricing Analyst, Data & Analytics Manager, Management Consultant, Operational Researcher, People Insights Consultant, Product Manager and Underwriter. As a qualified degree apprentice, they will become an agile and skilled data scientist capable of rising to the challenges of the workplace. They will be prepared for a wide variety of professional roles in the field including not only data scientist but also business intelligence analyst, IT consultant, machine learning practitioner or IT project manager.

IfATE has designed the End-point Assessment (EPA) plan to enable the apprenticeship to be completed in accordance with its Data Scientist (integrated degree) standard (2018). Figure 2 sets out the context of EPA which includes three assessment methods: (1) Knowledge Test, followed by (2) Report (based on a work-based project) and (3) Professional Discussion (informed by a portfolio). The Data Science (Apprenticeship) programme design at Winchester has implemented EPA through two modules within the degree:

- **Data Science Project**: meets the requirements of "a suitable work-based project" which is "based on a Data Science solution that forms part of the apprentice's role" – the assessment of this module corresponds to EPA (2), i.e. *Report* – this should cover a significant work-based project detailing its aim and objectives, the apprentice's responsibilities and the action taken by them (in planning and executing the project)
- **Data Scientist Portfolio**: "enables the apprentice to demonstrate how they have applied their Knowledge, Skills and Behaviours in a real-work environment" – the assessment of this module corresponds to both EPA (1) and (3), i.e. *Knowledge Test* and *Professional Discussion* – the latter informed by a portfolio which presents evidence from other real-work projects

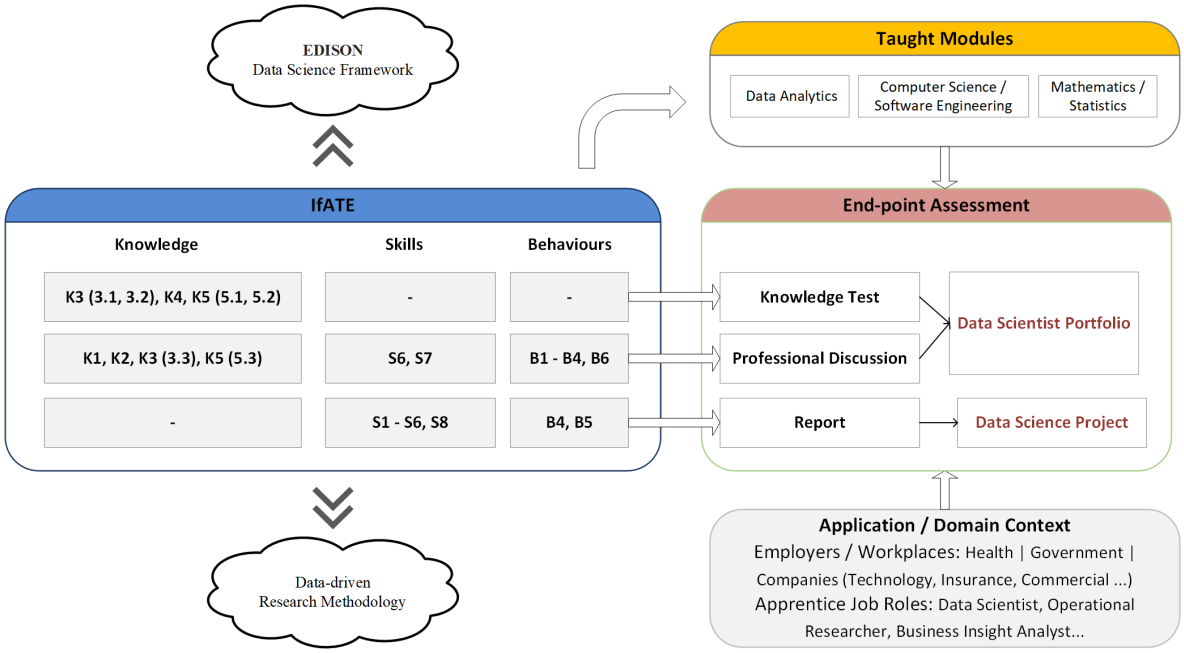

Figure 2: Context setting for End-point Assessment in relation to KSBs, academic modules and workplace

IfATE standard defines 16 areas of Knowledge, 8 Skills and 6 Behaviours which the University should follow through their teaching for Data Scientist (integrated degree) and these will also be tested through End-point Assessment. It is worthing pointing out that, as the name indicates, the Knowledge Test only assesses relevant knowledge, i.e. not skills or behaviours – on the other hand, the Data Science Project Report is not assessed for knowledge as such.

EDISON (2017b) proposed an extensive Data Science Body of Knowledge (DS-BoK) structure with identified Knowledge Areas in the same five competence groups mentioned in section 2, in summary:

- Data Analytics: including machine learning, data mining, statistical methods and visualisation
- Data Science Engineering: including software engineering, database and big data technologies
- Data Management: including data governance, data curation and preservation
- Research Methods and Project Management: including data-driven research and project quality
- Domain-based Business Analytics: including business analysis planning, processes and operations

DS-BoK (EDISON 2017b) suggested detailed data science knowledge areas, with corresponding knowledge units as well as certain alignment with other existing bodies of knowledge (e.g. DMBoK, BABoK, PMI-BoK, SWEBoK, ACM BoK etc.). Thus EDISON DS-BoK has been selected as a baseline to map KSBs from IfATE.

Figure 3 shows the mapping in a graphical way by adapting the EDISON framework illustrated in Lu (2022a) and using K2 as an example – the Business Analytics dimension is not considered in the mapping example here as degree apprentices are working in their own organisations across various domains.

The knowledge areas in EDISON DS-BoK which have not been considered specifically in IfATE KSBs are labelled in Figure 3 in italic and grey colour, e.g.

- Data Management group: Data infrastructure
- Data Science Engineering group: Agile development, Big data technologies
- Data Analytics group: Qualitative analytics, Prescriptive analytics
- Research Methods and PM group: Data collection, Use case analysis, Data stewardship

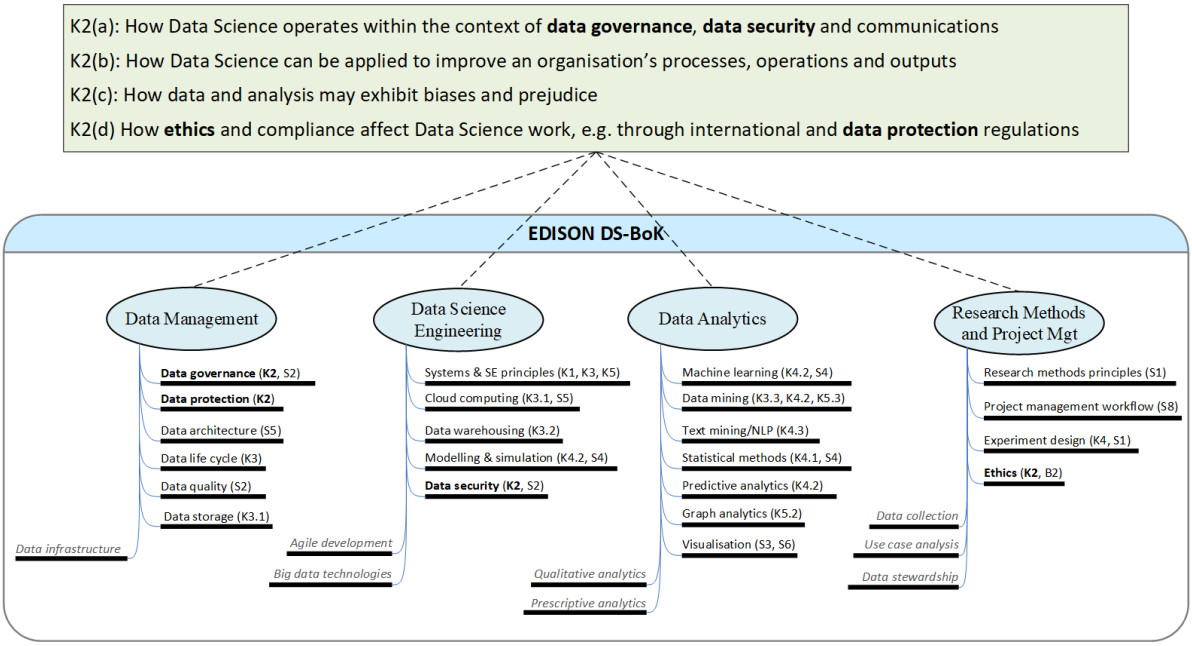

Figure 3: KSB mapping example in relation to EDISON framework

There are 35 instances of KSB in Figure 3, where 21 correspond to IfATE areas of knowledge, 13 to skills and just 1 to behaviour. Alongside the K2 highlighted, K4.2 also features in 4 of these instances, covering Modelling & simulation; Machine learning; Data mining; and Predictive analytics. At the same time, 13 of the 16 areas of knowledge are represented in the figure, 7 of the 8 skills and 1 of the 6 behaviours. The "missing" knowledge and skills so to speak typically belong to the more organisational business analytics domain. Behaviours can be considered among the softer skills and are not dealt with to the same extent in the more technological EDISON Body of Knowledge.

The next section will demonstrate the applicability of a data-driven research methodology in the context of the Data Science degree apprenticeship project as well as corresponding skills and behaviours from the IfATE standard.

4. Application of a Data-Driven Research Methodology

It is often necessary to develop a holistic approach to guide the process for executing a data science project (Martinez, Viles and Olaizola 2021). This section first reviews representative solution methodologies before presenting a data-driven research methodology linking the processes used in completing the EPA with relevant academic and technical skills. The section concludes by highlighting some sample real-work projects across different business and organisational domains.

4.1 Macro-Solution and Data Science Methodologies

Data science can be described as an interdisciplinary field of methods, processes, algorithms and systems to extract knowledge or insights from data, with data analytics as one of the key underpinning components. The Institute for Operations Research and the Management Sciences has produced their Analytics Body of Knowledge (Cochran 2019), which represents perspectives on a wide variety of analytics-related topics. INFORMS introduces the notion of micro- and macro- solution methodologies for analytics projects – macro-methodology provides the more general project path and structure, drawing on scientific research, OR/MS (Operations Research / Management Science) and CRISP-DM (Cross-Industry Standard Process for Data Mining).

For many years the most widely used approach for data analytics has been CRISP-DM (Provost and Fawcett 2013, Saltz 2021). This methodology breaks up the overall task of finding patterns from data into a set of well-defined sub-tasks: business understanding, data understanding, data preparation, modelling, evaluation and deployment. IBM Analytics has proposed a 10-stage Foundational Methodology for Data Science (IBM 2015) which extends CRISP-DM. It spans various technologies and approaches to form an iterative process for using data to uncover insights. The methodology has been redrawn here in the middle of Figure 4 to provide a central spine facilitating comparison with the scientific research and OR/MS project methods.

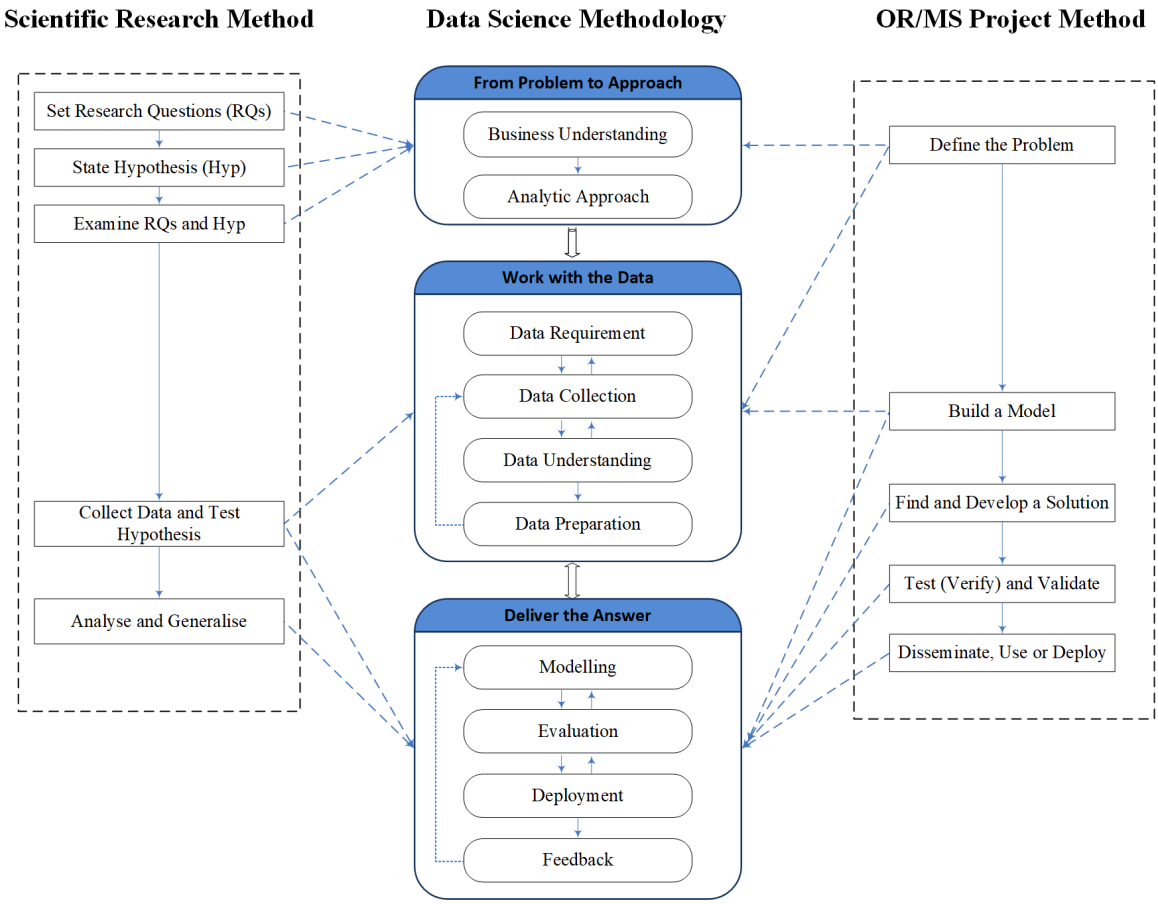

Figure 4: Comparing scientific and OR/MS project methods with a data science methodology

Saltz and Krasteva (2022) conducted a systematic review to explore the current approaches for executing data science projects and indicated that workflow is one of the most popular deployed with pre-defined phases, tasks and activities. There has been consistent research in data science process and methodologies, including the most recent work from Li et al. (2023) to embed data innovations in organisations by identifying data roles and associated skills with a workflow approach.

4.2 A Data-Driven Research Methodology Associated with KSBs

It is important to note that, while each data science project is unique, they can usually benefit from following a well-established methodology which recommends the steps to follow in a clear process (Cochran 2019). This will not only underpin credibility for the project path but also provide a structure for handling data and actionable insights. A composite data-driven process model was proposed previously and extended to provide both a procedural approach and structure which organisations can apply (Lu 2022b). This methodology has been evaluated in the business environment as a systematic process with well-structured stages. Case studies have included applying visual analytics on primary customer data to assist the strategic management of sales (Lu, Cairns and Smith 2021); as well as applying machine learning on a secondary health insurance dataset to gain knowledge about consumers and generate insights to remain price competitive (Lu 2022b).

The composite data-driven process model has been adapted in this paper as a consolidated data-driven research methodology which potentially can be used to guide a data science project for apprentices. As shown in Figure 5, the left-hand side indicates three distinct stages namely (i) Explore Data, (ii) Discover Insights and (iii) Make Decisions, each with its own structure. The extension in this paper is achieved by linking with an additional dimension, as shown on the right-hand side of the figure – the corresponding Skills and Behaviours which a work-based data science project report should demonstrate, according to the IfATE standard.

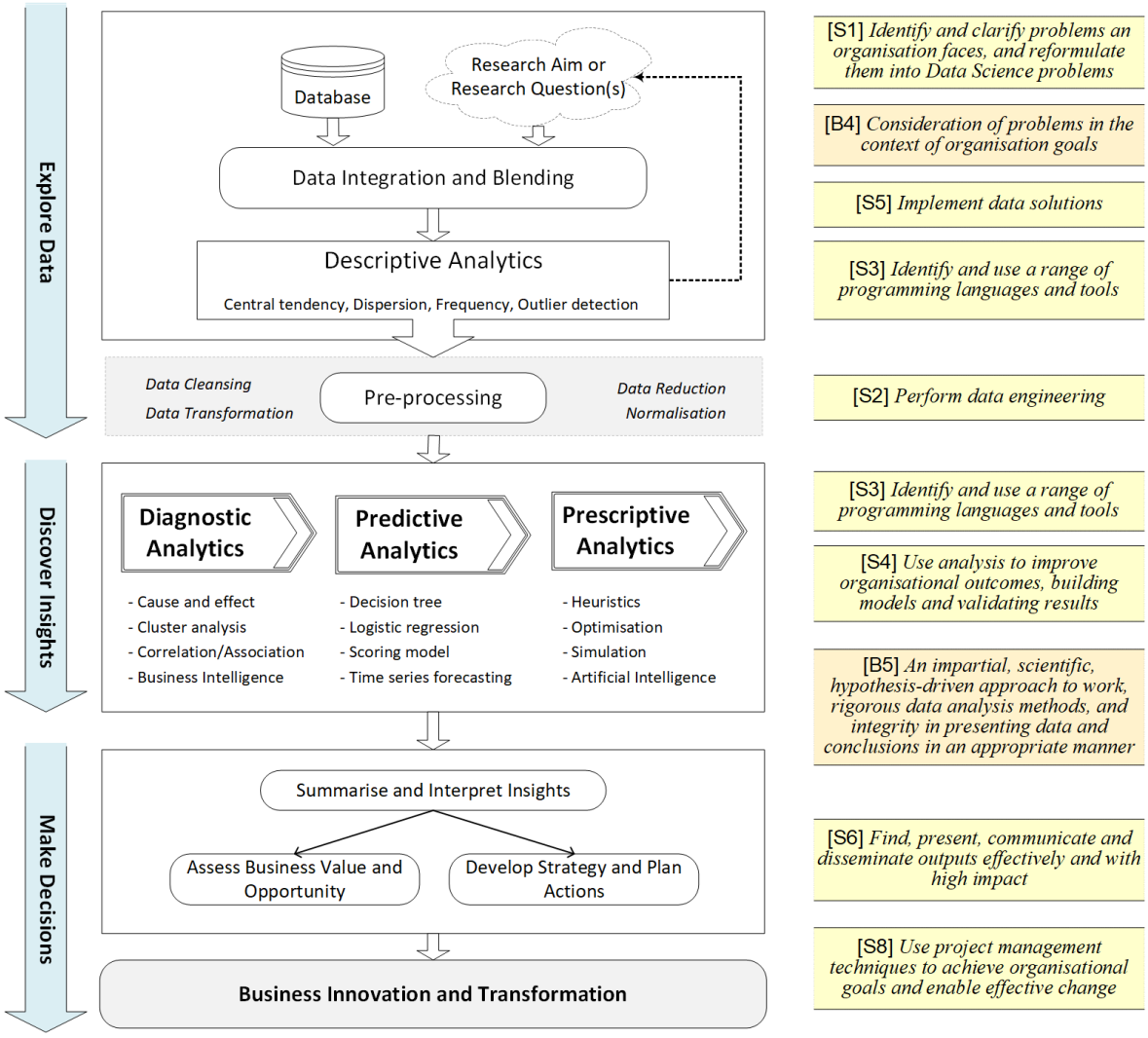

Figure 5: A data-driven research methodology with corresponding skills and behaviours defined by IfATE

The Data Science Project represents an ideal opportunity for the apprentices to showcase their Skills and Behaviours (SBs) as required by the Data Scientist degree apprenticeship standard. The project must be based on a Data Science solution that forms an integral part of the apprentice's role. The apprentice should show evidence of the planning and execution of the work-based project, including an evaluation of the processes followed, measurement of the SBs, a summary of learning derived from the execution of the work-based project as well as recommendations for future activities.

4.3 Selected Samples of Real-Work Projects

This paper will not evaluate in detail the application of data-driven research methodology in the real-world environment. However, some work-based data science projects from apprentices have been referenced in Table 1 by highlighting the domain-based context, datasets used, research aim (or questions) proposed and analytical methods applied.

These examples cover several domain-based business analytics areas including financial analytics, marketing analytics and human resource analytics – by using multiple data sources in the real-world across banking and insurance industries, sports as well as healthcare. Apart from Excel spreadsheets and SQL for data preparation, popular analytical tools include leading programming languages (Python and R) and visual analytics software (Tableau and PowerBI).

Table 1: Data, technologies and context – Examples of data science applications in the workplace

Context / Application and Datasets	Research Aim	Analytical Tools and Data Science Methods
Commercial Banking **Virtual assistant dataset**	To understand the causes of abandonment in customer conversations and identify how these may be grouped to improve helpfulness in the customer experience	Tableau (visual analytics) Python (sentiment analysis, clustering)
Health **Mental health dataset**	To investigate the impact of ethnicity, gender and age on mental health waiting times	SQL (data preparation) Python (regression model, time series analysis)
Insurance **Claims data**	To implement and test a method of Bayesian parameter estimation in commercial insurance modelling	Python Excel (numerical integration)
Sports **Football match data**	To find a correlation between the use of substitutes (subs) and total expected goals (xG) as an outcome variable	Python (multi-linear regression and decision tree)
HR **Employee data**	To allow stakeholders to view the diversity make-up of the business and to track progress against diversity goals	SQL server (querying data) PowerBI (dashboard)
Marketing **Leads and sales data**	Improving the comprehension of how diverse media channels influence the conversion of a sale, utilising the power of data science	R (time series analysis)

In terms of the Data Science Project Report assessment, in particular for the Methodology category, apprentices need to demonstrate:

- Are the methods which have been employed appropriate for the aim and objectives of the project?
- Have appropriate research methods been used?
- Is there evidence throughout the report that the methodology has been followed?
- Have the ethical implications been considered when discussing the methodology?
- Have the ethics of researching within the apprentice's own organisation been considered?

5. Conclusions

One of the key factors to determine the success of data science projects is the process followed – through established and mature methodologies (Saltz and Krasteva 2022). In this paper, the knowledge and skills required for a Data Science degree apprenticeship have been evaluated both from a UK standard and European perspective – data-driven processes are then linked to apprentice work-based projects and shown to be applicable through a research methodology.

The contribution of this paper lies in relating an occupational standard for Data Scientist with the still emerging professional practice through competence and skills mapping. Significant alignment is demonstrated between key aspects of the IfATE standard and EDISON framework – the former includes the more organisational and behavioural elements while the latter tends to emphasise the more technological. A consolidated data-driven research methodology then links the data exploration, knowledge discovery and decision-making stages of a work-based data science project with corresponding skills and behaviours specified by IfATE. This serves to underpin the domain-based knowledge and expertise required not only to achieve business and organisational goals, but also for successful completion of End-point Assessment.

The employer's role throughout the EPA exercise is integral to success too. They will not only continue their support and mentorship with the apprentices, but also participate in regular discussions with the University. The employer is required to offer necessary support with the Data Science Project, allowing the apprentice to carry out projects/tasks of significance to demonstrate their KSBs. As one of the key objectives for data science

projects is to offer business value, the data/information is likely to be confidential. As such the employer will need to approve of the project before submission, as well as the evidence within the portfolio, to ensure the level of information offered is appropriate.

The scope of data science "work" goes beyond analytics (Lahiri and Saltz 2023), not just being limited to the technical aspects such as modelling data and applying statistical or machine learning methods (McGregor and Inibhunu 2022). Data scientists can also have an impact at strategic and operational levels by building and maintaining collaborative relationships with key stakeholders, subject experts and colleagues as well as the wider data science community. The data-driven research methodology presented in this paper does not involve team collaborations at this stage, given its primary purpose of guiding an individual data science project which can then be assessed.

As part of the future work, further "soft skills" for data scientists could be embedded within the research methodology in order to accommodate other behaviours required by IfATE, notably: "*B2. Empathy and positive engagement to enable working and collaborating in multi-disciplinary teams, championing and highlighting ethics and diversity in data work"* as well as *"B6. A commitment to keeping up to date with current thinking and maintaining personal development. Including collaborating with the data science community"*. Employers offer additional support through a testimonial to acknowledge demonstration of the behaviours, as it can be difficult to evidence these through documentation for the EPA – it is also an opportunity to focus on the apprentice's competence from a management perspective.

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The Influence of Demographic Factors on the Creativity Level of Undergraduate Agricultural Students

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Abstract: The purpose of this study is to establish the influence of demographic factors on the creativity level of undergraduate agricultural students. It seeks to understand how gender, status of family owned business, field of study, and place of upbringing affect the creativity level of these students. The research adopts a quantitative approach, using a self-administered questionnaire. The survey data, collected from 421 participants, is analyzed using structural equation modelling. Hypotheses are statistically tested to establish the relationships between demographic factors and creativity level of undergarduates students. The survey data for this research was collected through a self-administered questionnaire. The participants were undergraduate agricultural students from various South African universities. To statistically test the hypotheses and analyze the relationships between demographic factors and the creative level, structural equation modelling was used. The study reveals that all demographic factors do not significantly influence creativity level of agricultural students. This suggests that gender, status of family owned business, field of study, and place of upbringing are not reliable indicators to test creativity level of undergraduate agricultural students. This research adds to the existing creativity literature on entrepreneurship by providing insights into the role of demographic factors in shaping the creativity level of agricultural students. It contributes to an understanding of how these factors influence students' perception on their creative abilities. The findings highlight the grounds of not considering demographic factors when evaluating creativity in educational settings.

Keywords: Creativity, Entrepreneurship, Field of study, Gender, Place of upbringing, Status of family owned business

1. Introduction

Education plays a crucial role in society and it holds the pathway to both future prosperity and an abundance of opportunities. Individuals can benefit much from education because it enhances the standard of living. Depending on the person, a number of elements affect their quality of life. According to Mali and Kumar (2017), variables such as intelligence, creativity and self-concept, enhance the quality of life because creativity is the ability to integrate or change existing ideas and make new ones. Treffinger, Isaksen and Stead-Dorval (2023) detailed that creative thinking significantly improves the quality of human life. Because creativity is the ability to integrate or change existing ideas and make new ones. Creative ideas might be complex, prudent, or straightforward concepts that no one else seems to have thought of yet, while others are astounding and amazing (Kishor, 2012). Due to the lack of a precise definition, scholars have defined creativity in a range of views due to the lack of a definitive concept (Craft, 2003). It is vital to understand that creativity is important for entrepreneurship and the expansion of any organisation (Thomas, Balogun & Oyinlola, 2023), and it affects entrepreneurial behaviour (Shaheen, Al-Haddad, Marei & Daoud, 2023).

Balogun, Attah and Famakinde (2021) confirmed that certain demographic factors such as marital status, familial and religion either enhance or reduce creativity. Balogun et al. (2021) further affirmed that these demographic factors are vibrant to the creative process and most importantly, creativity predicts entrepreneurship (Abdelfattah et al., 2022). The study done by Mavhungu and Dhliwayo (2023) confirmed that creative thinking predicts individual attitude to engage in entrepreneurial activities. Creativity is one of the dimensions of entrepreneurship. South Africa as a country is experiencing a high rate of youth unemployment, the highest unemployment rates were found among youths aged 15–24 and 25–34, with 39.8% and 60.7%, respectively (Stats SA, 2023). Establishing farming enterprises in the agricultural sector could be one way to fight high unemployment rate. Agricultural products are imported from other countries, e.g. malt, rice, poultry meat and wheat amongst others (National Agricultural Marketing Council, 2024). The agriculture sector in South Africa is competitive and resilient with many investment opportunities in livestock farming and crop production fields (Mavilia & Pisani, 2022). Therefore entrepreneurial opportunities are available that young entrepreneurs may take advantage of. According to Balogun et al. (2021), creativity and demographic factors influence entrepreneurship. The purpose of this study is to determine how demographic factors influence undergraduate agriculture students' creative thinking. It seeks to understand how gender, status of family owned business, field of study, and place of upbringing affect the creativity level of these students. This research addresses the following questions: Does gender have an influence on the creativity level of undergraduate agricultural students? Does the place of upbringing play a role in their creativity level? How does the status of family owned business impact their creativity level? Is their level of creativity affected by their field of study?

2. Literature Review

2.1 Creativity and Demographic Factors

Creativity and entrepreneurship contribute to economic growth. According to academics, creativity and divergent thinking are critical for entrepreneurial success (Shadiev, Wang, Liu & Yang, 2022). The establishment of new businesses is also linked to creativity (Shaheen et al., 2023). However, Borges, Lopes, Carvalho, Vieira and Lopes (2021) found that gender also has an influence on creativity and is has been linked to entrepreneurship. The study done by Oniye, Hassan, Saleh, Muhammed, Girei and Mayanchi (2020) established contrary findings with no evidence on the influence of gender, area of residence and field of study differences in the level of creativity of undergraduate students of Kwara State in Nigeria. Perchtold-Stefan, Rominger, Papousek and Fink (2022) revealed that creativity varies between genders. Reflections on the topic suggest that men and women may differ in certain areas of creativity due to biological and/or societal influences (Bart, Hokanson, Sahin & Abdelsamea, 2015). The study done by Nakano, Oliveira and Zaia (2021) found that gender disparities in creativity may vary according on the sample size and type of creativity being evaluated. Some studies show that females score higher than males, while others show the opposite, despite the former being more numerous (Baer & Kaufman, 2008). Nakano, et al. (2021) confirmed that men and women may have different views, showing that gender does not impact creativity. Hora, Badura, Lemoine & Grijalva (2022) established gender's relationship with creative performance. Abraham (2016) report the absence of significant differences between gender and creativity. No significant differences were found gender and creativity of business management student in selected universities in Brazil (Bignetti, Santos, Hansen & Henriqson, 2021).

Family businesses are widely recognised as essential for fostering potential entrepreneurs (Hoffmaan, Junge & Malchow-Møller, 2015), and involvement of entrepreneurs in steering young people towards an autonomous/entrepreneurial job becomes vital (Fraccaroli and Vital, 2001; Odoardi, 2003). These family businesses promote entrepreneurship as a viable career path by providing a setting for exposure-based learning (Sorensen, 2007). On the other hand, the parents' socioeconomic situation has an impact on off spring level of creativity (Battle & Lewis, 2002). Gerei (2020) confirmed that students from successful family business backgrounds are well-exposed to business setups that ultimately enhance their entreprenrial creativity level. Some studies have revealed no statistically significant link between entrepreneurial parents role models and children's decision to pursue an entrepreneurial career (Cardella, Hernández-Sánchez & Sanchez Garcia, 2020). The more extensive and successful the parents' business is, the greater their children are influenced to engage in entrepreneurial activities (Hundley, 2006). Entrepreneurial success may be influenced by one's family of origin, which can be done by modelling procedures and communication, as well as parental views (Staniewski & Awruk, 2021). Parents can serve as role models and impart genes that promote entrepreneurship (Hoffmann et al., 2015). Having parents who are entrepreneurs increases a one's chances of becoming an entrepreneur (Soares, Jeronimo, Melo & Sampaio, 2022).

According to Matraeva et al. (2020), to foster student creativity, higher education institutions should implement a complete, systematic approach across three levels: personal, procedural, and environmental. Cheung et al. (2003) confirmed that the field of study also predicts the individual creativity level. The findings of the study done by Sumarniand and Kadarwati (2020) revealed that ethno-STEM project-based learning was able to increase students' average critical and creative thinking skills across all variables ranging from low to medium. The study by Gerei (2020) further revealed that the level of study has no influence on their level of creativity. Based on the perspective of the area of residence, perceptions of creative thinking reveal that respondents' (students') perceptions of creative thinking tend to be more complex when they are from rural areas and more knowledgeable when they are from urban areas (Saputro, 2022). Family attributes, community norms, and the rate of participation with friends and families all affect behaviour to act in a particular way (Sabuhilaki, 2016).

We hypothesise that there is a statistically significant relationship between gender, status of family owned business, field of study, and place of upbringing, and creativity level of undergraduate agricultural students.

3. Methodology/Research Methods

This study used a descriptive research design to conduct empirical research using secondary sources. A survey has been used as a means for collecting data. Surveys may be used in studies that are mostly quantitative in nature and aim at providing an in-depth understanding of a representative sample of a large population (Mouton, 2001). Considering the primary objective of the study, the researcher believed that a quantitative approach would be appropriate.

For this study, a non-probability sampling design was considered appropriate. The research population contained third-year students from all 27 South African universities who were enrolled only in agriculture studies; however, only six universities granted permission to gather data. There were 1,123 agriculture students in these six participating universities. The questionnaires were personally distributed to the participants by the researcher. Only 421 students completed the questionnaires, and this number was used in the analysis. A questionnaire was found to be appropriate when the researcher required an analytical technique to investigate relationships between variables. Jansen (2010) reports that when compared to other instruments, researchers choose questionnaires as a data collection method because of its advantages, which include delivery to a large number of respondents at a low cost and a high response rate. As a result, a questionnaire was found suitable for the purposes of this study.

A constructed questionnaire titled Prospective Farmers Profile Questionnaire was used to collect data. The questionnaire questioned agricultural students about their demographic information, namely gender, status of family owned business, field of study, and place of upbringing. The level of creativity of agricultural students has been assessed using a 7-point Likert scale and is analysed further in the data analysis section. Table 1 reflects factor loading after rotation. The following nine constructs were used to measure the creativity of agricultural students. **C1** (I am confident in my ability to manage the process of establishing a business). **C2 (**I believe it would be simple for me to come up with a business idea). **C3** (I'm determined to face the challenges that life presents). **C4** (I believe myself to be a creative individual). **C5** (I appreciate taking on difficult projects and creating ambitious objectives). **C6** (I am capable of coming up with unique ideas that may lead to viable plans). **C7** (Developing a shared vision is critical to the long-term achievement of an enterprise). **C8** (I embrace and promote the technique of handling complex and persistent problems in a more effective approach). **C9 (**I am confident that the plans I develop always work). The factor loadings for creativity ranged from 0.42-0.71, indicating that the factors had a strong relationship and were essential to the factor creativity. The personal attitude subscale has nine items (α=.83), indicating a high level of internal consistency.

Table 1: Factor loading after rotation

Constructs	Factor loadings	Item rest correlation	Crα in the absence of the item	Cronbach's Alpha
C1	0.42	0.455	0.82	
C2	0.59	0.525	0.81	
C3	0.55	0.449	0.82	
C4	0.69	0.611	0.80	
C5	0.67	0.609	0.80	0.83
C6	0.71	0.674	0.79	
C7	0.58	0.519	0.81	
C8	0.61	0.601	0.80	
C9	0.51	0.390	0.83	

Source: Compiled by Author.

4. Results

Figure 1 shows the gender of respondents in percentages, and of the total respondents (N=421), 223 (52.98%) were female and 198 (47.02%) were male. The results show that slightly more females (53%) than males (47%) took part in this study. This is an appropriate representation of the gender of the decomposition of agricultural students based on all respondents of the study. The study reveal no gender prejudice in agriculture programmes enrollment at South African educational institutions. According to the findings of the study, female students were more interested than male students in pursuing agricultural-related qualifications. This is astonishing considering the fact that men are more into agriculture-related enterprises than women in South Africa.

According to Figure 2, of the total respondents (N=421), the families of 118 respondents (28.10%) own a business, whereas the families of 303 respondents (71.90%) do not. According to the findings, the majority of students who participated in the study come from families who do not have a business. Agriculture is the foundation of the majority of African economy. Agriculture and related sectors employed 748,113 people at the

end of June 2017, up from 739,878 in June 2016, representing a 1.1% increase (SSA, 2018). Figure 3 depicts the percentages of respondents' fields of study. According to Figure 3, of the total number of respondents (N=421), 212 (50.36%) were studying animal farming/production, 57 (13.54%) were studying field crops, 102 (24.23%) were studying horticulture, and 50 (11.86%) were studying mixed farming. According to the findings, over fifty percent of the respondents (50.36%) were registered for animal farming/production, while the rest (11.89%) were registered for mixed farming.

Figure 4 reveals that 72 (17.10%) of the total respondents (N=421) were raised in urban areas, 232 (55.11%) in rural areas, and 117 (27.79%) in semi-rural areas. More than half of the students (55.11%) grew up in rural areas, while 17.10% grew up in urban areas. Students raised in rural settings, as opposed to urban and semi-rural pupils, were introduced to agricultural-related activities at a young age, such as caring for livestock and ploughing maize and other vegetables in the fields or backyard. This may be the main reason majority of them choose a career in agriculture.

The results reflect no relationship found between gender and creativity level of agricultural students, b=0.95, 95% CI [-1.867; 1.867], p=1.000 (see Table 2). According to Table 2, there was no significant relationship between the status of family owned business and the level of creativity of agricultural students, b=1.08, 95% CI [-3.124; 1.124], p=0.355. The findings further revealled no relationship found between all fields of study and creativity level of agricultural students, b=1.48, 95% CI [-.905; 4.905], p=0.177; b=1.18, 95% CI [-2.311; 2.311], p=1.000 and b=1.53, 95% CI [-1.008; 5.007], p=1.192 (see Table 2). No relationship established between the place of upbringing (rural and semi-rural) and creativity level of agricultural students, b=1.35, 95% CI [-1.648; 3.648], p=0.458 and b=1.47, 95% CI [-3.890; 1.890], p=0.497 (see Table 2). According to Table 2, there was no significant relationship between the status of family owned business and the level of creativity of agricultural students, b=1.08, 95% CI [-3.124; 1.124], p=0.355.

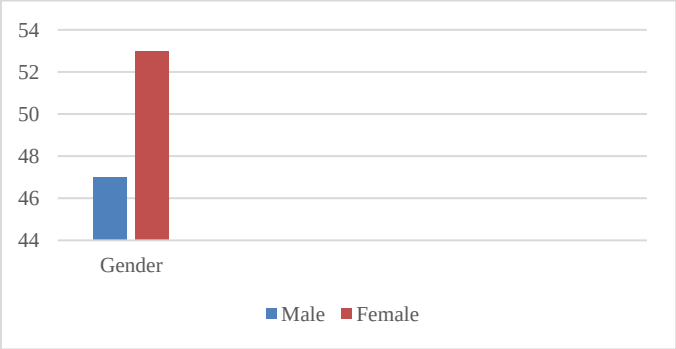

Figure 1: Gender

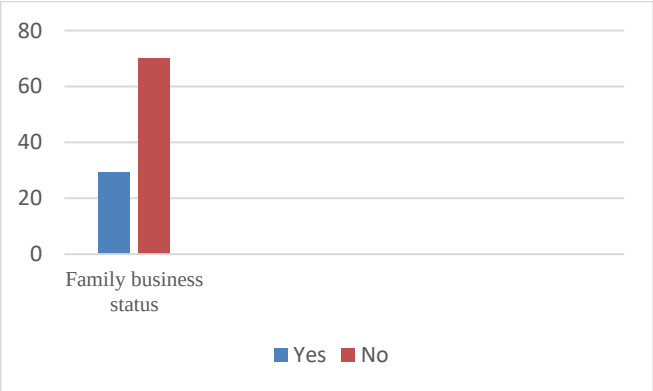

Figure 2: Family business status

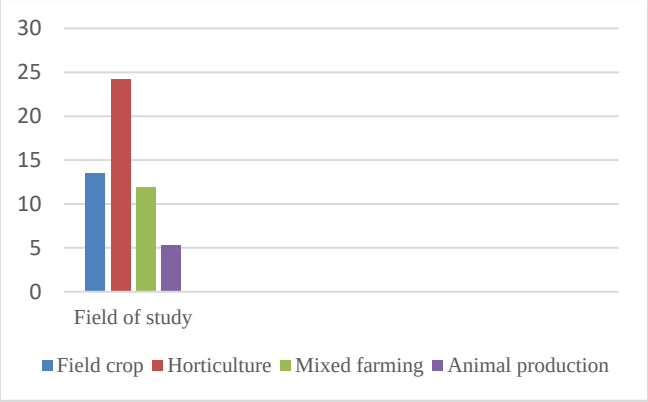

Figure 3. Field of study

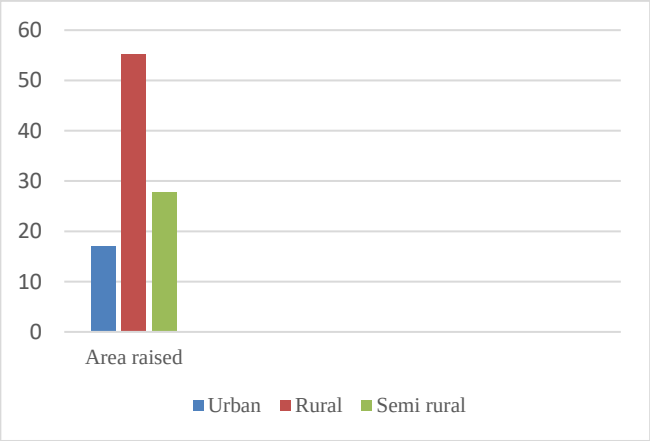

Figure 4. Place of upbriging

Table 2: Factors affecting creativity level of undergraduate agricultural students

Creativity	Coefficient	Std. err	t	P>|t	[95% conf]	Interval
Gender						
Female	0	.95	0.00	1.000	-1.867	1.867
3	-4	9.73	-.41	0.681	-23.13	15.13
Field of study						
Field crop	2	1.48	1.35	0.177	-.9053	4.905
Horticulture	0	1.18	0.00	1.000	-2.311	2.311
Mixed farm	2	1.53	1.31	0.192	-1.008	5.007
Area raised						
Rural	-1	1.35	0.74	0.458	-1.648	3.648
Semi-rural	-1	1.47	-.68	0.497	-3.890	1.890
Farmily business						
No	-1	1.08	-.43	0.355	-3.124	1.124
Cons	70	1.41	-49.6	0.000	67.227	72.77

5. Discussion

H_1 states that: There is a statistically significant relationship between gender and the creativity level of agricultural students. This hypothesis is rejected because there was no relationship found between gender and

creativity level of agricultural students. These results indicate that agriculture students' creativity level is not gender-based. These results are consistent with the findings of the study Karaboga et al. (2022) who established no gender influence on creativity level on task performance but contradict the study done by Perchtold-Stefan et al. (2022) who revealed that creativity varies between genders.

H_2 states: There is a statistically significant relationship between status of family owned business and the creativity level of agricultural students. This hypothesis is rejected. According to Table 2, there was no significant relationship between the status of family owned businesses and the level of creativity of agricultural students. The findings show that the status of their family business has little bearing on their creativity level to engage in entrepreneurial initiatives. The findings of this study contradict Gerei (2020) who established that students from strong family business backgrounds are well-exposed to business setups, which eventually boosts their creativity level.

H_3a, H_{3b} and H_{3c} state: There is a statistically significant relationship between the field of study (field crop, horticulture, animal and mixed farming) and the creativity level of agricultural students. This hypothesis is rejected because there was no relationship found between all fields of study and creativity level of agricultural students. The study confirms that the field of study does not influence creativity level of agricultural students. The results contradict those of Cheung et al. (2003) who confirmed that a student's field of study impacts their level of creativity. The findings are might be because to students having similar agricultural worldviews and studying the same courses in the programme, which moulds their worldview. One of the contributing aspects is social media and easy access to news/media since students have the same access to current situations, such as access to resources to start a business. When studying agriculture, for example, topics such as creativity, proactiveness, and innovation will come up amongst others.

H_{4a} and H_{4b} state: There is a statistically significant relationship between the place of upbringing (rural and semi-rural) and the creativity level of agricultural students. This hypothesis is rejected because there was no significant relationship established between the place of upbringing (rural and semi-rural) and creativity level of agricultural students. The results are contrary to the findings of Sabuhilaki (2016) who reported that cultural and social variables such as family attributes, community customs, and the rate of interaction and collaboration with friends, neighbours, and relatives impact creativity. The results reflect that place of upbringing does not influence agricultural students' behaviour towards creativity.

6. Conclusion(s)

The results confirm that there is no statistically significant relationship between demographic factors and the creativity level of agricultural students. Firstly, gender has no influence on the creativity level of undergraduate agricultural students. Secondly, the area where undergraduate agricultural students place of upbringing doesn't play a role in their creativity level. Thirdly, status of family owned business doesn't impact their creativity level. Lastly, the field of study doesn't affect their creativity level. The reasons seem to be the critical role that institutions of higher learning and policymakers are playing in addressing gender inequalities and the importance of creativity as a crucial factor in entrepreneurship through media and public platforms. It is also clear based on the findings that agricultural students are exposed to the approaches and driving forces that enhance creativity such as imagination, incubation, investment and improvement irrespective of gender, their family business background, field of study and geographic area of origin. Therefore institutions of higher learning, government and policymakers should continue to eliminate barriers that demographic factors may impose in discouraging creativity enhancement because creative youth will benefit countries through economic advancement because creativity may lead to entrepreneurship through business establishments.

The study employed a convenient sample of students from only six of South Africa's 27 higher education institutions. More universities and colleagues should be included in future studies to improve the findings' generalizability. The research was limited to third-year students who were pursuing agriculture studies at various universities and colleges. As a result, the study's findings cannot be considered representative of all third-year students enrolled in various programmes in South Africa. Moreover, perceptions of students studying in other disciplines (e.g. faculty of commerce and humanities) were not considered. As a result, the research might be expanded to include such fields.

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Sensory Panel Training: Developing Hospitality Students Analytical and Research Skills

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Abstract: Having been conducted for many years, sensory and flavour analysis have been instrumental in not only developing and assessing the quality of products, but also understanding their nature and unique characteristics. Relying on a variety of methods, this analysis can take on different forms, ranging from mostly descriptive to more instrumental approaches, which can include sensory panels, whose training is often time-consuming and demanding. Valued by winemakers, descriptive analysis procedures carried out with the help of sensory panels has been extensively used in the food and beverage industry and can be perceived as key within the scope of sommelier training and hospitality programs. However, despite this importance, given its subjective and intensive nature, sensory analysis can be affected by bias and fatigue, requiring regular calibration exercises, combined with structured tasting procedures and protocols. As a result, training sensory panels requires knowledgeable and experienced instructors, dedicated facilities and continuous support, in addition to a comprehensive view that includes other research approaches and tools that can be combined as to produce more valuable and accurate assessment. Focused on wine production and drawing from the authors' experience, this paper aims to reflect on exploratory research methods involving sensory evaluation, putting forward strategies that can be used to support sensory training. Consistent with a work in progress, it addresses the topics of research methods, action research and reflective practice, contributing towards the development of novel approaches within the scope of teaching research methodology in business and management. Despite the focus on wine production, the strategies described aim at enhancing tourism and hospitality students' research and analytical skills, ultimately being able to benefit other practitioners in the field.

Keywords: Descriptive analysis, Sensory analysis, Sommelier training, Wine, Wine education

1. Introduction

Recent market and behavioural changes, brought about by changes in consumption patterns and the amount of readily available information on food products, having resulted in a significant growth regarding sensory information and research (Stone and Sidel 2021). In addition to an impact on consumers, these changes have also affected businesses, with more companies acknowledging the importance of sensory analysis, particularly when it comes to expert recruitment and/or consultancy and the building sensory infrastructure. As a result, given the "growing demand for newly trained sensory scientists and more course offerings at universities" (Stone and Sidel 2021, p.2), there is currently an increased awareness on the importance of sensory training, not only in areas associated with food production, but also in areas pertaining to business, particularly marketing and sales.

In the case of wine and winemaking, sensory analysis is crucial, with various methods and best practices available for both large and small wineries (Lesschaeve and Noble, 2022). For that reason, and much like in other sectors, as wine becomes increasingly more relevant within the scope of the hospitality and tourism industries, there is an increased necessity for specialized staff, that value wine sensory experiences (Carmer, Kleypas, and Orlowski 2024). Having made its way into tourism and hospitality education and training, sensory analysis and training is considered to influence students' product perceptions, not only from a consumers' perspective, but also in their marketing and sales ability, opening up a wide range of possibilities for their future (Carmer, Kleypas, and Orlowski 2024; Thomas et al 2014).

Based on this premise, this paper focus on exploratory research methods involving sensory evaluation, putting forward strategies that can be used to support sensory training within the scope of tourism and hospitality higher education. In addition to describing research methods which are aligned with action research and reflexive practices, they the authors share insights on the development of novel approaches within the scope of teaching research methodology in business and management. Despite the focus on wine production, the strategies described aim at enhancing tourism and hospitality students' research and analytical skills, ultimately being able to benefit other practitioners in the field.

2. Context and Methodology

Considering the growing interest surrounding wine, particularly within the scope of tourism and hospitality education, and the lack of studies in "wine sensory experience as a pedagogy" as well as the "little to no standardization in wine sensory experience pedagogy within the academy" (Carmer, Kleypas, and Orlowski 2024), the training strategies described in this paper build on the work of previous, non-academic, instruction methods in order to describe a panel training initiative implemented at a post-graduate course.

Attended by 23 students, this course aimed to train specialised professionals, who can grasp the strategic importance of experience tourism and human resources when promoting wine and wine-growing territories/wine tourism destinations, offering unique facilities to support sensory training. Overall, students enrolled in the programme had no previous specialized sensory training, even though they had previous interest and/or experience with wine and wine-tasting activities.

The activities described focussed on the sensory panel training and aimed to develop students' skills in performing descriptive sensory analysis. This type of analysis involves the "the detection (discrimination) and description of both the qualitative and quantitative sensory components of a consumer product … [including] aroma, appearance, flavour, texture, aftertaste and sound properties" (Murray, 2001) with panelists being required to quantify aspects in order to factually describe the product attributes. In addition to the facilities and protocol used, the authors will outline the different stages of training, drawing preliminary insights based on their experience and defining future work.

2.1 Sensory Analysis Facilities

Sensory analysis training usually takes place in a dedicated laboratory equipped with individual booths for each panellist, ensuring controlled environmental conditions of 20 ± 2°C temperature and 60 ± 20% relative humidity. The most important criterion for a tasting room is that it provides a quiet, odor-free, temperature-controlled environment where judges can evaluate wines under controlled lighting, free from distractions. The booth area is separate from the preparation area to prevent judges from inadvertently receiving clues about the experiment.

In the booths, controlled lighting allows for the evaluation of wine color under a constant light source. Each booth has a light switch, for the judge to signal the experimenter. A small hatch door in each booth allows communicate with the judge and change samples without distracting others. Spittoons are provided for expectorating samples.

As mentioned previously, this course was taken by 23 students, who were introduced to the lab and the tasting protocol prior to their first experimental session.

2.2 Protocol

According to the established research protocol, samples should be presented coded with random numbers in identical containers. By randomizing the order for all judges, bias is eliminated. For evaluations involving aroma and taste, standard wine-tasting glasses with 35ml of each solution/wine sample must be provided. To enhance aroma evaluation, watch glasses should be available as lids for the wine glasses. Before the tests, the panel leader must smell each glass to ensure that no defect odor is present. The samples are coded and presented in random order (ISO 6658, 2017).

2.3 Panellists and Training

The panellist selection process usually consists of two stages: selection and preliminary training. In this case, considering the nature of the course, there was no initial selection, with all students taking part in the session. Nevertheless, in order to understand their profiles and appetence, a questionnaire was applied as to evaluate personal attributes such as interest in wines, health status, smoking habits, availability and other general factors. Theoretical insights on wine sensory evaluation were provided during this phase.

Following this introductory stage, students went through an established training programme consisting of 3 consecutive stages (Fig. 1):

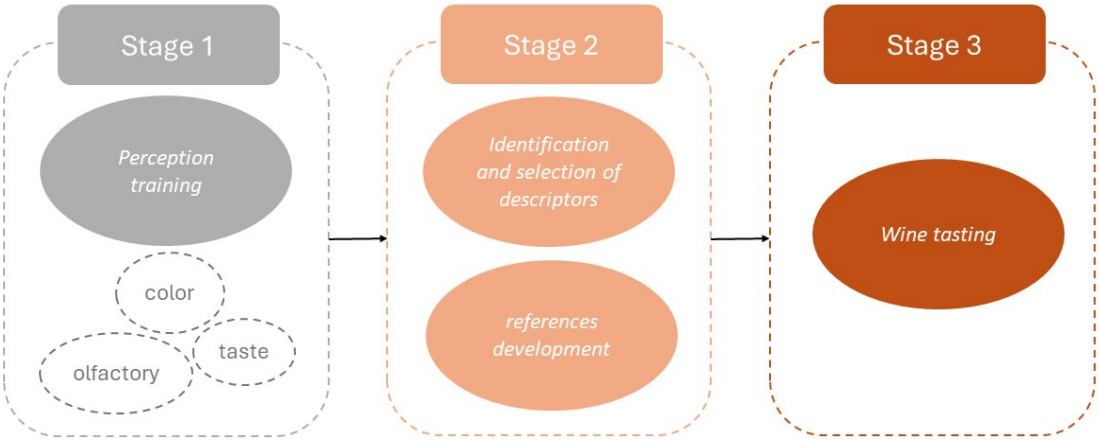

Figure 1: Panellist training stages

2.3.1 Stage 1 - Colour, olfactory and taste perception

Stage 1 consisted of perception training activities based on the senses.

The colour perception training took place in one session. Students were presented with 12 random colour samples of wines (white, rose and red) and were then asked to put the samples in ascending order in terms of the degree of colour intensity.

The olfactory perception training consisted of five sessions. To enhance comprehension of the aroma profile of wines, sensory tasting containing (aroma kit box - Le Nez Du Vin©), the Wine Aroma Wheel (Noble et al, 1987) (Figure 2) and natural products linked to wine aroma were provided.

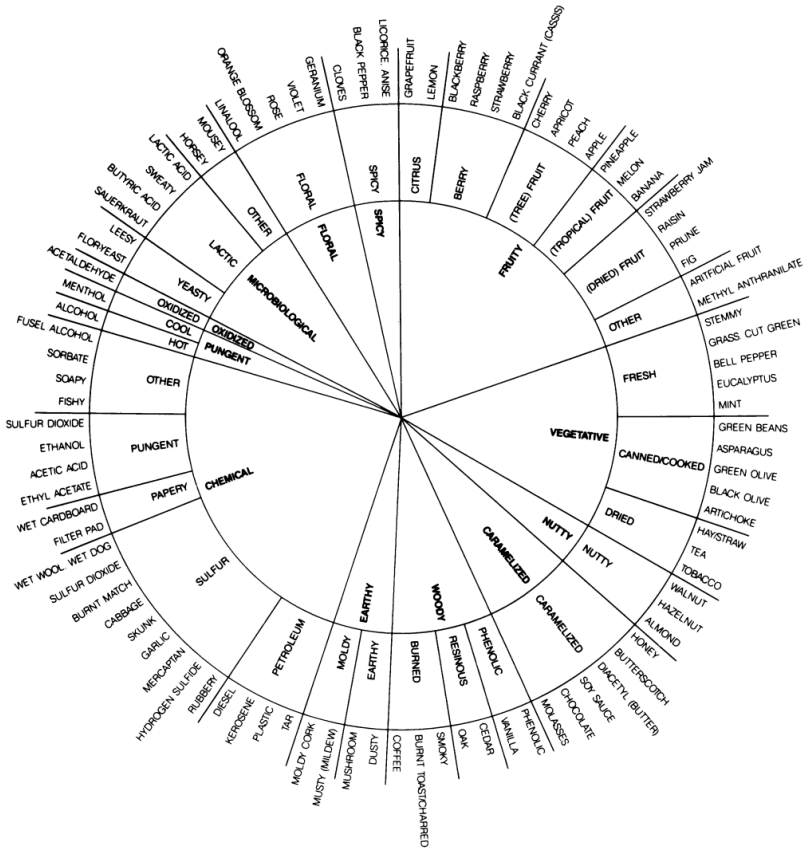

Figure 2: Wine aroma wheel (Noble et al., 1987)

These olfactory assessments were conducted in the initial sessions of training to introduce students to different aromas, oak barrel aromas and wine defects (see Table 1). Participants were instructed to smell fragrances presented in series of ten and mentally categorize the sensory perceptions detected, recording the corresponding descriptors. Finally, in the fifth session, panellists were asked to detect which sample was different by using triangle tests method. To evaluate the discriminatory capacity of the tasters, three samples were presented simultaneously, two being equal and only one different. Testers were asked to detect which sample was different.

Table 1: Odour qualities evaluated during the training of the panel (reference compounds from aroma kit box – Le Nez Du Vin ©)

Aroma by Families	Sample number	Aroma
Fruity	1	Lemon
	2	Grapefruit
	3	Orange
	4	Pineapple
	5	Banana
	6	Lychee
	7	Melon
	8	Muscat
	9	Apple
	10	Pear
	11	Quince
	12	Strawberry
	13	Raspberry
	14	Redcurrant
	15	Blackcurrant
	16	Bilberry
	17	Blackberry
	18	Cherry
	19	Apricot
	20	Peach
	21	Marzipan
	22	Prune
	23	Walnut
Floral	24	Hawthorn
	25	Acacia
	26	Linden
	27	Honey
	28	Rose
	29	Violet
Vegetal	30	Bell pepper
	31	Mushroom
	32	Truffle
	33	Wine lees
	34	Cedar
	35	Pine

Aroma by Families	Sample number	Aroma
	36	Liquorice
	37	Boxwood
	38	Cut hay
	39	Thyme
Spicy	40	Vanilla
	41	Cinnamon
	42	Clove
	43	Pepper
	44	Saffron
Animal	45	Leather
	46	Musk
	47	Butter
Roasted	48	Toast
	49	Roasted almond
	50	Roasted hazelnut
	51	Caramel
	52	Coffee
	53	Chocolate
	54	Smoky notes
Oak	55	Oak
	56	Coconut
	57	Vanilla Pod
	58	Woody-Spicy
	59	Clove
	60	Smoky
	61	Medical
	62	New Leather
	63	Roast Coffee
	64	Burnt Sugar
	65	Candied Orange
Faults	66	Green Wood (Fault)
	67	Vegetal
	68	Rotten Apple
	69	Vinegar
	70	Glue
	71	Soap
	72	Sulphur
	73	Rotten Egg
	74	Onion
	75	Cauliflower
	76	Horse
	77	Mouldy-Earth
	78	Cork

Following the olfactory assessment, students carried out taste sessions, having been presented with samples (Table 2) representing each fundamental taste, allowing them to acquaint themselves with these basic flavors (sweet, acid, bitter, salty and umami) and mouthfeel (astringent and body)

Table 2: Compounds used in the initial taste session

Taste	Compound	Concentration/Quantity
Sweet	Sucrose (g/l)	30 g/l
Acid	Tartaric acid (g/l)	1 g/l
Acid	Malic acid (g/l)	1 g/l
Acid	Citric acid (g/l)	1 g/l
Bitter	Quinine sulfate (g/l)	0,5 g/l
Salty	Sodium chloride	1 g/l
Umami	Sodium monoglutamate	0,5 g
Astringent	Tannin	160 mg/l
Body	Milk (fat and light)	35 ml

Subsequently, to evaluate their detection thresholds, they were asked to assess solutions which were both below and above the expected detection threshold for wine. For sweetness, five sucrose solutions were prepared with concentrations of 0, 5, 10, 15 and 20 g/l; for acidity, five tartaric acid solutions with concentrations of 0, 0.05, 0.15, 0.40 and 0.75 g/l tartaric acid, respectively; and for bitterness, five tannin solutions with concentrations of 0, 20, 40, 80 and 160 mg/l.

In the subsequent sessions, students were tasked with ranking the samples in order of increasing intensity – a duplicate assessment conducted on different days. The presentation order remained consistent for all students across these sessions.

2.3.2 Stage 2 – Identification and selection of descriptors and references development

This stage focused on developing students' descriptive analysis skills and their ability to rate different aspects of wine based on standards.

Descriptive analysis (DA) is one of the most important techniques for evaluation of wine, making it possible to carry out an analytical evaluation of the differences between wines. For better results, the wines should have significant differences and the panel must be well trained (Linskeens et al., 1988).

Within the scope of this course, the attributes were defined verbally, presenting physical reference standards. Aroma, taste, sensation, flavor and persistence references were introduced as to make reference evaluation as close as possible to wine tasting conditions. Following this introduction, training sessions were carried out following existing standards and terminology (ISO 13299, Marques et al., 2016; Monteiro et al., 2012). Students were trained in the use of these terms in discussion sessions and in formal scoring tests, with references that clearly define each attribute.

Traditionally, in order to carry out descriptive analysis, one to six weeks of training are required, with the first sessions involving discussions regarding reference standards and their appropriateness for rating the flavor of selected wines. Moreover, panelists must agree on and work with specific terminology to describe the sensory qualities and attributes of different types of wines. Once these references have been established and final terms selected, training sessions resemble formal testing. Prior to each session, the students should smell and/or taste each of the references and then rate the intensity in coded wines.

Within the scope of their training, students were asked to score attributes' intensities on a five-point scale (ranging from 1 – not perceived at all, to 5 – the attribute is clearly perceived, and the intensity is higher than that of the reference), adapted from Monteiro et al. (2014) and Vilela et al. (2015). The scoring was carried out in the perceived order they perceived, with students having to rinse with water between wines.

Throughout the session, students received feedback. Every time someone student did not rate a term properly, he/she was presented with wines or reference standards that illustrate "low" and "high" intensity of the term. After familiarizing themselves with these, they rated coded samples, with results being systematically reviewed.

After all references were developed, two training sessions were carried out according to the methodology that would be used to evaluate the wines.

2.3.3 Stage 3 – Wine tasting

The last stage is wine tasting. In line with the defined protocol, sessions were carried out in the tasting booths of a sensory lab. Wine bottles were opened immediately before tasting, and 35ml sample of each wine were served in standardization wine-tasting glasses.

Attribute intensities were scored on a five-point scale (1 – lowest intensity to 5 – highest intensity). The students were instructed to give scores to the attributes in the order they perceived them, in the tasting sheet.

Samples were expectorated, and the students rinsed their mouths with water between wines, eating unsalted crackers to decrease astringency carry-over. If necessary, the students could have a rest and leave the tasting room.

3. Insights and Final Remarks

Reflecting on the course's outcomes, students' experience and research methodology teaching, it was possible to establish that students showed interest in participating in this study and like to consume wine (100%, n=23). However, everyone recognized the importance of improving the quality of wines and their marketing and promotion.

Most participants had never taken part in a sensory test (78.2%, n=18), being that all of them were fit to attend the training, as they there were no health restrictions, intolerances and food allergies that prevented the performance of the said tests. Overall, students were able to complete all the assigned tasks with the training having been successful in developing their sensory and descriptive analysis skills.

Following the training sessions, sensory analysis, which is a crucial component of wine tasting, particularly for professionals who aim to assess and evaluate wines accurately, was perceived as a way of acquiring valuable information about the characteristics, quality, and potential of a wine. Despite the subjective nature of tasting, training was instrumental in equipping students with instruments and information to assist them with unbiased assessment of wine.

Following up on the first sessions, in which the samples used differed significantly in the test variable to assist in training and reinforce differences, students' assessment became more consistent, sensitive, and reproducible. In addition to regular attendance and concentration, feedback on their performance proved to be effective in motivating and improving engagement levels. This progress supports the use of these methods within the scope of postgraduate courses, making a case for sensory training in tourism and hospitality.

As a method, despite its potential shortcomings (mostly related to bias and the fact that it relies on human perception) descriptive analysis has proven to be comprehensive and useful, being that individuals can be trained to carry out this type of analysis. This signal potential benefits in integrating sensory evaluation into tourism and hospitality curricula, as it can help provide a better understanding of wine both as a product and as an experience, thus having an impact on company's management and promotional strategies.

These findings are in line with the literature, in that this approach can contribute to the success of product development in the wine and wine-making industries, with company's management playing a pivotal role in integrating sensory analysis into their organizations.

On the other hand, considering "even minimal sensory analysis training may change consumer product perceptions in wine", the strategy described can contribute to the ongoing discussion on wine pedagogy, having an impact that extends further than academia.

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On the Use of Generative AI for Literature Reviews: An Exploration of Tools and Techniques

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Abstract: To carry out a literature review often involves hard and tedious work. There is a tradition of using facilitating tools, that extended to the AI field in 2018 when iris.ai appeared. Today, in the emerging field of Generative AI tools based on Large Language Models, there has been rapid development of new literature search tools and approaches. This study has the aim of exploring this vast array of Generative AI tools, in a literature study where some of the found tools were used to facilitate the selection of relevant publication. Three research questions guided this study: RQ1) "What Generative AI tools can be found in literature?", RQ2) "Which of these tools could be of use in the literature review conducted in this study, and how?", and RQ3) "What are the ethical aspects of using Generative AI tools in literature studies?" The approach has been a scoping review, built around a search that combined the keywords: "AI supported", "AI generated", "AI based" and "Literature review". An initial result set was filtered with inclusion exclusion criteria in a strive for an interesting quality answer to the research questions. However, most publications that passed the filtering lacked any potential to contribute to answer the research questions. The most interesting finding in the first search was a hint about the new feature 'Scopus AI'. A new search with the Scopus AI tool resulted in a small but very relevant set of publications. These publications were analysed in a deductive inductive thematic analysis, and primary sorted into the categories of: 'Generative AI Tools', 'Supportive AI Techniques', and 'Ethical Issues'. Findings indicate that there is a wide variety of tools that can facilitate the skimming process of a literature, and to provide adequate summaries of retrieved publication. However, authors recommendation is to keep the tools on the facilitating support level, and that the main analysis and conclusion should be human conducted. With this, rather traditional approach, researchers will have clearly less ethical issues to consider. Finally, the ethical aspects of Generative AI tools in research ought to be investigated more in detail, in a separate future study.

Keywords: Literature review, Research methods, Generative AI, AI supported research, AI tools

1. Introduction

The idea of automatising literature reviews is older that the current spring of Generative AI (Jonnalagadda, Goyal and Huffman, 2015; Marshall, 2016). However, the recent breakthrough for Generative Artificial Intelligence (GenAI) has opened new possibilities for faster and more efficient literature review processes. GenAI tools are based on deep learning models to generate human-like content in response to prompted instructions or questions (Lim et al., 2023). On the other hand, the generation of human-like content raises ethical consideration, and as highlighted by Buriak et al. (2023), care and cautiousness seem like relevant recommendations.

This study had a focus on how GenAI has changed the landscape for literature reviews. The research approach was a scoping literature review that partly was experimentally carried out with a GenAI tools, but with the main thematic analysis conducted traditionally. The aim of the study was to explore and discuss tool, techniques for GenAI supported literature reviews. Moreover, the ethical aspects of AI generated literature reviews have been analysed and discussed. The tree research questions guided the study were: RQ1) "What Generative AI tools can be found in literature?", RQ2) "Which of these tools could be of use in the literature review conducted in this study, and how?" and RQ3) "What are the ethical aspects of using Generative AI tools in literature studies?"

2. Method

The research approach for this study was an experimental scoping literature review to retrieve a set of publications that have a potential to answer the research questions. In a strive for peer-reviewed quality publications only the authors' choice was the Elsevier Scopus research database. The keywords presented in the abstract were combined to the following search string: (TITLE-ABS-KEY ("Literature review") AND TITLE-ABS-KEY ("AI supported") OR TITLE-ABS-KEY ("AI generated") OR TITLE-ABS-KEY ("AI based")). This gave a result set with 365 publications, where all were published during the last five years, involving AI, and of high quality. Initially, this looked promising, but the problem was that there was a very weak focus on literature reviews with generative AI tools and techniques. After a first skimming, most publications lacked the real potential to contribute to answer the research questions.

However, in between some of the result listings there was a hint about the new feature 'Scopus AI'. A new search was carried out with the search question depicted in Figure 1 here below.

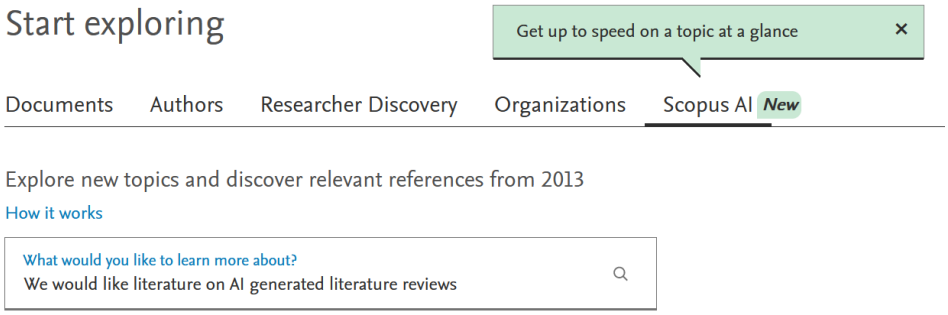

Figure 1: The second search with the Scopus AI tool

The result set from the Scopus AI search was highly relevant with a result set containing 10 publications from 2021 – 2023. Moreover, there was an additional result set with 5 'Foundational papers'. The 11 publications that passed the inclusion and exclusion criteria in Table 1 below are listed in Table 2 in the beginning of the 'Results and discussion' chapter.

Table 1: Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
Published in 2019–2023	Published before 2019
Publications in English or Swedish	Other languages
Peer-reviewed	Not peer-reviewed
Direct contribution to the RQ	No contribution to answering the RQ
	Duplicate
	Only abstract available

Main findings in the 11 publications regarding 'Tools', 'Techniques' and Ethics' were extracted by the Scopus AI feature as depicted in Figure 2 below. The summary provided by Scopus AI could be seen as an alternative to the human abstract and keywords screening that is a part of most literature reviews. Results from the AI generated screening have later been cross-checked by the authors in the main analysis, and far from all summaries were 100% correct.

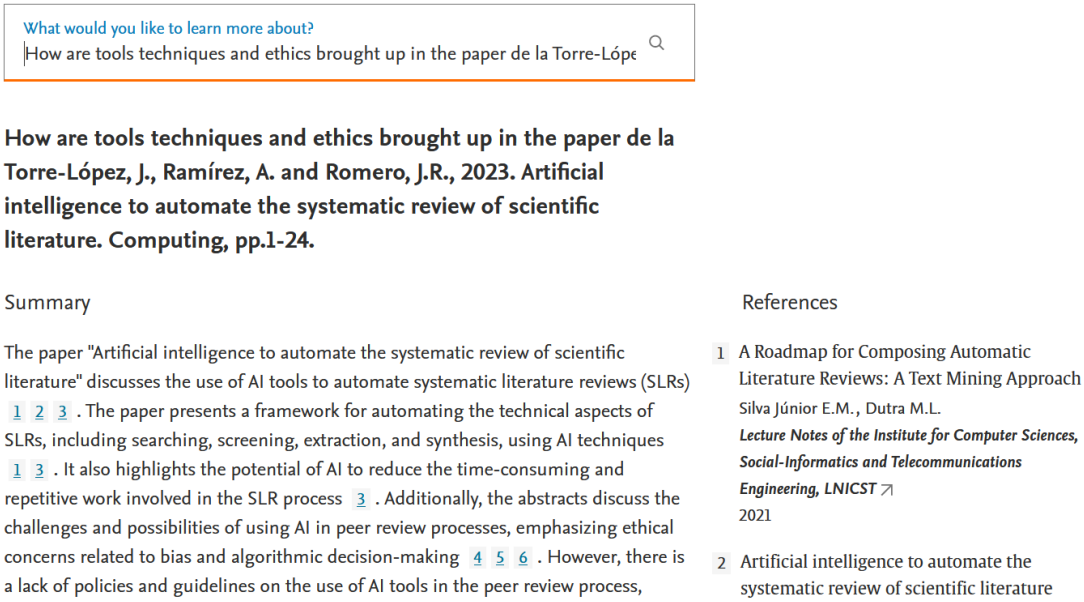

Figure 2: An automatised abstract screening with Scopus AI

After discussions among the authors, the final, more detailed and thorough analysis of the publications, were conducted as a traditional thematic analysis. Main reasons for the choice of a traditional and manual main analysis were quality and accountability. The tested GenAI feature looks promising but should not be seen as a mature and well-evaluated tool.

2.1 The Manual Data Analysis

The remaining set of publications were analysed in a deductive inductive thematic analysis, and primary sorted into the pre-defined categories of: 'Generative AI Tools', 'Supportive AI Techniques', and 'Ethical Issues'. Themes that were decided in a minor initial literature search as a pre-phase for the six-phase process for thematic analyses described by Braun and Clarke (2006). In several publications on creative use of GenAI in various fields, there themes of AI tools, AI techniques and AI ethics were brought up (Flick and Worrall, 2022; Mijwil et al., 2023; Pant et al, 2023). Themes that the authors found interesting to bring into the exploration of AI generated literature reviews, and to use as a sieve for the thematic analysis described below.

In the initial phase of the thematic analysis the authors' focus was on getting familiar with the publications, in an iterative reading, rereading and close reading of the selected the publications. In the second phase, the systematic analysis was carried out when authors created preliminary codes and sub-codes and compared them to the AI generated codes in Table 2. In the following third phase, codes and subcodes were sorted into the pre-defined themes, combined with annotations for new emerging themes. Phase four consisted of a collaborative revision involving a critical discussion between the authors about the themes, and potentially emerging new themes or sub-themes. After the fifth phase where the analysis was fine-tuned and cross-checked, results were with the thematic analysis idea of emphasising findings that contribute to the answer the research questions. (Braun & Clarke, 2006)

3. Results and Discussion

The initial AI supported filtering and skimming steps resulted in the 11 publications listed below.

Table 2: The final result set with publications in chronological order

Publication	Tools	Techniques	Ethics
Marshall, I.J. and Wallace, B.C., 2019. Toward systematic review automation: a practical guide to using machine learning tools in research synthesis. *Systematic reviews*, *8*, pp.1-10.	Based on the provided abstract, there is no direct information about the specific tools, techniques, and ethics discussed in the paper "Toward systematic review automation: a practical guide to using machine learning tools in research synthesis"	Based on the provided abstract, there is no direct information about the specific tools, techniques, and ethics discussed in the paper "Toward systematic review automation: a practical guide to using machine learning tools in research synthesis"	Based on the provided abstract, there is no direct information about the specific tools, techniques, and ethics discussed in the paper "Toward systematic review automation: a practical guide to using machine learning tools in research synthesis"
van Dinter, R., Tekinerdogan, B. and Catal, C., 2021. Automation of systematic literature reviews: A systematic literature review. *Information and Software Technology*, *136*, p.106589.	Tools based on machine learning techniques, such as SVMs and Naïve Bayes. More a description of deep learning techniques than of tools	Selection of Primary Studies, Natural Language Processing, Text mining. The proposed modified SLR process includes automation and bibliometrics to improve the efficiency and effectiveness of literature reviews	Publication bias, the phenomenon that authors are more likely to publish positive results than the negative results of their research
da Silva Júnior, E.M. and Dutra, M.L., 2021. A roadmap toward the automatic composition of systematic literature reviews. *Iberoamerican Journal of Science Measurement and Communication*.	MySLR and Porifera RobotReviewer	Searching, screening, extraction, and synthesis A framework for automatically creating systematic literature reviews by combining and placing existing techniques in stages where they possess the greatest potential to be useful	The specific ethical considerations in the automatic composition of systematic literature reviews are not explicitly addressed
Wagner, G., Lukyanenko, R. and Paré, G., 2022.	ASReview, Litbaskets, RevMan, RobotReviewer	Step 1: Problem formulation, Step 2:	Transparency and replicability.

Artificial intelligence and the conduct of literature reviews. *Journal of Information Technology*, *37*(2), pp.209-226.	WebPlotDigitizer and Graph2Data for extracting data from statistical plots	Literature search, Step 3: Screening for inclusion, Step 4: Quality assessment, Step 5: Data extraction, Step 6: Data analysis and interpretation	Contributions require human interpretation and insightful syntheses, as well as novel explanation and theory building.
Müller, H., Pachnanda, S., Pahl, F. and Rosenqvist, C., 2022. The application of artificial intelligence on different types of literature reviews-A comparative study. In *2022 International Conference on Applied Artificial Intelligence (ICAPAI)* (pp. 1-7). IEEE.	ChatGPT	Searching, screening, extraction, and synthesis, and proposing a pipeline for automatic creation of literature reviews	
Burger, B., Kanbach, D.K., Kraus, S., Breier, M. and Corvello, V., 2023. On the use of AI-based tools like ChatGPT to support management research. *European Journal of Innovation Management*, *26*(7), pp.233-241.	ChatGPT Python, including frameworks like Pandas, PyTorch, or TensorFlow	(1) The use of AI in the preparation phase (2) Use of AI in the research initiation phase (3) Use of AI in the data analysis phase	The researcher is always fully responsible for the results they get from AI models. The researcher must always keep these points in mind and exercise caution when working with AI, as the field is constantly evolving and new challenges are always emerging.
Tlili A, Huang R, Mustafa MY, Zhao J, Bozkurt A, Xu L, Wang H, Salha S, Altinay F, Affouneh S, Burgos D. Speaking of transparency: Are all Artificial Intelligence (AI) literature reviews in education transparent?. Journal of Applied Learning and Teaching. 2023;6(2).	More of Artificial Intelligence in Education than Artificial Intelligence supported Literature reviews	PRISMA criteria and PRISMA techniques to increase tranparency	The use of AI in education raises ethical challenges related to transparency
Carabantes, D., González-Geraldo, J.L. and Jover, G., 2023. ChatGPT could be the reviewer of your next scientific paper. Evidence on the limits of AI-assisted academic reviews. *Profesional de la información/Information Professional*, *32*(5).	ChatGPT	The use of ChatGPT in academic reviews with ChatGPT as a tool to support literature review processes for undergraduate students Idea generation, summarizing literature, and manuscript preparation	Ethical concerns such as plagiarism and misinformation Limitations of ChatGPT in enabling a reliable and transparent generation of content, as well as its incompatibility with current ethical and legal obligations of academic publishing
de la Torre-López, J., Ramírez, A. and Romero, J.R., 2023. Artificial intelligence to automate the systematic review of scientific literature. *Computing*, pp.1-24.	Respondents commonly used tools such as **Covidence** and **RevMan**, with reported time savings and increased accuracy, but also encountered barriers such as lack of knowledge and mismatch to workflow	Searching, screening, extraction and synthesis Peer-review process Emphasising ethical concerns	*Ethical concerns, particularly associated with bias and the potential unintended consequences of algorithmic bias * The lack of policies on the use of AI tools in the peer review process * The need for transparent procedures to protect the integrity of the peer review
Ismail, F., Tan, E., Rudolph, J., Crawford, J. and Tan, S., 2023. Artificial intelligence in	ChatGPT, GPT-4, Bard, Bing Chat, Claude, or Ernie, DALL-E, GitHub Copilot,	A method for creating a systematic literature review to facilitate an analysis of	There is a need to investigate the potential benefits and challenges of Generative AI tools to

higher education. A protocol paper for a systematic literature review. *Journal of Applied Learning and Teaching*, *6*(2).	GPT-4 plugins, Midjourney, Runway, and Synthesia	studies on generative AI and higher education A systematic approach to craft out and analyse the metadata of articles published on specific types of generative AI	ensure its ethical, effective, and responsible use
Guo, E., Gupta, M., Deng, J., Park, Y.J., Paget, M. and Naugler, C., 2024. Automated Paper Screening for Clinical Reviews Using Large Language Models: Data Analysis Study. *Journal of Medical Internet Research*, *26*(1), p.e48996.	**ChatGPT** and **GPT-4 APIs**	Plain language prompts to the publicly available OpenAI GPT application programming interface (API) Screening titles and abstracts in clinical reviews	

The results from the thematic analysis are presented and discussed theme by theme here below, with a focus on findings that add value to the answering of the research questions.

3.1 Generative AI Tools

The first initial finding of the built in Scopus AI tool clearly facilitated the inception phase of this literature review. To get the earlier huge and unfocused result set filtered with a coherent focus on publications bringing up AI generated literature reviews was helpful and saved hours of hard work. Regarding the AI supported abstract skimming this could have been done manually, and the AI generated summaries had to be checked since they are not always correct. The summaries worked relatively well for longer and structured abstracts, but for short and abstract abstracts the results were poor or none. An example is the 112 words abstract in the article Marshall and Wallace (2019), where the abstract summary consisted of "Based on the provided abstract, there is no direct information about the specific tools, techniques, and ethics discussed in the paper". In a human screening a scarce abstract can be followed up by skimming the results and conclusion sections, but maybe that abstract screening is a doubtful technique for both humans and GenAI tools in literature reviews.

3.1.1 Before and after ChatGPT

The oldest publications that were published before the release of ChatGPT, bring up more of general deep learning techniques (Marshall and Wallace, 2019; van Dinter, Tekinerdogan and Catal, 2021). In the study by Marshall and Wallace (2019), there are discussions on two prototype platforms for Identifying reports of randomized controlled trials. The first one is ExaCT (Kiritchenko et al., 2010) and the second one, developed by the authors is RobotReviewer (Marshall et al., 2017). Other tools brought up in this publication were Thalia [for literature exploration], Abstracker, EPPI reviewer and RobotAnalyst [for screening], and NaCTeM [for text mining] (Przybyła et al., 2018; Marshall and Wallace, 2019). The study by van Dinter, Tekinerdogan and Catal (2021), discusses machine learning and text mining on a more abstract level, referencing to more specific tool descriptions in the publications of O'Mara-Eves (2015), Jonnalagadda, Goyal and Huffman (2015), Thomas, McNaught and Ananiadou (2011), Feng, Chiam and Lo (2017), and Beller et al. (2018).

Moreover, the pre-ChatGPT publications bring up tools such as MySLR, Porifera and RobotReviewer (da Silva Júnior and Dutra, 2021), and ASReview, Litbaskets, RevMan, RobotReviewer and WebPlotDigitizer (Wagner, G., Lukyanenko and Paré, 2022). Here the idea is to use different tools for the different steps i a literature review process, and to use the tools in the steps where they have the greatest potential to be useful. Some tools have a strong specialisation, with WebPlotDigitizer as an example for extracting data from statistical plots. In the study by da Silva Júnior and Dutra (2021), a literature review is divided into the steps of searching, screening, extraction, and synthesis. Compared to the division presented by Wagner, G., Lukyanenko and Paré (2022), with the six steps of 1) Problem formulation, 2) Literature search, 3) Screening for inclusion, 4) Quality assessment, 5) Data extraction, and 6) Data analysis and interpretation.

Later, in the publication from late 2022 and onwards ChatGPT is the most frequently occurring tool (Müller et al., 2022; Burger et al., 2023; Carabantes, González-Geraldo and Jover, 2023 Guo et al, 2024). Now with the idea of using the same GenAI tool for all the steps of searching, screening, extraction, and synthesis in a literature review (Müller et al., 2022). There are also ideas of complementing ChatGPT with programming and scripts, where the Python programming language with specialised extensions such as Pandas, PyTorch, or TensorFlow seems like an interesting option (Burger et al., 2023). GenAI can be applied to more modalities than text only,

and today, in 2024 the array of Gen AI tools involves a lot more than ChatGPT. There are also several versions of ChatGPT and an application programming interface and plug-ins for ChatGPT (Guo et al., 2024). Some examples of GenAI tools for other modalities than text are DALL-E and Runway [image generation], and Synthesia and Runway [video generation]. However, for literature reviews the main modality is text and how to extract and analyse text, where the current alternative tools to ChatGPT are Bard, Bing Chat, Claude and Copilot. (Ismail et al., 2023)

3.2 Supportive AI Techniques

One theme in the collected material is that AI techniques shows promise in supporting humans in narrowed and specialised tasks of literature reviews, such as abstract screening and paper selection. Prior research notes that the screening and selection phase of a literature review is one of the more explored and prominent of AI assisted literature reviews (Marshall and Wallace, 2019; da Silva Júnior and Dutra, 2021; de la Torre-López, Ramírez, and Romero, 2023). At the same time, it is stressed that humans should be kept in the loop even at these stages since machine learning algorithms mainly estimate the probability of inclusion/exclusion and therefore rather expedite tasks than automate them (Marshall and Wallace, 2019; Müller, Pachnanda, Pahl, and Rosenqvist, 2022). A related challenge is that the used AI techniques rank papers according to their probability of being relevant for inclusion, low ranked papers can still be relevant and therefore potentially be overlocked, then how do we make sure that the reviewer does not stop the manual screening and leave the rest to the AI too early (Marshall and Wallace, 2019)? Another potential problem that has been highlighted in previous research is that some AI techniques for screening and selecting may be more proficient in excluding irrelevant papers than what they are in identifying potentially relevant papers (Guo, Gupta, Deng, Park, Paget, and Naugler, 2024).

3.2.1 Reducing the workload

Another theme that emerged from the analysis is that supportive AI techniques could reduce the workload in literature reviews. Included papers note that the human workload can be reduced in literature reviews, especially in the operational stages (da Silva Júnior and Dutra, 2021), and that many tasks that are perceived as repetitive and costly by humans could be automated (de la Torre-López, Ramírez, and Romero, 2023). Machine learning (ML) techniques are highlighted as especially interesting for supporting paper screening, which is perceived by many as a burdensome task (de la Torre-López, Ramírez, and Romero, 2023). Prior research further stresses the importance of designing AI systems for literature reviews with both human and machine in mind, since full automation, end-to-end automation, will only be applicable in a subset of the literature reviews that are needed (Müller, Pachnanda, Pahl, and Rosenqvist, 2022).

3.3 Ethical Issues

A theme relating to ethical issues is the needs that the AI systems serve. A problem that has been noted in the collected material is that AI systems or prototypes that have been developed by academic groups to serve a purpose often does not age well, with errors, slow interfaces, and broken links (Marshall and Wallace, 2019). It is often difficult to obtain academic grants for maintaining these types of systems and commercial companies are not likely to spend resources on adapting a technique or method specialised for research if there is not a substantial user group or economic interest (Marshall and Wallace, 2019). Papers further highlight that different types of literature reviews often have different needs and therefore require different designs of the AI system. Applying AI techniques for literature reviews have for example been studied in computing and medicine (de la Torre-López, Ramírez, and Romero, 2023), although more research is needed to expand and explore application in these fields also (Guo, Gupta, Deng, Park, Paget, and Naugler, 2024). It could however be problematic to apply the same techniques in other fields, since terminology and types of research differ between every field of research (de la Torre-López, Ramírez, and Romero, 2023). Further, the design of AI tools should take into consideration the objective of literature reviews (Müller, Pachnanda, Pahl, and Rosenqvist, 2022). For example, is the literature review qualitative or quantitative, interpretivist or a positivist, narrow or broad, and so on (Müller, Pachnanda, Pahl, and Rosenqvist, 2022).

3.3.1 Assessment bias

A recurrent theme in the collected material is the risk of biases in the AI algorithms. Papers points to, for example, the risk of assessment biases in the selection, extraction and classification phases of conducting literature reviews (Marshall and Wallace, 2019; de la Torre-López, Ramírez, and Romero, 2023). It is further highlighted that classification is strongly reliant on the content or vocabulary of the paper and the field that it is a part of, which could result in excluding papers that apply a different or new terminology, but still relevant (de la Torre-López, Ramírez, and Romero, 2023). Prior research therefore recommends that the input from AI

systems in literature reviews are viewed as suggestions and not the final assessment (Marshall and Wallace, 2019). However, it should also be noted that AI could be used to lower the risk of human biases and errors, for example through supporting a selection of papers that could be viewed as more consistent and objective (Guo, Gupta, Deng, Park, Paget, and Naugler, 2024).

4. Concluding Discussion

AI supported built-in filtering in research databases seems like a promising feature, but the filtering might be biased and leave out some publication. This is a new technique and as pointed out at the Scopus web portal "Scopus AI is a newly-developed feature. The quality of results may vary." Some days during this study the feature worked excellent, but others there were repeated gateway time-outs caused by the Scopus AI tool. Moreover, the whole web portal collapsed sometimes after searches with the built-in AI tool.

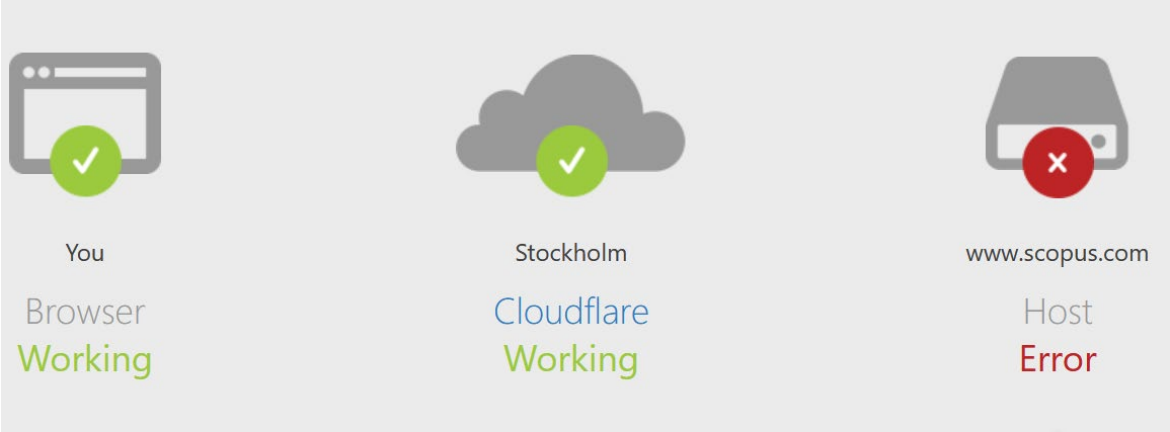

Figure 3: Scopus AI timeouts resulting in HTTP errors.

GenAI is a field that moves forward rapidly and in this literature review some of the found tools might be classified as 'yesterday's tools'. However, the presented findings could be seen as a summary of the rapid development in the field and that the fundamental techniques such as multi-layered neural networks and large language models remains. Finally, several ethical issues were found, and that they need further investigation. In this study, authors decided to use GenAI for the initial search and for abstract screening, but that data extraction and the thematic analysis was carried out manually. With the traditional approach to the most important phases of the literature study, accountability is a non-issue. Finally, the implications of the study are that many of the rapidly developed GenAI tool are far from mature, but literature reviews will definitely be AI supported in the near future.

5. Limitations and Future Research

Generative AI is a moving target and since some of the oldest publications in the result set are publications are from before the release of ChatGPT, the listing of found tools is missing some of the recently released GenAI tools. As an example, the literature review conducted by van Dinter, Tekinerdogan and Catal (2021), discusses some tools and techniques from publications older than 2020. Much has happened in the rapid development of GenAI, and some tools that would be interesting to evaluate in a future study are ChatPDF (Panda, 2023), Elicit (Whitfield and Hofmann, 2023) and ResearchRabbit (Cole and Boutet, 2023). Finally, ethics and accountability need further research.

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Making Sense of Legitimacy Across Universities: Ecocritical Ontological Perspective

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Abstract: This paper reflects on research methodological considerations of how legitimacy of publicly funded universities occurs. From an ecocritical ontological perspective the paper uses a metaphor and sense-making techniques to shed light into effective modalities universities use to connect with local economies. The Milky way Galactic ecosystem metaphor is used not only to make sense of the ecocritical ontological stance taken to make sense of legitimacy but is used as a metaphor to make sense of the findings. The paper asserts that the legitimacy theoretical lens is particularly appropriate to probe universities' legitimacy and connectedness to the local communities they are embedded in. The rationale behind this assertion is that legitimacy is only conferred to the extent the actions of an entity are perceived as desirable, efficient, proper, or appropriate by the ecosystem stakeholders. The theory is thus useful for examining connectedness of publicly funded universities to its local community. The paper argues that the university system that is delinked from local economic development is like a Milky way Galaxy delinked from its Galactic ecosystem. Against this backdrop, the paper juxtaposes Mondragon University, located in a rural part of Northern Spain with two South African universities embedded in poverty stricken rural South Africa. Mondragon University is presented as a hallmark of success when it comes to local community legitimacy. The paper is centered around the following question: (1) how does university legitimacy yield impactful local community outcomes? Using the Milky way Galaxy metaphor, the findings show a considerable variety in local community connectedness depending on bureaucratic arrangements of the universities. The findings also showed that alternative income sources, outside the public purse, just like the gravitational force in the galactic ecosystem, is the key force that determines legitimacy in a university setting. The paper contributes to business research methods by fusing metaphorical as well as sense-making research techniques to bring to sharp focus permeability of the university space to enable local economic development.

Keywords: Ecocritical ontology, Sense-making methodology, Legitimacy theory, University ecosystem, University governance, Mondragon University

1. Background

This paper explores how metaphors can be used to make sense of theoretical concepts using a case study methodology The legitimacy theoretical concept is thus critiqued to make sense of how universities are linked to local economic development. Legitimacy as Suddaby, Bitektine, and Haack, 2017 explain is conferred to the extent an entity is perceived as desirable, efficient, proper, or appropriate. The paper uses the Milky way Galactic ecosystem with its known and unknown components as a metaphorical device to conceptualise legitimacy in a university setting. The paper argues that the higher education system that is delinked from local economic development is like a Milky way Galaxy delinked from its Galactic Ecosystem.

2. Problem Statement and THE RESEARCH Question

There is a crisis of legitimacy in the university sector in South Africa that is characterised by the centrality of students from the working class and poor households who require university education funding which has been diminishing over time. Students from the working class and poor households are not only the majority in South Africa; they are also the majority social actors that confer legitimacy, by virtue of their presence or absence in the university space. The paper is cantered around the following question: (1) how does university legitimacy yield impactful local community outcomes?

3. Research Design

Sense-making is a methodological approach that focuses on understanding three scenarios: (1) what is the issue and the situation related to that issue? (2) What is the envisaged outcome, if the issue is resolved; and (3) what is the gap or what are contradictions/paradoxes that need to be resolved in order to yield the desired outcome. Sense-making data can be sourced from secondary sources, secondary case study data, or case study augmented with primary data or from primary sources including observations, interviews or surveys. For the study reported in this paper three case study universities were used: (1) Mondragon University; (2) University of Limpopo and (3) University of Fort Hare.

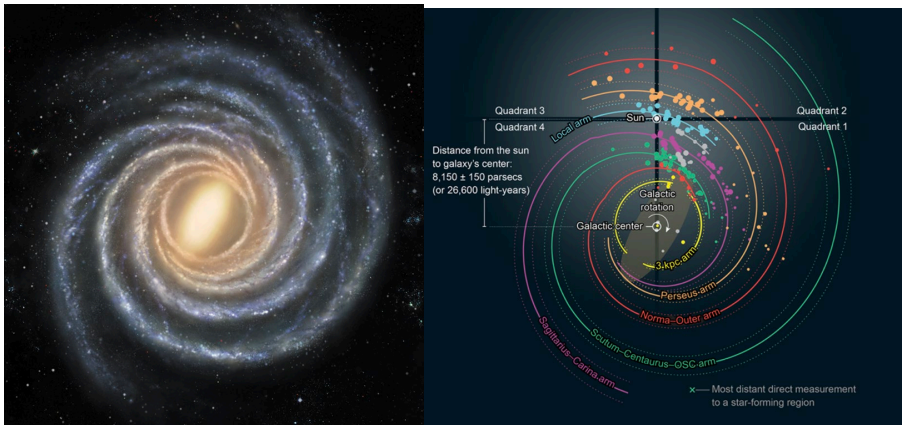
The rest of the paper is structured as follows: The next section describes the ecocritical ontological stance taken to understand how legitimacy is gained. The Milky Way Galaxy metaphor is used to make sense of the ontological

position taken to present arguments in this paper. This is followed by a section that makes sense of the South African university legitimacy crisis using the sense-making methodological approach. Thereafter, Mondragon University is presented as a barometer against which to measure legitimacy and connectedness of universities with to their local communities, on the basis that Mondragon is a U-Multiranked university for excellence in local and regional development. The last part of the paper closes the sense-making loop by discussing how the legitimacy paradox may be resolved by making sense of how it conceptualised as a resource or gravitational force that holds the university ecosystem together, borrowing from the Milky Way galaxy metaphor.

4. Ecocritical Ontological Stance and the Milky Way Galaxy Metaphor

In order to address the question of how university legitimacy yields impactful local community outcomes, this paper takes an ecocritical ontological approach. As explained by Biloslavo, Bagnoli and Edgar (2017), the ecocritical analytical approach views the environment, nature and future generations as part of core elements of society. The same authors (*Biloslavo et al*, 2017) define society as the public, the partner, and the customer. Likewise, a university exists within a society, has external partners, and multiple stakeholders with internal customers (employees, the labour movement and students) and external customers (companies and organisations that purchase and consume the services of the university. The ecocritical approach takes a view that human beings are *"inextricably woven in the social and natural fabric of the world that shaped them"* (Bislavo *et al:* 750). The Milky Way Galaxy is a metaphor and image that expresses very clearly the inextricability of each star to the galactic center (see Figure 2). Astronomers (see for example Reid, Menten, Zheng *et al. (2009)* identify at least five structural features of the Milky Way Galaxy: (1) galactic center; (2) extended bulge of stars that is nearly spherical in shape around the galactic center; (3) the disk where most of the hot and young stars/planets are located (disk contain very large quantities of gas and dust); (4) rotation forming spiral regions (arms) of active star formation – the stars bend the waves into spirals and stars pass through the waves as the orbit the Galaxy center; (5) dark matter as explained by astronomers (see Buzea, Agop, and Butler, 2020) is substance that neither reflects nor absorbs light, but seems to make up most of the mass-energy content of the Milky Way Galaxy. The most humbling definition of dark matter is offered by Bagdoo (2020): "It *has the particularity of emitting no radiation and interacting only by the action of gravity… More than 80 percent of the mass of the universe is invisible… it escapes the telescope…"*

These views about our universe offer a fresh insight on what research conversations can develop when looking at a university as a space and place that crisscrosses the public, local communities, industries, customers and nature beyond anthropocentric values, in ways that we do not always know and understand.



Source: Reid, M.J., Menten, K.M., Zheng, X.W., Brunthaler, A., Moscadelli, L., Xu, Y., Zhang, B., Sato, M., Honma, M., Hirota, T. and Hachisuka, K., 2009.

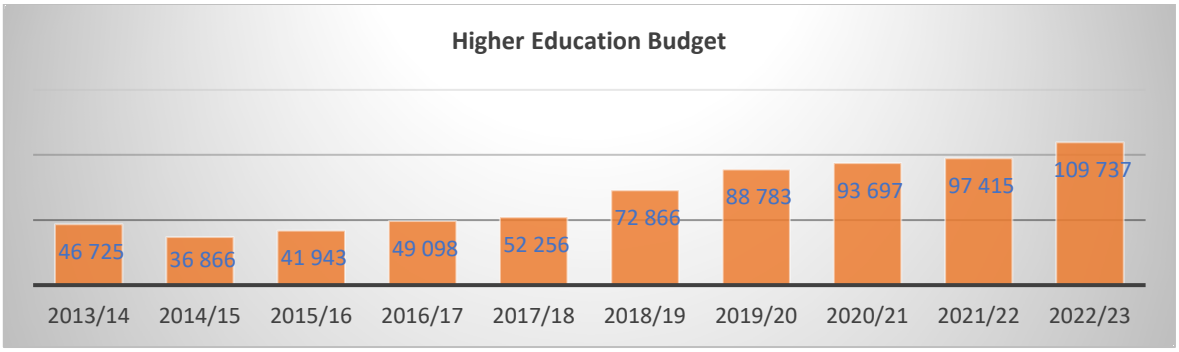
Figure 2: The Milky Way Galaxy

Back to the ontological position of the paper, Heise (2006) asks the following question to invoke an ecologically balanced way for humans and their institutions to co-exist with non-humans and nature: "*Is it possible to return to more ecologically attuned ways of inhabiting nature, and what would be the cultural prerequisite for such a change?*" Heise (2006) explains that the ecocritical approach seeks to think "*beyond conceptual dichotomies and the separation of subject and object, body and environment, nature and culture…"*. Heise emphasises the view that nature should not be seen as a resource, a commodity to be technologically manipulated and economically exploited as this empties the essence and the connectedness of humanity with the environment and nature.

From the foregoing discussion it can be observed that ecocritical ontology seeks to infuse multiple threads of diverse disciplines, diverse political and socio-cultural influences in ways that highlight interdependency of human, nonhuman, society, nature and the environment. Following on the same line of logic, the paper compares two traditional university case studies located in rural South Africa with Mondragon university, a Spanish university located in rural Spain to understand how legitimacy is conferred. But first let us try to understand the South African University context.

5. Legitimacy in South African Universities

Extant literature as useful as it is in understanding the higher education landscape, tends to focus on the transformation and pedagogical issues without bringing to sharp focus issues and expectations of the immediate local communities, especially those located in rural and peri-urban parts of the country, (see for example, Bovill, 2020; Chinyamurindi, 2023; Gallagher and Savage, 2023; Hlatshwayo, Shawa and Nxumalo, 2020; McKeveer, 2017: Moyo, 2023; Mzileni and Mkhize, 2020; Ntombela and Ntombela, 2022; Van Staden, Khaile, October, Human-Hendricks, and Roman, 2023).



Source: Developed by author from Department of Higher Education Annual Reports

Figure 3: South Africa's Higher Education Budget 2013-2023

The legitimacy crisis symptoms are observable in the way universities in South Africa are funded and governed. Take for instance the governance and finance model of two case study universities located in rural Limpopo (University of Limpopo) and Eastern Cape (University of Fort Hare). Both University of Fort Hare and Limpopo are located in the Provinces that are characterised by high levels of poverty and high incidence of impoverished schools. Fort Hare university, based in the Eastern Cape, was established in 1916 by British settlers who at the time where on a colonial expansionist programme. The colonial programme required a knowledge base or a think-tank and an education system to grapple with the challenges of coloniality. The university has evolved from being the South African Native College to what is fondly known as KwaNokholeji. The university is the *alma mater* of illustrious personalities including the former president of South Africa – Nelson Mandela and other luminaries including Bishop Desmond Tutu, Robert Sobukwe, Robert Mugabe, Govan Mbeki, Mangosuthu Buthelezi and others who have impacted their nations including *Elius Mathu* and Charles Njonjo from Kenya (UFH, 2023). University of Limpopo on the other hand took a different persona to Fort Hare in its establishment in 1959 under the apartheid regime's separate ethnically-based institutions of higher learning policy (University of Limpopo, 2024). The establishment of University of Limpopo, then known as the University of the North, is the hallmark of the Bantu Education Act that was promulgated in 1953. As explained by Mouton, Louw and Strydom (2013) Higher Education policy legitimacy was premised on meeting the needs of White minority.

Different restructuring processes from the time each of the case study university was established right through to a restructuring process that resulted in the Merger of universities with Technikons and creation of FET universities, created a phenomenon akin to the "dark matter" in the Milky Way galaxy. The effects of the merger to the local economy have not been measured. Whether the growing rate of unemployment over the past 20 years is spuriously related to the merger of universities or legitimately related is a matter than has not yet been tested. That notwithstanding, the restructuring process is evident in the similarities in the faculty governance model of the two case study universities where Council is the highest decision making authority. UFH and UL's legitimacy while conferred by the government as the largest source of revenue to fund the universities, it seem to also focus on the power of the voice of either labour movement that represent staff as well as the student representative bodies. Figure 4 illustrates the revenue structure of the two universities; and shows that subsidy from government is the largest source of revenue.

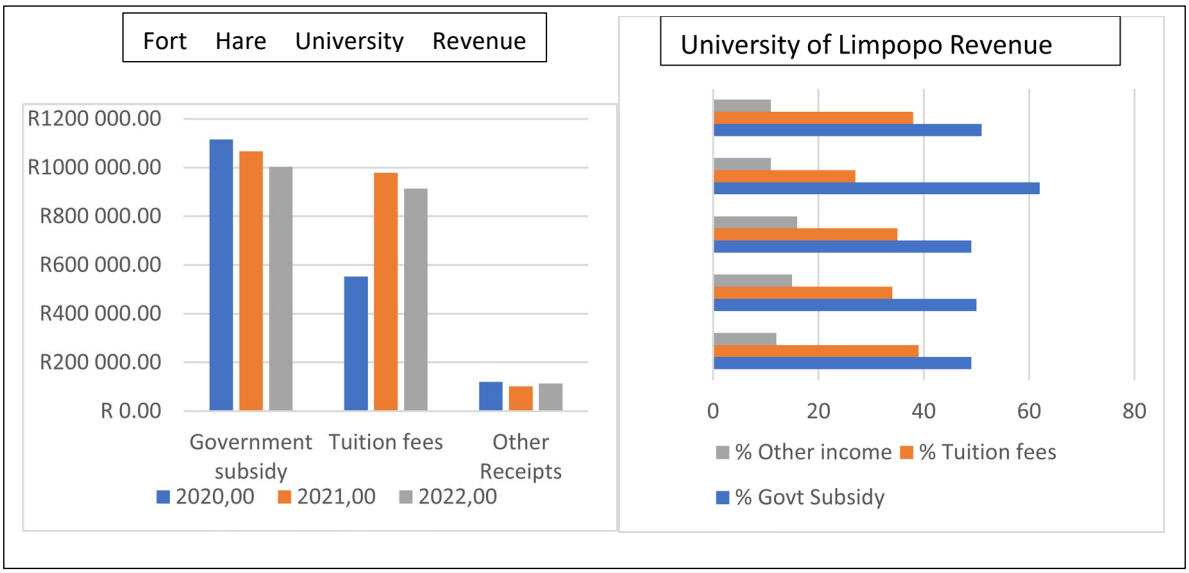


Figure 4: Revenue Structure of UL and Fort Hare

5.1 Envisaged Outcome: Resolving Legitimacy Issues by Assigning Equal Power to all the University Stakeholders

Students, communities they come from, employees, academic leaders and companies that sponsor students, the scientific community, media and the Higher Education Ministry would be categorized as powerful stakeholder groups that confer university legitimacy. That notwithstanding, students are at the centre stage of higher education institutions as part of input and output variables in the performance of universities. This work argues that flow of resources from universities to local communities is fluid and organic when there is no wall structurally and metaphorically that separates the university from society. Just like the Milky Way galaxy which consists of new and old stars students are categorised as first entering (new) and returning students in the university ecosystem. And just like the stars cannot be viewed outside the unknown dark matter and the gravitational fingerprints that keep the stars orbiting the Galactic centre, students cannot be viewed in isolation from society, from local communities and in isolation to institutions and organisations that sponsored their study. This interconnectedness is demonstrated in how the Mondragon university navigates its ecosystem with its governance and funding model, as explained below.

Mondragon University is a cooperative university located in in a small town in the Gipuzkoa Province, Basque Country, in Spain (source). The university was established in 1997 as part of the Mondragon Corporation, one of the largest cooperatives in the world. The establishment of the Mondragon Co-op is traced back to the arrival of a young priest, Father José María Arizmendiarriet, in Mondragon in 1941 who facilitated a collaboration and an alliance between the Catholic church, local businesspeople, local community and technology (Molina and Miguez, 2008). The university evolved from an apprentice school established by Jose Maria Arizmendiarriet in 1943 to three educational cooperatives that merged to create Mondragon university. The university has four faculties: (1) Engineering established in 1943; (2) Business Studies established in 1960; (3) Humanities and Education established in 1976 Gastronomy established in 2011 (see Mondragon University, 2022). Each faculty is a different co-operative and an autonomous entity operating under the Mondragon Corporation.

There are two academic features that make Mondragon a unique local community anchored university. The first one is the university's teaching and learning strategy. Mondragon university has built its reputation around the experiential learning approach which integrates cooperative work experience, real life global oriented projects, and internships into curriculum design and delivery. Not only are students integrated into the co-op world of work, but they are active co-op members who also gain industry experience and build professional network while studying at Mondragon. This approach enhances students' employability when they complete formal education at the university.

The second academic feature that distinguishes Mondragon university is its research model which is oriented towards the business world through research transfer. As explained in the university's annual report (Mondragon, 2022). U-Multirank qualified Mondragon university as the number one Spanish university in transfer of knowledge based on the following metrics: co-authorship with industry partners, research income

from private sources and external funding for research. (U-Multirank is a European ranking system whose basic aim is to provide transparency about the diversity of higher education institutions.) What makes the Mondragon research model highly rated is its alignment of technological capabilities of the university with the needs of the community, linking private research contracts to long-term collaborative research transfer programmes. The transfer programmes range from basic research to industrial research, experimental projects which lead to innovative products, processes and services (Mondragon, 2022).

A critical distinguishing factor to the success of the Mondragon ecosystem is how the funding model is structured. Unlike South African public universities, Mondragon's largest source of funding as figure 5 illustrates is from tuition, followed by research and technical transfers and contracts.

Mondragon University

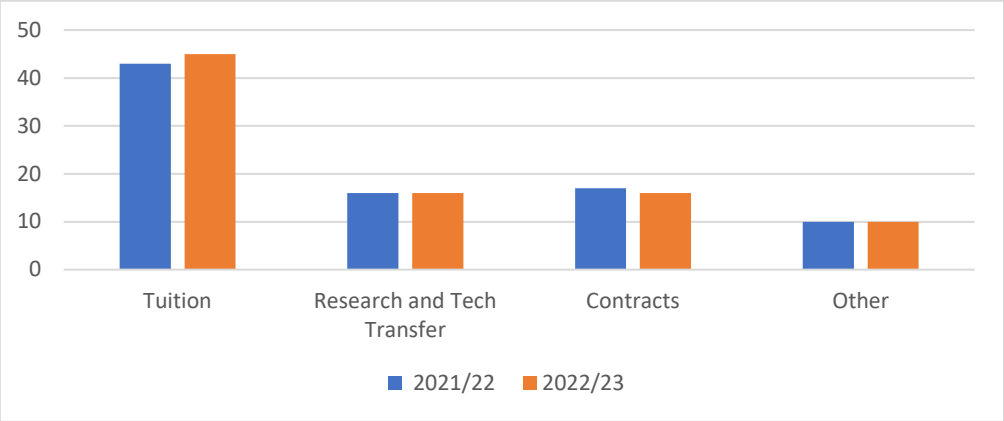


Figure 5: Mondragon University Revenue Structure

6. Theory Building: The Legitimacy Paradox to be Resolved to Yield the Desired Outcome

Legitimacy building is a proactive undertaking, that relies on managers' advanced knowledge of their environment and strategies to succeed (see for example Deephouse and Suchman, 2008). Organisations that rely on public funds have a greater need for legitimacy because the funds that run universities are sourced from members of society and from the corporates and those employed via the tax system. As such public universities' existence, continuity and growth rely largely on the continuous support of citizens (Tilling, 2004). Tilling (2004) provides a helpful approach in working with legitimacy. Tilling (2004) posits that legitimacy theory must examine how relevant stakeholders influence the flow of resources crucial to the organization's establishment, growth and survival. In his work, Tilling (2004) identifies four important stakeholders: (1) government; (2) the public; (3) the financial community; and (4) media. According to Zhao and Yang (2013: 11), government legitimacy has been challenged on the basis that its legitimacy is the product of false consciousness (a way of thinking that prevents a person from perceiving the true nature of their social or economic situation). Weber (cited in Zhao and Yang, 2013, p. 12) identifies three types of legitimacy that are the basis of government power including "traditional legitimacy", based on inherited power; "charismatic legitimacy" based on unique charismatic qualities of the head of government and "legal legitimacy" based on judicial principles that bind society.

While Tilling's (2004) work identifies four important stakeholders, Reuf and Scott (1998) categorises stakeholders into two groups: external stakeholders and internal stakeholders. External stakeholders as pointed out by Reuf and Scott (1998) as accreditation bodies, funding agencies, intellectuals in society, professional bodies, business circles, public opinion and the media; while internal stakeholders include personnel, managers, specialists, and members of the board. Reuf and Scott (1998) argue that internal stakeholders influence the effect of the opinions of external stakeholders in their actions, attitudes, values and behaviours. In other words, legitimacy is co-created in a bidirectional process between internal and external stakeholders. Tilling (2004) points out that an entity may either be in a phase of establishing legitimacy, or maintaining, extending or defending it. These different phases have key stakeholders that hold sway when it comes to establishing, maintaining, or defending legitimacy. This opens up another way of working with the legitimacy construct: to explore the assumption that the resources that different stakeholder groups control will determine the degree to which each stakeholder group can heighten or diminish performance legitimacy.

The legitimacy framework adopted for this paper is provided by Suddaby, Bitektine and Haack (2017), which views legitimacy as a resource that pulls the ecosystem together. Borrowing from the Milky Way Galaxy

metaphor, legitimacy may be viewed as gravitational force that keeps the ecosystem orbiting around the galactic centre. And the galactic centre in the university space would be viewed as the collective energy, wisdom and knowledge located in individuals, academics, academic leaders, the university governance structure and in the funds that run the university.

Table 3: Making Sense of Legitimacy utilising the Milky Galaxy Metaphor

	Legitimacy as a Resource	**Legitimacy: Milky Way Galaxy Metaphor**
What is legitimacy?	A property A capacity	A gravitational force at play facilitating the orbiting of the planets and the galaxy in spiral arms around the galactic centre
Where does legitimacy occur?	Inside and outside the university In known and unknown university spaces Legitimacy occurs in the governance spaces such as College/Faculty Boards, Senate Council; in partnerships with local communities, industry partners and other collaborative organisations	Between and within planets/stars, halo, spiral arms, the disk; the dark matter and the known and unknown components of the Milky way galaxy Inside and outside the Milky Way Galaxy
How does legitimacy occur?	Through "fit" between organisation attributes and external audience's expectations Through energy/ideas/solutions/resource exchange	Through energy exchanges, interactions and movements of stars, dust, spiral arms

Source: Adopted from Suddaby Bitektine and Haack (2017)

7. A Word on Trustworthiness

The use of metaphors in sense-making requires validity criteria of trustworthiness, credibility, and objective reflection of the research process followed which include (see Schimdt, 2005):

- Explication of one's understanding of the metaphor used to make sense of the concept under research scrutiny. While not pretending to be an astrophysicist, I was able to illustrate how structurally the Milky way Galaxy can be likened to how and where a university may be legitimised by its principal stakeholders through different university interfaces. The metaphorical projects of the Milky Way Galaxy made in the paper to explain where and how legitimacy and connectedness with society may be achieved were comprehensively covered.
- Empirical Anchoring of concepts under scrutiny

The legitimacy concept was empirically anchored with the use of two South African universities located in rural South Africa that were juxtaposed with best practice in terms of governance and funding model in Mondragon University. The legitimacy concept was further anchored with the sense-making research technique that addressed three scenarios: (1) what is the issue and the situation related to that issue? (2) What is the envisaged outcome, if the issue is resolved; and (3) what is the gap or what are contradictions/paradoxes that need to be resolved in order to yield the desired outcome.

- Appropriately documented research methodology

Sense-making research technique, the ecocritical ontological stance and case study data related to governance and funding structure were adequately covered in the paper. As explained in the paper the methodological approach taken (sense-making using a metaphor) was done to not only to explicate the abstract legitimacy concept, but to make sense of the patterns of the legitimation emerging from the case study data.

8. Reflections and Conclusion

Just like the Milky Way Galaxy, the university space is a vast epistemic space that has known and unknown elements. It is a space that is ever evolving, in tandem with the evolving consciousness of the knowledge and truth seekers in the university ecosystem. In this paper, the Milky way Galactic ecosystem metaphor is fused with sense-making and the ecocritical worldview to probe into the legitimacy conferring modalities and connectedness of the university to its local economic ecosystem. Ecocriticism is positioned as an ontological approach which is depicted metaphorically as a Milky way Galaxy Ecosystem. The findings are also presented

metaphorically using the Milky way Galaxy Ecosystem to illustrate the "gravitational force" (legitimation force) at play in different university spaces where legitimacy is conferred including inside and outside the university, and in known and unknown university spaces. Legitimacy occurs in the governance spaces such as College/Faculty Boards, Senate Council; in partnerships with local communities, industry partners and other collaborative organisations.

It is against the picture painted above, that this paper views a university as part of an ecosystem made up of internal and external stakeholders including local community, the public, the socio-economic, the natural environment and students. This approach emphasises a holistic ontological connection between the university space, the students' agency, and the socio-political local community space, just like Earth and other planets orbiting the Galactic center are part of the Milky Way Galaxy. This ontological approach as argued earlier brings to sharp focus the permeability of universities with the local economic environment they are embedded in. The data on revenue structure and the finance model of the Mondragon University provides an apt example of how and where university legitimacy occurs in order to engender permeability between internal and external stakeholders, society and local community in a university ecosystem, while simultaneously building personal and individual agency of university students to serve local communities. That permeability occurs in two areas; (1) In the collaborative, co-operative governance model; and (2) in the finance model of the university. Data presented in this paper showed that the cooperative governance model is financially resourced sustainably by fee income as well as by 3rd and 4th stream income. The two South African university case studies also show a disconnect between the university and its local community when there is an intense and thick organizational field with multiple centers of power arranged in a bureaucratic fashion where authority at faculty level is limited. Further research may build on this work by testing the two propositions advanced in this paper that connect local community legitimacy and connectedness with collaborative governance and university finance model.

This paper fills a gap in knowledge on connectedness of universities to their local communities and how the connectedness can be assessed using the sense-making methodological technique and metaphor analysis.

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Influence of Quality Education on FDI Inflows in Subs-Saharan Africa: A Theoretical and Empirical Research

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Abstract: The non-traditional influences of Foreign Direct Investment (FDI) are increasingly gaining attention in international business studies; however, the empirical evidence of these influences is still scant. Using human capital theory within the context of the national competitive framework, the study reported in this paper considers the progress towards achieving Quality education as a likely influence of FDI inflows in Sub-Saharan Africa (SSA). The paper employs a panel data research design and conducts fixed effects estimations. The analysis categorizes FDI flows into global FDI, FDI from developed countries, and FDI from developing countries to SSA. Thus, the paper is centred around three research questions: (1) How does progress toward quality education influence global FDI inflows? (2) How does progress towards quality education influence FDI inflows from developed and (3) from developing countries? The analysis mainly utilizes a bespoke dataset from the United Nations Conference on Trade and Development (UNCTAD) and data from trustworthy databases such as UNCTADSTAT and the World Development Indicators (WDI). The results support the claim of the increasing importance of non-traditional influences of FDI flow. Quality Education significantly influenced FDI inflows from the globe and developing countries to SSA. This research provides further evidence that the national competitive framework can thoroughly explain the factors that have different significant powers in influencing FDI flows to SSA from developed and developing countries. The study is highly policy-relevant because it examines the effects of the degree of attainment of specific UN Sustainable Development Goals (quality education) on inward FDI performance. It, therefore, shows the benefits of SSA countries investing in the SDGs for the policy goal of attracting more considerable amounts of inward FDI.

Keywords: FDI inflow, Quality education, Sub-Saharan Africa, Fixed effect model, Human capital theory

1. Introduction

Since the early 1990s, developing economies have been experiencing a boom in their Foreign Direct Investment (FDI) inflows. However, Africa as a continent has not witnessed much increase relative to the FDI surge in developing countries despite the efforts undertaken to attract FDI (Sichei & Kinyondo, 2012). For example, global FDI inflows in 2015 recorded the highest peak since the global economic and financial crisis of 2008/2009, increasing 38 percent over the previous year. Unexpectedly, FDI to Africa fell by 7 percent while the overall developing countries experienced a rise of 9.5 percent in the same year (UNCTAD, 2016).

In the late 1990s, scholars in the field of international business started to argue on the reformation of the determinants and motivations for FDI inflows due to globalization (Dunning, 2004; Kokko, 2002). Nonetheless, studies on FDI determinants have been dominated by traditional factors such as natural resources and market size for over three decades (Naanwaab & Diarrassouba, 2016). The reformation of FDI determinants may result in MNEs evaluating host countries on broader policies than before (Nunnenkamp & Spatz, 2002). Thus, it becomes essential to assess how various non-traditional determinants, such as human capital, health, and well-being, affect FDI allocation (Naanwaab & Diarrassouba, 2016). The United Nations Sustainable Development Goals (SDGs) have highlighted some of these factors. In particular, the 'People' category includes the following goals: quality education, eradicating poverty, ending hunger, gender equality, and health and well-being.

This study addresses three significant gaps in the literature and practice related to the discussion above, focusing on quality education as one of the SDGs. The first category is the scant nature of literature that assesses the influence of quality education on FDI inflows in developing countries, particularly Sub-Saharan Africa (SSA). The second category refers to the lack of studies that use an adequate theoretical framework to incorporate the non-traditional determinants of FDI flows in SSA. The third category refers to extending the sparse literature that assesses the influence of quality education on FDI flows to SSA, broken down by different types of investing or source countries. This research is novel as many studies in the literature attempt to analyze how FDI contributes to sustainable development, which is an international development perspective (Gohou & Soumaré, 2012; Mihalache-O'keef & Li, 2011; Oetzel & Doh, 2009; Wang, 2009) and neglects the other side of the coin which is to say, how progress on the sustainable development influences the attraction of inward FDI. It is this latter question this study pursued.

The study is centered around three research questions: (1) How does progress toward quality education influence global FDI inflows? (2) How does progress towards quality education influence FDI inflows from developed and (3) from developing countries?

The remainder of this article is organized as follows: A brief literature review and an in-depth discussion of the methodology. Then, estimation results and discussion are presented, followed by the last section, the conclusion.

2. Literature Review

Quality education is typically regarded as a country-level characteristic and thus qualifies as an FDI location factor. In this regard, location-based theories organized under the Dunning paradigm can comprehensively explain the relationship between quality education and FDI inflows in SSA (Dunning, 2000; Dunning, 1977). Based on the location-based theories, the national competitive framework is more relevant to the current study. The national competitiveness framework is mainly referred to Porter's diamond theory of national competitive advantage (Porter, 1990). Contrary to standard economic theory, the diamond system emphasizes that national prosperity is created and not inherited (Porter, 2011; Porter, 1990). It draws more attention to created factors of production, such as skilled labour, rather than endowed resources, such as land and natural resources. The national competitive model avers that a nation gains a competitive advantage when it creates and possesses certain hard-to-imitate factors (Porter, 1990). These hard-to-imitate factors included in the diamond framework are the firm's strategy, structure and rivalry, related supporting industries, demand conditions, and factor conditions (Porter, 1990).

According to Delgado et al. (2012), country competitiveness could be viewed in two ways. One way is to view it as foundational competitiveness (expected output per potential worker), and the other way is to relate it to a global investment attractiveness, which is the gap between the country's foundational competitiveness and the country's current factor cost (Delgado et al., 2012).

The national competitive framework incorporates quality education and explains how it affects competitiveness and, consequently, a country's attractiveness to FDI inflows by linking them to human capital, productivity, and transaction costs (Delgado et al., 2012). The theoretical grounds for the link in the framework can be drawn from the human capital theory.

The human capital theory can be traced back to authors such as Mincer (1958) and Becker (1962). According to Porter (1990), productivity is the only sensible indicator of a country's competitiveness. Thus, an increase in a nation's productivity could be equated to an increase in the competitiveness of a country. "The human capital theory is premised on the notion that an increase in a person's stock of knowledge and health raises his or her productivity in both market and non-market activities" (Tompa, 2002: 183). Among human capital forms are knowledge capital, which results from schooling, and health capital. Education is a critical component of human capital (Bleakley, 2010; D. Bloom and Canning, 2003).

A country with an educated population has skilled and highly educated labour. These workers would work with advanced methodologies, execute their duties with competencies, and have minimum errors in their operations; this could increase efficiency and productivity. Educated workers are easily trainable; consequently, an intellectual and well-trained worker can handle various tasks, lowering unit costs as opposed to the uneducated worker (Shatz, 2003). When human capital is enhanced, productivity is high; unit labour cost should decrease.

Also, Ishak and Rahmah (2002) state that as far as skilled workers are concerned, a country's education level is critical to ensuring the workforce supply is what is required by the economy. To support this view, Shatz (2003) argues that most multinational industries deal with differentiated products or technically advanced industries, which produce more appealing products to educated or high-income earners. Therefore, MNEs also need highly skilled labour to make these sophisticated products. On the other hand, highly educated workers could imply high wage costs to MNEs because of their qualifications, but according to Kucera (2002), MNEs are more concerned with skills than wage costs. Thus, the argument for highly educated workers seems to be stronger than the uneducated and cheap ones (Shatz, 2003).

3. Methodology

The study is mainly quantitative and employs panel data. It falls under the explanatory studies category since it seeks to explain the relationship between progress towards quality education and the inflow of FDI in Sub-

Saharan Africa. Because the objective of this study is not to include every possible explanatory variable of FDI flows to SSA, we, therefore, needed a method that could deal with the problem of omitted variables. In this regard, the fixed effects models are appropriate for dealing with omitted variables (Wooldridge, 2002). The only drawback of fixed effect is that it cannot include time-constant explanatory variables (Torres-Reyna, 2007). However, because the interest is only on time-varying explanatory variables, this limitation does not cause worry (Wooldridge, 2002: 266).

There are 48 countries in Sub-Saharan Africa. Due to data availability, the study includes only 38 countries, covering 2001 to 2016. Of these 38 countries, 23 are least developed countries (LDCs), and 15 are low- and high-middle-income countries.

4. Data Collection and Management

We first obtained the bilateral FDI flow data for Sub-Saharan African Countries from UNCTAD as bespoke data in mirror data format. The mirrored data provides the amount of FDI inflows received by a particular Sub-Saharan African country from individual countries around the World and the amount of FDI outflows this country invests in different countries worldwide every year. We grouped the partner countries into developing and developed countries. After this, we create distinctive bilateral FDI flow data sets, which show the amount of FDI flows into SSA countries from developed countries as one dataset and developing countries as the other data set. The aggregate or global FDI flows to SSA countries were obtained from UNCTADSTAT. The three unique FDI data sets, namely global or aggregate FDI flows data set (FDI), FDI flows from developed countries data set (FDID), and FDI flows from developing countries data set (FDING), were cleaned and rearranged into a long format. The format makes the data clear and usable, ready to be combined with independent and control variables. Despite the benefits of this data source, such as a wide range of reputable sources for control variables, clarity, and usability, limitations exist, including limited control over data collection and incomplete information. In the current study, we had a limitation of the data; we obtained data for 38 out of 55 countries. We follow Blanco et al. (2016), Albulescu and Goyeau (2016), and Azemar and Desbordes (2009) in doing linear interpolation to fill the gaps.

Econometric model

According to Delgado et al. (2012)

$$FDI = f(FOUNDATIONAL\ COMPETITIVENESS), (FACTOR\ COST) \quad \textbf{1}$$

Where:

Foundational competitiveness depends on Social Infrastructure and Political Institutions (SIPI), which include education, health, and institutional factors.

Factor costs include labour costs, cost of materials, transaction costs

Apply natural logarithm transforms to equation 2 and include quality education

$$Ln\ FDI = \propto + \beta_1 Education_{t-1} + \varepsilon \quad \textbf{2}$$

Note: the t-1 is the time lag

The study employs three main models:

Model 1: the first model assessment involves FDI flows from the World to SSA.

$$Ln\ FDI = \propto + \beta_1 Education_{t-1} + \beta_2 Control\ variables_{t-1} + \varepsilon \quad \textbf{3}$$

Where:

Ln FDI is a natural logarithm of FDI flows from the World

Model 2: the second model assessment involves only FDI flows from developed countries to SSA.

$$Ln\ FDID = \propto + \beta_1 Education_{t-1} + \beta_2 Control\ variables_{t-1} + \varepsilon \quad 4$$

Where:

Ln *FDID* is a natural logarithm of FDI flows from developed countries to sub-Saharan African countries.

Model 3: the third model assessment involves FDI flows from the developing countries to SSA.

$$Ln\ FDING = \propto + \beta_1 Education_{t-1} + \beta_2 Control\ variables_{t-1} + \varepsilon \quad 5$$

Where:

Ln *FDING* is a natural logarithm of FDI flows from developing countries to sub-Saharan African countries.

Estimations

On the three models that we developed, we estimate our models with a fixed-effect model with robust standard errors, wherein the explanatory variables lagged one period. An intensive examination of the data confirms that both the selective choice of countries during a benchmark survey and the cross-country nature of the data introduce sample selection bias and omitted-variable bias. The fixed-effects estimation technique reduces the omitted variable and sample-selection biases by including the country-specific effects as regressors rather than assigning them to the error term (Wooldridge, 2002). Furthermore, fixed effects estimation is chosen as an estimation method because the fixed effects interpretations prove useful for policy analysis and program evaluation (Wooldridge, 2002).

We could use pooled regression by OLS; however, this will bring heterogeneity bias because each country has different real models; thus, pooling them all together without considering unobserved effects will create biases in the estimation. Fixed effects estimation is appropriate when analyzing the impact of variables that vary over time. The estimation explores the relationship between the predictor and outcome variables within an entity. Each entity has its characteristics, which may or may not influence the predictor variable; the fixed effects assume that some characters within an entity may impact the predictor or outcome variables, and we need to control for this.

A fixed-effects model is reliable for removing omitted variable bias or endogeneity problems (Allison et al., 2017; Qian and Su, 2014). Firstly, it controls for the average differences across countries in any observable and unobservable predictors (Francis et al., 2013), significantly reducing the threat of omitted variable bias (Qian and Su, 2014). Secondly, It removes the effect of the time-invariant characteristics to assess the net impact of predictors on the outcome variable (Torres-Reyna, 2007) by applying a first-difference transformation (Wooldridge, 2010).

In the equation:

$$Y_{it} = X_{it}\beta + C_i + U_{it} \ldots t = 1 \quad 6$$

$$Y_{it-1} = X_{it-1}\beta + C_i + U_{it-1} \ldots t = 2 \quad 7$$

Subtracting eq7 from eq6 we get

$$\Delta Y_{it} = Y_{it} - Y_{it-1} = \Delta X_{it}\beta + \Delta U_{it} \ldots t = 2 \quad 8$$

This removes the unobserved C_i; hence, the FD estimator avoids bias due to some omitted, time-invariant variables using repeated observations over time. Subsequently, we apply OLS to the different variables.

5. Results and Discussion

It is crucial to conduct several pre-tests before performing the analysis to ensure that all fixed effects assumptions are met.

Normality

Normality in the regression errors allows us to assume more stable regression solutions and makes our inference procedures more straightforward (Hair et al., 2009). We transformed the dependent variables by applying the natural logarithm transformation; the normality test indicates there is no reason to suppose they are not normally distributed.

Heteroscedasticity test for model 1 (global FDI flows to SSA)

Modified Wald test for GroupWise heteroscedasticity in the fixed effect regression model

$H_0: \sigma_i^2 = \sigma^2$ for all i

$H_i: \sigma_i^2 \neq \sigma^2$ for all i

chi2 (21) = 2.6e+28

Prob>chi2 = 0.0000

Since Prob>chi2 <0.05, we reject the null and conclude the presence of heteroskedasticity.

Heteroscedasticity test for model 2 (FDI flows from developed countries to SSA)

Modified Wald test for GroupWise heteroscedasticity in the fixed effect regression model

The null hypothesis $H_0: \sigma_i^2 = \sigma^2$ for all i

An alternative hypothesis $H_i: \sigma_i^2 \neq \sigma^2$ for all i

i = σ^2 for *i* = 1. . . . . *Ng*, where *Ng* is the number of cross-sectional units.

chi2 (19) = 7.5e+28

Prob>chi2 = 0.0000

Since Prob>chi2 <0.05, we reject the null and conclude there is evidence of heteroskedasticity.

Heteroscedasticity test for model 3 (FDI flows from developing countries)

Modified Wald test for GroupWise heteroscedasticity in the fixed effect regression model

$H_0: \sigma_i^2 = \sigma^2$ for all i

$H_i: \sigma_i^2 \neq \sigma^2$ for all i

chi2 (20) = 415.43

Prob>chi2 = 0.0000

Since Prob>chi2 <0.05, we reject the null and conclude the presence of heteroskedasticity.

The three models above show the presence of heteroscedasticity. To control for the heteroscedasticity problem, we add a robust option in running a fixed effect (FE) regression (Torres-Reyna, 2007; Drukker, 2003).

Hausman Test

Each model is subjected to the Hausman test to determine which estimator between fixed and random effect is consistent and unbiased.

Hausman's test for the three data sets

For aggregate FDI flows (Model 1):

Hausman's Prob>chi2 = 0.0009

Since Hausman's p-value is less than 0.01, we reject the null hypothesis; therefore, a fixed effects estimator is required.

FDI flows from developed countries (Model 2):

Hausman's Prob>chi2 = 0.0005

Since Hausman's p-value is less than 0.01, we reject the null hypothesis; therefore, the fixed effects estimator is required.

FDI flows from developing countries (Model 3):

Hausman's Prob>chi2 = 0.0040

Since Hausman's p-value is less than 0.01, we reject the null hypothesis; therefore, the fixed effects estimator is required.

Table 1: Summary of the fixed effects estimation on Model 1, Model 2, and Model 3

Hypothesis	explanatory variable	Aggregate FDI (Model 1)	FDI from developed countries (Model 2)	FDI from developing countries (Model 3)
+	Progress toward quality education	**-19.85834****	12.3316	**5.858174***
+	GNI	**2.578028*****	-1.376757	**3.04387*****
+	Openness	**1.320821****	**2.668459***	.5863179
+	Natural resources	**6.076851***	-8.788389	.7476992
+	Infrastructure	.1211656	-1.73678	-3.20e-08
+	Governance index	.2626634	-.8978056	1.042253
+	Labour	**-30.04718*****	**44.9407****	-.0000171
+	GDPW	-.8257098	3.22982	**-5.962376*****
	R^2	0.8745	0.8806	0.8654
	Adjusted R^2	0.8145	0.7964	0.7912
	P-value	0.0000	0.0000	0.0000
	constant	-7.13853	4.386575	**-118.7668****

*** Significant at a test size of 1% ** Significant at a test size of 5% * Significant at a test size of 10%

RQ1: How does progress toward quality education influence global FDI inflows?

Quality education was significant and negatively related to global FDI flows in SSA countries at a test size of 5 percent **(-19.85834***).** The result suggests that the higher the quality of education, the less the global FDI flows to SSA countries. The result is inconsistent with expectations. On the contrary, the result supports the alternative hypothesis that FDI is undertaken "in countries with low levels of education to escape the high compensation costs with which higher levels of education and skill are associated" (Shatz, 2003: 188). The negative relationship is consistent with the view that MNEs seek indigenous workers for casual jobs, which often require less qualification than tertiary-level jobs (Shatz, 2003). Thus, an increase in tertiary-level enrolment might cause a negative relationship between education and FDI inflows.

RQ2: How does progress towards quality education influence FDI inflows from developed countries?

The quality of education relating to FDI flows from developed countries was positive; however, it was not significant. The lack of significance of education could be because FDI flows from developed countries, which are most likely not looking for technological innovations or quality education in developing countries such as SSA.

RQ3: How does progress towards quality education influence FDI inflows from developing countries?

The quality of education was significant and positively related to FDI flows from developing countries to SSA countries at a test size of 10 percent (5.858174*)**.** The result suggests that the higher the quality of education,

the more the FDI flows from developing countries to the SSA region. The result is consistent with expectations. The results support Noorbakhsh et al. (2001) and Globerman and Shapiro (2002), who argue that education positively and significantly impacts foreign investment flows to low- and middle-income countries and that its effect has increased over time.

For the control variables, the study found a significant and positive relationship between a country's market size and global FDI flows to SSA and FDI flows from developing countries to SSA at a 1 and 5 percent test size, respectively. This aligns with the observation that larger markets with untapped resources tend to attract more FDI, exemplified by nations like Angola, Congo, Mozambique, South Africa, Ghana, and Nigeria.

A positive and significant relationship exists between a country's openness and FDI flows to SSA, particularly from global and developed countries, at a 5 and 10 percent test size, respectively. This result supports the notion that the more open the economy is, the higher levels of FDI attraction, as evidenced by previous research by Mijiyawa (2015), Demirhan and Masca (2008), Kinaro (2006), and Asiedu (2002).

A positive and significant relationship exists between the abundance of natural resources in SSA countries, and global FDI flows to SSA at a test size of 10 percent. This finding reflects the traditional trend of FDI allocation to natural resource exploitation, consistent with Cleeve et al. (2015) and UNCTAD (2016).

Contrary to expectations, the study found a negative and significant relationship between the labor force and global FDI flows to SSA at 1 percent test size. These results are supported by Meyer and Thaijongrak (2013), who argue that a highly skilled workforce is seen as a disadvantage because of the cost of maintaining them. However, a positive and significant relationship exists between the labor force and FDI flows from developed countries to SSA at a 5 percent test size. This aligns with the expectation that multinational enterprises (MNEs) seek countries with large working-age populations for cheaper labor costs (Dunning, 1993).

Model diagnostics

The fixed effects estimations of all three models are highly significant at a 1 % level. The explained variance of the three models expressed by R^2-type measures ranges between 0.8654– 0.8806. These values are in line with or above related longitudinal studies that applied fixed effects analysis (Demir, 2016; Davies et al., 2008; Kimino et al., 2007; Dees, 1998)

Robustness test of the models

We follow Hair et al. (2009) in using split sample analysis to test for the robustness of the model. The regression results of the divided sample models resembled the original models significantly. Therefore, the result of the split sample technique validated the models.

In addition, the ex-post Harman Single Factors test (Podsakoff et al., 2003) was employed to detect any Common Method Bias. Principal Axis Factoring Extraction derives the result, and the single construct's total percentage of variance is 20.491%, which indicates the minimal presence of common method bias.

6. Conclusion

This study contributes to the knowledge and demonstrates that an existing international business framework (national competitive framework) can explain the relationship between non-traditional influences of FDI, particularly SDGs, and FDI flows to SSA (Delgado et al., 2012). Previous literature lacks holistic and integrated approaches to explain non-traditional influences, particularly in SSA (Cleeve et al., 2015; Busse and Nunnenkamp, 2009; Noorbakhsh et al., 2001).

The study demonstrates that the national competitive framework offers a comprehensive analytical framework using human capital theory to assess the non-traditional influences via their effects on productivity. Since the framework has been applied in the context of developed countries (Delgado et al., 2012), the results show that the national competitive framework can integrate and merge the theoretical underpinnings of the human capital theory within the new context of developing countries (SSA). Therefore, as far as we know, this is the unique application of the framework in this particular context.

The study adds value to the empirical studies of non-traditional influences by applying the bespoke bilateral FDI inflow data to SSA from UNCTAD. This data set is new and not publicly available. This adds novelty to this research.

This research offers a robust quantitative methodological approach in the reasonably new research context of FDI flows and non-traditional influences of FDI in SSA. It adopted a novel feature in FDI research by collecting

secondary data from authoritative organizations and databases responsible for collecting official data from states such as World Development Indicators (WDI), UNCTADSTAT, and ILO. The study adds a contribution to the methodology by analyzing the novel data set in categories of North to South FDI flows (Developed countries to SSA), South to South FDI flows (Developing countries to SSA), and global to SSA flow (world FDI to SSA). Generally, this approach has already been used. However, it has never been used in Sub-Saharan Africa, as data is not publicly available unless obtained from UNCTAD.

The findings of this study imply that universities, public and private scientific research institutions, industrial concentrations, and highly skilled R&D employees in a country constitute the fundamental force behind the development and success of FDI flow levels, particularly from developing countries. It is worth noting that institutions have always been considered drivers of productivity improvement, which translates to more FDI flows per human capital theory linkage (Bénassy-Quéré et al., 2007).

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Applying a Systematic Literature Review Process in a Grounded Theory Investigation

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Abstract: This paper offers a critique of the application of a systematic literature review (SLR) process during a grounded theory (GT) investigation. The place of the literature review (LR) within GT has long been discussed, contested, and frequently misunderstood. One of GT's hallmarks is its inductive nature, allowing salient concepts to 'arise' rather than being deduced. Hence, there are differing perspectives on the role of the LR concerning enabling or constraining this inductive process. However, scant guidance is available on conducting LRs for GT studies. Wolfswinkel, Furtmueller and Wilderom (2011) offer a five-stage GT method for reviewing literature. This paper will provide insights into the advantages and disadvantages of their method. Though grounded in theoretical principles surrounding the LR's purpose in GT, this paper gives practical guidance on operationalising this five-stage SLR process. This is done by demonstrating the application of their stages in a doctoral dissertation. A contemporaneous research audit trail was used to document each stage, reflect on challenges, and justify deviations from the original five stages. Excerpts from the audit trail will be used to illustrate how the process was applied. Based on the findings from applying these stages, tentative advancements to the model will be offered so that other researchers will have more detailed guidance on how a SLR may be conducted within GT studies.

Keywords: Grounded theory, Systematic literature review, Audit trail, Middle leadership in education, Theory development

1. Introduction

The subject matter of this paper is an outline of the SLR process used by the author for a doctoral dissertation related to educational leadership. This process resulted from the need for a literature review method compatible with the GT approach that underpinned the research. A lack of definitive guidance on conducting LRs for GT studies was identified. The position of the LR within GT has been a subject of debate among grounded theorists (Yu and Smith, 2021). Additionally, scholars' understanding of the LR as a concept more generally has been described as poor, often offering summary rather than knowledge development (Boote and Beile, 2005; Snyder, 2023). Thus, a guide for rigorously reviewing literature that encourages theory development is needed. Wolfswinkel, Furtmueller and Wilderom (2011) provide such a guide. The advantage of their method is the detailed stepwise approach offered. They emphasise that 'one size does not fit all' and encourage well-intentioned deviation from their stages. The objective of this paper is to illustrate how the author applied and adapted their five-stage LR method. The paper is structured to allow for the demonstration and discussion of how each stage was applied using the dissertation LR as an example or case study. The illustration of each stage is enhanced by extracts from a research audit trail (Carcary, 2009; Carcary, 2020), making decision-making processes transparent and illuminating the method's benefits and challenges.

2. Background

2.1 Misapprehensions Surrounding the LR

As far back as 2005, Boote and Beile highlighted the general weakness of dissertation LRs, referring to this as the 'dirty secret' known by dissertation committees. They also described inadequate LRs submitted to journals for publication. This problem persists today as Snyder (2023) bemoans the frequency at which authors submit LRs that contain merely descriptive summaries. Webster and Watson (2002) share a similar concern, describing the lack of awareness regarding the LR's structure and format amongst many information systems scholars, which they surmise is not exceptional in other fields. However, Boote and Beille (2005) note that this is not the fault of students, but an inevitability stemming from a lack of institutional guidance and published works. Though some textbooks may provide the steps for completing a LR, these can be simplistic and vague and, therefore, belie the complexity of the LR process in reality.

It is accepted that a LR is a critical step in any academic endeavour. What a good LR entails is framed in marginally different ways by authors, but the essence is summarised here. It involves examining past literature and situating it within a broader scholarly and historical context, not simply reporting on the claims made but critically examining them. It should not cease at the point of summarising and synthesising. Instead, it should be future-facing, pinpointing questions for further inquiry and suggesting future research directions. It can do this by identifying and highlighting knowledge gaps, clarifying what is known and unknown about a topic as

well as uncovering key dilemmas and conflicting findings (Boote and Beile, 2005; Palmatier, Houston and Hulland, 2018; Rowe, 2014; Webster and Watson, 2002).

2.2 Positioning the LR Within GT

The LR's purpose within a GT study differs from studies with other approaches at their core (Creswell and Creswell, 2018). In other studies, a line can be drawn relatively clearly from LR to research questions, data collection instruments and results. This is comparatively less so in GT, as the study should be guided by what emerges from the data rather than existing concepts from the LR. The place of the LR in GT has been disputed and poorly understood (Charmaz, 2014). Some grounded theorists believe that reviewing literature before data collection hinders theory generation (Glaser and Strauss, 1967), while others believe a lack of familiarity with the literature is neither desirable nor possible (Charmaz, 2014).

Of note, Yu and Smith (2021) offer a two-step LR process to resolve this issue. They propose conducting a pre-LR prior to data collection. This allows the study to be situated within a scholarly and historical context, enabling the researcher to critically examine claims, summarise, synthesise, identify gaps, and highlight areas for exploration. Additionally, and crucially for grounded theorists, it makes the researcher theoretically sensitive. A second LR takes place post-data collection and analysis. At this point, the main categories from the data analysis are sought out in existing research, beyond the limits of what was searched in the pre-LR, in a more deductive process. In this way, theory development is not limited to existing concepts from the initial LR but remains open.

2.3 The SLR Process

Rowe (2014) describes how the quality of a review can depend on its systematicity, particularly if it is to have an explanatory rather than a descriptive purpose. The ability to explain requires viewing existing concepts related to a topic at play. Systematically approaching the review assists with this. SLRs differ from traditional ones because they aim to identify all studies that address a specific question, their methodology has been developed to minimise bias, and they are protocol-driven and rigorously conducted (Nightingale, 2009). Snyder (2023) warns that collecting literature should not be the researchers' sole focus; a solid plan for meaningful analysis is also crucial. A SLR should allow the reader to make sense of the accumulated knowledge on a topic by synthesising and presenting it to them (Webster and Watson, 2002). Rowe (2014) explains synthesising as summarising numerous research findings using a novel interpretation. GT is a way of interpreting this information in a novel way; it is concept-centric and can provide the basis for how the information will be presented to a reader.

Wolfswinkel, Furtmueller and Wilderom's (2011) article elaborates on this type of review, outlining an explicit protocol, stages to progress through, and instructions on analysing, interpreting, and presenting the information gathered. Their method clarifies the commonly misapprehended LR process, satisfies the criteria for systematicity and is congruent with a GT approach.

3. Methodological Proposal

3.1 Case Study Overview

The research referenced throughout the methodological proposal is a doctoral dissertation concerned with middle leadership in Irish Primary Schools. There are over 3,000 mainstream primary schools in Ireland. Children may be enrolled from age four and attend for eight years. The leadership structure of a typical primary school consists of the principal, deputy principal and a number of assistant principals. Assistant principals are full-time teachers, whereas the others may have an administrative (non-teaching) role depending on school size. Assistant principals can be considered middle leaders (MLs). The concept of middle leadership is under-researched and under-theorised (De Nobile, 2018). The dissertation seeks to examine, understand, and then explain how their role is enacted and conceptualised.

The remainder of this section will explore each stage of Wolfswinkel, Furtmueller and Wilderom's (2011) method. First, each stage is summarised from their original paper; following this, how the researcher implemented each stage will be illustrated using excerpts from the research audit trial. Deviations from the original stages, rationales for decisions and reflections regarding each stage are commented on.

3.2 Stage 1: Define

3.2.1 Stage 1: Summary

Four steps are used to identify the most suitable literature: determining inclusion/exclusion criteria (subject to revisions), identifying fields, formulating search terms that reflect the chosen topic and selecting suitable databases. A logbook should be started to record all search terms and operators, reflect how the search was conducted, and make it replicable.

3.2.2 Stage 1: audit trail

Table 1: Define stage

Timeframe*:* The last 15 years. ***Later Revised to 10***.
Field: Primary Education. ***Later revised to Education***.
Search Terms*:* middle leadership in schools, middle leaders, middle leadership in education, *middle management in schools, teacher leaders, school leadership and management, teacher leadership.* ***Terms in italics were later removed***
Databases: Education Source, ERIC, Google Scholar, JSTOR, Sage, Science Direct, Scopus, Taylor and Francis

3.2.3 Stage 1: Comments on its application:

The application of this stage was iterative from the outset. The initial search criteria were revised after the first attempt at Stage 2 (detailed in section 3.3.2). No deviation occurred from the original stage, but upon reflection, selecting a focus question and adding this to the 'define' stage is recommended. This is not necessarily the study's overall research question but broader and relates to what, ideally, the researcher wishes to uncover in the existing literature. In this example, '*How is middle leadership organised and conceptualised in educational settings?*' This assists in focusing the search at this early stage. A research audit trail (Carcary, 2009; Carcary, 2020) was used in place of the suggested logbook.

3.3 Stage 2: Search

3.3.1 Stage 2: Summary

The decisions made in Stage 1 are actioned, and the search is carried out. This can be time-consuming and episodic and may necessitate revising search terms, selecting synonyms and/or adjusting the scope. These can call for a return to Stage 1, which must be documented.

3.3.2 Stage 2: Comments on its application

Revisions were made to the timeframe and search terms. The original time frame of fifteen years and the broad nature of the search terms resulted in an unmanageable number of texts. The timeframe was reduced to ten years with the intent that later backward citation tracking would alert the researcher to any seminal works outside this timeframe. Wolfswinkel, Furtmueller and Wilderom (2011) do not refer to reading publications until later in their stages. However, from experience, reading SLRs related to the topic of interest, where these exist, can assist in refining search criteria. In the case of this project, DeNobile's (2021) LR quantitively showed the decline in the use of the term middle management, the predominance of middle leadership and teacher leadership, and how those terms were becoming interchangeable. This resulted in dropping dated and unnecessary search terms. Additionally, the first search retrieved studies related to post-primary, mixed (primary and post-primary), and third-level studies. Studies relating to primary education were rare, so the field was adjusted to education more generally. The rationale being that attempting a LR solely on primary education would lack conceptual depth, given the dearth of relevant studies.

3.3.3 Stages 2 and 3: Audit trail

Table 2: Search and select details

Database	Search Terms and Filters Used	Retrieved	Relevant
Education Source	Middle leadership in schools, 2011-2022 academic journals, articles, English.	82	33
ERIC	Middle leadership in schools, 2011-2022, journals, conference proceedings	391	120
Google Scholar	Middle leadership in schools, 2011-2022, articles	>1,000	208

Database	Search Terms and Filters Used	Retrieved	Relevant
Sage	Middle leadership in schools, abstract, education, 2011-2022	45	2
Science Direct	Middle leadership in schools, 2011-2022	12	3
Scopus	Middle leadership in schools, 2011-2022 educational journals	51	9
Taylor and Francis	Middle leadership in schools, 2011-2022, abstract	183	24
		Total	**399**
		Without duplicates	**145**
		Post abstract review	**85**
		Post full-text review	**53**

3.4 Stage 3: Select

3.4.1 Stage 3: Summary

This is the point at which texts are actually selected. It is recommended first to filter out doubles and then set aside texts that do not fit the review's criteria. This is done by reading titles, abstracts or more of the texts. Forward and backward tracking should take place at this stage. This 'corpus' of papers should represent the best available knowledge of a specified topic.

3.4.2 Stage 3: Audit trail

> *'The original 399 articles were filtered for doubles and reduced to 145. The abstracts/introductory sections of this 145 were examined, and a further number were removed from the review corpus due to the following: article quality, research referred to was a dissertation/thesis, title no longer accessible, irrelevant content, language other than English, duplicates not previously found. This resulted in 85 readings. Next, the sample was refined based on the full text. 32 were set aside during this stage as they were irrelevant to the guiding question, leaving 53 articles to use as a "corpus".*
>
> *Wolfswinkel et al. recommend doing backwards and forward citations at this point, i.e. after full texts have been reviewed, as doing so any earlier could result in tracking from articles that ultimately are not selected.*
>
> *This is where my review process deviates from theirs. They advocate entering the analysis phase only after backwards and forward citation tracking, which are two further literature (or data) collection processes. However, in GT it is not acceptable to gather all data and only at that stage begin the analysis. Data collection and analysis are not separate sequential steps but should be conducted concurrently so that analysis guides further data collection. I propose to analyse the data from what I consider the first data collection, i.e., those 53 articles resulting from the* ***select*** *stage. This analysis can then later be used to guide backwards and forward citation tracking. This will narrow the focus of the tracking and should result in selecting only the most relevant texts to add to the corpus.'*

3.4.3 Stage 3: Comments on its application

In practice, the search and select stages are strongly interrelated. There is an element of pre-selection in the search stage as titles and abstracts are scanned; some are determined to be irrelevant and set aside even then. At the search stage, a method of gathering and storing the literature that passes this pre-selection is required so that they can be further screened later, which is not expressly articulated by Wolfswinkel Furtmueller and Wilderom (2011). In this project, EndNote™ was used to collect and store texts in a folder (Literature Search 1) for later review. The 'find duplicates' feature filtered out doubles (399 to 145). This folder was worked through by reading the abstracts/introductions (145 to 85). These 85 texts were printed, and the full text was reviewed in hard copy. Texts that passed the full-text review (53) were stored in a new folder on EndNote™ (Refined Literature Search 1). Rather than deleting texts that did not pass this screening process, these were stored in case something seemingly irrelevant became important later and to demonstrate transparency. Reviewing the full texts commences the analysis stage. Relevant sections are highlighted, and notes/memos are made on hard copies, which may later find their way into codes.

3.5 Stage 4: Analyse

3.5.1 Stage 4: Summary

This stage reflects the 'heart of the literature reviewing effort', where the 'key principles of GT are most expressly applied'. They propose beginning the analysis by choosing a random paper and highlighting relevant findings/insights. Each highlighted piece of text becomes a relevant excerpt. While reading each study, the researcher engages in the intertwined process of open, axial, and selective coding.

- Open coding: The analytical process of generating higher abstraction level type categories from sets of concepts. Repeated reading of excerpts causes concepts that capture parts of the data to appear. The process begins with the first paper but can be revised following new insights from further reading. Thus, quickly revisiting papers is essential as codes, categories and properties are (re)developed.
- Axial coding: Further developing categories and identifying interrelations between them and their subcategories.
- Selective coding: Identifying and developing the relations between the main categories. A main category is either the subject of the review or directly concerns the specific research questions. It is mainly here that the researcher theorises and tries to develop a single reasoning to explain phenomena.

The researcher should conduct comparative analysis, continually comparing and linking categorisations. Analysis continues until theoretical saturation occurs. The coding process and the origin of each excerpt should be documented.

3.5.2 Stage 4: Audit trail

> *'To manage this large amount of data, the 'excerpts' from the selected papers were typed into tables in Microsoft Word for ease of review. As all excerpts are collected and typed into tables, analysis using open coding begins as I re-read excerpt after excerpt, during which process more concepts start to appear. The aim is to identify a set of categories or a bird's eye view of the findings/ideas in each piece of literature (Wolfswinkel et al., 2011). A separate column is inserted next to the excerpts where codes are recorded. Axial coding is used to identify the interrelations between categories and their subcategories. Selective coding takes place to integrate/refine the categories that are identified. The analytical coding steps are performed in an intertwined fashion, going back and forth between articles, rather than a step-by-step process where open coding was followed by axial and completed using selective.*
>
> *The code list part of these tables (the column 'coding') was printed and reviewed to create tentative categories. Mind mapping software was used with the central category in the middle and sub-codes/categories surrounding it. In this way, possible or preliminary categories began to emerge. These mind maps were then used to elevate these ideas into broader categories from which the narrative for the LR was eventually drawn.*
>
> *The preliminary results of this analysis will guide the selection and analysis of further texts during backwards and forward citation tracking.'*

3.5.3 Stage 4: Comments on its application

Wolfswinkel, Furtmueller and Wilderom (2011) do not detail how excerpts should be organised, only that it should be done in such a way that they can be easily returned to. As instructed, each article was read and highlighted, but this occurred towards the end of the select stage before their formal analysis stage. In addition to describing how the excerpts were managed in 3.5.2, an example is given in Figure 1. The excerpts were read, re-read and coded, i.e., labelled to capture their contents. Memos were produced to pose questions to push analysis forward, help elevate codes into more abstract concepts and compare excerpts. Storing the large number of codes, excerpts, and memos in one document allows information to be compared quickly using the search feature. This process could be significantly shortened with programmes such as NVivo if a researcher had the requisite training. However, reading hard copies, highlighting excerpts, and typing excerpts, though time-consuming, assists with analysis by encouraging repeated reading and familiarity with texts. Mind mapping programmes allow codes/concepts to be dragged around a central category, moved up or down hierarchically, revised, and collapsed easily (Figure 2). These mind maps assisted with axial coding and were used to create narrative memos explaining the ideas that the maps represent (3.5.4).

	Excerpts	Coding	Memos
Murphy, G. (2020)	1. In the past preparedness to lead linked to experience based on seniority. For a minority this view persists.	Linking preparedness with seniority in the past. Expertise-experience duality	1. Seniority. What are principals views on the role of seniority in MLs preparedness for the role? How does this play out in ML appointment? How do we differentiate between seniority i.e. years of service and experience i.e. track record of leadership? Similar issue explored in Bufalino (2017)
	2. A major obstacle for teacher leaders seeking informal learning in their schools can include principal support.	Importance of principal support	2. Factors constraining teachers from experiencing leadership. Do principals understand this responsibility? What forms does principal support take?
	3. Aspiring leaders need a deep understanding of policy and the capacity to perform in competency based interviews	Selection based on familiarity with policy and interview performance	3. What other factors influence selection?
	4. Unsuccessful candidates may feel rejected, these potentially wounding events may make collaboration challenging. These can be a growth opportunity and lead to powerful conversations.	'wounding events' jeopardising collaboration Failure as growth opportunity	4. Challenges surrounding appointment. How do principals manage staff disappointment? Does it affect collaboration/relationships? Open competition is avoided in other studies for the threat is poses (Moshel and Berkovich, 2021)
	5. Disparities between remuneration and a lack of consistency in what the roles entail across schools are perceived to especially deter applicants.	Remuneration deterring applicants Lacking consistency in role expectations	5. Lack of role clarity. Barriers to people seeking ML roles. Are there other barriers to teachers seeking ML roles?
	6. Principals are responsible for building leadership capacity and the preparation of leaders.	Expecting principals to build leadership capacity	6.Principal's role in building leadership capacity. Do principals see this as their role? In what ways to they do this?

Figure 1: Excerpt management sample

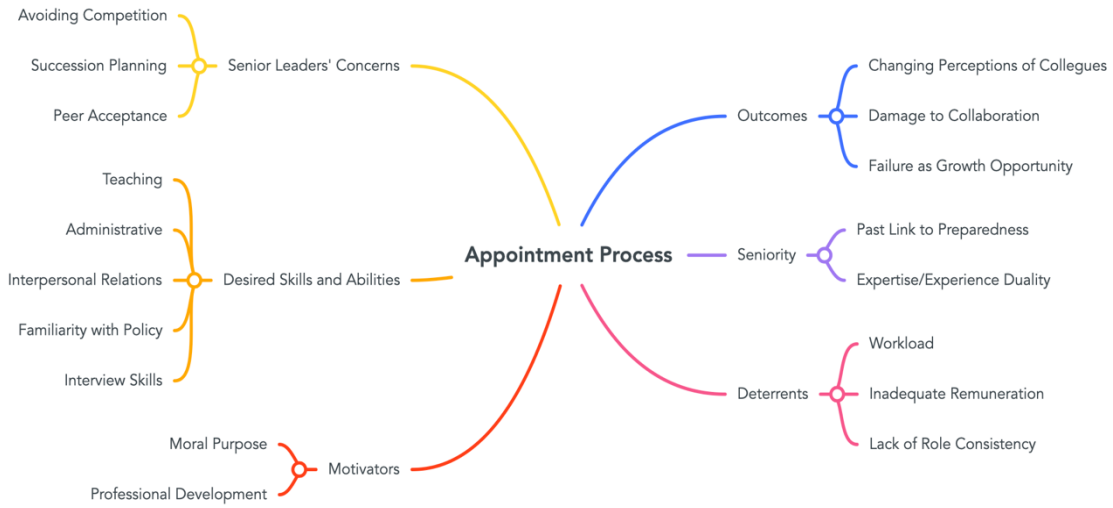

Figure 2: Mind map example

3.5.4 Memo accompanying mind map

'Factors deterring applicants from seeking middle leadership roles include concerns regarding work-life balance, the perceived lack of consistency regarding the role across schools and inadequate remuneration. For some, professional development programs dealing with middle leadership lead to an increased desire for the role. Others are drawn to the role by a moral purpose to improve student outcomes (Elton-Chalcraft, Kendrick and Chapman, 2018; Murphy, 2020). The desirable skills and abilities of a ML vary across studies. Some cite teaching skills as a reason for their appointment, and others report the value of administrative ability (Bryant and Walker, 2022; Carter, 2016; Grootenboer et al., 2021). Familiarity with policy and performance at competency-based interviews were key elsewhere in addition to interpersonal skills (Grootenboer, Edwards-Groves and Rönnerman, 2019; Gurr and Drysdale, 2013; Moshel and Berkovich, 2021; Murphy, 2020). There is also an experience-expertise tension at play. Seniority has been linked to preparedness to lead in some countries, described as selecting for seniority over meritocracy (Bufalino, 2017; Murphy, 2020). When approaching the appointment of middle leaders, senior leaders were concerned with avoiding competition, when possible, succession planning, and selecting leaders easily accepted by staff (Fernandes, 2018; Moshel and Berkovich, 2021). Outcomes of the appointment process is the changing perceptions of colleagues regarding those who are successful and disappointment among unsuccessful staff, which can damage collaborative cultures. However, when managed carefully, these failures can be used as a growth opportunity (Kavanagh, Sexton and Fitzsimons, 2021, Murphy 2020).'Stage 5: present

3.5.5 Stage 5: Summary

The analyse stage results in an overview of accumulated facts but can also lead to explanations for findings. Process notes (logbooks, memos) may rise to prominence when representing and structuring this knowledge. They suggest a structure from Creswell (2008), stating the scope, how/why the topic was approached, and presenting one or more specific review questions. The review should offer insight into the definition of key terms. The discussion should bring surprising items to the fore and explain the benefits of using GT to explain emerging concepts' interconnections.

3.5.6 Stage 5: Comments on its application

Presentation and analysis coalesce in this project. The analysis stage resulted in a series of mind maps and memos explicating the categories and subcategories from the literature. Forward and backwards citation tracking can then supplement or bolster these. In this project, the traditional LR chapter is not completed until after data collection, when a further LR occurs. This pre-LR's purpose is to cause the researcher to become theoretically sensitive and discover gaps, stopping short of theory generation, which should happen later. What follows is a list of the main categories that were uncovered:

- Defining the ML.
- ML Position.
- Expectations of the ML Role.
- Actions and Qualities of Successful MLs.
- The Principal's Role in Relation to Middle Leadership.
- Challenges and Constraints of the ML Role.

Each was the result of the combination of multiple mind maps and memos. From each mind map, a narrative was drawn that attempted to draw all the minor codes or ideas together, first in a descriptive and later in an explanatory fashion. The idea is to ask or explain why these codes and categories are relevant, how they affect others, and what might be missing from possible explanations. The complete explanatory argument of the LR from this case study cannot be expounded within the confines of this paper. However, for completeness, a simplified summary is as follows: A working definition of middle leadership was framed, connecting the seemingly separate sections was the role of the principal concerning the ML. They influence how the role is enacted in their contexts; in a hierarchical system such as a school, the role of the ML can be shaped by the principal, who decides what work to delegate (or distribute) and delineates the role. The principal's role in ML development could influence who seeks out formal positions and which qualities and skills are valued and nurtured. Many of the challenges and constraints can also be related to the principal themselves or mitigated by some action on their part. So, to return to the guiding question, how middle leadership is conceptualised is contained within the working definition, the role expectations and qualities and skills of MLs. It is organised in differing ways across and within jurisdictions, which is heavily influenced by the principal.

For research projects completing the LR in one phase, prior to data collection, the mind maps and memos can be used to construct the LR essay or chapter. Samples inserted as an appendix can demonstrate the process and show rigour. Showing the processes behind this type of work may find increasing importance with the proliferation of AI tools in academia.

4. Conclusion

An advantage of Wolfswinkel, Furtmueller and Wilderom's (2011) method is that it provides distinct stages to guide a researcher through the LR. A disadvantage is that in the latter stages, as the process becomes more complex, it lacks detailed explanations of the practicalities involved. These explanatory details, along with illustrative examples, are needed if the method is to be truly instructive to other researchers. Wolfswinkel, Furtmueller and Wilderom (2011) state that although many reviewers have adopted a similar approach to theirs, none have articulated a guide. This article demonstrates the application of this guide using examples from a real research project to outline how it can be adopted and adapted to serve a researcher's specific purposes. The following tentative advancements were offered, which have theoretical, methodological, and practical implications for future research.

- Adding a focus question to the define stage and utilising existing SLRs to refine search terms and expedite the search process.
- Changing when backward/forward citation tracking is applied to align the method more closely with GT.

- Regarding the latter stages, this paper illustrates how to organise literature and excerpts for ease of comparison and analysis and provides guidance on conducting coding, moving from codes to categories, and presenting categories using real research examples.
- Though the original authors refer to the iterative nature of the model, this paper endeavours to show more clearly how each stage overlaps and informs the next by detailing how one stage often begins before the conclusion of the previous one.
- Wolfswinkel, Furtmueller and Wilderom aim to enable more thorough and transparent reviews; utilising a research audit trail, as demonstrated here, significantly furthers this aim.

Wolfswinkel, Furtmueller, and Wilderom (2011) refer to their article as the groundwork and welcome further analytical refinement to achieve better and more transparent reviews; this article offers some refinement to their method. A limitation of this paper is that it only refers to how one researcher applied this method to one research project in a single field, so the results may be subjective with limited generalisability. Advancement to the work in this paper could come from other researchers in disparate fields taking the information and example offered, applying, and adapting it for their own research and then contributing even more detail and advice on how such reviews can be conducted and presented.

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Teaching Research in an Employability-Focused Undergraduate Curriculum

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Abstract: Employability has emerged as a key part of many universities' strategies, with initiatives to integrate work with employers, and input from professional careers advisers, into course material. This is especially relevant for business and management courses, and particularly at the undergraduate level offers some scope for courses to be differentiated through the nature of the interaction which they provide with employers. Undergraduate students are expected to learn some research techniques and to demonstrate an ability to carry out a measure of independent inquiry as part of their studies. Superficially these research techniques can appear to represent a very different facet of academic study from employability, and be seen as training in purely academic techniques. This paper explores the potential to build connections between research and employability and to harness students' knowledge of research methods when working on practical business issues. This paper is based on experience of developing a series of projects which students in their final year of an undergraduate degree can carry out in partnership with employers. These projects are on a smaller scale than independent projects that students have worked on in the past and allow for more focused aims and more structured supervision than other student research projects. While the original motivation was to increase the structure and certainty for students their final year the approach has evolved to be aligned with the university's policies around practical experience and employer engagement. Therefore the project, while not mandatory for students, is positioned as one of a number of possible ways to gain practical experience, with the expectation that students will take up at least one of these options so that they will graduate with this experience. Setting up these projects has depended on collaboration between academics, careers advisors, and others involved with employer engagement including the team working with alumni. The approach has been implemented across a range of business, management, and finance degrees and has proved effective in creating a connection between independent research and employability.

Keywords: Employer engagement, Curriculum design, Relevance, Independent research, Undergraduates

1. Introduction

Employability is a key element for any vocational degree course. Undergraduate students taking Business and Management degrees are typically very focused on how, at a practical level, their degrees will prepare them for the workplace. Careers guidance is a well-established part of a university's activities but in recent years there has been a trend towards integrating this increasingly closely into courses, typically through career specialists and academic staff working in tandem and recognising that they both have a contribution to make.

Universities have also for many years offered opportunities for students to include internships and other formats for part-time work into their courses. For Business and Management this is particularly relevant because the opportunity to observe and participate in an organisation contributes directly to students' understanding of their discipline. At a practical level graduates entering the workforce with experience from internships or the equivalent typically have an advantage in seeking employment so the opportunity to participate in them is an integral part of universities' preparation of students for their careers.

As an aside Business and Management degrees attract students whose ambitions are to be entrepreneurs and a significant number who have an expectation of going into a family business, so any employability agenda needs to acknowledge needs beyond those relevant to those of students expecting to spend their careers working for an organisation.

One avenue to build up students' employability is to incorporate a connection with employers into the final project that students take as part of an undergraduate degree. Typically the project is framed as an opportunity to carry out independent learning and to address an identifiable problem relevant to the course content. This implies that there is a chance to use research methods to address that business problem and the preparation that students receive before carrying out such projects usually includes an introduction to research methods. So the intersection of the employability agenda and the individual project raises questions about students' needs to learn how to operate as researchers. To what extent do employers and academics have different ideas on what constitutes research? How much is this a difference in the language used and how much is it a difference in the actual meaning of the term? And what is the scope for employers and students to benefit from each others' ideas of research?

This paper is based on experience from ongoing development of the way that final projects function within a UK business school with a successful undergraduate programme (success in this context being represented by an undergraduate intake increasing in numbers by 40% since 2018 and a gold award in the Teaching Excellence Framework for student outcomes). It addresses the challenges and immediate impact of revising the approach to projects in the light of a major impetus to build a curriculum around employability.

2. Background and Selected Literature

Much of the current approach to building experience with employers in higher education can be traced to the evolution of sandwich courses – courses with one or more significant periods spent working for an employer – over the years. Silver (2007) discusses the development of technical education in the period following the second world war, a time when universities were expected to adapt to a changing workforce with an increasing need to develop skills in what at the time was termed 'applied science' and there are repeated references to sandwich courses, typically in the context of institutions which were set up as Colleges of Advanced Technology and which subsequently attained university status in the 1960s. The ability to include a year's placement with an employer within a conventional three-year degree is typically classed as a thick-sandwich course, while a thin-sandwich course would offer more than one shorter period of work. Interestingly Brunel University in London, which was originally a College of Advanced Technology and in its early years as a university adopted a format with multiple periods with an employer as the norm for undergraduate degrees, continues to offer thin-sandwich courses as an option (Brunel University, 2024).

Over the years a greater range of options for students to gain experience has emerged. Shorter internships are widely offered: Kim et al (2012) survey business schools in the USA and establish the benefits of internships and the types of offering that they relate to are mirrored in the UK and other countries. Fowlie and Forder (2018) focus on a UK post-1992 university and also on experience from Germany in documenting the benefits of a placement, typically a whole year, spent in industry. While there are limitations in the data available to carry out detailed analysis of students' career trajectories there are strong indications that taking an internship gives students multiple advantages through their career (Brooks and Youngson, 2016; Jones et al, 2017).

Yorke (2004) discusses student perceptions of employability, noting the importance of work experience and the need or universities and employers to work together to make this effective. He uses the initials USEM, for Understanding, Skilful Practices, Efficacy Beliefs, and Metacognition to unpick what exactly is meant by employability. He identifies students engaging in work experience and identifying then filling gaps in the knowledge that they have gained through formal instruction at university – the U in USEM. He gives examples to represent the S in USEM of instances where the practices followed within an organisation do not necessarily align with those which might be expected on the basis of students' formal learning. For self-efficacy he gives the example of a student who, emboldened by the need to prepare themselves for employment, pursued the careers service very tenaciously to secure some help that they needed for a CV. The M in USEM is discussed in terms of self-knowledge, for example understanding their strengths and weaknesses and how to apply these in the context of their studies.

A typical honours degree in the UK includes a final year project of some sort based around a measure of independent work (Webster et al, 2000). This can take many forms but for a typical Business and Management degree includes an element of research and requires students to undertake some learning of research methods. A perennial challenge which Webster et al discuss is to attain some sort of consistency between different projects which could represent considerable variations in the difficulty that they present to students: there is a tension that needs to be managed between providing a range of individual projects and ensuring consistency and fairness for students. Dingus and Milovic (2018) give an account of client-based projects focused on marketing within a US university to demonstrate the extent to which a project conducted by students in conjunction with an employer can achieve one of the key objectives typically associated with an independent project within a taught degree course: that is to cement the connection between theory and practice in anticipation of a student's transition into the workforce.

3. Creating Employability-Focused Projects

This account covers the move towards employability-focused projects in a UK business school with over 2000 undergraduate students spread across three years of a degree course. In line with the approach taken by most in the sector, students enrolled on a three year course but had the option to extend it to four years by taking either an additional year studying with an overseas partner or by taking a year in business. Combined with the options for students who fell slightly short of the entry requirements for the main degree to take an additional

foundation year at the start, and the fact that the undergraduate degrees formed the largest feeder for the school's specialist masters degrees aimed at candidates coming straight from a first degree, the option was there for students to spend as long as six year studying in the business school.

Many aspects of the school's activity were informed by the interplay of the school's priorities and those of the university as a whole. The business school was highly research-intensive and committed to research-informed teaching. Some, though not all, the teaching of research methods to undergraduate was conducted by active researchers who had typically worked in areas which undergraduates could be expected to find compelling and were able to promote the benefits of research. They worked in tandem with PhD students whose research was often also very interesting to students and who were expected to carry out tutoring to undergraduates as an integral part of their role, and also with more education-focused academics who nevertheless had some familiarity with research and who were well attuned to how best to present it to a group of undergraduates, who might approach something that looked like an obscure academic concept with some scepticism.

The university also had a commitment to employability. This was expressed partly by providing not only the option for students to work in industry for a full placement year to create a thick-sandwich course but also by a number of options for shorter placements and internships. Students who took the placement option covering the whole year were usually extremely satisfied with the experience. Moreover the negative comments that did arise were typically associated with deficiencies in administrative processes either at the university or in the employer where they were placed, and typically did not detract from the learning that the students attained. The process was highly structured with students and their managers contacting tutors at the university on occasion to monitor progress (a requirement for a placement was for the student to have a designated line manager), students keeping a log, and employers committing to ensuring that students did something close to a graduate-level job.

Nevertheless the take-up of placements was low, with fewer than 20% of students choosing to take a year in industry. Despite this being heavily promoted on the basis that students would build up the same amount of work experience and studying experience whether or not they took a placement year, it became apparent that many were deterred by the prospect of taking an additional year and in response to this a number of options around internships, typically up to three months over the summer, and micro-internships, which could be as short as five or six weeks, were developed. These were university initiatives though in general enthusiastically adopted by the business school.

In recent years the university's employability strategy has become more ambitious. One key element of this has been to strengthen the careers-focused material in the first year of an undergraduate degree. Part of this is to provide students with very specific skills and knowledge relevant to seeking a job. In Yorke's classification this would embrace S – skilful practices in context would include knowing how to approach an assessment centre and knowing how to deal with the recruitment practices and industry structures in various sectors. It would also cover a certain amount of M – metacognition would extend to building students' self-awareness in terms of understanding the sort of careers that they would like to pursue. Another part was to generate awareness of the careers specialists within the university, since in student surveys conducted later in their studies a consistent pattern was that a tail of students did not even know that the careers service existed. Student feedback on this was generally positive but tempered with some opposition to this being delivered to first year students, partly because the skilful practices were perceived as more relevant to later stages of their study and partly because of a sense that resources from the careers service could be dedicated to providing more tailored guidance to final year students who were applying for graduate roles.

Additionally the university took a significant step to introduce an aspiration that every undergraduate student should have some experience within an employer as part of their degree. This was built on a recognition that in a typical course students would have a number of different potential approaches to choose from in achieving this. The placements and internships already mentioned offered one possible route, but a range of other activities including a module based around consultancy skills and a module in which students trained as mentors were also designated as suitable employability components.

So where does research and independent scholarship fit in to this approach to employability? Students who took a placement in industry have typically been at an advantage in working on independent final year projects. They are strongly encouraged to draw on their working experience as part of their projects, something that they can do in many cases through having access to a live organisation facing real problems which can in turn inform their choice of subject or the project. Often the organisation where they worked can be a source of primary data which in turn ensures that the project is distinctive (students who want to do a project based purely on

secondary data are typically warned that this is not an easy option because it makes it hard to establish exactly what differentiates their work from a purely descriptive account of the subject). Given that they have already had an opportunity to spend time in a workplace and to apply concepts from their course to that workplace, they have some training in understanding connections between theory and practice which in turn forms the basis of a research mindset.

This provides an opportunity to develop the current final year project into a much more worthwhile experience for many students than it has been before. An outcome of the teaching team's evaluation of the final year project was that it had been a worthwhile exercise, and a good introduction to research skills, for a proportion of students but that a large number of others had not internalised the connections between theory and practice or the understanding of how to carry out research that had been hoped for. Connecting the final year project to a wider range of experiences with employers offers opportunities for more students to develop and investigate research questions based on their previous experience.

The next step towards increasing employability has a direct impact on the final year project. This is to involve employers directly in the project itself. For a strong and ambitious student this could be achieved by the student in effect being embedded within the employer for part of each working week while producing the project, and using their experience while with the employer as primary data for the project. This would result in a project being distinctive, relevant, and authentic. It is valuable but for similar reasons to the placement year attaining only a limited take-up is not something that could be expected to attract more than a minority of students.

The challenge, then, is to create a project structure which offers both employer engagement and research experience and additionally for students cements the idea that research is not purely an obscure academic activity but is applicable to businesses as well. The applied industry project has been introduced on a small scale and the response from students and employers alike has been positive. It depends on a number of students working with one employer and one academic supervisor, sharing their understanding of the context but each having a distinct focus. It was initially introduced for students specialising in finance, partly because a number of employers within the finance sector were interested in participating in the initiative but also because it proved possible for employers to make a certain amount of data available to a group of students and to ask each member of the group to take a different approach to analysing that data with a view to addressing a different problem facing the employer. The supervisor was able to conduct group supervision sessions which provided valuable opportunities for students to exchange ideas and the students were offered training in the use of statistical techniques, principally multiple regression which could be used to construct models of financial data.

Cautiously it appears possible to expand this to more management-focused projects and also to those which are based around qualitative and quantitative approaches alike. For qualitative projects the initial data could be collected through interviews or surveys, and techniques covered in training include coding and thematic analysis. There is an extra level of complexity associated with the collection of primary data and there are ethical issues which need to be approved by both the university and the employer – typically the primary data and the research question can be carefully chosen so that the exercise is unambiguously low-risk and the university's process for approving research ethics recognises this.

It has proved possible to engage a number of employers in these projects despite the teaching team's initial concern that they might be expected to source data and contacts for many more students than the employers could cope with. If anything, it has enhanced the relationship between the business school and employers and built up a certain amount of momentum. Also at the level of research associated with an undergraduate degree the employers' expectations do seem well aligned with the students' abilities.

In terms of Yorke's classification, these projects address U, S, and E. U is undoubtedly present because students learn about research concepts and understand their relevance. S appears because they can develop their own skills in the context of an employer's requirement and they make their understanding applicable outside an academic environment. E is present because they learn to apply these skills effectively in a context where they are working towards a clear aim.

4. Next Steps

The applied industry project is still in its infancy. It requires commitment not only from students and from industry partners but also from academic staff willing to supervise and from professional staff able to provide administrative support. It does depend on students providing work of a reasonable quality and it does carry a reputational risk if students do not act professionally when with industry partners although this risk will decrease as the process becomes more established.

It also forms a key part of the business school's efforts to align with the university's employability strategy and to ensure that the aspiration for every student to gain experience with an employer is reached. The role of the careers service in sourcing the projects and supporting the relationship with employers is crucial and this reflects close collaboration between careers professionals and the academic staff supervising the projects.

By being implemented with both finance-oriented and business-oriented projects it has already proved adaptable to different contexts and it would be worth looking for further opportunities to adapt the overall approach.

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The Challenges of Health Units During Covid19: Qualitative Analysis in the Lens of Dynamic Capacities

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Abstract: In all sectors, whether public or private, the current organizational context is characterized by technological, economic, political, social, and cultural changes, which affect the ongoing relations between countries and companies. In the public sector, the political factor and its political cycles are more present, as well as social and human responsibilities in health allow us to differentiate our study environment from all the others. Currently, during the pandemic phase, according to the need for adaptation and dynamics of the Health Units, this was even more visible. Dynamic capabilities (DCs) need to be renewed to respond to emerging changes in the environment, and organizations must develop their capabilities to sustain good levels of performance. Therefore, CDs play an essential role in the performance of organizations. The main objectives of this study are to study the HC in Health Units during the initial phase of the COVID-19 pandemic, with the objective of developing a mapping of indicators that would allow a more efficient response to the organizational and structural changes of the Health Units, users' needs (whether COVID or non-COVID). This article presents preliminary data from an investigation still ongoing on the topic. As contributions, we highlight how the study helps to identify the relationships between the various capacities, relating the importance of technological capacity, human resources capacity and the special importance given to learning resources (through routine activities).

Key Words: Dynamic capabilities; Health organizations, Qualitative research, COVID-19.

1. Introduction

Strategic Management represents a field of multidisciplinary research that has evolved rapidly with various theories and approaches in recent decades. It was the criticisms of the Theory of Resources and Capabilities that led Teece and Pisano (1994) to present the perspective of DC, becoming one of the most notorious approaches in the field of strategic management, however, still difficult to measure and operationalize today from a practical point of view and with great weakness in terms of theoretical conceptualization. In all sectors, public or private, the current context of organizations is characterized by technological, economic, political, social, and cultural changes, which affect relations between countries and companies.

In the public sector, the political factor and its cycles are present in a higher dimension, as well as social and human responsibility in health, allowing us to differentiate our study environment from all the others. In this environment of constant change, we can consider that all public sector Health Organizations feel, daily, the need to innovate and respond to demand, with increasingly differentiated technology and the need to position themselves in the market, improving the market perspective. in relation to the service provided. The DCs are renewed to respond to changes in the environment, and organizations must assemble capacities to sustain a good performance. In this segment, DCs have an essential role in the performance of organizations.

In this sense, the present study seeks to contribute to a broader understanding of the DC phenomenon in health organizations and to a focus on chief nurses or team leaders, which is a recent area of study that has not yet been explored, during the pandemic phase. The present investigation seeks to study the DC in Public Health organizations during the initial pandemic phase COVID-19, aiming to develop a mapping of indicators that allowed to respond more efficiently to the organizational changes and structures of the Health Units, as well as to the needs of the Users (whether COVID or non-COVID). The paper is structured as follows. After the present introduction, a state-of-the-art DC, after which the methodology adopted in the study will be explained. The results of the DC will then be analyzed in health organizations and to a focus on chief nurses or team leaders

and finally the conclusions, with recommendations of future investigations. This article presents preliminary data from an investigation still ongoing on the topic.

2. Literature Review

Dynamic Capabilities (DC)

The DC concept stems from company growth theory (proposed by Edith Penrose in 1959) that characterizes the set of resources, and their repercussions through the resource-based theory of Wernerfelt (1984), subsequently adjusted by Barney in 1991. A DC represents "the capacity of an organization to create, expand or modify its resource base" (Helfat et al., 2007, p.1). The original proposition of the DC concept came from Teece. According to authors including Teece et al. (1997), DC constitutes the aptitudes and abilities of companies to integrate, build and reconfigure internal and external competences to respond to changes in their surroundings environment swiftly. DC thus reflect the potential of companies to resolve problems systematically, shaped by the aptitude to detect opportunities and threats and take timely decisions to appropriate changes to their respective resource bases (Barreto, 2010).

There are various theories around the DC concept even while Eisenhardt et al. (2010) base their approach on psychological and organizational theories and center their attentions on flexibility and efficiency. According to Barreto (2010), studies should compare the effects of distinctive environmental conditions (different industries or different timeframes) as there is still only scant research explicitly approaching just which types of company are most susceptible to benefitting from DC. More recently, Fernandes et al. (2017), through a bibliometric study with recourse to co-citations, apply cluster analysis and factorial analysis to identify five distinct approaches to DC: digital capabilities, knowledge capabilities, absorption capabilities, strategic capabilities and resources and capacities. However, according to these same authors, the lack of empirical validation has ensured that the concept remains under construction and hence empirical advances shall return a better theoretical understanding of DC. This shortcoming had already been subject to identification back in 1999 when Barreto argued that the DC concept and its fundamental concepts are not appropriately operationalized (Barreto, 2010). Years later, Newbert (2007) proposed that there is only a low level of empirical support for the DC approach while Barreto (2010) considers the operational implementation of DC a task remaining for the future.

According to Zollo and Winter (2002), the DC interrelate with the activities that organizations develop and adapt to their routines in a systematic and relatively predictable fashion. In this way, while the common capacities incorporate the efficiency of daily activities based on the best technology and qualified staff (Winter, 2003), the DC focus on improving organizational efficiency, aligning operational routines to the external environment and the broader sweep of organizational objectives. Thus, Zollo and Winter (2002) describe DC as a stable pattern of learning of a collective activity through which the company generates and systematically modifies its operational routines and seeks to leverage improvements in its levels of efficiency. Learning is a process through which the organization acquires new knowledge and adapts to the internal and external changes of the environment to remain sustainable and developing (Chen, 2005; Pacheco, Ferreira & Simões, 2021, 2023; Costa et. al, 2023).

Graça, Simões & Loureiro, 2019a defends that companies acquire knowledge that may be utilized to resolve identical situations in the future when resolving problems. Thus, this enables analysis of what worked well and poorly in the past, enabling companies to embark on problem resolution processes. This type of choice, between the application of old and new learning and knowledge frequently gets characterized as the choice between exploitation (when there exists the capability to take advantage of the resources and competences existing in the company thereby ensuring their current viability) and exploration (exploring new opportunities in striving for future viability). Due to questions of security and success in the short term, exploitation, almost always receives greater valuation than exploration, considering that the latter represent a greater likelihood of failure and error.

In a rapidly changing environment, knowledge management can reduce response time for implementation and new techniques, and knowledge creation can improve DC, making organizations more prepared and flexible in a dynamic environment (Lesser & Prusak 2001, Sher & Lee, 2004). The absorptive capacity, as defined by Zahra and George (2002) in learning, is defined by Lichtenthaler (2009) as the ability of an organization to use external knowledge through exploratory and routine learning processes. Organizations should pay special attention to knowledge management to improve DC in turbulent environments (Sher & Lee, 2004). Knowledge articulation is a fundamental path for the evolution of the dynamic competitiveness of a company. Teece et al. (1997) also argue that DC should be developed based on the articulation of knowledge and the learning process, and the articulation of knowledge has been increasingly recognized as an important mechanism for DC development in

organizational routines (Teece, 2016, Zollo & Winter, 2002), and can promote competitive capacities that can evolve to unique advantages (Eisenhardt & Martin, 2000).

3. Methodology

Characterization of the Health Sector

The study population consists of 90 Health Organizations, subdivided by Health Center Groups, Public Business Hospitals, and Local Health Units. Firstly, it is important to briefly present the organization and structure of health organizations in Portugal. At the Primary Health Care level, the Health Center Groups constitute a structure comprising of several Health Centers, which include, in addition to the Family Health Units (USFs), a series of other functional structures always based on the classic triad of Primary Health Care professionals: doctors, nurses and administrative staff (Miguel & Brito de Sá, 2010). In terms of Hospital Health Care, the hospital governance models for public hospital care in Portugal have remained identical since the legislation enacted in 1968 (Vaz, 2010; Graça, Graça, Simões & Loureiro, 2019b, Pacheco *et al.,* 2021, 2024). Currently, Hospitals (or Hospital Centers when including more than one health organization), defined as public business entities, hold the following strategic objectives (Vaz, 2010): Greater and better access for citizens; Professional development and merit; and Economic sustainability. Recently, the health paradigm in Portugal has changed following the launching of Local Health Units, which began to expand in 1999 with the implementation of the Local Health Unit in Matosinhos, to improve the interconnection between primary health care and hospital care through the integrated provision and management of all levels of health care (Loureiro et al. 2018; Loureiro et al. 2021a; Loureiro et al. 2021b; Loureiro et al. 2023).

In this investigation, mixed methods will be used to test propositions and hypotheses under study, previously developed and that make up the research model, based on evidence collected from interviews, questionnaire survey and analysis documentary. In this way, the investigation aims to be: i) exploratory, with the function of bringing new knowledge about the profile of CDs existing in the Health Sector; ii) descriptive, because it seeks to discover the frequency with which some of the phenomena, as well as their nature/characteristics; iii) explanatory, because it is intended to contribute, in this way, to a better understanding the behavior/acting and performance of the Health Sector, considering takes into account the variables under study. Thus, based on the mixed approach and the specific objectives of the investigation, one can group research methods essentially within the scope of DC Learning, several interviews will be carried out to consolidate the studies collected and evaluate some future lines of investigation. The third study is a scope work qualitative, and uses the interview survey, applied to logistics managers of organizations public, private and social sectors. In Portugal, Primary Health Care is structured into 47 Health Center Groups while Hospitals, Hospital Centers and Local Health Units are structured into 43 Health Organizations. Of the organizations participating in the study, we received 6 responses from leaders and chief nurses, 2 of whom work in Primary Health Care; 3 in Hospital Care, and 1 in Local Health Units. The data were collected through a semi-structured interview, which presents a structuring guide, and the questions are ordered and related to each other (table 1).

Table 1: Interview Questions

DIMENSION	QUESTIONS
ADAPTATION	1. How has the organization adapted to respond to new diseases? In the last decades, what organizational changes have you seen? Do you consider that these adaptations contributed to face this new reality (covid-19)?
	2. How did the team you lead adapt to the pandemic? What are the main changes?
LEARNING	3. Regarding the 1st wave of Covid 19, what lessons were learned? Are you ready now? If so, how?
NEW FEATURES	4. What resources are now being used that were not used before? Have these new features contributed to improving the organization's performance?
TECHNOLOGY	5. At a technological level, is the organization prepared to face these new challenges? Do they have enough resources? Necessary skills? What adaptations must be made?
HUMAN RESOURCES	6. Are Human Resources recognized for their knowledge, and is it used to improve the services provided? Do you consider that this recognition has been increasing after the arrival of the Pandemic?

To select the organizations under study, the following criteria were considered (Yin, 2014): i) prior knowledge of covid-19 patient; ii) the organizations under study were chosen because of the ease of access to information; iii) collection of information in real context; and iv) integrated organization in sectors in constant change, in which the difficulties of management resources are based on the main strategic axis and where knowledge and experience have an important role. The interviews were conducted from December 10 to 18, 2020 and lasted, on average, between 27-34 minutes. Several internal documents have been analyzed, but for reasons of data restriction, they are not disclosed here. The interviews were carried out with four leaders and chief nurses from Portuguese health organizations in the Lisbon and Tagus Valley regions, in the various areas: Primary Health Care; Hospital Care, and Local Health Units.

4. Analysis and Discussion of Results

Adaptation

Problem solving skills are a process of change through learning (Probst & Buchel, 1996; Silva et al., 2014). Regarding the skills for future tasks needed to solve problems and improve procedures, that is, adaptability, according to the interviewees: *E1: Issues related to hygiene defined as institutions have been adapting to changes*; *E2: training, technology introduction and digitization throughout the various processes*; Already, at the level of the E3*: Increasingly, associations tend to structure themselves with a view to an increasing number of pathologies, specifically chronic ones, which is associated with an aging population and a consequent increase in its morbidity. In the last decades, there has been a structure both in terms of services, in other words, specialties, and in terms of teams, increasingly more qualified and specialized, which fortunately requires a better adaptation to face this harsh reality of the covid-19 , teams are increasingly able to mobilize, although there are more and more specialists (in terms of nursing) these are more dynamic professionals, with better knowledge and differentiating experiences, which undoubtedly enriches care in complex situations such as those we currently live; E4: Hospitals are structures and trained to adapt whenever necessary. Nurses have more and more differentiated training, which allows a timelier adaptation to external changes; E5: More and more the profile of the patient has been changing and multiplying his comorbidities. Currently, hospitals are organized by specialties, but perhaps the current organization is not the best in a pandemic situation. The screening systems or the lack of response from PHCs also do not help hospitals; That way, E6: The example of the response that was given to COVID, shows that the Hospital is prepared for new realities and that it adjusts quickly to needs.*

The necessary adaptation in the Health Units studied, focus not only on the urgent need to introduce technology and digitalization in terms of Health Care, but also on the need for leadership, teamwork, and a lot of training. Organizations are structured with a view to an increasing number of chronic pathologies, which is associated with an aging population and a consequent increase in its morbidity. The teams seek to adapt through in-service training, updating processes and creating routines. The organization of hospitals by specialty may not be beneficial, considering the pandemic, according to some respondents. Another important point in adapting to the pandemic is the reinforcement of stocks and materials, although overall respondents agree that the Health Units are prepared for new challenges. The following table presents a summary of the interviews carried out in the adaptation dimension.

Table 2: Summary of the interviews - adaptation

Dimension	E1	E2	E3	E4	E5	E6
Adaptation	The introduction of Technology and Digitization	A lot of Process Training, Teamwork, Leadership	In-Service Training and Training.	More Differentiated Formation.	Triage Systems or the unresponsiveness of Primary Health care also do not help Hospitals.	Changes in the team structures in training, simplify processes and increase our stocks.

Learning

Information sharing may not only be internal, but also through suppliers and the surrounding environment, and information and learning economies can be achieved, and synergies between organizations are also developed through the sharing of intangible resources (knowledge and information) (Lane & Lubatkin, 1998, Schilke, Hu & Helfat, 2018, Zahra & George, 2002, Simões et al., 2012, Simões et al., 2014). Regarding the first wave of the pandemic, it is important to know what lessons have been learned. Thus, according to the interviewees:

E1: Infrastructures and human resources are included, no matter how much they increase; That way, E2: The need for a stable team allows not only a better adaptation to needs, but also great internal and learning

dynamics. The more routine the activities, the better prepared and the better the performance of the team; E3: Routines are now more internalized, as in everything, learning is continuous, and today we are more prepared than during the first wave, although the capacity for response is today reduced due to the demand that exists. Resources start to run out, although better prepared

Already, at the level of the E4*: It is a daily, constant learning that gets better every day and the best results. The knowledge already acquired is always an advantage in the face of everyday difficulties; E5: The routines already implemented and defined, allow to improve processes, and minimize existing errors. We learn by making mistakes, but we try to minimize the error so that more and more quality attention is provided; E6: Many learnings were made during the first wave. From changing processes, changing routines, needing constant adjustments, often without prior information. We participated several times and were promoters in the pedagogy and dissemination of information for health education. This was one of the main unis of the hospital and it is becoming increasingly important for the hospital to serve as a guiding thread as good health practices and the population. Digital channels can minimize the number of hospitalizations and provide health gains.*

Although infrastructures and human resources are limited, or rather not infinite, to have internal dynamics and learning, a stable team is important to better adapt to the needs of the service. Routines needed to be internalized, as well as trying to minimize error through continuous process improvement. The pedagogical routines, focusing on health education, were also an innovative process that had to be acquired during the first wave of the pandemic. In short, all respondents focus on these main ideas (see following table).

Table 3: Summary of the interviews - learning

DIMENSION	E1	E2	E3	E4	E5	E6
Learning	Infrastructure and Human Resources are Limited.	A stable team allows great internal and learning dynamics. Routine activities.	Routines; Continuous Learning.	Daily Learning, continuous improvement.	Acquired Knowledge; Routines; We learn by making mistakes.	Change in processes, changes in daily routines. Promoters in pedagogy and dissemination of information for health education; innovate. .

New Features

Knowledge creation can improve DC, making organizations more prepared and flexible in a dynamic environment (Lesser & Prusak 2001, Sher & Lee, 2004). It is important to know which new resources to use and how they improve the organization's performance:

E1: The reinforcement in terms of Human Resources allows to bridge the existing gaps and somehow better manage the teams; E2: Human resources there is a higher rate of absence; and Material resources There have been some material shortcomings at the beginning of the pandemic. There is a need to use technology to minimize the distance between the patient and the family; E3: That way, we maintain the same resources as before, although the absenteeism rate has increased, largely due to anxiety-related losses. The team mobilized is today more united, but exhausted, since to compensate for the failures, it is necessary to sometimes assign extra-ordinary shifts; E4: Not only the medical equipment that is public knowledge, but all the human and technological resources available to be able to respond to all requests.

On the contrary E5: There was a need to use more human resources to respond to the pandemic, but also to try to use other types of tools never used: as pedagogical strategies through YouTube; use of radio communication means in a covid environment, etc.; E6: All resources were used. We try to guarantee the minimum in response to needs. To improve performance, there needs to be another type of adaptation and more effective planning.

The various necessary resources involved the reinforcement of human resources, but not only. There was a need to reinforce materials (stocks) and technological tools (to help in the patient-family relationship), but also in the various medical equipment. Still, there was a use of other tools, such as pedagogical strategies through the internet and means of communication, as well as other types of equipment previously not used in the Health Units, which were required to minimize the effects of the necessary leave. The following table presents a summary of the interviews conducted in the new resources dimension.

Table 4: Summary of the interviews - New Features

DIMENSION	E1	E2	E3	E4	E5	E6
New Features	Reinforcement at the level of human resources better manage teams	Greater lack of Human Resources; Material Resources; Technology.	Absenteeism rate has increased.	Medical equipment – Human and Technological resources.	Human resources; Pedagogical strategies; Technology	All resources were used. More effective Planning.

Technology

While common capabilities incorporate the efficiency of daily activities based on the best technology and qualified personnel (Winter, 2003), the DC focuses on improving organizational efficiency, aligning operational routines to the external environment and the broader reach of organizational objectives (Zollo & Winter, 2002). In this way, *will the organization be prepared to face these new challenges? Do they have enough resources? Experience needed? What adaptations should be made?*

E1: There has been a concern about replacing technological equipment, creating conditions to improve information systems; E2: That way, more training and greater integration of the various systems and units is required, for example, in response to COVID. It is necessary to create new conditions to respond to the access of the visitors and in this way, through technologies, contact with the sick family.

Even so, E3: Yes, I believe that there are technological resources adequate to the needs, I believe that more training in this field, updating knowledge would be important. But now it is not a priority. It is necessary to integrate and interconnect the various systems and existing health structures.

E4: There are no technological systems to meet the needs of communicating with families at a distance, making it necessary to use personal mobile phones. It was necessary to digitize areas such as information for the family member or companion, who now cannot enter; E5: We need to improve the relationship between the various services, several hospitals, integrate computer systems in a more advanced and digital way. This will help a lot in the management of pandemic situations like the one we are experiencing.

Even so, E6: Technological resources are always accurate, but also when there is more management and technological capacity there is a need for each team member. Total dependence on technology can also have weaknesses, if there are difficulties in accessing the internet, which can invalidate the whole process.

There has been a concern about replacing technological equipment, creating conditions to improve information systems. However, when increasing the information systems, there is a need for training and qualification of its users. There is also an urgent need for the integration and interconnection of the various existing health systems and structures. As a future suggestion, there is the need to create digital communication capacity between professionals, families, and users. The table below shows the summary of the interviews carried out in the technological dimension.

Table 5: Summary of the interviews - Technology

DIMENSION	E1	E2	E3	E4	E5	E6
Technology	Replacement of technological equipment, creating conditions to improve information systems.	Training to integrate the various systems. Necessary to create new technological conditions for the family-patient.	More Training in this field, updating knowledge.	Integration and Interconnection of the various technological systems; Digitize information to the family member or companion.	Integrate computer systems.	Greater technological management capacity in each team member.

Human Resources

Knowledge management can reduce response times for implementation and new techniques, and knowledge creation can improve DC, making organizations more prepared and flexible in a dynamic environment (Lesser &

Prusak 2001, Sher & Lee, 2004). Regarding the knowledge and recognition of professionals, it has varied after the arrival of the pandemic. According to the interviewees:

E1: In March, at the beginning of the pandemic, there was some recognition from the guardianship and the community; E2: Recognition is something that needs to be valued across the NHS. The better the professionals, the better the services provided. Knowledge is accumulated over the years, from routines, from learning and in my opinion, the more knowledge the greater and better the results achieved; E3: As I mentioned earlier, knowledge is dynamic and continuous, and today we are much better prepared and with much improved levels of knowledge about the situation compared to the beginning of the pandemic. Undoubtedly, this knowledge is the key to the success of the services provided.

Even so, E4: The recognition of nurses is something that is urgent to resolve from a financial point of view, not least because they are the main pillar of the NHS.

E5: More and more professionals do more, but they are more tired, devalued and worn out. It is important to have a more effective talent recruitment and retention policy. There is an urgent need to recruit trained professionals with the capacity to innovate, adapt and respond to all the needs of the NHS; E6: Knowledge is not everything. It is necessary to know how to apply it, but also to be able to absorb information and define learning strategies.

In short, according to the interviewees, it is agreed that to be recognized, knowledge is necessary. However, Health Units need a more effective talent recruitment and retention policy. There is an urgent need to recruit trained professionals, with the capacity to innovate, adapt and respond to all the needs of the Health Units. Knowledge is not everything, as it is necessary to know how to apply it, but also to be able to absorb information and define learning strategies. The following table presents the summary of the interviews carried out in the Human resources dimension.

Table 6: Summary of the interviews - Human Resources

DIMENSION	E1	E2	E3	E4	E5	E6
Human Resources	Recognition of Guardianship and community.	Recognition is something that needs to be valued.	It is the key to the success of the services provided.	The recognition of Nurses is urgent.	More tired, devalued and worn out. More effective talent recruitment and retention policy.	To be able to absorb information and define learning strategies.

Finally, in the following illustration, a theoretical map is made with the main terms taken from the interviews.

Figure 1: Summary of the interviews

As a map of ideas and indicators, we can consider that: i) health technology and equipment, were the most public and critical in the management of the pandemic; ii) learning and training, were especially important in creating knowledge and processes to create better responses to users; iii) the integration of processes and human resources were, from the perspective of the interviewees, an advantage in the management of the pandemic; iv) recognition, and in this case, a motivation influences the response given to the population, in the Health Units studied. More than just "the capability of an organization to create, expand or modify its resource base" (Helfat et al., 2007, p.1), this systematic literature review encountered various studies that consider measuring DC involves the dimensions of knowledge, learning, and technology.

Correspondingly, and in keeping with the systematic review of the DC, we may affirm that the studies published form three large groups around the DC concept: i) Company Performance; ii) Innovation Performance; and iii) Human Resource Management. Measuring the relationship existing between the DC and Company Performance incorporates three such capabilities: i) Marketing, ii) Technologies, and iii) Operations, with this relationship mediated by variables depicting the turbulence/dynamism of the environment surrounding the respective company. In terms of this relationship, Curado & Bontis, 2006 have already demonstrated how these operational capabilities act as mediators in the relationship between DC and performance.

We can corroborate with Teece (1998) when he states that organizations must know the assets to be developed and which ones to abandon, being a decisive element in the success of the organizational equation. So, we can say that DC can help the Health Units' response to the COVID-19 pandemic.

5. Conclusion

Firstly, the present study aimed to study CD in Collective Health organizations during the initial phase of the COVID-19 pandemic, with the objective of developing a mapping of indicators that would allow a more efficient response to the organizational changes and structures of the Units as well as the needs of Users (whether COVID or non-COVID). The instrument developed and applied to nurses of health organizations made it possible to verify that, at the level of strategic management and DCs, these institutions must accompany the development of other areas or sectors, being increasingly important during pandemic phases, consider the importance of CDs to improve the efficiency of Health Units (Graça et al., 2019).

DC are operationalized in health organizations, through three major dimensions i) Marketing, Operations and Technology Capacity; ii) Innovation Capacity and iii) Human Resources Capacity, subdivided into nine areas: i-a) Marketing Capacity; i-b) Capacity of Operations; i-c) Technological Capacity; ii-a) Management; ii-b) Development; ii-c) Transaction; ii-d) Integration; iii-a) Processes and iii-b) Knowledge. In the Marketing dimension, Operations and Technology, it appears that DC are the use and adaptation of technology to needs of the organization, using formal and routine procedures, through continuous learning from past processes and statistical models, studying the changes external to the organization, creating tools to communicate and promote the brand and using internal capabilities. The evidence found in this dimension (Marketing, Operations and Technology) is related to the conclusions obtained in studies by Eisenhardt and Martin (2000), who stated routine as a learning mechanism and CD development, but also the use of errors and small flaws, which allow greater motivation in learning and the process.

Thus, DCs emerge as "the ability of an organization to create, expand or modify its resource base" (Helfat et al., 2007, p.1), but also the ability to learn, gain knowledge and boost a technology organization, always seeking to improve performance levels (Fulk & DeSanctis, 1995; Grant, 1996; Bontis, 2002; Curado & Bontis, 2006; Loureiro et al., 2019a; Loureiro et al., 2019b; Loureiro et al., 2019c).

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Efficiency Indicators as Management Research Tools at Scientific Institutions

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Abstract: The theme of research is topical in the present situation with management research tools at scientific institutions of agriculture, forestry, and veterinary science in Latvia. The object of the research are the management research tools of agriculture, forestry, and veterinary science at scientific institutions. The subject of the research is the comparative analysis of efficiency indicators of the involvement of academic staff and students in the formation of intellectual capital of agriculture, forestry, and veterinary science in Latvia. The objective of the research is to study efficiency indicators of academic staff and students in the formation of intellectual capital of agriculture, forestry, and veterinary science at scientific institutions in Latvia in the period from 2013 to 2018. The following tasks are set in order to reach the objective: to study the management research tools at scientific institutions; to identify the concept of efficiency indicators of the involvement of academic staff and students in the formation of intellectual capital of agriculture, forestry, and veterinary science; to calculate their efficiency indicators; and, to conduct comparative analysis of efficiency indicators of the involvement of academic staff and students in the formation of intellectual capital of agriculture, forestry, and veterinary science at scientific institutions in Latvia. Research methods used in the paper are as follow: content analysis, economic analysis, and economic experiment.

Keywords: Efficiency, Management research, Intellectual Capital, Scientific institutions

1. Introduction

Efficiency indicators are widely used for evaluation of financial and economic activities of commercial enterprises, but minimally for evaluation of the results of the work of scientific institutions. The authors therefore focused on studying efficiency indicators as a tool for managing a scientific institution across different scientific sectors.

Compared to the previous work by Spica et al (2022; 2023) this paper draws a more complete portrait of intellectual capital (IC) of agriculture, forestry, and veterinary science, and the efficiency of its formation at scientific institutions (SIs) in Latvia. Here, the same methodology as in the previous papers has been applied.

Every six years, the Ministry of Education and Science of the Republic of Latvia (MoES) organises an international evaluation of SIs registered in Latvia. The previous International Evaluation of Scientific Institutions' Activity (IESIA) in Latvia covered the period from 2006 to 2011. The last IESIA refers to the period from 2013 to 2018. In order to establish the dynamics of efficiency indicators of academic staff involved in the formation of IC in agriculture, forestry, and veterinary science at scientific institutions at SIs of Latvia (MoES, 2021), the authors used the output data of findings across the set of evaluation of SIs of agriculture, forestry, and veterinary science per period from 2013 to 2018 offered by "Technopolis-group" (TG).

TG developed the above IESIA for the period from 2006 to 2011 and from 2013 to 2018 using similar methodology. Consequently, it provides an opportunity for the authors to calculate the IC indicators in agriculture, forestry, and veterinary science at scientific institutions at SIs of Latvia and to compare their dynamics during the period from 2013 to 2018.

The comparative analysis of efficiency indicators of involvement of academic staff of agriculture, forestry, and veterinary science at SIs of Latvia in the IC formation will let them to know whether and how the business environment affects them. IESIA happened during the economic crisis caused by Covid-19. Data of the comparative analysis will help to develop support programs to increase the efficiency of involvement of the academic staff in the IC formation. In addition, the comparative analysis will reveal whether the score of agriculture, forestry, and veterinary science at SIs of Latvia in the IESIA of TG coincides with the place of SIs of Latvia in the ratings of IC indicators, and whether the overall score of SIs of Latvia also reflects the efficiency of the involvement of the academic staff of SIs of Latvia in the IC formation.

Hypothesis: The overall score of SIs shows the efficiency of the IC formation at SIs of Latvia.

2. Theoretical Background

Business and management research is systematic research to find out things about business and management. Key outcome of management researcher is academic publication (Saunders, Lewis & Thornhill, 2019). The Research of the role of human capital in educational-training process at the university (Contu, 2017) presented different aspects of IC. Spica et al (2017a) state that IC is an economic category, the spiritual value created by the human potential, and it can be accumulated and converted into the value of other capitals. By investigating certain information about the management of education, we can increase the capacity and significance of the country's total economic capital movement. Rondeau et al (2022) remind that peer reviewed publications remain a traditional form of academic productivity. Performance can be measured by several different indicators. Spica et al (2017a; 2017b) have worked out four indicators of the efficiency of the formation of IC in the higher education establishment (HEE): (1)The efficiency of the involvement of academic staff in the formation of IC per year in percentages (AIK); (2)The efficiency of the involvement of academic staff with a Doctorate degree in the formation of IC per year in percentages (DIK); (3)The efficiency of the involvement of students in the formation of IC per year in percentages (SIK); (4)Mutual efficiency of the involvement members of the academic staff with Doctorate degrees and the academic staff without Doctorate degrees in the formation of IC per year in times, (DE).

3. Methodology

In order to calculate the AIK, DIK, SIK, and DE of the HEE Spica et al (2017a; 2017b) have worked out four formulas: (1) AIK = (ZPS : AS) x 100; (2) DIK = (ZPS : DS) x 100; (3) SIK = (ZPS : SS) x 100; (4) DE = DIK : AIK. Where: ZPS represents the number of scientific publications of the HEE per year; AS represents the number of academic staff in full-time jobs per year; DS represents the number of academic staff with Doctorate degrees holding in full-time jobs per year; SS represents the number of students per year.

The authors modified the above mentioned formulas for the purposes of the study. Namely, they calculate IC efficiency indicators for total numbers of full time equivalent (FTE) academic and research personnel (KIK), for FTE academic personnel (AIK), for FTE academic and research personnel (PIK) and for PhDs completed at SIs (SIK). In addition, all the said IC efficiency indicators were calculated for different forms of IC such as total number of self-reported outputs of IC (KS), articles in peer reviewed scientific edited journals and conference proceedings included in WoS or SCOPUS (WS), articles in peer reviewed edited journals, and conference proceedings not included in WoS or SCOPUS (RS), monographs (MS), and Latvian patent (LPS), and European patent and International patents (EPS). The authors calculated mutual efficiency indicators (PE) regarding involvement of the FTE academic and research personnel (PS) and the FTE academic personnel (AS) in the formation of IC in times.

In the present research, the authors used the following data from the IESIA: output data on the number of FTE academic personnel (AS), the number of FTE academic and research personnel (PS), the total number of FTE academic and research personnel (KS), the number of PhDs completed (SS), the number of articles in peer reviewed scientific edited journals and conference proceedings included in WoS or SCOPUS (WS), the number of articles in peer reviewed scientific edited journals and conference proceedings not included in WoS or SCOPUS (RS), the number of monographs (MS), the number of Latvian patents (LPS), and the number of European and International patents (EPS), and total number of self-reported outputs (KS) in period from 2013 to 2018 per SI of agriculture, forestry, and veterinary science in Latvia. Authors revised the above WS, RS, MS, LPS, EPS and KS for the year.

The number of scientific publications and patents are the main results of the IC formation at SIs of agriculture, forestry, and veterinary science. TG analysed 5 SIs of agriculture, forestry, and veterinary science of Latvia. In the IESIA there were collected output data on 5 public SIs of Latvia including 1 Latvian university, and no one private SI of Latvia were collected.

During the period analysed in the IESIA, there were only 5 such SIs in Latvia: Institute of Agricultural Reources and Economics (IARE); Institute of Horticulture (IH); Latvian State Forest Research Institute “Silava” (SILAVA); Institute of Food Safety, Animal Health and Environment “BIOR” (BIOR); Latvia University of Life Sciences and Technologies Agricultural, Forestry and Veterinary Sciences (UL/LT/A).

In this study, one scientific publication or one patent are accepted as one unit of IC. Further, using the modified formulas 1; 2; 3; and 4, were calculated: KIK, AIK, PIK, SIK, PE. Then, according to the results obtained through

the author's calculations, a corresponding rating place was assigned to each SI of Latvia per year and each of the above indicators KIK, AIK, PIK and SIK.

Each place in the rating was then assessed with an appropriate score, where the lowest score is 1 point, while the highest score is 5 points. Thus, the SI, which took first place in - KIK, AIK, PIK and SIK received 5 points in the ranking, took second place - received 4 points, took third place - received 3 points, took fourth place - received 2 points, and took fifth place - received 1 point.

The above mentioned assessment system allows to compare the quantitative efficiency indicators of SIs of agriculture, forestry, and veterinary science in Latvia calculated by the authors to IESIA overall assessment criterion - quality of the SI research performance. The relevant TG Panel was the score of research performance of each SI using a scale where score 5 means an outstanding level of research, score 4 means a very good level of research, score 3 means a good level of research, score 2 means an adequate level of research, and score 1 means a poor level of research (MoES, 2021).

The score assigned to the overall assessment by the relevant TG Panel was based on the assessment of five sub elements A to E, where element A characterises the quality of the research, element B - the impact on the development of the specific field of science, element C - the economic and social impact of the research, element D - the research environment and infrastructure of the institution, element E - the institution development potential. The Panel was provided with scores against each sub-element and the overall score and was also provided with narrative descriptions of their scores, the overall score and the sub-elements (MoES, 2021).

The follow-up authors compared the results of their own estimates of SIs quantitative indicators to the qualitative indicators of the relevant TG Panel and calculated the difference between the indicators and the changes. For this purpose, the authors calculated the average score of indicators for each SI recording the efficiency of the IC formation and compared these scores to scores of the research quality of each SI and overall score developed by the TG Panel.

4. Results

It follows from the IESIA that in Latvia, 5 SIs of agriculture, forestry, and veterinary science have corresponding fields of science in agriculture, forestry, and fisheries, 3 SIs corresponding fields of science in agricultural biotechnology, and, 2 SIs corresponding fields of science in veterinary science. In turn, such corresponding fields of sciences as social and economic geography; animal and dairy science are operated by 1 SI in each field of science.

According to the authors' estimates, from the IESIA data show that the total number of self-reported outputs of SIs of agriculture, forestry, and veterinary science in Latvia is taken in the largest proportion by the WS - 60,28%, which is followed by the RS - 35,73%, the MS - 1,70%, the LPS - 1,91%, the EPS - 0,38%.

To calculate the efficiency of the involvement of academic and research staff in the WS formation, the authors used formulas that were developed and applied already before and are modified now.

$$AIK = (WS : AS) \times 100 \quad (1)$$

$$PIK = (WS : PS) \times 100 \quad (2)$$

$$KIK = (WS : KS) \times 100 \quad (3)$$

$$SIK = (WS : SS) \times 100 \quad (4)$$

$$PE = PIK : AIK \quad (5)$$

These indicators of SIs and their place in the rating of SIs of agriculture, forestry, and veterinary science in Latvia as well as its scores are summarized in Table 1. The table of the SIs indicators, ratings, and score was drawn up by authors. The summarized indicators show that in general, in Table 1, the figure rests in the range from 51% to 547% in respect of the SIs in Latvia. The highest indicator is SIK in the IARE, while the lowest indicators are PIK and KIK in the SILAVA. Comparing the figures collected in Table 1, the authors conclude that the AIK indicator of 191% is for the UL/LT/A, and no one AIK indicator at SIs of agriculture, forestry, and veterinary science of Latvia were collected. The lowest PIK and KIK indicators of 51% are for the SILAVA, the highest PIK indicator of 338% is for the UL/LT/A also the highest KIK indicator of 122% is for the UL/LT/A; the highest SIK indicator of 547% is owned by the IARE while the lowest SIK indicator of 237% is held by the UL/LT/A. The PS of the UL/LT/A is 1,8 times more efficient in the WS formation.

Table 1: The efficiency of the involvement of academic and research staff in the WS formation at SIs of agriculture, forestry, and veterinary sciences in Latvia per year in period from 2013 to 2018

SI	AIK (%)	AIK rating	AIK score	PIK (%)	PIK rating	PIK score	KIK (%)	KIK rating	KIK sco-re	Average of AIK & PIK score	PE in times	SIK (%)	SIK rating	SIK score	Average of AIK & PIK & SIK score
IARE	0	0	0	70	4	2	70	4	2	1,0	0	547	1	5	2,3
IH	0	0	0	80	2	4	80	2	4	2,0	0	354	3	3	2,3
SILAVA	0	0	0	51	5	1	51	5	1	0,5	0	477	2	4	1,7
BIOR	0	0	0	77	3	3	77	3	3	1,5	0	303	4	2	1,7
UL/LT/A	191	1	5	338	1	5	122	1	5	5,0	1,8	237	5	1	3,7
Average	478			96			80				0,2	316			

In Table 1, the authors created the rating and score of the SIs of agriculture, forestry, and veterinary science in Latvia based on the AIK, PIK, KIK, SIK indicators of the efficiency of the academic research personnel and PhDs involvement in the WS formation. According to the AIK indicator, the first and single place, and highest score is taken by the UL/LT/A; according to the PIK and KIK indicators, the first place and highest score is taken also by the UL/LT/A; and according to the SIK indicator the first place and highest score is taken by the IARE.

On the other hand, when comparing the average KIK without SIK, the highest score is obtained by the UL/LT/A, and the comparison of the average KIK with the SIK shows that the highest score goes to the IARE.

The authors compared the SIK indicators of all students of HEE in Latvia to SIK indicators of PhDs students of SIs of agriculture, forestry, and veterinary science in Latvia, and found that SIK indicators of the PhDs students were considerably higher. It follows from the study by Spica et all (2018) that the highest SIK indicators were held by Daugavpils University (1,45% in 2013) and the University of Latvia (1,82% in 2014). Meanwhile, between 2013 and 2018, the highest annual SIK indicator for PhDs students of SIs of agriculture, forestry, and veterinary science in Latvia was held by the IARE and represented 547%.

When analysing the results obtained by SIs in the IC formation in the field of agriculture, forestry, and veterinary science, the same methodology was used as in the fields of social sciences, and humanities and art sciences. Thus, the quantitative results of SIs in these fields can be compared. One of the main criteria for the quantitative evaluation of SIs is the efficiency of the involvement of the SIs staff in the formation of WoS and SCOPUS publications.

The comparison of the results of the three fields of science leads to conclusion that the highest score of the KIK indicator in the field of social sciences is 278% (Spica et al, 2022) while the highest score of the KIK indicator in field of agriculture, forestry, and veterinary science is 122%, and, the highest score of the KIK indicator in field of humanities and art sciences is 53% (Spica et al, 2023). In addition, it should be noted that the highest score of the KIK indicator in the field of humanities and art sciences is a little higher than 51% received by the SILAVA, which is the lowest score in the field of agriculture, forestry, and veterinary science.

A similar trend is observed when comparing the efficiency of the involvement PhD degree holders in the formation of WoS and SCOPUS publications in the three above-referred fields of science. Here, the highest rate of the SIK indicator in social sciences is 667% (Spica et al, 2022) while in agriculture, forestry, and veterinary science the highest rate is 547%, and, the highest rate of the SIK indicator in humanities and art science is 450% (Spica et al, 2023). In turn, the lowest rate of the SIK indicator in the field of agriculture, forestry, and veterinary science is 237%; the lowest rate of the SIK indicator in the field of social sciences is 58% (Spica et al, 2022); the lowest rate of the SIK indicator in the field of humanities and art science is 13% (Spica et al, 2023). This means that the lowest rate in the field of agriculture, forestry, and veterinary science, however, is almost 18 times

higher than the lowest rate in the field of humanities and art science, and, almost 4 times higher than the lowest rate in the field of social science.

In Table 2 authors calculate efficiency of the involvement of academic and research staff in the RS formation, the authors used formulas 6; 7; 8; 9; 10.

AIK = (RS : AS) x 100 (6)

PIK = (RS : PS) x 100 (7)

KIK = (RS : KS) x 100 (8)

SIK = (RS : SS) x 100 (9)

PE = PIK : AIK

Table 2: The efficiency of the involvement of academic and research staff in the RS formation at SIs of agriculture, forestry, and veterinary sciences in Latvia per year in period from 2013 to 2018

SI	AIK (%)	AIK rating	AIK score	PIK (%)	PIK rating	PIK score	KIK (%)	KIK rating	KIK score	Average of AIK & PIK score	PE in times	SIK (%)	SIK rating	SIK score	Average of AIK & PIK & SIK score
IARE	0	0	0	40	2	4	40	2	4	2,0	0	311	1	5	3,0
IH	0	0	0	27	3	3	27	3	3	1,5	0	119	3	3	2,0
SILAVA	0	0	0	12	4	2	12	4	2	1,0	0	108	4	2	1,3
BIOR	0	0	0	5	5	1	5	5	1	0,5	0	20	5	1	0,7
UL/LT/A	200	1	5	354	1	5	128	1	5	5,0	1,8	248	2	4	3,0
Average	283			57			47				0,2	187			

In Table 2, in respect of SIs of agriculture, forestry, and veterinary science in Latvia, the figure rests in the range from 5% to 354%. The highest indicator is the PIK in the UL/LT/A but the lowest indicators are the PIK and the KIK in the BIOR.

The AIK indicator of 200% is for the UL/LT/A, and no one AIK indicator at SIs of agriculture, forestry, and veterinary science of Latvia were collected; the highest PIK indicator of 354% is held by the UL/LT/A, while the lowest PIK indicator of 5% belongs to the BIOR; the highest KIK indicators of 128% is held by the UL/LT/A, while the lowest KIK indicator of 5% is held by the BIOR; the highest SIK indicator of 311% is held by the IARE, while the lowest SIK indicator of 20% belongs to BIOR. The PS of the UL/LT/A is 1,8 times more efficient in the RS formation.

In Table 3 authors calculate efficiency of the involvement of academic and research staff in the formation of MS, the authors used formulas 11; 12; 13; 14; 15.

AIK = (MS : AS) x 100 (11)

PIK = (MS : PS) x 100 (12)

KIK = (MS : KS) x 100 (13)

SIK = (MS : SS) x 100 (14)

PE = PIK : AIK (15)

Table 3: The efficiency of the involvement of academic and research staff in the MS formation at SIs of agriculture, forestry, and veterinary sciences in Latvia per year in period from 2013 to 2018

SI	AIK (%)	AIK rating	AIK score	PIK (%)	PIK rating	PIK score	KIK (%)	KIK rating	KIK score	Average of AIK & PIK score	PE in times	SIK (%)	SIK rating	SIK score	Average of AIK & PIK & SIK score
IARE	0	0	0	3	3	3	3	2	4	1,5	0	25	1	5	2,7
IH	0	0	0	2	4	2	2	4	2	1,0	0	8	4	2	1,3
SILAVA	0	0	0	2	5	1	2	5	1	0,5	0	15	2	4	1,7
BIOR	0	0	0	3	2	4	3	1	5	2,0	0	14	3	3	2,3
UL/LT/A	3	1	5	5	1	5	2	3	3	5,0	1,8	4	5	1	3,7
Average	13			3			2				0,2	9			

In Table 3 the figure rests in the range from 2% to 25% in respect of the SIs in Latvia. The highest indicator is SIK in the IARE, but the lowest indicators are PIK and KIK in the SILAVA.

Table 4: The efficiency of the involvement of academic and research staff in the LPS formation at SIs of agriculture, forestry, and veterinary sciences in Latvia per year in period from 2013 to 2018

SI	AIK (%)	AIK rating	AIK score	PIK (%)	PIK rating	PIK score	KIK (%)	KIK rating	KIK score	Average of AIK & PIK score	PE in times	SIK (%)	SIK rating	SIK score	Average of AIK & PIK & SIK score
IARE	0	0	0	1	5	1	1	5	1	0,5	0	6	4	2	1,0
IH	0	0	0	4	2	4	4	2	4	2,0	0	17	2	4	2,7
SILAVA	0	0	0	2	3	3	2	3	3	1,5	0	18	1	5	2,7
BIOR	0	0	0	1	4	2	1	4	2	1,0	0	5	5	1	1,0
UL/LT/A	7	1	5	12	1	5	5	1	5	5,0	1,8	9	3	3	4,3
Average	15			3			3				0,2	10			

In Table 4 authors calculate efficiency of the involvement of academic personnel and research personnel in the formation of LPS, the authors used formulas 16; 17; 18; 19; 20.

$$AIK = (LPS : AS) \times 100 \quad (16)$$

$$PIK = (LPS : PS) \times 100 \quad (17)$$

$$KIK = (LPS : KS) \times 100 \quad (18)$$

$$SIK = (LPS : SS) \times 100 \quad (19)$$

$$PE = PIK : AIK \quad (20)$$

In Table 4 the figure rests in the range from 1% to 18% in respect of the SIs in Latvia. Comparing the figures collected in Table 4, the authors conclude that the highest AIK, PIK, and KIK score is held by the UL/LT/A, while the lowest PIK and KIK score belongs to the IARE. The comparison of the SIK, shows that the highest SIK score is held by the SILAVA, while the lowest SIK score belongs to the BIOR.

In Table 5 authors calculate efficiency of the involvement of academic personnel and research personnel in the formation of EPS, the authors used formulas 21; 22; 23; 24; 25.

AIK = (EPS : AS) x 100 (21)

PIK = (EPS : PS) x 100 (22)

KIK = (EPS : KS) x 100 (23)

SIK = (EPS : SS) x 100 (24)

PE = PIK : AIK (25)

Table 5: The efficiency of the involvement of academic and research staff in the EPS formation at SIs of agriculture, forestry, and veterinary sciences in Latvia per year in period from 2013 to 2018

SI	AIK (%)	AIK rating	AIK score	PIK (%)	PIK rating	PIK score	KIK (%)	KIK rating	KIK score	Average of AIK & PIK score	PE in times	SIK (%)	SIK rating	SIK score	Average of AIK & PIK & SIK score
IH	0	0	0	3	1	5	3	1	5	2,5	0	15	1	5	3,3
SILAVA	0	0	0	0	2	4	0	2	4	2,0	0	3	2	4	2,7
Average	3			1			0,5				0,2	2			

Of the 5 Latvian SIs in the field of agriculture, forestry, and veterinary sciences, only the IH and the SILAVA have the EPS. In Table 5 the figure rests in the range from 0% to 15% in respect of the SIs in Latvia. In all tables, the average indicators PE are the same, and the average SIK indicators are the highest, while the average KIK indicators.

Table 6: The Comparison of the results of qualitative and quantitative evaluation of Latvian SIs in the field of agriculture, forestry, and veterinary sciences using the IC form for period from 2013 to 2018

SI	Quality score by TG (QTG)	Overall score by TG (OTG)	Total average score of AIK & PIK using IC form (TAAP)	Difference of score (QTG-TAAP)	Difference of score (OTG-TAAP)	Total average score of AIK & PIK & SIK using IC form (TAAPS)	Difference of score (QTG-TAAPS)	Difference of score (OTG-TAAPS)
IARE	2	3	1,5	0,5	1,5	2,7	-0,7	0,3
IH	3	3	2,0	1,0	1,0	2,3	0,7	0,7
SILAVA	4	4	0,5	3,5	3,5	1,7	2,3	2,3
BIOR	4	4	1,0	3,0	3,0	1,0	3,0	3,0
UL/LT/A	3	2	5,0	-2,0	-3,0	2,3	0,7	-0,3

Table 7: The Comparison of the results of qualitative and quantitative evaluation of Latvian SIs in the field of agriculture, forestry, and veterinary sciences using the overall IC for period from 2013 to 2018

SI	Quality score by TG (QTG)	Overall score by TG (OTG)	Total average score of KIK using IC overall (TAKO)	Difference of score (QTG-TAKO)	Difference of score (OTG-TAKO)	Total average score of KIK & SIK using IC overall (TAKOS)	Difference of score (QTG-TAKOS)	Difference of score (OTG-TAKOS)
IARE	2	3	2,2	-0,2	0,8	2,8	-0,8	0,2
IH	3	3	3,6	-0,6	-0,6	3,5	-0,5	-0,5
SILAVA	4	4	2,2	1,8	1,8	3,0	1,0	1,0
BIOR	4	4	2,2	1,8	1,8	1,8	2,2	2,2
UL/LT/A	3	2	3,6	-0,6	-1,6	2,7	0,3	-0,7

5. Conclusions

The study of the authors did not result in confirmation of their hypothesis. When comparing the qualitative ratings of TG group to the quantitative assessments performed by the authors, it can be concluded that they differ from minus 3,0 points to plus 3,5 points in total. The hypothesis is accepted *pro tem* for other branches of SIs of Latvia.

The study shows that the KIK, AIK, PIK, and SIK of SIs of agriculture, forestry, and veterinary sciences in Latvia were lower than the results compiled by the relevant TG Panel except for one to two SIs of agriculture, forestry, and veterinary sciences.

The authors concluded from comparison of the qualitative indicators analysed by the TG Panel with the quantitative efficiency indicators developed by the authors that they differ significantly. Therefore, it is encouraged to supplement the methodology for international evaluation of scientific institutions with efficiency indicators in order to improve the quality of the evaluation.

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Integrating Qualitative Content and Narrative Analysis: A Five-Step Approach

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Abstract: The integration of different analytical approaches allows harnessing their respective benefits. Nonetheless, the integration of varied methods is challenging, primarily due to the scarcity of comprehensive guidelines for such complex analyses. **This paper introduces a five-step approach for combining two distinct research methods: qualitative content analysis and narrative analysis** as a useful tool for researchers working under critical realist paradigm, or those who just wish to use both – categorizing and connecting approaches – in their research analysis. Qualitative content analysis plays a crucial role in categorizing insights from data. However, an exclusive reliance on content analysis might result in the loss of important contextual aspects associated with these insights. Consequently, narrative analysis becomes valuable, as it enables linking diverse elements in the data, such as the subject of study, its context, associated events, and identified categories. The process of combining the qualitative content analysis and narrative analysis method introduced in the current study was formulated during a doctoral research project within a critical realist paradigm, which necessitated a thorough consideration of both the subject matter and its context. In response to the absence of guidelines for combining content and narrative analysis, the author developed and tested a unique process during her research project. Employing the suggested approach of connecting content and narrative analysis can assist researchers, particularly those applying the critical realist paradigm in the process of generating contextually situated yet generalisable results. From a practical standpoint, innovative research methods and more comprehensive insights from academic studies enhance our understanding of various patterns in the business and management landscape.

Keywords: Multimethod approach, Categorising and Connecting methods, Qualitative content analysis, Narrative analysis, Critical realism

1. Introduction

The integration of different methods in qualitative research has been considered beneficial for several reasons. One, and perhaps the main reason, is that people's lives and experiences are multi-dimensional, and applying a single method for data gathering and analysis may restrict researchers from making sense of the worlds in which we live (Mason, 2006; Chamberlain, Cain, Sheridan et al 2011). The multimethod approach is further associated with the ability to “think outside the box”, thereby broadening and enriching the logical foundation of explanations, fostering creativity in the interpretive process, and facilitating a more comprehensive analysis across multiple levels (Mason, 2006). However, despite the acknowledged benefits of integrating various methods —a discussion that has spanned several decades—the persistent challenge reported by researchers involves the absence of systematic guidance for the combination of research and analysis methods (Zhou and Wu, 2020).

The term “multimethod approach” is mainly used to refer to the application of two or more qualitative methods, two or more quantitative methods, or the integration of qualitative and quantitative methods in the same study (Schutz, Chambless, DeCuir, 2004). Pluralism in methods is usually connected with the integration of different ways to gather data or different ways of analysing the data. However, it can also mean involving other people in the data gathering and analysis, moving iteratively between data and theory, or going back and forth between different steps in the research process (Chamberlain et al 2011). The current article discusses the integration of two qualitative analysis methods – qualitative content analysis and narrative analysis and the iterative combination of theory throughout this process.

Chapter 2, "Origins of the Problem," outlines the background that led to the development of the current approach. Chapter 3 provides an overview of the paradigmatic underpinning, critical realism, and introduces the two analysis methods: qualitative content analysis and narrative analysis. The fourth section details the approach for combining these analysis methods, while Chapter 5 discusses the potential challenges in applying this approach. The final chapter summarises the article.

2. Origins of the Problem

The current article is derived from doctoral research conducted within the framework of critical realism, which was selected because it allows for generating contextually situated explanations. The challenge encountered

by the author in her study was the complexity and lack of guidance to achieve the desired outcomes. The critical realism approach itself, despite being open to methodological pluralism (Wynn and Williams, 2012), does not offer clear guidelines for obtaining these results. While a case study, which is associated with the possibility to develop contextual explanations appears to be a logical method for research under the critical realism paradigm, it may not always be the most suitable option, depending on the research question or the data available. Even when the case study approach is applicable, it still leaves many options for selecting the analysis methods.

At a certain point, it became evident that applying only one analysis method would be insufficient. Adding narrative analysis methods to the selected method of qualitative content analysis, to enhance the ability to consider contextual elements in the categorizing process, seemed promising. However, similar to the main challenge associated with multimethod approaches, guidelines for integrating these methods were scarce. Some articles that discussed categorizing and connecting techniques (for example, Maxwell and Miller, 2008) referred to the grounded theory approach as one possible way to combine the two methods. However, since this approach belongs to the constructivist paradigm and was much more inductive in nature than the research at hand, it was not found applicable.

Through experimentation, the author developed her own way of combining both analysis methods. As this proved to be useful and yielded interesting results, it was considered worthwhile to share the developed process with other researchers planning a critical realist study using a qualitative research approach. The process, presented in the current study, can also be useful to those who do not apply the critical realism paradigm but wish to benefit from both analysis streams—those that support categorizing and those that support connecting. Before describing the process of integrating the two analysis methods, a brief overview of critical realism paradigms, along with the benefits and limitations of qualitative content and narrative analysis when used separately, will be provided.

3. Literature Overview

Critical realism serves as a philosophical foundation, often positioned between positivist and constructivist approaches, with the aim of understanding the mechanisms leading to specific events and/or actions (Wynn and Williams, 2012). One of the unique and useful aspects of conducting research under the critical realism paradigm is that the emphasis is not only on discovering the mechanisms leading to certain actions but also on understanding the role of context in the trajectory of events and actions (Danemark 2002; Wynn and Williams, 2012). For example, Y and Z need to be present for X to occur, or event A may be followed by event B in the case of X. This approach is called *contingent causality* (Zachariadis et al 2013) and is particularly beneficial in business research. For instance, in analysing leaders' decisions in specific situations and how these decisions may evolve as circumstances change.

Qualitative Content Analysis (hereafter Q-CA, to distinguish it from Qualitative Comparative Analysis, commonly abbreviated as QCA) is a widely used method in qualitative research. It is defined as "a research method for the subjective interpretation of the content of text data through the systematic classification process of coding and identifying themes or patterns" (Hsieh and Shannon, 2005). The sources of textual data encompass a wide array, including but not limited to interviews, surveys with open-ended questions, focus group discussions, observations, print media, books, email logs, etc. (Kondracki, Wellman, Amundson, 2002). Q-CA can range from inductive to deductive approaches, which can also be combined in the same analysis process. To illustrate the possible applications of Q-CA, Hsieh and Shannon (2005) described three different approaches (for more descriptions of approaches, see also Mayring, 2010, and Scheiner, 2014):

- *Conventional content analysis* – an inductive method where researchers allow the codes and categories to emerge from the data;
- *Directed content analysis* – between the inductive and deductive approaches, where researchers have some preliminary understanding of the possible codes and categories, but these are not fixed and can change during the analysis process;
- *Summative content analysis* – the most deductive content analysis method, where researchers have predetermined codes and are looking for how many times certain words, actions, and experiences are mentioned in the data.

The qualitative content analysis offers several strengths, such as its suitability for analysing retrospective data, its capacity for analysing temporal changes in phenomena, and its adaptability to a diverse array of textual data sources (Kondracki et al 2002). Additionally, Q-CA enables the condensation of a large datasets into

systematic concepts to describe or explain certain phenomena, offering flexibility in its application from inductive to deductive approaches (Elo, Kääriäinen, Kanste et al 2014). Compared to some other analysis methods, numerous guidelines and examples of successful application of Q-CA are available.

However, like any research method, Q-CA has its constraints, including its limited capacity for understanding causality (Kondracki et al 2002). This means that while Q-CA can be useful for explaining relationships between different aspects, it cannot when applied alone, assist in understanding how these relationships came to be (Kondracki et al 2002). Additionally, the use of Q-CA often leads to the decontextualization of data, meaning that the relationships and patterns identified between the codes may not accurately reflect those in a real-life context (Maxwell and Miller, 2008).

Narrative analysis (hereafter NA) can involve using narratives as a source of data or creating narratives based on the data. In the current example, the latter approach was employed, defined as a method where "the researcher organizes and interprets empirical data describing some more or less consistent events, happenings, and actions in a way that they construct one or more narratives to be interpreted and discussed" (Eriksson and Kovalainen, 2011). In simpler terms, the researcher creates narratives (or stories) by combining various "sections" from original stories to explain some phenomena. The rationale for decomposing and recomposing narratives, rather than using the original narratives directly, is that the original narratives may not describe the phenomena as clearly.

It is recommended that researchers applying NA use data that is narrative in nature, such as stories and descriptions, since these would be "richer and thicker," thereby enabling the creation of compelling, easily memorable, and contextually rich results (Eriksson and Kovalainen, 2011). Narrative analysis can be conducted in several ways, with the most common being *thematic*, *structural*, and *performative* narrative analysis (Eriksson and Kovalainen, 2011; Frost, 2011):

- *Thematic* narrative analysis focuses on identifying themes that emerge from the data and organizing them to develop meaningful stories.
- *Structural* narrative analysis examines how the story (narrative) is told, for example, the words used.
- *Performative* narrative analysis concentrates on the contextual aspects that influence the construction of narratives.

One of the strengths associated with NA is the aspect that stories are compelling by their nature, and storytelling enables individuals to better understand themselves and the world around them (Eriksson and Kovalainen, 2011). Additionally, NA has proven useful in identifying key relationships within the data and integrating them by discarding information that is not essential to explain these relationships (Maxwell and Miller, 2008). Contrary to Q-CA, NA not only supports the development of connections between emerging themes but also maintains the relationships between these themes and their real-world context (Maxwell and Miller, 2008). It has also been argued that NA allows researchers to perceive multiple and sometimes contradictory layers of meaning (Frost, 2011).

However, NA has its limitations, such as its ineffectiveness in making comparisons and gaining insights into the similarities and differences between aspects in different contexts (Maxwell and Miller, 2008). Consequently, researchers who have been encouraged to employ coding methods in addition to NA have reported a significant enhancement in their ability to understand the data beyond the contextual frameworks, thereby recognizing other relationships besides those identified through narrative approaches (Maxwell and Miller, 2008).

4. Five-Step Approach for Combining Narrative and Qualitative Content Analysis

The research, upon which the current example is based, sought to understand how organizations can support virtual team members in overcoming challenges related to virtual teamwork. To achieve this, the author aimed to identify the challenges experienced by virtual team members and organizational support mechanisms to assist individuals in navigating these challenges. While some of these questions could have been addressed using either content analysis or narrative analysis alone, to fully comprehend which support mechanisms should be applied and when, neither method was found sufficient on its own.

Thus, the combination of Q-CA and NA was found useful, as it enabled the development of relationships between categories (such as between different challenges) and their contexts (when challenges occurred), as well as relationships between different categories that go beyond the current narrative context (such as the relationship between the organizational support mechanisms and virtual team-related challenges).

Consequently, the author of this article found it to be a useful combination for creating contextually situated explanations within the selected critical realist paradigm.

The author's pursuit of integrating the two analysis methods led to the implementation of five distinct, yet interconnected steps: 1) developing tentative ideas from the data, 2) developing codes, 3) creating narratives, 4) linking codes and narratives, and 5) connecting the data with theory (see **Figure 1** below). The following sections elaborate on how each step was executed and how the outcomes were utilised to meet the research aim. Examples are provided based on the actual research to facilitate a clearer understanding and application of this approach in new research projects. It is important to note that the fifth step, e.g. connecting the findings with the existing theories, was applied throughout the entire analysis process.

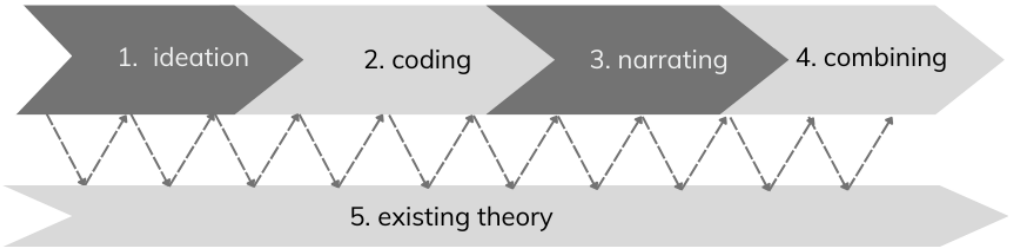

Figure 1: Illustrating the steps when integrating content analysis with narrative analysis

Before continuing with the description of the integration process, it is important to note that perspectives on integrating qualitative methods vary. Approaches range from systematic methods outlining specific sequences of steps to more fluid strategies employing diverse "moves" throughout the research process (Maxwell and Miller, 2008; Chamberlain et al 2011). Although this article presents a more systematic approach to integrating two analysis methods, it serves more as a source of inspiration than a strict guideline. This aligns with the nature of qualitative research, where researchers have greater freedom in design and application (Mason, 2006).

Also, it should be noted, that the current approach to integrating content and narrative analysis was implemented using data from semi-structured interviews. However, the current approach should apply to other types of data, such as structured and unstructured interviews. Additionally, it is assumed that secondary data, including reports, biographies, and various textual data such as emails, blogs, and chat logs, would also be suitable. The primary prerequisite is that the data must be qualitative, and preferably narrative in nature, as this enables the application of both Q-CA and NA.

4.1 Description of the Steps for Combining the two Analysis Methods

The first step involved reading the interview transcripts, which led to tentative ideas about the categories and relationships in the data and selecting which parts to focus on in the text. In this phase, the researcher developed several preliminary theories that emerged from the data and could potentially explain certain phenomena. These preliminary theories were documented to ensure they were not forgotten while moving to the next analysis stages. In this case, after completing the first step, the researcher recognized the need for additional analysis methods (beyond Q-CA), as it was apparent that some potentially interesting results would be "lost" if relying solely on Q-CA. This realization led to the selection of NA as the second method of analysis.

The second step involved categorizing with the aid of Q-CA. Among the three approaches to Q-CA proposed by Hsieh and Shannon (2005), the current example employed directed content analysis, meaning that before beginning the analysis, the researcher already had an idea of the codes that might emerge. However, these predetermined codes evolved during the analysis process. Considering the three analysis methods outlined by Hsieh and Shannon (2005), it is believed that both conventional content analysis and summative content analysis would be suitable for the integration of Q-CA and NA, as the primary goal of all three is to create codes – which can then be connected to the context using the NA approach.

In the current example, the categorising method, provided by Grounded Theory, originally introduced by Glaser and Strauss, 1967, as cited in Charmaz (2006, p. 165), was found applicable. Although the Grounded Theory approach itself is rooted in the constructivist paradigm, its analysis method, which consists of developing first-order categories, second-order categories, and third-order categories, has been found to be helpful to researchers working under other paradigms as well (Gehman, Glaser, Eisenhardt, et al 2018). **Figure**

2 below illustrates how the development of first-, second-, and third-order categories facilitated the identification and categorisation of constraints related to virtual teamwork.

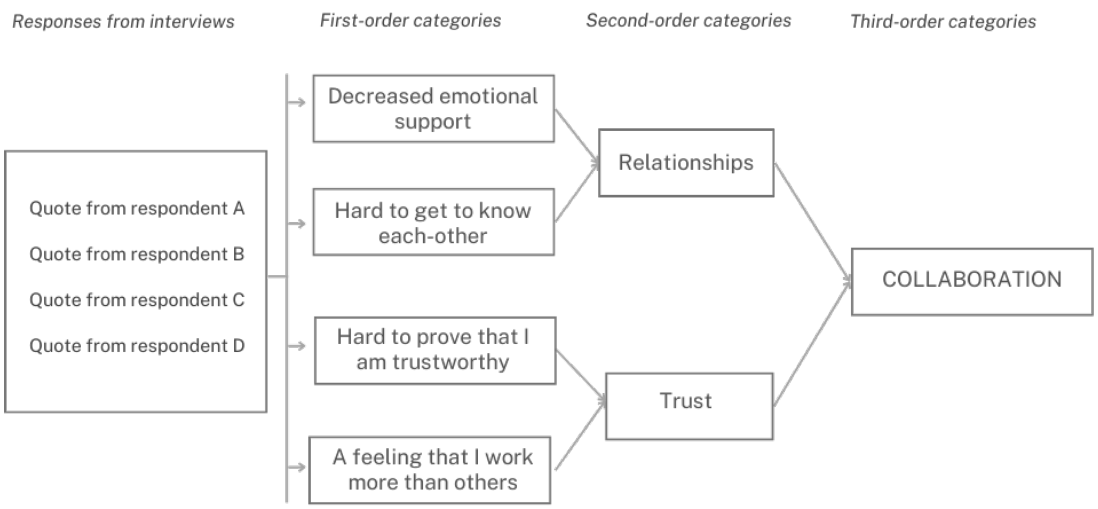

Figure 2: An example of how Q-CA was applied to identify and categorise the challenges associated with virtual teamwork

Applying Q-CA facilitated the identification of main categories and sub-categories of challenges associated with virtual teamwork from the interviewees' responses. In this example, trust and relationships, which are linked to collaboration, are emphasized to illustrate the process and its outcome. However, condensing the data into codes and categories significantly decontextualized the results, leading to the loss of much of the richness found in the original stories. Consequently, it became even clearer that additional analysis methods were necessary to reintroduce some of that context.

The third step involved implementing NA. To develop the narratives, a thematic analysis approach was applied (Eriksson and Kovalainen, 2011; Frost, 2011). During this process, the author reviewed all the transcripts and identified themes based on the continuity found in the text. The themes that emerged from the data facilitated the development of narrative descriptions of three different types of individuals (e.g. personas) who experienced challenges related to virtual teamwork in different ways (see **Figure 3** below). Identifying these narratives facilitated the connection of challenges (identified in the second step) with the external context (e.g., when and how these challenges are experienced), thereby providing a more comprehensive and richer understanding of how individuals experience challenges in virtual teams and which support mechanisms to employ and when. Before describing the integration process, here is a brief description of the three personas developed through the narrative analysis.

The first persona that emerged from the data was the novice virtual team member, who had just started to work in such a way and to whom everything was new and frightening. To support adjusting, they reported the need for moral support from their direct manager and colleagues. The second persona has had approximately 1-5 years of experience with virtual teamwork, and they are usually looking for ways how to improve themselves and therefore eager to learn new collaborative tools and techniques. The second personas are motivated to take part in different trainings. The third type can be illustrated as a person who has had more than five years of experience with virtual teamwork, and who is in the process of evaluating different tools and techniques and letting go of those that are not bringing results. This type was found to benefit most from an opportunity to share experiences with their peers.

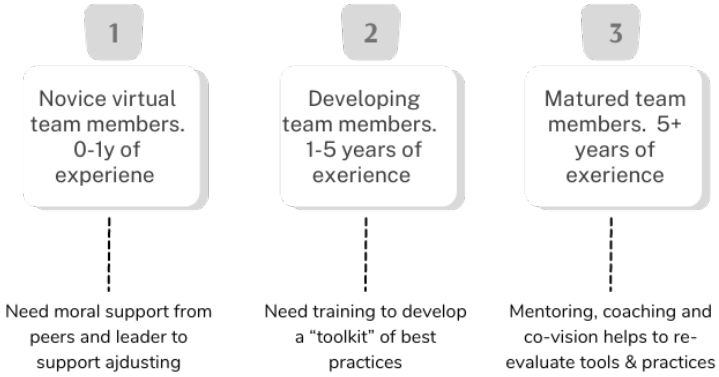

Figure 3: Example of narratives developed regarding virtual team members and their varying needs for support

The fourth step entailed linking the categories and narratives, aiming to establish connections based on the relational logic and causal explanations that emerged from the categories (codes) and the contextual aspects. Through this process, the author identified connections between the determined codes and the developed narratives (see **Figure 4** below). With the help of combining the codes and narratives it was possible to create profiles of three different types of employees based on their experience with virtual teams by highlighting firstly how they experienced the same constraints (for example trust-related issues) differently and identification of different support mechanisms to support them in these various stages. It is worth highlighting that after the development of personas in step three, it was possible to extend the categorized challenges (with the help of data) so that the final outcome provides a richer understanding of how individuals perceive challenges related to virtual teamwork, depending on their prior virtual teamwork proficiency.

categories →		adjusting	developing	maturing
COLLABORATION	Trust:	*How can I make sure my team leader and members know I am working hard?*	*Which tools can I use to see progress of my team members and show mine?*	*How can I contribute to the process of developing trust within our team?*
	Relation-ships:	*How to get to know my team members?*	*Which tools help me stay connected with team members?*	*How to effectively manage task, and relationship related communication?*
	Support mecha-nisms:	*Moral support*	*Training*	*Mentorship, coaching, etc*

narratives ↓

Figure 4: An example of blending codes and narratives that resulted in a deeper understanding of how individual prior experience with virtual teamwork influences the manifestation of challenges and the subsequent need for support

The fifth step was a continuous process taking place in an iteration between the empirical data and the existing theoretical base throughout the entire doctoral research process. The author was reading and increasing her theoretical knowledge base throughout the whole doctoral project, and the continuous iterative process of reading and connecting took place even when the author was not directly working on the doctoral project. The iterative process of going back and forth between data and theory is in line with the critical realist paradigm, where theories are seen as helpful tools in guiding the research process, while also accepting that theories are sometimes impartial or otherwise incomplete views of reality (Baker, 2016).

5. Possible Problems While Integrating the two Analysis Methods

One of the potential risks of integrating Q-CA and NA is the possibility of becoming too focused on following the method(s) rather than analysing the data. This is particularly likely when researchers are novices or when one of the applied methods is new to them. One solution to overcome this challenge is to approach the integration of methods creatively and fluidly as suggested by Maxwell and Miller (2008) and Chamberlain et al (2011). The creative approach to combining different methods is supported by the underlying philosophy in qualitative and critical realist studies, where the interpretations of researchers are considered valuable rather than undermining the trustworthiness of the results (Eriksson and Kovalainen, 2015).

A second challenge, closely related to the first, is that narrative analysis—e.g., creating narratives based on qualitative data—is less known compared to Q-CA. When researchers apply NA for the first time, they often face questions about how to reconstruct the original story told by the interviewee into a story that resonates with the audience. Also, if there is a wide set of qualitative stories, selecting whose story to use in the reconstruction phase can be challenging (McCormack, 2012). The advice for overcoming this issue is to focus on the outcome the researchers aim to achieve by remembering that the purpose of narrative creation is not to produce a definitive truth but to offer one version of it (Eriksson and Kovalainen, 2011). However, if this approach feels uncomfortable, one way to decrease discomfort is to involve the respondents in the narrative creation process (Eriksson and Kovalainen, 2011; McCormack, 2012).

Thirdly, employing any multimethod approach requires more time (Chamberlain, 2011) – which was also true in the current example. However, this extra time brought several benefits. Primarily, it provided an opportunity for reflection on the data, existing theories, methods, and insights emerging from the data. Consequently, it can be said that this approach allowed ideas to mature, thereby enhancing the explanatory power of the results. Therefore, dedicating more time to analysis by integrating content and narrative analysis approaches can be considered valuable not only for the methodological diversity and the benefits derived from their integration but also because the additional time itself facilitates deeper reflection and sense-making.

Finally, adopting new approaches to data analysis can pose challenges to validity and trustworthiness, potentially affecting publishing opportunities. Fortunately, qualitative scholars generally support "transcending boundaries, rather than reinforcing them" (Mason, 2006). Common criteria have been developed to assess trustworthiness and validity in qualitative studies (see, for example, Ryan and Rutty, 2019; Healy and Perry, 2020), emphasizing purposefulness and transparency. This means that the chosen research methods must align with the research purpose, and the research process should be described clearly and transparently. Furthermore, Porter (2007) has suggested that instead of establishing universal criteria for evaluating the validity of qualitative research, the assessment should be left to the readers—that is, research can be considered valid until proven otherwise.

6. Conclusion

The current article described a process of integrating qualitative content analysis (Q-CA) and narrative analysis (NA). This process was developed during a doctoral research project under a critical realist approach. The need to develop an additional process for integrating these two approaches arose from the specific aims of the research project, its paradigmatic foundations, and the absence of suitable guidelines for conducting such a multi-method analysis. The integration of the two methods resulted in a five-step process detailed in this article: 1) developing tentative ideas from the data, 2) developing codes, 3) creating narratives, 4) linking codes and narratives, and 5) connecting the data with theory.

From a theoretical perspective, researchers are encouraged to employ multi-method approaches, as integrating two or more methods has been linked to the ability to generate more innovative and comprehensive theories (Mason, 2006; Chamberlain, Cain, Sheridan, Dupuis, 2011). More specifically, combining a categorizing method (such as Q-CA) with connecting methods (such as NA) enables the development of causal explanations that are contextually meaningful (Maxwell and Miller, 2008). In this example, adding NA to the initially selected Q-CA method allowed for further systematization of the identified categories and the opportunity to extend insights regarding the categories considering the contextual aspects. Meanwhile, the use of Q-CA provided greater generalizability to the results than employing only NA might have allowed.

From the practical side, as our lives become increasingly complex, adding different methods to the same study or combining various studies can significantly enhance our ability to make sense of the world around us. Integrating Q-CA and NA in the same study, for instance, can aid in understanding the broader patterns within certain phenomena, as well as the deeper meanings and narratives behind those themes. This combination can reveal layers that might remain hidden when using a single method alone. In essence, the practical implication of integrating Q-CA and NA is a more nuanced, detailed, and comprehensive explanation of phenomena. This approach not only has the potential to deepen our understanding of complex issues but also aids in making more informed decisions, for example in the fields of business and management.

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Methods for Learning in Tripartite Collaboration: A Study Inspired by Action Research

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Abstract: Both private and public organizations are in need of employees with sustainable health, to be effective and productive. Mobile health applications have now started to be implemented for health promotion for individuals and groups at work. Such applications can motivate participation and engagement for health activities, and support managers in suggesting appropriate activities for the individuals and for the working groups, to promote the health of the employees in the production industry. The aim of this research is to analyze how research activities can be designed in collaboration with industrial companies and a software company to support learning for improved work-related health, in implementing digital applications. Action research is used as an approach to knowledge production within this field of work. This paper sheds light on the underlying mechanisms that make the collaborative endeavor a dynamic and impactful process. The active involvement of researchers, private industrial companies, and the software company is not merely a facilitator for data collection; it is the driving force that propels the research forward, ensuring its relevance, innovation, and real-world impact.

Keywords: Action research, Work-related health, Tripartite collaboration, Digital application, Engagement

1. Introduction

Both private and public organizations are in need of employees with sustainable health, to be effective and productive. Health promotion is generally seen by those who have defined it as involving a diverse set of actions focused on the individual or environment which through increasing control, ultimately leads to improved health or well-being (Rootman et al, 2001). According to the World Health Organization (WHO, 1998) health promotion is the process of enabling people to increase control over, and to improve, their health. Human relations departments and managers in organizations have challenges related to evaluating the employees' work-related health, and to initiating different activities to support the work-related health for their employees (Brynjolfsson et al, 2019). Organizations often repeatedly follow up the employees' well-being in the working environment, but obviously in practice they have difficulties in using those data to improve the employees' psychosocial health and the company's productivity.

Workplace interventions that are implemented to improve the working conditions are expected to achieve substantial reductions in work-related ill health (Dellve and Eriksson, 2019). For this work digital applications can be used for smoother work processes for evaluating the employees' work-related health (Zhang et al, 2021). Mobile health applications have now started to be implemented for health promotion for individuals and groups at work, like for example applications with gamification. Such applications can motivate participation and engagement for health activities, and support managers in suggesting appropriate activities for the individuals and for the working groups, to promote the health of the employees in the production industry. Thus, digital solutions can be used to drive organizational change (Markus, 2004). As such, the opportunities with use of digital applications for evaluating and supporting work-related health factors are far from fully utilized. Furthermore, activities to promote work-related health at the workplace also have the potential to be supported by digital applications. It is important for managers in organizations to get information and an increased understanding about the employees' working situation and their well-being, together with what they need in the context of their competence and learning in relation to the changing requirements at work and to have work-life balance (Nunstedt et al, 2020). Therefore, there is a need to study the implementation process of digital applications to support learning for new and innovative practices in organizations in relation to promote the employees' work-related health. The aim of this research is to analyze how research activities can be designed in collaboration with industrial companies and a software company to support learning for improved work-related health, in implementing digital applications. Action research is used as an approach to knowledge production within this field of work.

2. Research Method

In this study the researchers are collaborating with three private industrial companies, together with a software company. Methods on how to collaborate are emphasized in this qualitative research, as a way for research to synergistically inform digital application development, practice and research (Avison, et al, 1999; Nicolini and Monteiro, 2017). As such, this research is conducted inspired by action research. Several dialogue meetings were held, and quantitative data were collected by questionnaires. Thus, both qualitative and quantitative data are used to develop work processes in collaboration.

The research has been conducted since August 2021, thus been ongoing for two and a half years. The aim of this action research project has been to promote the work-related health of the employees at the three private industrial companies. The software company is a small company developing a digital application to support human relations (HR) departments and managers in organizations to promote the work-related health of their employees.

As preparation, the researchers have had a few reconciliations with the CEO and the PCO at the software company each week and discussed several things during a period before the study was started. For example, questions in the survey, results of the surveys, work processes when managers and employees use the digital application, actions that could be built in the digital application, and how the company responds to ideas and opinions about changes and improvements of the digital application.

Several meetings and dialogues were held with HR partners and managers at the industrial companies, on average once a month (Grundén et al, 2020). Notes were taken during all the meetings and dialogues. Interviews were held with employees at the industrial companies, on what they think of using digital applications to increase their work-related health. Ten, eight and seven semi-structured interviews respectively were held with employees from the different industrial companies in the first round, and 24, 32 and 15 respectively in the second round (Gioia et al, 2012; Yin, 2009). It was each company that selected the employees that were interviewed. The interviewees were informed of the aim of the study and gave their consent to be participants in the interviews.

The interviews were analysed by thematic analysis (Brown and Clarke, 2006). Then reports were written concerning each of the industrial companies. The reports were then distributed to the HR partners in each of the included industrial companies, and to the software company. The content of the reports was also discussed with each of the HR partners and the management group together with the CEO of the software company.

The results of the employee surveys were analyzed by the software company and the researchers and were reported to the industrial companies. Then suitable actions were discussed that could contribute to increased work-related health of the employees at the industrial companies.

3. Results

The aim of this research is to analyze how research activities can be designed in collaboration with industrial companies and a software company to support learning for improved work-related health, in implementing digital applications.

The results show why and how participation of the three actor groups; researchers, private industrial companies, and the software company, is important. The various phases of research, forming the constellation of companies, crafting research design and research questions, selecting methods for qualitative and quantitative data collection, sampling, analyses in different phases and figuring out how to proceed to produce knowledge in collaboration, depending on the actors' different interests.

3.1 Forming the Collaboration

Issues in work-related health are on the agenda for the industrial companies in this study. Traditionally, employee surveys have been conducted on a yearly basis at these companies. However, the companies perceive that a digital application could be a tool to support the work-related health issues to a greater extent.

The software company is a new venture company, started in 2017, developing a digital application to support work-related health issues in companies. The idea behind this digital application is based on the founder and his previous work at an insurance company. Due to marketing activities the company has provided the digital application to the industrial companies. Thus, resulting in a business relationship.

Researchers at the university have collaborated with the software company in previous research projects, and they have established a positive collaborative relation. For the researchers, an opportunity arose to seek external funds for a research project, with the aim of collaborating with industrial partners. Based on the relation between the researchers and the software company, an idea for this project was initiated, and the work in forming an application was started in late 2020. The industrial companies were asked to collaborate, and they accepted. The application resulted in the project being granted funds for the researchers' work. In return, all companies were also required to contribute in-kind.

3.2 Analysis of the Current Situation

The software company already has established its relationships with the software company and a few of the researchers respectively. Therefore, the project started with meetings where researchers had opportunities to learn more about each of the industrial companies, to get an understanding of the current situation. The researchers also got the opportunity to have a few workshops to get familiar with the digital application.

The first meetings and dialogues were aimed at supporting the HR partners and managers with advice in their daily work on planning and following-up employee surveys. It was discussed how to use the digital application to increase work-related health, and to implement actions to enhance issues that were assessed below average in the surveys.

Meetings were then held where the researchers got more detailed information from the industrial companies. Employees from the software company were also invited to these meetings. In the meetings the researchers also got information on the companies' challenges related to their work for sustainable work-related health for their employees. From this information the researchers then prepared a proposal for further collaborative work, for each of the companies. Meetings were held with the management group to discuss the proposal with each company, where they had the opportunity to reflect and give feedback. During those meetings a plan for further collaboration then was created. In the plan it was also included how the digital application should be used during the study. Moreover, meetings were also specifically held between the software company and the researchers on how the digital application could be used during the study, so the functionality of the digital application could be adapted to the activities planned.

3.3 Pilot Studies at Each Industrial Company

Based on the agreement on the plan for further collaboration, the work was continued at each of the three companies. First, interviews with managers and employees were held. The use of the digital application and the interest in using it for promoting work-related health was of interest in the first round of interviews. The second interview guide was based on a framework of critical success factors (CSFs). In each round, the interviews were analyzed, and the results of the analysis were presented for the management group at each company, where also employees from the software company attended. Each company had the opportunity to ask questions at the meetings.

From the analysis a focus group interview guide was formulated, to be used during focus group interviews at the industrial companies. Between 8 and 10 employees were included in each focus group. Moreover, specific activities were arranged, to be conducted by the employees in between the different rounds of focus group interviews. An example of such an activity is that each employee could, before going to work, reflect on what positive expectations there are for the working day. The activities were integrated in the digital application, so the employees could use the application to document their activities. During the period of three to four focus group interviews, one each month, an employee survey was distributed to the employees included in the focus groups.

4. Discussion

The collaboration ensures a synergistic blend of expertise. This interdisciplinary collaboration enhances the research by bridging gaps between traditional organizational practices and cutting-edge technological solutions. The mutual exchange of knowledge fosters an environment where theoretical concepts are tested against practical feasibility, leading to the generation of insights that are both innovative and actionable.

Design of tripartite research activities in implementing digital applications reveals the following aspects that promote the different actor groups in accordance with their different purposes.

4.1 Unveiling Collaborative Synergy: A Dynamic Intersection of Practice and Research

In a continued exploration of collaborative synergy, the results illuminate not only the integration of action research principles but also the emergent insights from the collaboration with private industrial companies and the software company. Beyond being a facilitator of data collection, the collaborative approach reshapes the very nature of research as a co-creative process. The dialogue meetings, meticulously designed for knowledge exchange, lead to synergies that go beyond the study's immediate scope. The dynamic interplay between researchers and industry partners becomes a nexus where theoretical insights meet real-world applications, fostering innovation and influencing the trajectory of the ongoing research. This collaborative synergy emerges as a catalyst for transformative endeavors, exemplifying how the fusion of theory and practice can yield novel solutions.

4.2 Beyond Time: Unravelling the Threads of Ongoing Engagement

The temporal evolution of the research process reveals not only the outcomes but the iterative nature of collaboration. The weekly reconciliations, rather than being routine, become strategic sessions where outcomes from surveys and insights into digital application integration are woven into an evolving narrative. The commitment to ongoing engagement is not solely driven by data outcomes but is deeply rooted in a shared commitment to organizational well-being. The results emphasize the importance of sustained, adaptive collaboration over time, demonstrating how ongoing engagement transcends the conventional boundaries of a research project and evolves into a dynamic partnership.

4.3 Multi-Modal Data Narratives

The research uncovers rich insights from the multi-modal approach employed. Employee questionnaires, as a quantitative tool, reveal not only statistical trends but also nuanced sentiments. Semi-structured interviews, guided by thematic analysis, uncover qualitative narratives that add depth to quantitative findings. The deliberate inclusion of employees in the interview process proves instrumental in capturing nuanced perspectives, transforming the interviews into collaborative sense-making sessions. The reports, distributed and discussed collaboratively, become iterative artifacts that embody the continuous evolution of understanding. This approach highlights not only the richness of the data but the transformative potential of collaborative sense-making.

4.4 Learning in the Collaborative Crucible: Orchestrating Actor Groups' Harmonious Participation

The collaborative crucible, as a metaphor for the research process, underscores that the orchestration of actor groups goes beyond the static delineation of roles. The results reveal that collaborative learning is not only about sharing insights but actively shaping the research trajectory. The collaborative constellation becomes a dynamic space where research design, methodology, and analysis are iteratively co-created. The emphasis on diverse interests is not merely a recognition but a deliberate strategy for fostering innovation. This section emphasizes that the collaborative process itself is a result, showcasing the profound impact of collaborative research activities in producing not only insights but also a sustainable and adaptive learning process that contributes to the ongoing improvement of work-related health and organizational practices.

These new insights provide a deeper understanding of how collaboration and ongoing engagement are not just means to an end but integral components that shape the very nature and outcomes of the research endeavour.

4.5 The Significance of Tripartite Participation

The active participation of the three actor groups – researchers, private industrial companies, and the software company – is pivotal for several reasons. Firstly, it brings diverse perspectives to the table, enriching the research process with a comprehensive understanding of both theoretical and practical dimensions.

Work-related health is a multifaceted issue influenced by organizational culture, managerial practices, and technological interventions. This holistic approach not only broadens the scope of the research but also ensures that the proposed solutions are comprehensive and address the intricacies of work-related health from multiple angles. Moreover, collaborative engagement is not a one-time event but a continuous process. Regular dialogues, as evidenced by weekly reconciliations and monthly meetings, foster a culture of open communication and mutual learning. The ongoing interaction allows for real-time adjustments, iterative improvements, and dynamic adaptations to emerging challenges. This iterative nature of collaboration ensures that the research remains responsive to the evolving needs and dynamics of the participating entities.

5. Conclusions

The findings explore how relationships and collaboration are developed, how the resources from both academia, private industrial companies and a software company with employees are combined, and how the activities are performed, as well as the outcomes of the processes. The study shows that all the actors' commitment to participation in the work is important. This includes reflection on values, power, and the democratic production of knowledge. This contributes to the practical implications for organizations to collaborate and create sustainable relationships.

Tripartite participation is crucial for its ability to bring diverse perspectives, blend interdisciplinary expertise, adopt a holistic problem-solving approach, and foster an ongoing, adaptive collaboration. This paper sheds light on the underlying mechanisms that make the collaborative endeavor a dynamic and impactful process. The active involvement of researchers, private industrial companies, and the software company is not merely a facilitator for data collection; it is the driving force that propels the research forward, ensuring its relevance, innovation, and real-world impact. The theoretical implications are emphasizing the active involvement of participants from the tripartite organizations as a method to enhance learning for innovation.

As this study is based on only one case this could be considered as a limitation. Although, the method used in this case proved its usefulness for the participants, that would not allow for applying the method successfully in other contexts. Future research should focus on more case studies, also in other contexts.

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Soliloquy Methodology: A Cradle for Credible, Practice-Based Research

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Abstract: Practice-based research is becoming increasingly popular with scholars of creative arts, writing and even business studies. The author is currently using practice-based research in conjunction with her original, Soliloquy Methodology, to address the research question: *How does my application of Soliloquy Methodology produce insight into the phenomenon of judgement?* The practice component, which aligns with a method in the framework of Soliloquy, involves writing, directing and staging a full play about human judgement. Through the practice, new insights into the research question have been gleaned. Debate is now emerging about the validity of practice-based approaches – is it academic inquiry or is it just art? This paper will argue that whereas artists do not need to be able to explain their work (as the work speaks for itself), academic researchers using arts-based methods do. The very nature of academic inquiry requires a solidly aligned methodology to service the research question, along with clearly articulated research outcomes. This paper will look at the academy's recent attempts to find suitable frameworks for practice-based research and then contrast these with the author's alternative and original methodology, Soliloquy Methodology. It will argue the latter both compliments the creative nature of the practice and validates the need for academic structure and explanation. Soliloquy Methodology has been developed over two decades as an adaptation of Husserl's philosophical, pure phenomenology. The author will describe her current, practice-based research that uses creativity - specifically play writing and performance - as a research method. It will demonstrate how this method cradles comfortably in the theoretical framework of Soliloquy Methodology. There is potential for different and new knowledge to be accessed through arts practice. Answers come initially in abstract forms, which must then be interpreted and articulated by the researcher. This paper will emphasise the need for investigators to be vigilant about rigor in their research. It will demonstrate how this is being achieved with reference to the author's current, theatre-inspired inquiry into judgement. Furthermore, it will detail the research framework of Soliloquy Methodology for possible use in future arts-practice-based projects.

Keywords: Practice-based research, Soliloquy Methodology, Arts-based methods, Phenomenology

1. Introduction

I have embarked on a second PhD. I don't need this for my career, but it greatly supports the development of my work in research methodology. The new PhD builds upon the methodology I established over the past two decades, in that it adds an explicit, practice-based research component to the framework. I am writing and producing a play, which will serve as an essential method to contribute to the overarching methodology of Soliloquy. Having been accepted now as a PhD student in the discipline of Creative Arts (my previous PhD is in Education), I have access to expert guidance by performing arts supervisors who will help me to execute the play I write. Additionally, I have full access to professional theatre facilities at the Conservatorium in Mackay, Australia, and I can work with the trained musical theatre students at the university. Had I not associated myself with CQUniversity, I would not be able to facilitate this kind of research.

I am increasingly mindful that a PhD using practice-based research should be scrutinised on several levels. Some artists may just want to do art and hope to also pick up a degree along the way. I argue that this is inappropriate, as the purposes of art and research differ. However, I contend that art may serve as a method within the research design. Manghani (2021) agrees:

> …. *One of the common mistakes of the PhD application is the outlining of a pre-formed 'project'. Sometimes, projects simply are projects, which can be pursued equally well (and often more satisfactorily) outside of a PhD. Sometimes projects are useful vehicles or containers within which to pursue the practice of your PhD, but in this case they need to be starting points, not endpoints. In short, the difference is between a 'project' (which practically speaking can be executed) and a 'research project' (which will have specific parameters, but its final shape is not known) (Manghani, 2021)***.**

When I embarked on my research question about the nature of judgement, I did not know what I would find. I knew I wanted to write a play, but it was not pre-planned to any extent. I followed my tacit (Csikszentmihali, 1997) inclination to read into mythology – Greek, Mesopotamian, Viking and Egyptian. The information gave me ideas for setting the play. Mostly, the breakthroughs in thought came through the voices of the characters as they dictated to me their lines. I know that may sound strange, but it is not uncommon for writers to feel as though characters are speaking through them (Flood, 2020). I suspect that when this happens, I am accessing

my creative unconscious. This phenomenon aligns with the methodology of Soliloquy. One of the steps is to embark on a period of quiet waiting for information to be given – the Epoche. This is followed by a breakthrough to conscious awareness of what it all means – the Epiphany. The play writing ushered me through these essential methods.

I contend that the theatre art in my practice-based PhD served as vehicle to take me to the research outcomes about judgement. The writing has a clear place in the research framework. It completes the 'Epoche' method in the overall design of Soliloquy Methodology, which is detailed below. In the past I have used this established the methodology (Vallack, 2021) to reach outcomes, but this new research is an attempt to analyse *how* it works rather than (as was previously done) only *what* outcomes are produced. As I draw near to the completion of this PhD, I see that my research question – *How does Soliloquy Methodology produce insight into the phenomenon of judgement?* – has been clarified through the practice of play writing. I argue that creative writing and playmaking engages the unconscious mind, which according to Milton Erickson, is much smarter than even our intelligent, conscious minds. He said, "Trust your unconscious; it knows more than you do."(Erikson, 1979).

I will firstly show the framework of Soliloquy Methodology so that the place for practice-based research is evident. It cradles in the Epoche method. I will then explain the ways in which the focus for this specific research, the phenomenon of judgement, was clarified through Soliloquy, and through this application of practice-based research.

2. Soliloquy Methodology as a Framework for Arts-Practice-Based Research

Soliloquy Methodology is a research approach developed from the pure, transcendental phenomenology of Edmund Husserl. It takes the philosophical foundations of phenomenology, which Husserl developed one hundred years ago, and sets out methods or steps through which it can be applied to research. I have argued previously (Vallack, 2014; Vallack, 2016) that phenomenology has been misunderstood and maligned by followers of Heidegger and the existential school of thought throughout the twentieth century. It is evident that the propaganda espoused by this movement has misrepresented phenomenology. The 'new'(Crotty, 1996) approach appealed so well to 20th century scholars, who in their pursuit of qualitative forms of inquiry seemed to have avoided reading the primary sources. The secondary sources compounded the misunderstandings until Husserl's phenomenology became distorted and unrecognisable. The confusion caused by the misreading of Husserl has seen students avoid using phenomenology, believing it to be too difficult. It is more than difficult – it is non-sensical, and nothing like the original phenomenology of Edmund Husserl. Over the past twenty years of inquiry, I have found the many 'new' versions of phenomenology were inconsistent and confusing. The problem is that the entire theoretical framework is different to that which holds Husserl's phenomenology. I have attempted to clarify the epistemological differences in the following table.

Table 1: The epistemological differences between Soliloquy Methodology and Existential Phenomenology

Husserl's phenomenology as applied through Soliloquy Methodology

Theoretical Framework	Soliloquy Methodology based on Husserl's original phenomenology	'New' (Crotty's term) Phenomenology as manipulated by existential interpreters
Epistemology	Objectivism	Constructionism
Theoretical Perspective	Transcendental Phenomenology	Interpretive research
Methodology	Soliloquy Methodology	Interview-based data collection and theme analysis
Methods	EXPERIENCE – The researcher works only from hir own experience. EPOCHE – A period of altered consciousness, wherein the unconscious mind controls the direction of the inquiry. This may be though dream, meditation or creative, practice-based research for example. EPIPHANY – The unconscious presents an insight as (perhaps cryptic) an image, myth or metaphor, for example. This will need to be interpreted by the conscious mind in the next step. EXPLICATION – The conscious mind makes sense of the information so far and applies it to the research question.	Methods vary, but generally include interviewing a number of coresearchers with an interest in the topic and drawing themes from the responses. (Note: Husserl insisted that phenomenology was a process done only by the researcher on hir personal experience. Only then, he argues, can the outcome elevate from being the most subjective to having an application for the most intersubjective or universal.

Theoretical Framework	Soliloquy Methodology based on Husserl's original phenomenology	'New' (Crotty's term) Phenomenology as manipulated by existential interpreters
	EXPLANATION – The researcher explains the outcomes presented through the Soliloquy process.	It is this point that 20th century positivists could not accommodate.)

Pursuing phenomenology as a postgraduate student last century, I became confounded by the contradictions throughout the literature. Finally, I came across a small group of philosophers who saw through the issues and helped me to clarify an understanding of phenomenology. In 1999, when the misconstrued views were becoming commonplace in Australia, Professor Michael Crotty presented a Keynote address on 'Phenomenology' at the Conference for Qualitative Research. He distinguished between Husserl's original 'transcendental' concept and what he called 'new' phenomenology (Crotty 1996/1998). When I asked him about it later, he did me a great service by signposting the direction for my future research. He identified that I was doing 'transcendental phenomenology' and mused that not many had followed Husserl down that path. With a clear direction, I could then go forth into the philosophy of Husserl. At first, I found the philosophy difficult to read, but gradually, with the help of my philosophical dictionaries, I began to get an inkling for it. It resonated with my postpositivist and intuitive inclinations and helped me to articulate what later became Soliloquy Methodology.

Reading the works of philosophers who understood the transcendental concepts better that I, helped to confirm my grasp of phenomenology. I learned from Hopkins (Hopkins, 1999) that Heidegger, a former student of Husserl's, had taken the terminology of the master and distorted the meanings to create an approach which amounted to little more that basic interview-based inquiry. He did this as he chose to limit his vision to existential, science-based thinking of the twentieth century. Ironically, his distorted interpretation appealed to most scholars in the twentieth century, who also could not think beyond empirical inquiry (Sheldrake, 2013).

Some years later, Soliloquy Methodology emerged as an application for Husserl's transcendental phenomenology. Husserl never set out an explicit approach for doing phenomenology, but he did set down guidelines. These included the need for researchers doing phenomenology to only start from personal experience of the given phenomenon. One must start with subjective experience, which when reduced, will reveal essences that relate to humanity generally. He quoted St Augustine who said, "Do not wish to go out; go back into yourself. Truth dwells in the inner man"(Husserl, 1977). Focus on the personal experience will eventually present the researcher with profound, 'intersubjective' outcomes to the phenomenological research. Through the steps that emerged to form Soliloquy Methodology, I have found the research question is answered in the form of archetypes and metaphor, which the researcher must then interpret. So, what is an archetype? Neville points out there have been slightly different understandings, yet the gist of archetype is held in his definition:

> *For Plato, archetypes were ideas or forms of natural objects held to have been present in the divine mind prior to creation. For St Augustine they were 'principal ideas' which are themselves not formed, but contained in the divine understanding. In the Buddhist-Hindu systems, they are the first forms of manifestation that emerge from Void Spirit in the course of creation. Kant and Schopenhauer were more immediate precursors of Jung in dealing with this idea. For Jung, archetypes are typical and universal 'modes of apprehension' which appear as images charged with great meaning and power, images which exert a great influence on our individual and collective behaviour. (Neville, 2005)*

Transcendental Phenomenology uses archetypes to present a'priori forms relating to the research inquiry. This was the final word in the philosopher's lifetime refinement of the phenomenology. Those who followed Heidegger away from Husserl's insights did not understand phenomenology (Hopkins, 2011). They missed the point of Husserl's focus on a'priori objects and consequently distorted his terminology to make it mundane and therefore familiar. Much of the phenomenology we see used today in social research uses this unremarkable approach. But Husserl's phenomenology was ultimately one that transcended the mundane. The objects it summoned up were archetypal and therefore held universal significance. Starting with the researcher's own, personal experience of the phenomenon, awareness is given through the stillness of the Epoche. It is given up to consciousness from the depths of the unconscious – and from the collective unconscious (Jung, 1953) – to present truths that apply to every person. This is the Epiphany. In the following prototype example, I will describe how the epiphany manifested in this PhD research about judgement.

3. The Prototype: How Practice-Based Research Contributed Answers to the Question of Judgement

One of my supervisors identified that Soliloquy was a kind of back-the-front approach to research. Whereas most PhDs start with a review of existing literature on the topic, Soliloquy requires the researcher to avoid this to a degree. Rather than consider what others have written on the topic, the research fills the curious void with the individual's information and original imaginings about the topic itself. In this example, I was drawn to understanding the notion of judgement. There were personal motivating factors in this choice, which are essential for the phenomenologist.

Here is a summary of my personal journey.

Many years ago I shared accommodation with a young psychologist who was training in psychoanalysis. At that time, I was an actor doing further work on method acting. There are strong parallels between these two endeavours, as the method actor analyses hir personal life to find the truth in hir performance. We would say then that we were not acting but rather, we were being. My friend would bring home various psychology tests and we would amuse ourselves with them. The Myers-Briggs test (Briggs and Myers, 1977/2011), which is still in popular use, is based on Jung's personality types:

- Extraversion (E) or Introversion (I)
- Sensing (S) or Intuition (N)
- Thinking (T) or Feeling (F)
- Judging (J) or Perceiving (P)

Individuals score various amounts on each indicator, resulting in an overall profile. I was surprised that as an ENFP, I had no score for Judging (J). None.

My apparent lack of judgement became problematic when teaching Creative Arts Education. The university required allocated grades for student art works. This was perplexing, as I could see merits in each work, and although I wrote the required marking criteria as broadly (and vaguely) as possible, I still had difficulty judging art in that somewhat punitive way. Fortunately, I was able to assign marking to a qualified art teacher, who just knew how to grade the works. She would have been blessed with a more useful personality type I suppose.

I investigated judgement as a topic for this PhD. I had met the first requirement for the phenomenology – personal experience with the lack of it. Next was the Epoche. This time is the most blissful for ENFPs like me. It is a time of flow – with feelings rather than rational thought; with dreams and intuition and for embracing the perceptions as they appear. I found myself drawn to ancient mythologies. So that is where I began. While my fellow researchers were cleverly discerning data, I was reading about the Gods of ancient Mesopotamia, Egypt, Greece, the Vikings and the Christian bible. The last one may seem odd, but the final Book of Revelation contains stories of dragons and headless horsemen, so it seemed to fit. I started to see parallels in the texts. There were intercultural versions of great floods and of folk turning into pillars of salt or rock. It was if the great myths were not cultural but rather archetypal. They belonged to humankind. That resonated with my readings of Husser's transcendental phenomenology, wherein the personal truth is a microcosm for a universal truth. However, at this stage I did not know what this had to do with my research question. Was it all irrelevant? I feared that six months into my PhD I was only enjoying stories that may have nothing to do with the research. This can be a time of anxiety for the phenomenologist. Fortunately, my previous attempts at trialling Soliloquy had convinced me that in time the unconscious would reveal to the conscious mind the connections. And when it did this for the current research, as always, it took me by surprise.

During this Epoche, I began writing a play. I knew it would be about judgement, but I knew not how it would unfold. My personal experience as a hobby cat breeder and cat show judge became the starting point. (Of course, I struggle with judging cats as well as art works, but this research is helping.) The play starts in the theatre foyer as a 'real' cat show with real cats. It then progresses to the auditorium and the Egyptian Hall of Truth, where mortals are judged by cat goddesses to determine their fates in the Afterlife. The readings had informed me that according to Egyptian mythology, there are two phases to qualifying for eternal bliss in the Afterlife. The first is a criteria-based checklist whereby one must be able to testify that one has not sinned. This is a convoluted process, involving protocols about remembering every name of the forty-two inquisitors and being able to deny participation in all of the listed sins – eavesdropping, kissing, being cruel to animals, for example. Then, as if to usurp phase one altogether, the second step in determining the fate of the deceased is to weigh the victim's dismembered heart against a feather. Here, the process goes from rational, criteria-based

assessment to a metaphysical and absurd one. According to the mythology, the heart is removed from the individual by Anubis, the God of death. It is then weighed by the great goddess, Ma'at. She has a special feather, which she places on one end of the scale. On the other is placed the heart. If the heart is heavy with sin, it is tossed to the greedy Goddess Ammit – part crocodile, part lion and part hippopotamus - who will devour the heart. When this happens, the victim will just cease to exist. They are no more. If however, the heart is pure and light, the deceased will go forth to the place where there is joy and peace and where everyone known and loved by the candidate will be there to eternally celebrate reunion. (Unless, I suppose, they have ceased to exist?)

During the Epoche, I drafted the play script. Like many writers, I hear voices of characters in my head, and follow their dictated dialogue, editing occasionally. I believe this process is a way of accessing the voice of my unconscious mind. In the past, when trialling Soliloquy Methodology, I recalled dreams, which would inform me and provide archetypal insights for conscious recognition and analysis. This current research, using practice-based scriptwriting, is another way to reach the phenomenon; a means to an end.

The Epiphany is the point where the unconscious offers up to consciousness the answer to the research question. I recall the day I sat at my desk and considered that all of what I had been doing. Although engaging, it did not seem to be informing my research. Then, as if the little egg of truth had incubated, I began widening my focus from the characters to the play as a whole. The script was showing me that the nature of judgement was two-fold. Basically, judgement is something we do intuitively, on an instinctive level. We intuit our judgements – in an absurd way – like the heart and the feather. However, we have also learned to be rational beings and pride ourselves on logic. We do not take seriously that which is not 'evidence-based'. So, to justify what we already know on a primal level, we invent logical checklists by which to rationalise our decisions. The Egyptians use the forty-two negative confessions. My university uses criteria-based rubrics to measure student success. My cat club uses a 'Judges' Standard', as a guide for assessing the quality of each animal. But as a wise cat judge advised me when I was trainee, 'a good cat just jumps out at you (not in a literal sense, of course) . You just know it when you see it.' She said that we can then use the Judges' Standard to qualify what we already know. Similarly, when I need to modify the artworks marked by my tutor, I can explain my gut decision using the criteria. It supports my preference for works that are light-hearted and fine. It supports my inclinations that come from a place that is deeper than consciousness.

Writing the play allowed my unconscious to take me to a position on judgement that I could not have worked out by just thinking about it. It is not an approach for everyone, as many would not tolerate the surrendering of so much control. If the researcher can withstand the period of anxiety caused by not knowing what is occurring under the surface of consciousness, it is possible that more original outcomes to the research question will be facilitated. In the Book of Revelation, it prescribes that for one to be judged favourably, one must simply believe. Similarly, to apply Soliloquy Methodology, one must have faith that the unconscious will produce an answer worthy of scholarship. I am a believer in this regard, although I confess that it still surprises me a little when it happens.

The Explication stage of Soliloquy Methodology is where the conscious mind makes sense of it all. I found myself drawn to literature that resonated with my findings. This was a natural means to containment and for scoping my research. In this case, it drew me to the writing of Immanuel Kant's Critique of judgement. I continue to persevere with Kant's translations, for I somehow sense that it will eventually breakthrough my consciousness to reach understanding. For now, I struggle, yet some parts seem to describe an appreciation of judgement similar to my own experience. In the editorial it is written,

> *…the Critique of Judgement has two main divisions; it treats first (the Aesthetic) of the philosophy of Taste, the Beautiful and the Sublime in Nature; and secondly, of the Teleology of nature's working. It is a curious literary parallel that St. Augustine hints (Confessions iv. 15) that he had written a book, De Pulchro et Ápto, in which these apparently distinct topics were combined….A beautiful object has no purpose external to itself and the observer; but a useful object serves further ends. Both, however, may be brought under the higher category of things that are reckoned purposive by the Judgement. (Kant, 1882)*

As I understand it, Kant identifies Aesthetic judgement as the felt appreciation of things, whereas teleological judgement as the measured and applicable kind. Nevertheless, the two kinds of judgement set out by Kant are reminiscent of the two kinds presented through this research using Soliloquy. The play script reveals that one approach to judgement is light of heart yet powerful (aesthetic?); the other is laboured with rhetoric yet applicable to mundane needs (teleological?). My research revealed two types of judgement. One is the tacit knowledge of desire; the other is beholden to the calculated list designed to justify a score.

This PhD involves the third and most comprehensive trial of Soliloquy Methodology. The topic is new, but the methodology has again presented the phenomenon of the research in the form of an archetypal myth – that of the Egyptian Hall of Truth. In all trials of Soliloquy Methodology, the question comes from the passion of the researcher. Then, through the Epoche and the Epiphany comes an unconscious synthesis of knowledge, which is channelled through creative writing, dream and daydreaming. Here are the research outcomes of the three trials of Soliloquy Methodology so far:

The current research shows – Judgement is essentially two-fold. Like in the Egyptian Hall of Truth, it is administered superficially according to a set of criteria and then decisively through unfathomable magic that is preference.

Last time it was – Working with technology for some academics is like the myth of Echo and Narcissus. Like Echo, I felt inarticulate because I don't know the language and acronyms of technology, and the technology itself is like Narcissus, who cares not for my frustration and has complete lack of empathy (Vallack, 2011).

The first time it was – Directing a play is like the archetypal narrative of the Wizard of Oz. Like the Wizard in the story, the director's vision and power is somewhat mythical. The actors, like Dorothy and friends, already hold the power they seek. However, it is the Wizard, and the director, who can enable them with that knowledge (Vallack, 2014).

In this final, Explanation phase of Soliloquy Methodology, I am now writing about how it has shown judgement to be two-fold.

4. Soliloquy Methodology as a Cradle for Other Research Projects

I have assessed theses using Autoethnography and practice-based approaches, and to be candid, I wondered about the degree to which these inquiries had implications beyond each case. I will choose not to assess such work in future unless they are well supported with an aligned methodology that makes possible further scholarly knowledge. I believe it is important that PhD research presents (or attempts to show and can explain where it has failed) new insights. I agree with Manghani, who puts it this way:

> *Even cross-cutting research needs to pertain to methodological frameworks, and for the researcher to be sufficiently competent in the relevant methods (or at least to be able to acquire sufficient competency through the process of developing the research). What is vital is an appropriate balance, and this can be understood through the requirement to create (or interpret) new knowledge and to demonstrate a systematic understanding of a body of knowledge or field of enquiry ….*
>
> *The idea of merely producing an artwork (or collection of artworks), i.e. to simply submit your 'practice' alone seems spurious. No other subject area can be thought to do anything equivalent. (Manghani, 2021)*

I present Soliloquy Methodology as a framework for practice-based research, as it allows artists to start with their passion and what they need to say yet, it goes beyond this. They must form the desire for knowledge into a research question and then leave it planted in their unconscious mind. This is easier that it may sound. Have you ever told yourself you need to wake up at a certain time and found it happens? It is possible to leave instructions for your unconscious.

The proposed question will grow and return to the practitioner in symbolic form, at a later stage in their art-making process. The artist will know when it happens. If not, the unconscious will continue to knock at the door of consciousness with the delivery. Once the metaphor or the myth or the visual icon is presented, the artist will recognise the archetypal significance of the outcome and can then explain it.

5. Conclusion

My current PhD research will offer insights into the elusive concept of judgement. It has also provided an opportunity to refine Soliloquy Methodology and introduce to it arts practice as method. Further to a useful suggestion by the reviewer of this paper, my future work should also explore the possibility that Soliloquy may support a natural perceiver when placed in a position where they are expected to be judgemental.

I see now how practice-based research – the direct line to the unconscious – can facilitate Soliloquy Methodology's creative methods of the Epoche and Epiphany. It is the vehicle for research, not the outcome. I see that the artist who uses Soliloquy Methodology to move through subjective practice to an intersubjective (Husserl, 1964) scholarly knowledge, can contribute to the academy.

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PhD Research Paper

Using Grounded Theory to Derive a Performance Improvement Model for South African Municipalities

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Abstract: The dawn of democracy in 1994 was preceded by widespread political violence in black communities across South Africa. Thirty years into the democracy, communities continue to use violent protests albeit not for political reasons but as an expression of anger and frustration over poor service delivery. To address this problem, the democratic government introduced performance management reforms. Literature shows that the success of these reforms depends on the ability of public institutions to adopt and sustain a performance-oriented culture. Therefore, the increasing wave of service delivery protests in South African Municipalities is a response to the failure of the democratic government in this regard. The debate on the causes and consequences of poor service delivery in South Africa has been raging for long. Even though there is little space to contribute on this topic, the author observed inadequate use of grounded theory as a strategy to develop empirical solutions to poor municipal performance. Therefore, this paper uses constant comparative analysis and theoretical sampling to derive empirical an empirical solution to the performance challenges engulfing the South African municipal landscape.

Keywords: Grounded theory, South African Municipalities, Performance improvement, Constant comparative analysis

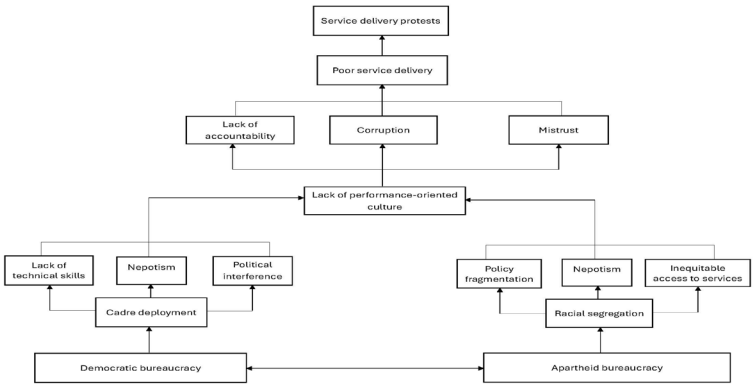
1. Introduction

Given its historical background of Apartheid, South Africa has a culture of violent protests. This culture is predominant in black communities that were deliberately subjected to poor service delivery compared to their white counterparts. Therefore, transforming the Apartheid bureaucracy and building a professional public service capable of delivering equitable services to all, remains a key priority of the South African democratic government. To this end, the government adopted performance management reforms aimed specifically at improving service delivery in Municipalities (Munzhedzi, 2020). Thirty years later, service delivery protests continue unabated indicating a spectacular failure of the democratic government in reversing the Apartheid legacy of poor service delivery in black communities. Several scholars largely attribute this failure to corruption, political interference, and nepotism (Dlamini & Migiro, 2016; Kariuki & Reddy, 2017; Masiya, Davids, & Manga, 2021; Mello, 2018). However, this attribution does not reveal the underlying cause of poor municipal performance, which according to Gumede (2015), is the inability of the democratic government to transform the administrative culture of Apartheid. International evidence highlights the significance of organisational culture as a performance-enhancing attribute (Bradley & Parker, 2001; Harrison & Baird, 2015). However, inadequate recognition of this thinking in South Africa, coupled with inadequate use of grounded theory in management studies, has created dearth empirical solutions for improving the performance of South African Municipalities. Therefore, this paper demonstrates the importance of constant comparative analysis and theoretical sampling in providing empirical solutions to poor municipal performance. The use of these techniques comes against the author's observation of inadequate use of grounded theory in management studies (Ndevu, 2019; Mabaso, 2018; Pretorius & Schurink, 2007). Therefore, this paper demonstrates how the two grounded theory techniques were used to derive a performance improvement model for use in South African Municipalities. Before doing so, the next Section interrogates literature to understand key dimensions of poor municipal performance. The third Section presents the empirical evidence that informed the proposed empirical solution while the last concludes the paper.

2. Literature Review

This paper is premised on the argument that South African municipalities are engulfed by poor performance arising from political interference. Thus, this Section interrogates literature to understand the root cause of this phenomenon as well as current and previous attempts to address it in the context of South African Municipalities. As a point of departure, the paper concurs with Samsonowa (2012) that public management literature identifies effectiveness and efficiency as indicators of performance. Therefore, poor performance as used in this paper, refers to the inability of South African Municipalities to deliver quality services. The issue of poor service delivery in South African Municipalities has been discussed at length with most scholars attributing its origin to corruption, political interference, and nepotism amongst others (Dlamini & Migiro, 2016; Kariuki & Reddy, 2017; Masiya, Davids, & Manga, 2021; Mello, 2018). Without negating the contribution of these scholars, the paper points to inadequate analysis of the root cause of poor performance in South

African Municipalities. Therefore, this paper applies problem tree analysis to offer an improved analysis of underlying factors giving rise to poor municipal performance.



(Source: Author)

Figure 1: Root causes of poor performance in South African Municipalities

Figure 1 presents two ideological positions that shape the structural and operational architecture of the South African public service. First is the policy of racial segregation introduced by the National Party in 1948. This policy created partisan control of bureaucracy (Cameron, 2010) characterised by patronage employment for white public servants (Posel, 1999). For example, a pre-1994 survey of Director-Generals shows that 54 percent were appointed on political considerations (Miller, 2005). These political loyalists were used as agents for implementation of separate development where service delivery became a privilege of the white minority. This means that the administrative culture of the Apartheid public service was characterised by nepotism, fragmentation, and inequitable service delivery.

When the ANC assumed power in 1994, it's priority was to eliminate racial inequalities in service delivery and create a new bureaucratic order based on principles of democracy. According to Gumede (2015), the ANC partially achieved its objective of dismantling the racial configuration of the Apartheid bureaucracy. However, the growing discontent on poor service delivery in black communities demonstrates continued existence of inequitable service delivery. Several authors attribute this to the ANC policy of cadre deployment which entails the appointment of political loyalists to senior positions across the public sector. As De Jager and Steenekamp (2015) point out, cadre deployment was introduced in furtherance of inward-looking, self-seeking, and self-preserving culture. For example, it has normalised political interference which according to Ndevu and Muller (2018), allows the ANC to decide on who should get government contracts. Further, it has entrenched a culture of nepotism and favouritism that has weakened the performance management system (Shava & Chamisa, 2018). Thus, Kariuki and Reddy (2017) attribute the prevailing shortage of technical and leadership skills across South African Municipalities to the appointment of political loyalists to key positions that they are not competent for. In addition, this shortage results from the factional battles of the ANC, which as Maqoko (2015) points out, lead to purging of qualified and skilled municipal managers. This explains why Kariuki and Reddy (2017) as well as Mello (2018) identify high staff turnover and incompetence as constraints to effective delivery of services across South African Municipalities.

On the issue of incompetence, the paper concurs with Ndevu (2019) that political patronage has resulted in the appointment of unqualified officials who are unable to perform their duties. Specifically, Masiya, Davids, and Mangai (2021) found that Municipalities lack technical competence in the provision of water and sanitation, electrification, and refuse collection. These findings echo Zindi and Sibanda's (2022) observation that recruitment practices in most Municipalities are improper resulting in the appointment of unsuitable candidates. This impropriety is an indication of the weak performance management system as deserving individuals are often overlooked for promotions in favour of the politically connected. This may be a reason why Ndevu (2019) attributes poor performance in South African Municipalities to mistrust amongst leadership and employees. Lack of trust amongst employees is also linked to the collapse of accountability mechanisms within Municipalities. In support of this view, Gumede (2015) argues that ANC appointees to government account to the ANC structures not the public. This leads to weak consequence management for non-performance (Ndevu, 2019) and contributes to increased corruption in municipal procurement systems (Moeti,

2004). Collectively, these factors have collapsed service delivery to the point that Municipalities across South Africa struggle to provide equitable basic services such as water and sanitation. For example, educated and employed whites living in the city are more likely to enjoy good-quality services than the less educated, unemployed and non-whites living in rural areas (Nkomo, 2017). Therefore, it is not surprising that service delivery protests emanate from poorer neighbourhoods, especially shack settlements and townships, rather than the better-off suburbs (Alexander, 2010).

Generally, service delivery protests are characterised by blockading of roads, burning of tires, looting, destruction of property. Because of these elements, researchers often classify service delivery protests as violent (Mello, 2018; Paret, 2015; Visser, et al., 2012). In light of this, the paper argues that violent service delivery protests is the symptom of poor municipal peforamance whose origins are deeply embedded in the culture of appointing political loyalists to key positions within the public service. Therefore, addressing poor service delivery is a function of creating and infusing a performance-oritented culture across South African Municipalities. Therefore, the next Section explains how grounded theory was used to construct a performance improvement Model that puts leadership at the centre of creating a performance-oriented culture in South African Municipalities.

3. Methodology

Glaser and Strauss (1967) discovered grounded theory together but later took different paths that led to the emergence of multiple brands of grounded theory. Although constant comparative analysis and theoretical sampling remain the hallmark of different types of grounded theory, these techniques are not adequately used in performance management studies in South Africa. For example, Ndevu (2019) created categories from the data collected through content analysis but did not explain how theoretical sampling enhanced data collection and analysis. The same weakness is evident in a recent study where the author failed to explain how these techniques facilitated generation of empirical theory to explain performance management issues in South African municipalities (Ndevu, 2022). Further, Pretorius and Schurink (2007) used Strauss and Corbin's (1990) coding techniques but did not mention constant comparative analysis and theoretical sampling anywhere in their paper. In recognition of these weaknesses, the paper adopted a three-phased approach to grounded theory. In compliance with established ethical protocols, the first step was to seek ethical clearance from the University. Through this clearance, the author was able to access the research setting and establish contact with the research participants. After obtaining access, he developed consent forms that were signed by the participants to ensure their voluntary participation. To ensure confidentiality, the author prepared an information note outlining the objectives of the study. In addition, the note articulated steps that the author took to ensure confidentiality.

After complying with ethical considerations, the author commenced the second phase of grounded theory. This involved intensive literature review to understand theoretical performance challenges in South African Municipalities. Consequently, this understanding was used to develop the structure of semi-structured interview schedules used to obtain data from 24 participants selected through purposive sampling. This procedure enabled the selection of 4 Divisional Heads who were provided credible information on the performance issues within the Municipality under investigation. This phase also involved open coding where the data from the initial interviews was recorded, transcribed, and coded.

Table 1: Open coding (Source: Author)

Excerpts	Excerpts from the interview data	Initial codes	Refined codes
Excerpt 1	The IDP and the SDBIPs are the basis for performance agreements. And implementation of SDBIP fully is contained in the Individual performance	Performance management tools Implementation of performance management	Instruments of performance management
Excerpt 2	Performance management is provided for in the Municipal Systems Act and other regulations	Legal frameworks for performance management	
Excerpt 3	Getting performance management rolled out into the City structures has been quite challenging	Difficult rollout of performance	
Excerpt 4	Permanent employees resist performance management system	Lack of cooperation from permanent employees	

As noted above, the four interviews generated preliminary codes that describe tools used for performance management as well as difficulties involved in the implementation of performance management in a particular Municipality where the study was undertaken. Based on personal experience and knowledge, the open codes

above are consistent with the general literature on performance management in South African public institutions. Therefore, the paper concurs with Glaser and Strauss (1967) that prior review of the literature enhances theoretical sensitivity. To test the researcher's knowledge of the literature against emerging data properties, the author compared the initial codes extracted from transcripts 3 and 4 against each other and back to the interview data bearing in mind the insights from the literature. This led to the refinement of initial codes and the creation of expanded codes as presented in Table 2.

Table 2: Outputs of theoretical sampling and comparative analysis (Source: Author)

Excerpts	Excerpts from the interview data	Initial codes	Expanded codes	Subcategories	Core categories
Excerpt 3	Getting performance management rolled out into the City structures has been quite challenging	Difficulty in implementing performance management	Lack of skills Nepotism Lack of leadership Lack of consequence management Political interference Political instability	Incompetence Cadre deployment Lack of accountability Poor consequence management	Politicised bureaucracy Incompetent leadership Lack of accountability Low staff morale
Excerpt 4	Permanent employees resist performance management system	Lack of cooperation from permanent employees	Lack of consultation Negative attitudes Disgruntlement Mistrust	Poor leadership Lack of communication Conflicts between management and staff	

After the refinement of the initial codes, the author embarked on the second phase where theoretical sampling was used to inform more data collection to explore the expanded codes. For example, the hostility between management and staff implied in the data extracted from transcript 3 required further exploration. Therefore, theoretical sampling was used to select additional participants who could provide more information on the apparent lack of cooperation between employees and management. These participants included senior management (Directors), leaders of the Labour Unions, members of the Labour Unions, and unorganised employees. After identifying additional participants, the author adjusted the initial data collection instruments to include specific questions for this group. As noted in Table 2, theoretical sampling allowed the author to obtain information that confirmed his suspicion that management and staff had a frosty relationship. Using selective coding, the author compared newly obtained information to existing data properties to create a category of *low staff morale* as the main concept underpinning consequences of inherent conflict between management and staff. The same procedure led to the emergence of politicised *bureaucracy* as a critical concept that defines the administrative culture of South African Municipalities. This culture is characterised by incompetent leadership, lack of accountability, and low staff morale.

In sum, Table 2 demonstrates how theoretical sampling and constant comparative analysis enhanced the author's understanding of underlying causes of poor municipal performance. Thus, the paper has successfully addressed the weakness observed in Pretorius and Schurink (2007) and Ndevu (2019; 2022) who have not adequately explained the importance of these techniques in their grounded theory studies. According to Flick (2019), constant comparative analysis and theoretical sampling are critical for effective application of grounded theory methodology. Therefore, this paper provides useful insights on how to effectively use grounded theory in the field of public management in South Africa.

4. Empirical Factors Underlying Poor Performance in South African Municipalities

Having demonstrated the importance of grounded theory in determining the root cause of poor municipal performance, the next step is to present a Model that may resolve this problem. Therefore, this Section presents empirical results that inform the construction of the proposed Model for improving performance in a South African Municipality. There results converge on cadre deployment as the key determinant of politicised bureaucracy that defines the structure and operations of South African Municipalities.

4.1 Cadre Deployment

The encroachment of politics into administrative space in the South Africa Public Service is expressed through cadre deployment. Shava and Chamisa (2018) define cadre deployment as a system of political patronage through which the ANC appoints its members to prominent positions in the public sector. The authors further mention that this system leads to poor performances in government institutions and in the nation at large. These views were corroborated by empirical evidence obtained from the research participants who mentioned that cadre deployment gives rise to political interference which in turn, creates mistrust, lack of accountability, and incompetence. Highlighting the significance of cadre deployment as the source of performance challenges engulfing South African Municipalities, one participant mentioned had this to say: '*appointing wrong people without requisite skills, leads to poor performance because some cadres appointed to senior positions within*

the Municipality cannot even think strategically. As a result, they are unable to perform their strategic functions and provide leadership where necessary.' This response confirms the findings of previous studies showing that cadre deployment results in the appointment of incompetent individuals who are unable to perform their functions effectively (Shava & Chamisa, 2018; Twala, 2014).

4.2 Manifestations of Cadre Deployment

Based on the empirical data obtained from the study that informed this paper, the author points to different manifestations of cadre deployment. In explaining the effects of cadre deployment on performance, one participant mentioned that '*after being appointed to powerful positions on political grounds, the officials appoint their friends and relatives without due process'.* This revelation is consistent with the literature showing that the ANC leaders have seized the duties and responsibilities for recruiting and selecting municipal workers without following the proper procedures and protocols (Shongwe & Meyer, 2023). It also confirms Kgatle's (2017) attribution of poor service delivery in Tshwane to the ANC's practice of appointing political allies, friends, and family. Empirical evidence further shows that the political patronage leads to the appointment of underserving and unqualified persons to key positions. As Shava and Chamisa (2018) point out, this has compromised the human resources management in the public sector and resulted in recruitment processes are marred by inconsistencies that affect the performance of handpicked cadres. Another dimension of cadre deployment that emerged is the shortage of qualified and competent employees at strategic positions within Municipalities. In this regard, the participants specifically mentioned that cadre deployment has compromised service delivery because people are appointed to senior positions based on political instead of academic credentials. Recent literature confirming this aspect points to the shortage of qualified and competent individuals at senior management level in South African Municipalities (Makole, 2022) with Kariuki and Reddy (2017) attributing the shortage of technical skills in these entities directly to nepotism.

On a slightly different note, the empirical evidence shows that cadre deployment has eroded accountability mechanisms. In explaining this, the participants were unanimous that ANC cadre deployed in a particular Municipality disregard established protocols and report administrative issues to their political masters who deployed them. This evidence corroborates Gumede's (2015) argument that cadre deployment has created a culture where ANC cadres deployed in government think they are untouchable. According to Shava and Chamisa (2018), wherever corruption thrives, accountability and transparency disappear. A similar view was expressed by the research participants who mentioned that cadre deployment has weakened accountability and consequence management to the point that ANC cadres openly engage in corrupt activities knowing that they have political protection. In support of this empirical evidence, Moeti (2014) as well as Shava and Chamisa (2018) argue that local government corruption emanating from cadre deployment is rampant, especially in the procurement systems.

Apart from corruption, weak accountability is expressed through unfair labour practices resulting from ineffective use of performance management systems. In this regard, the empirical evidence shows that deserving professionals are overlooked for promotions in favour of politically connected and incompetent employees. In addition, the empirical data revealed that inconsistent application of performance management system leads to low staff morale, mistrust, and conflicts between management and staff. On the issue of low staff morale, the empirical evidence reiterates the findings expressed in previous studies connecting cadre deployment to low staff morale (Shava & Chamisa, 2018). Further, the empirical evidence on the existence of mistrust owing to cadre deployment and inconsistent application of performance management system confirm Ndevu's (2019) argument that political interference leads to mistrust between politicians and officials in Municipalities. The empirical data on inconsistent use of performance management resonates with the findings of existing studies that municipal managers lack adequate understanding on how to use performance management system (Ndasana, et al., 2022; Masiya, Davids, & Mangai, 2021).

On the issue of conflicts between management and staff, one participant mentioned that staff uses Labour Unions to avoid accountability for poor performance. On the other hand, a labour representative mentioned that management use performance management system to reward their allies and punish politically neutral but performing individuals. This empirical evidence reiterates Mokhatso's (2008) finding that South African Unions focus more on protecting their members rather than engaging in constructive strategic issues that improve governance and service delivery in municipalities.

In sum, the empirical data that informed this paper puts cadre deployment at the centre of poor performance in South African Municipalities. In particular, the evidence shows that cadre deployment manifests in nepotism, incompetence, mistrust, conflicts, and lack of accountability. These revelations confirm existing

literature on causes of poor performance across South African Municipalities. Based on the empirical evidence and the author's insights obtained from the literature, this paper argues that cadre deployment has entrenched a culture of poor performance across South African Municipalities. The paper further argues that this culture manifests in nepotism, incompetence, mistrust, and lack of accountability. Collectively, these manifestations lead to poor service delivery which ultimately gives rise to violent protests.

5. The Empirical Model for Improving Performance in South African Municipalities

Drawing from insights obtained from the literature and from the empirical data, this Section proposes a Model for improving performance in South African Municipalities. This Model is premised on the argument that improving municipal performance is a function of transforming attitudes, norms, practices, and systems that give rise to the incompetence, mistrust, and lack of accountability. The need for addressing these attributes of poor performance emerged from the interviews. Specifically, the participants mentioned that improving municipal performance requires capable leadership with skills and experience in creating a supportive organisational culture anchored on meritocracy, communication, and trust. This thinking resonates with Schein's (2004) notion that culture creation is a function of leadership. When the issue of leadership emerged during data collection, the author employed theoretical sampling to identify additional participants who provided useful insights on key attributes of leadership required for improving municipal performance. These attributes are presented in Table 3.

Table 3: Empirical attributes for creating performance-oriented culture (Source: Author)

Raw data	Initial codes	Sub-categories	Core categories	Empirical themes
Management does not engage staff in critical decision-making. What happens is a one-way communication where management decides and then sends an email to inform staff about decisions. Therefore, there is a need for a more interactive and participatory engagement where employees could have a voice in decision-making.	Exclusive decision-making One way communication Email communication Need for interactive and participatory engagement Staff have no voice in decision-making	Exclusion of staff in decision-making Poor communication Interactive and participatory engagement strategy	Lack of participation in decision-making Communication improvement strategy	Enhanced accountability and transparency through interactive and participatory communication Reducing corruption through communication
Communication enhances transparency and can serve as a deterrent to corruption because the community would have necessary information to hold councillors accountable	Communication enhances transparency. Communication deters corruption. Use of communication for accountability	Improved accountability and transparency through communication Reduced corruption through communication	Benefits of communication	
Management should create a friendly environment where subordinates are encouraged to communicate ideas freely. If there is freedom of expression where feedback is given due consideration, employees would be motivated and trust, loyalty, and productivity would increase.	Creation of friendly environment by management Management should encourage free communication. Freedom of expression motivates staff. Freedom of expression improves trust. Freedom of expression improves loyalty. Freedom of expression improves productivity	Functions of management Benefits of freedom of expression	Creation of supportive work environment	Management creates a supportive culture characterised by trust, loyalty, motivated and productive employees
Building the capacity of managers on leadership can improve municipal performance	Leadership training enhances fairness in staff recruitment and performance management Capable leaders improves trust Capable leaders promotes open communication Capable leaders enhances participatory decision-making Capable leaders develop and implement the vision	Benefits of leadership training Characteristics of leadership	Leadership competencies for improving performance	Centrality of leadership as a performance-enhancing attribute

In sum, Table 3 underscores the centrality of leadership and a performance-enhancing attribute. Specifically, the centrality of leadership in creating a supportive culture characterised by trust, accountability, and open communication emerged from use of constant comparative analysis. For example, the categories presented on the Table were compared against each other and back to the initial codes. In addition, the categories were compared to the raw data leading to the emergence of empirical themes pillared on leadership as a key attribute for performance improvement. The empirical themes were further compared to the literature using a selective coding process. Through this process of iterative comparison, the author identified four concepts that match the established empirical themes. The first is hierarchy (Cameron & Quinn, 2011), which in this paper is renamed bureaucracy for its emphasis on hierarchical relationships of power entrenched in laws and regulations. The second concept derived from Schneider (1999) is competence, which directly links to the participants' idea of improving competency through leadership training and meritocracy. Closely related competence is Harrison's (1972) notion of goal-oriented culture. Inspired by the New Public Management (NPM) movement, this concept resonates with participants' view that participatory communication that promotes employee's participation in decision-making promotes loyalty, builds trust, and improves productivity. As noted in Table 3, the same empirical attributes are linked to the concept of a clan culture expressed in Cameron and Quinn (2011). This culture promotes values of teamwork and family like values hence the reference to supportive environment. The four concepts derived from the literature and linked to the empirical data constitute the pillars of the performance improvement Model presented in Figure 2.

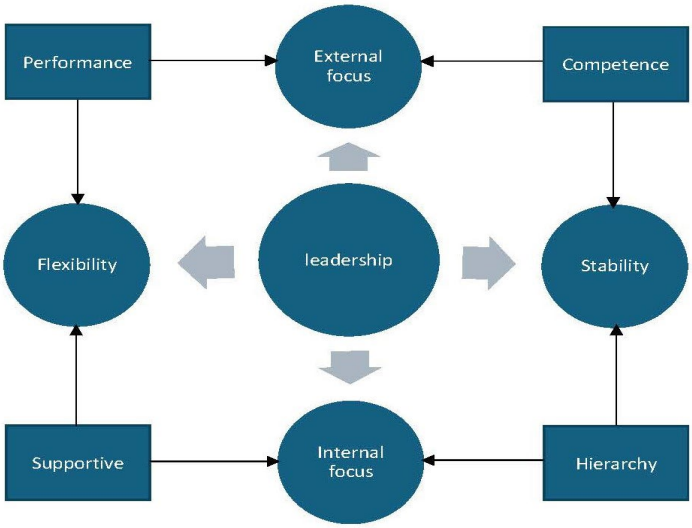


Figure 2: The proposed model for improving performance in South African municipalities Source: (Bless, 2023)

Now that the four components constituting the structure of the proposed performance improvement Model depicted in Figure 2 have been established, the next step is to describe how the Model works. First, hierarchy/bureaucracy is dependent on stability and internal focus. These elements of bureaucracy are derived from Weber's (1946) argument that bureaucratic rules and regulations create predictability, enhance accountability, and promote fairness. However, the empirical data presented earlier shows that failure to apply existing rules and regulations governing employment and staff assessment has entrenched cadre deployment leading to poor performance. Therefore, maintaining effective bureaucracy requires capable leadership to maintain stability through effective application of existing rules and regulations to maintain. This means that a stable environment where rules and regulations for individual and organisational performance management systems are applied fairly and competently, is a precondition for improved performance. Thus, unlike Heckscher (2007) who calls for alternative organisational forms to replace bureaucracy, the paper calls for its augmentation by introducing the principle of meritocracy. As indicated in Figure 2, meritocracy is equated to competence to underscore the need to address the incompetence associated with cadre deployment.

Table 3 identifies required leadership competencies for enhancing performance in South African Municipalities. These competencies include the ability to build trust, promote open communication, develop, and implement organisational vision. Specifically, open communication promotes accountability and transparency and connects to the empirical evidence highlighting the role of leadership in creating a supportive environment that promotes trust, loyalty, and performance. As Drucker (1959) points out, a supportive environment is necessary to promote workers' participation in decision-making and motivate them to achieve organisational goals. Because of its strong emphasis on creating trust within organisations, a supportive culture is internally focused. Therefore, this Model shows that principles and values of a supportive culture should be implemented within the confines of the existing rules and regulations provided under bureaucracy.

Although bureaucracy provides necessary stability for an effective administration, its rigidity curtails quick decision-making and ultimately results in poor staff attitude. For this reason, Figure 2 shows that an effective supportive culture requires flexibility to ensure adequate response to unique personal needs of employees. Based on the prescriptions of New Public Management (NPM), organisations that embrace flexibility are conscious of the external evironment. Most importantly, being to the external environment creates the opportunity for bringing new competencies required to sustain performance in light of the ever chaninging environment in which Municipalities operate.

6. Conclusion

This paper used literature review to argue that failure to transform the administrative culture of public institutions is the root cause of poor performance across South African Municipalities. In this regard, the paper contributes new knowledge on the significance of organisational culture as a performance-enhancing attribute

in South Africa. In addition, the paper used grounded theory to demonstrate the value of constant comparative analysis and theoretical sampling in generating empirical solutions to performance challenges engulfing South African Municipalities. Therefore, the paper makes a significant contribution towards improving methodological weaknesses observed in current and previous studies that have used grounded theory to explore the question of poor service delivery in South Africa. After diagnosing the root cause of poor performance and demonstrating the importance of grounded theory in management studies, the paper provides an empirical Model for improving performance. Anchored on theories of organisational culture, this Model underscores the centrality of leadership in creating a performance-oriented culture. Most importantly, the paper concludes that building a culture of performance requires competent leaders with adequate skills to adapt principles of bureaucracy to the changing external environment within which South African Municipalities operate.

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Masters Research Paper

Identification and Mapping of Fintech Clustering Using a Qualitative-dominant Mixed Method

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Abstract: This research delves into the complex landscape of the fintech ecosystem, specifically focusing on the Northwest City region of Ireland, employing a mixed-method approach. The study focused on the methodology used to identify and map the fintech clusters. Different methodologies have been used to map and identify clustering due to its evolving nature. In our case, due to the lack of fintech companies' records on publicly available databases, and fintech being an emerging phenomenon, our methodology relied on a combination of approaches like desk research, stakeholder engagement, geospatial analysis, and in-depth interviews which fall under the qualitative-dominant mixed method approach. Despite a diverse range of methodologies being used to identify clusters, some known studies have used mixed methods. This research aims to provide guidelines for identifying clusters by developing a database of the companies in the fintech sector and its validation in an evolving field like Fintech. It also highlights the importance of the use of geospatial analysis in clustering by mapping the fintech companies, however at the same time questions the simple agglomeration of the firms in the region. It's not only the physical proximity that develops the clusters but the local linkages, collaborations, and networks that play a pivotal role in reaping the benefits of clusters. The detailed interviews with the fintech companies in the region and their relationship with different components of the fintech ecosystem using the triple helix model highlighted the strengths and weaknesses of the fintech ecosystem in the region. The application of mixed methods in this research highlights the value gained in exploring fintech clustering and ecosystems. This study further enhances our understanding of the emerging phenomenon of fintech clusters and ecosystems in cluster-based economies, specifically how a combination of approaches could be used to map and identify fintech clusters. It also furthers the boundaries of knowledge in business and management methodological literature by introducing a comprehensive qualitative-dominant mixed method approach with a consolidating knowledge base on methodological approaches to clustering.

Keywords: Industrial clustering, Fintech, Cluster analysis, Visualization, Fintech clustering

1. Introduction

The landscape of the fintech ecosystem is complex, particularly in the Northwest City region of Ireland. This study delves into the methodology used to identify and map fintech clusters, employing a mixed-method approach. Fintech clusters are geographic areas with a concentration of fintech companies, startups, investors, and supporting institutions. Literature shows that it is not just a mere concentration of corporations in a geographic location (Ffowcs-Williams 2012; Ketels 2017). Clustering happens when companies from related industries interact with each other and create linkages and networks within and beyond the cluster boundaries (Byrne 2016; Walsh 2020). An in-depth analysis of the business linkages is required to understand the business environment and the level of interaction among corporations in the region. The level and type of analysis depend upon the availability of data, region, and the objective of the study.

Industrial clustering is not a new phenomenon. Literature shows different terms have been used for fintech clustering in academia and policy reports like fintech or digital or electronic finance clusters, hubs, agglomeration, ecosystem, cities, zones, or geographies (Wójcik *et al.* 2022). Despite the prominence of fintech clusters in global economic landscapes, identifying and mapping industrial clustering poses challenges (Porter, 2000a; Sölvell et al., 2006; Sölvell, Ketels and Lindqvist, 2008; Ketels and Protsiv, 2021). This study examined a border region of Ireland (Northwest City Region) where publicly available data on fintech companies is scarce. Literature shows that the major challenge in mapping industrial clustering is the availability of robust statistical data as well as the presence of data collection bodies in some geographic locations as well as sectors (Ketels 2017; O'Connor *et al.* 2017). Hence, the methodology adopted for this study integrates desk research, stakeholder engagement, geospatial analysis, and in-depth interviews within a qualitative-dominant mixed-method framework. Through a blend of quantitative and qualitative data insights, this study provides a comprehensive understanding of the industrial clustering phenomenon while enabling the researcher to identify and map the industrial clusters which contribute to both theory and practice.

The remaining study is organized in the following way. Section 2 provides the context highlighting the significance of the fintech clustering. Section 3 discusses the concepts central to the study based on the review of the literature. Section 4 discusses the application of mixed methods to the study in the context. Section 5 explains the value of the suggested approach and Section 6 concludes the study.

2. Context

Industrial clustering has become a significant drivers of economic growth and innovation as evidenced by the fourth industrial revolution and smart production processes (Jiao *et al.* 2021). Some of the famous Fintech clusters are Silicon Valley, London, Berlin, New York City, Singapore, Hong Kong and Shanghai. Fintech is a new phenomenon that has radically changed the traditional financial landscape (Abbasi *et al.* 2021). It has impacted important areas of the economy like banking systems, trading systems, and payment platforms which are leading countries to economic development and being a source of competitiveness (Jiao *et al.* 2021; Lai and Samers 2021; Guo *et al.* 2023). Today, cities are fighting to become fintech hubs rather than financial hubs, cities like London, New York, and Silicon Valley are well-known for being prominent FinTech hubs. However, other cities and nations are eager to become, if not global hubs of this rapidly expanding sector, then at least regional ones. Governments around the world are working with regulators and policymakers to support the development of fintech technologies by creating and testing environments known as regulatory sandboxes, fintech sandbox hubs, or innovation hubs (Parenti 2020). Fintech companies in the jurisdiction of the regulatory sandbox or innovation hub are given regulatory lenience, however, the regulators are working very closely with new technologies and are assessing the attached risks (Buckley *et al.* 2020). Since the 2008 financial crisis, the fintech industry has been growing, specifically in countries that faced severe repercussions because of the financial crisis (Laidroo and Avarmaa 2020a). Literature shows that there is a greater tendency for the fintech firms to operate in closer proximity and this phenomenon is defined as fintech clustering even though this sector operates online (Laidroo and Avarmaa 2020b; Gazel and Schwienbacher 2021; Jiao *et al.* 2021; Alaassar *et al.* 2022). Due to the technical infrastructure and the financial regulations in the region.

The Northwest City Region of Ireland consists of Donegal County, Derry City, and Strabane District Council. It's a part of the border region and is crucial for the economic development of Ireland as it provides direct access to the EU, UK, and Irish markets. The research conducted by the Western Development Commission declared County Donegal as the Atlantic Economic Corridor (AEC). The agglomeration of economic activities can be seen in this region. An initiative of the Irish government Investderrystrabane (2023) indicates the presence of different industrial clusters in this region including Medtech, Engineering, and a suspected Fintech cluster. In 2018 the North West Regional Skills Forum declared Information and Communication Technology and Financial Technologies (Fintech) as the fastest-growing sector in Ireland. There is an extensive occurrence of financial institutions, technology and communication companies, and fintech corporations in the region. The suspected fintech cluster and the related industries could be just an agglomeration of economic activities without knowledge sharing or linkages among themselves. The existing ecosystem of fintech and related industries in the Northwest City Region shows prominence of financial institutions and information technology (IT) corporations due to Ireland's stable financial regulatory system and internationally traded technologies. Fintech is given special attention because of the attached benefits for economic growth, productivity, and competitiveness which was highlighted during COVID-19. The strategic position of this region, welcoming tax policy, and a stable financial regulatory landscape without any restrictions for fintech companies, is encouraging fintech startups to grow a fintech cluster of its kind.

Industrial clustering has been used as a tool for regional development all over the world. Economies based on clustering are outperforming the rest of the market in the case of developing and developed countries (Sölvell *et al.* 2003; Ketels and Memedovic 2008; Ketels 2017). According to O'Connor et al. (2017), Ireland is lagging in the clustering of different sectors as compared to other European economies. Bryne (2016) and Walsh (2020) highlighted the lack of formal cluster policies and cluster organizations for the development of a micro-level business environment in Ireland, clusters are mentioned in policy plans to achieve policy goals. However, literature shows that clusters could lead to an improved business environment, resulting in locational competitiveness of the region which attracts more foreign investments, increases employment, and increases innovation in the related industries (Porter 2000a; Ffowcs-Williams 2012; Ketels 2017). Industrial clustering could be a game changer for the Irish economy after Brexit, being part of the European Union (EU) and having access to UK and EU markets, with a concentration of multinational companies (O'Connor *et al.* 2017). So, all the components of an industrial ecosystem to understand the opportunities and challenges related to the identification and mapping of industrial clustering in the environment.

3. Concepts Central to the Study (Review of the Literature)

The understanding of the evolution of industrial clustering and mixed method approach is crucial for the methodology opted for this study. The methodologies and models central to our study include the 4I linkage model introduced by Hobbs (2010) which measures the strength of the relationship based on the following four key aspects of the relationship: Intensity, Importance, Involvement, and Investment. The VLINC methodology (Visualization of linkages in networks and clusters) developed by Bryne (2016) introduced the visualization of companies within clusters on different levels and the triple helix model which emphasizes on integration of three components of any ecosystem, which are government bodies, educational institutions, and the industry.

The concept of industrial clustering has been introduced in the early works of Von Thunen (1842). Marshall (1890) and Weber (1909) highlighted the importance of location and agglomeration, which Hoover (1948) tested on different and similar types of industries. The terms industrial complexes and industrial cities were discussed referring to the concept of industrial clustering (Isard 1956; Warf 1995). It resulted in Porter's (1998) seminal work on national competitiveness and clusters. Literature shows that there is no standard approach used for cluster analysis (Feser and Bergman 2000). The integration of qualitative and quantitative techniques in cluster analysis has evolved, with mixed-method approaches gaining prominence due to their ability to overcome the limitations of individual techniques studies (den Hertog *et al.* 1999). However, the aim of the cluster analysis is important as it could vary from the identification of clusters, and mapping of clusters, to the functioning and operations of clusters. The aim of the cluster analysis depends on the level of cluster analysis.

Level of Analysis	Cluster Concepts	Aims
Micro (Local industry, cluster or firm level)	Examines a group of related firms, and their connections, in a locality.	Initiating or supporting specific firm level initiatives and supports.
Meso (Regional Level)	Examines the specialization and the inter and intra-industry linkages of a group of industries for a region.	Developing strategy for a region's clusters.
Macro (National or Supranational level	Examines specialization patterns at a national or supra-national level. Linkages between industry groups across the economy as a whole.	Identifies the cluster categories of a nation, for national and regional industrial and innovation policy-making.

Figure 1: According to Bryne (2016) there are three levels of analysis for industrial clustering

It could be a quantitative (top-down) or a qualitative (bottom-up) approach or a mix of both methods. Different techniques have been used under these methods location quotients, input-output tables, expert opinions and interviews, network analysis, 4I linkage model, and visualization of linkages in networks and clusters (VLINC) methodology based on network analysis. The relevance of these techniques depends on the level and type of analysis.

Characteristics	Top-Down	Bottom-Up
Research Question	How much?	How?
Approach	Quantitative	Qualitative
Principal Data	Secondary Data	Primary Data
Methodology	Statistical Modelling	Case Studies
Industrial Proximity	Classification System	Descriptive
Scope	Nationwide, Multi-Industry	Local, Single-Cluster
Dominant Logic	Deductive	Inductive
Measures	Employment, Patents, Wages, Output, Sales	Relationships, Institutions
Findings	Broadly Applicable	Narrowly Limited

Figure 2: Different cluster analysis techniques and their characteristics (Cortright 2006)

According to Brown (2000) most of the cluster studies use mixed methods. Some of the mixed method techniques are used to analyze predetermined clusters in a region. A location quotient shows the concentration of an industry in a region by comparing it to a benchmark (Porter 2012; De Propris 2005; Carroll *et al.* 2008; Cortright 2006.). Different economic measures have been used for the analysis of predetermined clusters using a quantitative technique which is further detailed with key stakeholder interviews of the ecosystem (Napier and

Bjerregaard 2013). Some scholars have used social network analysis to explain the network dynamics of clusters (Powell *et al.* 1996; Casper 2007; Giuliani and Pietrobelli 2011). These studies were focused on the understanding of the knowledge networks within clusters (Giuliani 2013). In 2010, Hobbs designed a framework for the understanding and analysis of industrial clusters. It is a mixed-method approach that is based on location quotients for the identification of a specialization of the region. However, qualitative methods are used for the identification of different linkages. In 2016, the VLINC methodology was developed for the identification and mapping of different industrial clusters (Byrne 2016). This methodology is based on the work of Hobbs (2010), who developed an industrial clustering framework with the addition of a visualization software based on Google Maps that shows the linkages on four different levels, namely the local, national, European, and international level for each participant firm in the study. There are macro-level industrial clustering studies also conducted on the US and EU levels for the development of region and business strategies for local businesses (Rosenfeld 2002; Sölvell *et al.* 2003).

The triple helix model, a concept introduced by Etzkowitz and Leydesdorff (1995), emphasizes the collaboration among academia, government, and industry in fostering innovation and economic development. In our study, the triple helix model guides the assessment of linkages within the fintech ecosystem, focusing on the roles of innovation centers, government agencies, industry associations, peers, customers, suppliers, and training services. Understanding these linkages is crucial for evaluating the innovation potential and competitiveness of a cluster.

4. Discussion: Integrating Mixed Methods in Understanding Fintech Clusters and Ecosystems

We employed a hybrid approach that combines qualitative and quantitative methods to explore the landscape of fintech clusters in the Northwest City region of Ireland. It is a micro-level fintech cluster analysis of the region of interest focused on the methodology of the study. The study began with desk research and stakeholder engagement to identify fintech companies and related industries in the region. This qualitative aspect helped us build a foundational understanding of the ecosystem's components. Quantitative methods were then employed to check the concentration and size of the fintech companies and map the dispersion of fintech companies using geospatial analysis. The visualization aided in identifying clusters within the region. It led us to in-depth interviews with stakeholders to further enrich the qualitative aspect which helped in understanding the dynamics of the fintech ecosystem, including linkages, collaborations, and networks. The 4I linkage model of Hobbs (2010) provided a structured framework for assessing these relationships.

The study started with desk research and stakeholder identification within the fintech ecosystem, for which we approached different components of the ecosystem. One of the primary challenges faced was the dynamic nature of the fintech sector, with new niches continually emerging. The firms, in the region, did not know whether they identify themselves as fintech or not. So, this study started from scratch by developing a database for fintech companies, related industries such as the financial industry and the IT industry, and other components of the fintech ecosystem. For this study, the following definition of fintech is used; the use of technology to provide new and improved financial services (Thakor 2020), which is further explained by (Lai and Samers 2021) via fintech framework which says that fintech unfolds at the intersection of technologies and institutions with advanced financial products and services.

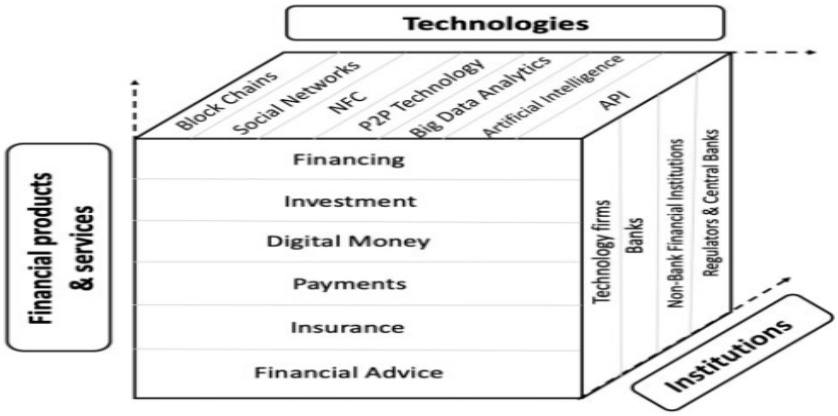

Figure 3: Lai and Samers (2021) fintech cubic framework

According to the literature, fintech and related industries resort under the traded clusters in Ireland and are crowded by multinational companies which increases the importance of this sector further (O'Connor *et al.* 2017). Traded clusters have spread all around the world and are an important source of exports (Porter 2000a; Snowdon and Stonehouse 2006; O'Connor *et al.* 2017). Fintech and related industries like financial services and IT industries are deeply embedded in the Irish economy as it is a valued contributor towards employment, gross domestic product (GDP), and exports. Consequently, this study is focused on the potential of industrial clustering to further the development of the fintech sector and regional development.

The search for fintech companies and firms from related industries leads us to the Chambers of Commerce. The study was presented to both Letterkenny and Derry chambers, along with some stakeholders. At the end of the meeting, chambers shared a list of the registered companies with us and assured us of complete support till the completion of the project. We updated all the data in a Microsoft Excel workbook and started looking for the companies of our interest in the region via the Google search engine. We also made a separate list of all the companies lying in the Fintech industry, Financial services industry, and IT industry in the region. The lists were sent to the Chambers of Commerce (Letterkenny and Londonderry), for cross-checking. Afterward, we shared those lists with government agencies and with companies that we interviewed later to ensure the validity of the study.

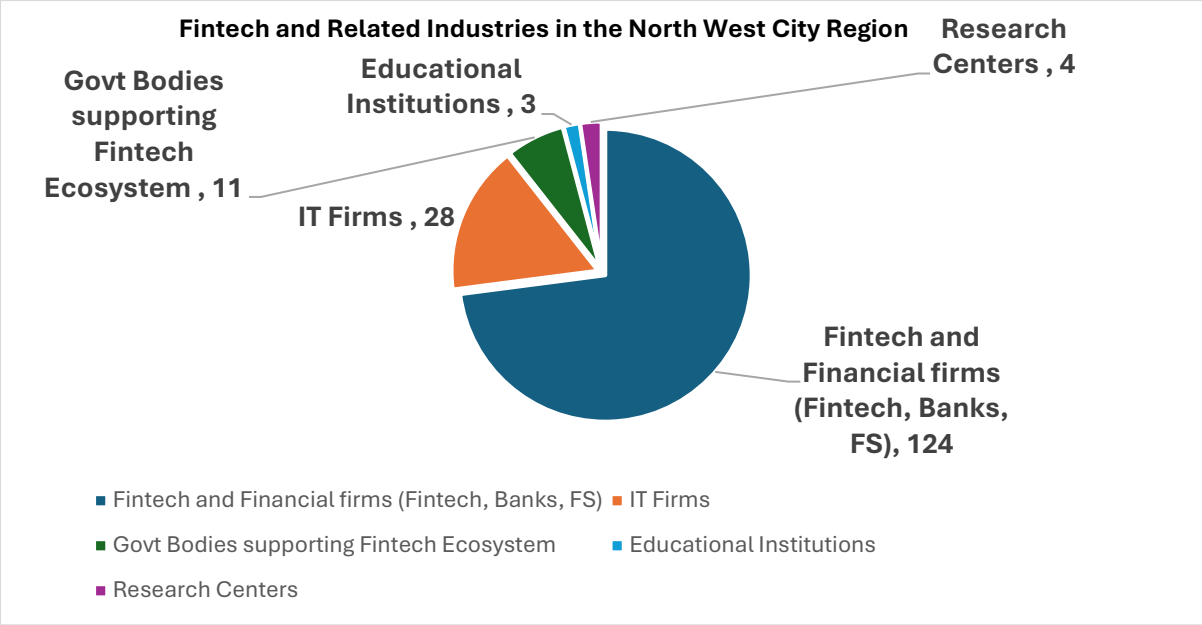

Figure 4: Fintech and related industries in the North West City Region

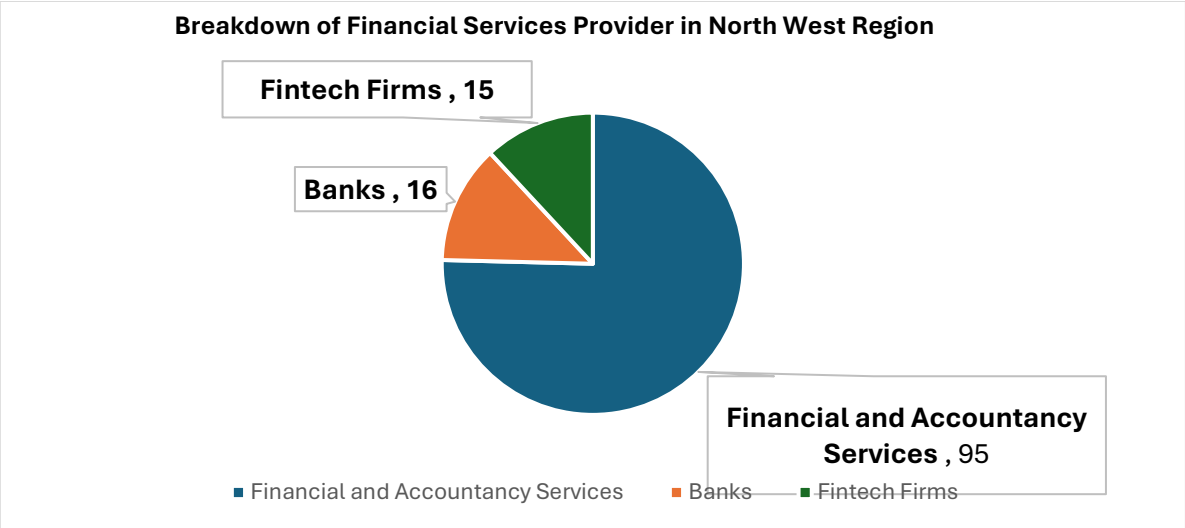

Figure 5: Breakdown of Financial Services

After having our final lists of different components of the fintech ecosystem, plotted fintech companies in the region using Google Maps to visualize the dispersion of the companies in the region. After expert opinion and the number of fintech companies, we identified the concentration of fintech companies in two regions, namely Letterkenny and Londonderry.

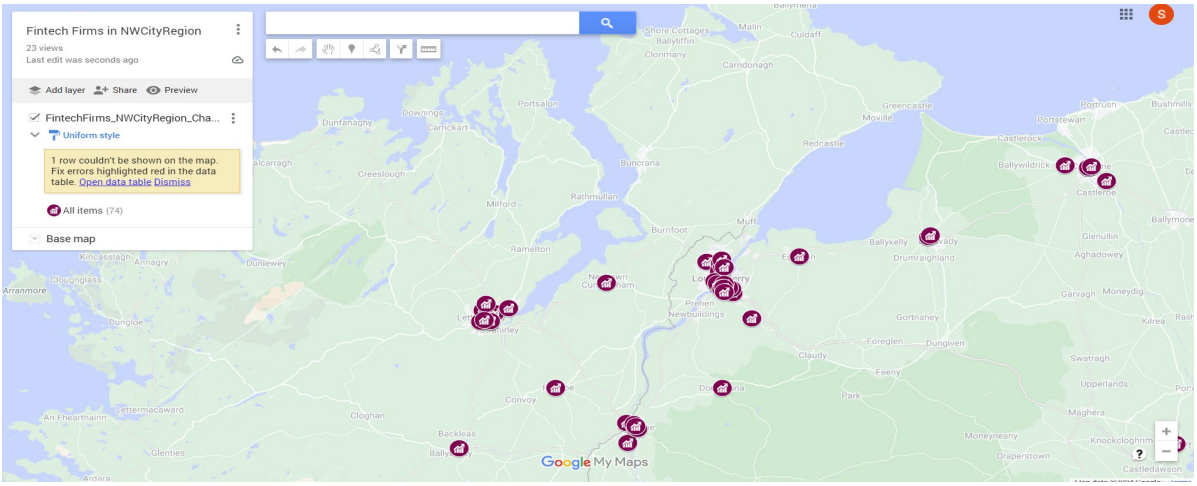

Figure 6: Visualization of Fintech companies

As highlighted in the literature, industrial clusters are not formed by mere concentration of corporations in a geographic location (Fowcs-Williams 2012; Ketels 2017). Clustering happens when companies from the same sector and related industries interact with each other and create linkages, corporations, and networks within and beyond the proximity, external to the cluster boundaries (Byrne 2016; Walsh 2020). For understanding of the business environment and the level of interaction among corporations in the region, an in-depth analysis of the business linkages is conducted based on the 4I linkage model (Hobbs 2010). It helped us in understanding the micro business environment for fintech firms in the region, which was made possible by in-depth interviews with different stakeholders of the fintech ecosystem.

The strength of the relationship among different components of the fintech ecosystem is measured using the 4I linkage model, through in-depth interviews. The 4I linkage model focuses on 4 key aspects of the relationship which are: Intensity, Importance, Involvement, and Investment which are further measured by other features as highlighted in the interview guide. In the first section of our in-depth interview, we collected introductory information from fintech companies to have an idea regarding when the company started its operation in the region, how many employees are in the company, what type of fintech niches the company is serving, and which fintech niche the company is more focused on.

The 4I linkage methodology gives a flexible framework that is based on a few questions for defining the local geographic scope of clusters for identification and analysis purposes, which in our case, is as follows:

- All the components of fintech reside within the North West City Region of Ireland.
- The administrative region for the fintech cluster resorts under NUTS 3. However, there is a lack of availability of data on the fintech sector.
- The firms in this region are within a range of 2 hour drive and have face-to-face contact.

There are eight different categories of linkages that have been identified based on previous literature (Porter 1998b, 2000a; Sölvell *et al.* 2003, 2008; Byrne 2016). Following are the identified categories of the linkages (Byrne 2016, p.131-132). These categories are further divided as per the triple helix model for data collection after expert opinions. The three primary actors of the triple helix model: academia which consist of innovation centers, a research and development center, and universities in the region. The second primary actor of the triple helix model is the government which includes government agencies and industry associations. The other primary actor is industry which consists of peers, customers, suppliers, specialist services, and training services. The defined linkages are divided into four categories depending upon the distance between the surveyed company and one of the primary actors of the triple helix model which are: Local, National, European, and International. Local linkages are located within the defined local geographic scope, where "national" refers to within a country, European to being on the Europe level, and international is anywhere in the world. This method investigates the linkages external to the clusters in detail, which helps in assessing the geographic reach of the

cluster which is missing in Porter's work (2000). The perceived significance of these linkages is assessed from the perspective of the surveyed company. A series of Likert scale questionnaires are used to assess the perceived significance of each linkage based on connection, influence, integration, and interdependence during the interview. The reasons for assigning the specified significance were also asked. Each dimension is given a score between 1 and 10, which are added up to give a linkage's perceived significance score out of 40. There is a division of the perceived significance score into four bands under which each of the calculated perceived importance scores of the linkages fall. This scale measures the strength of the relationship of different factors of fintech components with the three basic actors of the triple helix model in this study and thus explains a system's dynamics and linkages. We also inquired in detail about the reasons for the perceived significance of each linkage and how it could be improved or strengthened, which helped us in making policy recommendations for the region and the fintech sector.

5. The Value of the Suggested Approach

This approach enhanced the comprehensiveness of the fintech cluster in the region which enabled us to understand the underlying mechanisms driving industrial cluster formation and development. It highlighted the type of linkages and collaborations that exist among different components of the fintech ecosystem in the region of interest which would help researchers and policymakers to make policy recommendations for the region in general and the fintech sector in specific. One of the key advantages of this approach is its flexibility in adapting to the dynamic nature of the fintech sector, especially in an emerging phenomenon where new niches and companies continuously emerge. This adaptability allowed the researchers to overcome challenges such as the lack of publicly available data on fintech companies and the evolving nature of the sector.

Furthermore, the mixed method approach enabled a nuanced understanding of fintech clustering beyond just physical proximity. It delved into local linkages, collaborations, and networks among fintech companies, highlighting the importance of these factors in developing robust clusters. This depth of analysis is crucial for identifying strengths, weaknesses, opportunities, and threats within the fintech ecosystem, which in turn can inform policy recommendations for regional development and sector-specific interventions. By employing a mixed method approach, this study not only contributes to academic knowledge but also provides actionable insights for policymakers, industry stakeholders, and researchers aiming to understand and support fintech clustering initiatives.

In conclusion, the value of the mixed method approach lies in its ability to provide a holistic and nuanced perspective on fintech clustering in a specific geographic region. By integrating qualitative and quantitative methodologies, this study goes beyond surface-level analysis and dives deep into the intricate dynamics of the fintech ecosystem. This comprehensive understanding is essential for developing targeted strategies, fostering collaboration among stakeholders, and unlocking the full potential of fintech clusters for economic growth, innovation, and competitiveness. As fintech continues to shape the financial landscape globally, our study could serve as a valuable roadmaps for navigating and harnessing the opportunities presented by this rapidly evolving sector.

6. Conclusion

Through a blend of quantitative and qualitative data insights, this study provides a comprehensive understanding of the industrial clustering phenomenon while enabling academicians and policymakers to identify and map the industrial clusters which would lead to the identification of strengths and weaknesses of the fintech cluster in the region and contribute to both theory and practice. This study bridges the gap between theoretical concepts and real-world application while emphasizing the importance of practical outcomes and actionable insights which will assist the researchers to suggest a policy recommendation for the fintech sector specifically, and for regional development in general. The methodology used in this study could serve as a roadmap for unlocking the full potential of fintech clusters, contributing to economic growth, innovation, and competitiveness in the rapidly evolving global financial landscape.

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Work in Progress Paper

Unlocking the Dynamics of Social Entrepreneurship: An Investigation in Northwest Ireland Research Method Paper

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Abstract: The purpose of this research is to examine the establishment and development of social enterprises and entrepreneurs in Northwest Ireland. Using a multi-method approach which combines qualitative and quantitative methods, the research aims to understand the dynamics, challenges, and motivations behind social entrepreneurship. The research design commences with quantitative data collection and analysis, which subsequently informs and enriches the qualitative phase. In the first phase, the research applies a shallow cases analysis to develop the questions for the subsequent survey and interviews. A self-administered online questionnaire, facilitated through a snowball sampling approach, captures quantitative data. The collaboration with regional development entities bolsters the survey process, aiming to construct a demographic profile of social entrepreneurs. The goal of this phase is to gather information that will help explain and describe the motives and difficulties faced by social entrepreneurs. The second phase unfolds through in-depth interviews, engaging social entrepreneurs and stakeholders, including government departments. The aim is to fully understand the formation and evolution process. To understand what factors, impact on this process and how they overcome these events. The research uses a methodological toolkit that includes theme analysis for qualitative insights and SPSS for quantitative data analysis. This multi-method research contributes to the growing of literature on social entrepreneurship, particularly in regional contexts. The findings extend implications for various stakeholders, including government agencies, higher education institutions, and intermediaries actively involved in supporting and enhancing the impact of social enterprises. Essentially, the research provides a context-specific and comprehensive explanation of how social entrepreneurship has developed in Northwest Ireland. In summary, the research effectively advocates for a nuanced knowledge of the dynamics of social entrepreneurship in regional contexts by capturing the richness and complexity of the subject matter through the well-chosen use of a multi-method approach. The results contribute to scholarly discourse and provide practical insights for those committed to promoting social innovation and bringing about constructive changes in society.

Keywords: Social entrepreneurship, Ireland, Multi-Method approach, Quantitative data, Qualitative insights, Motivations, Challenges, Thematic analysis

1. Introduction

In recent years, social entrepreneurship has emerged as a powerful force for positive social and environmental change, with individuals and organisations alike harnessing innovative business models to address pressing societal challenges. Social enterprises play a vital role in driving economic growth and fostering community well-being in the Northwest of Ireland. As such, it is imperative for policymakers, practitioners, and academics to gain a comprehensive understanding of the factors shaping the successful development of social enterprises in this region. While existing literature has delved into aspects such as societal impact, community engagement, and government relations (Choi, Lee, & Hur, 2021), there remains a notable gap in empirical evidence regarding the size, scope, and tangible economic and social contributions of social enterprises in the Irish context (Choi & Park, 2021). To address this gap, this study aims to shed light on the impact, dynamics, and contributions of social enterprises, as well as the broader entrepreneurial ecosystem in the Northwest.

Drawing on previous research that explored social enterprise practitioners' perspectives on business support provision, this study will focus on the pre-startup, startup, and established stages of social enterprise development. By doing so, it seeks to provide policymakers and decision-makers across the local entrepreneurial ecosystem with valuable insights into how best to support the establishment and growth of social enterprises. The overarching goal of this research is to investigate the formation and evolution of social enterprises and entrepreneurs in the Northwestern region, with specific objectives outlined as follows:

1. To build a demographic profile of entrepreneurs.
2. “4P” Social Entrepreneurs for People, Profit, Planet and Place.
3. Identify the motivations and challenges they encounter at each stage of formation and evolution.
4. Identify the importance of local entrepreneurial ecosystem in the process.
5. Outline the importance of intermediaries, hubs, HEIs to the process.

2. Background

This study adopts a multi-method approach, primarily focusing on primary research. The research design entails quantitative data collection as the initial stage of the process, followed by qualitative data collection. Literature review findings and quantitative data analysis results will inform the subsequent qualitative phase. This sequential design ensures a clear and systematic approach to analysis and reporting, as advocated by Creswell and Báez (2020). The insights gleaned from the initial quantitative phase will guide the qualitative data collection process, particularly in profiling social entrepreneurs and enterprises and exploring their motivations and challenges in formation and growth.

The qualitative data collection phase involves conducting in-depth interviews with social enterprises, entrepreneurs, and stakeholders, including government departments. The use of semi-structured interviews with a carefully selected group of social entrepreneurs is essential to gaining deeper insights into the formation and evolution process. By integrating findings from the literature review and the initial quantitative phase, the research aims to develop more accurate predictions and insights.

The research employs SPSS for quantitative data analysis and thematic analysis for qualitative data analysis. SPSS facilitates the statistical analysis of quantitative data, while thematic analysis enables the identification and interpretation of patterns in qualitative data. This dual-method approach ensures a systematic and comprehensive understanding of the research questions. Thematic analysis helps uncover the various motivations, challenges, and dynamics of social enterprises in the Northwest. Themes identified in the literature and the quantitative phase inform interview questions, ensuring alignment with predetermined research objectives.

Semi-structured interviews allow for flexibility while maintaining a focus on predetermined themes. Stakeholders, including government departments, are interviewed to gain insights into the support landscape and ecosystem differences, addressing research objective 5. These interviews contribute to understanding the distinctions between the general ecosystem and the social enterprise ecosystem in the Northwest.

In summary, this research employs a rigorous multi-method approach to investigate the formation and evolution of social enterprises in the Northwest. By combining quantitative and qualitative methods, the study aims to provide valuable insights for stakeholders, including government agencies, HEIs, and intermediaries, to better support social enterprise development in the region.

3. Phases

This research employs a multi-method approach with quantitative data collection, including shallow cases analysis, and qualitative data collection through in-depth interviews. This approach allows a comprehensive exploration of social enterprises in the Northwest.

3.1 Phase 1: Quantitative Data Collection

The quantitative phase involves analysing shallow cases to establish a foundational framework. This phase aims to gather background information on social enterprises and entrepreneurs, including demographics and motivations, to address research objectives 1-3. Shallow case analysis serves as a guiding compass, facilitating a deeper understanding of the specifics of social enterprises. Employing a snowball sampling approach, participants are encouraged to complete an online questionnaire and share it with others. The study benefits from the support of organizations such as Donegal Local Development Company, Inishowen Development Company, and Donegal Women in Business, enhancing participant engagement.

Through this quantitative phase, valuable descriptive and explanatory data will be obtained, contributing to the profiling of social entrepreneurs. Descriptive data will aid in understanding the characteristics of the sample, while explanatory data will delve into motivations, challenges, and various influencing factors. This approach ensures a focused exploration, allowing survey and interview questions to extract meaningful information. Overall, the quantitative phase plays a crucial role in addressing research objectives 1-4, providing insights into the multifaceted dynamics of social enterprise development.

3.2 Phase 2: Qualitative Data Collection

To fully understand the thoughts, feelings, or human participants, it is very important that qualitative analysis is undertaken. For this reason, it is vital that semi-structured in-depth interviews are conducted with a selection of the social enterprises/entrepreneurs to fully understand the formation and evolution process. To understand

what factors, impact on this process and how they overcome these events. These findings would help Government agencies, HEIs, intermediaries to understand how best to support these enterprises. As previously outlined in literature, this is an emergent area in which additional research is necessary (Qingqing, Collins and Ranabahu, 2021). The qualitative phase will provide necessary detail and insight. Both literature and the findings from phase one will allow the development of predetermined themes, and a theme sheet enabling the semi-structured approach to interviewing (Saunders et al. 2019). The survey and interview questions will be designed based on the literature, previous studies, and shallow cases analysis. SPSS will be utilized to analysis the quantitative data and thematic analysis, a method for identifying, analysing, organising, describing, and reporting themes found within a data set (Braun and Clarke, 2006).

4. Challenges and Solutions

Addressing challenges such as participant availability is achieved through flexible scheduling and collaboration with local development organizations like Donegal Local Development Company and Inishowen Development Company. These partnerships provide crucial support for participant engagement. Regular communication with supervisors enables prompt resolution of unforeseen challenges. It is important to note that challenges identified in the research are diverse and stage dependent.

Ethical considerations play a pivotal role in the research process. Consent is obtained from participants, and measures are taken to ensure confidentiality and anonymity. The study strictly adheres to ethical guidelines, with a focus on safeguarding the well-being and rights of participants. This includes obtaining informed consent, maintaining data confidentiality, and treating participants with respect. These ethical practices are fundamental to maintaining the integrity and credibility of the research.

5. Research Contributions

The research aims to offer practical support to social entrepreneurs by elucidating the available support within the local entrepreneurial ecosystem. Additionally, it addresses the needs of key decision-makers by providing insights into the motivations, resources, and challenges encountered by social entrepreneurs at various stages of their journey. The study emphasizes crucial elements of the ecosystem, areas requiring improvement, and the roles of Higher Education Institutions (HEIs), local intermediaries, and regional hubs in fostering growth and sustainability. By examining these factors, the research seeks to inform policies and practices that promote the advancement of social entrepreneurship in the region.

The significance of mentorship programs, access to funding networks, and collaborative spaces within the local ecosystem is underscored in the study. Areas for enhancement include improving resource accessibility for social enterprises, streamlining regulatory support, and expanding networking opportunities. These elements are identified based on the expressed experiences and needs of social entrepreneurs.

HEIs, local intermediaries, and regional hubs play distinct yet complementary roles in supporting social enterprise growth. HEIs contribute through tailored research, training, and educational programs. Local intermediaries, such as business development agencies, facilitate connections and provide targeted assistance. Regional hubs serve as collaborative platforms, promoting networking and knowledge exchange. The research explores how these institutions can synergize efforts to cultivate an optimal ecosystem for social enterprises.

6. Conclusion

In conclusion, this research has illuminated the intricate network of relationships, resources, and support mechanisms essential for the success of social enterprises in the Northwest region. By comprehensively analysing the roles of higher education institutions, local intermediaries, and regional hubs, valuable insights have been gleaned regarding the factors contributing to the sustainability and expansion of social entrepreneurship. The collaborative efforts and tailored support provided by these entities are pivotal in fostering an environment conducive to the thriving of social enterprises and their lasting impact on society.

Moving forward, stakeholders must capitalize on these findings to inform policies, practices, and initiatives aimed at further fortifying the entrepreneurial ecosystem. By doing so, they can empower social entrepreneurs to spearhead positive change not only in the Northwest region but also beyond its borders.

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