

Corporate Effectuation in the Digital Age: the Role of Absorptive Capacity and Digital Skills

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Abstract: Effectuation has become a highly influential decision-making logic for entrepreneurs. While most studies have viewed effectuation as an approach to managing resource constraints in the new venture context, few of them have directly investigated the effects of effectuation as an approach to absorptive capacity (AC) in the corporate context. Specifically, the relationship between the usage of an effectual logic and its impact on the knowledge of individuals remains underexplored in corporate entrepreneurship (CE), i.e., entrepreneurship in incumbent organisations. Moreover, in a digital world characterised by the growing proliferation of digital technologies, digital skills can support the learning and knowledge absorption process of individuals in incumbent organisations facilitating the development of corporate innovation. By using the survey data from employees of an incumbent firm, we test hypotheses developed to examine the relationship between effectuation and entrepreneurial orientation (EO) as well as the mediating role of AC and the moderator role of digital skills in this relationship. The empirical results generally support our hypotheses by showing that (i) effectuation positively influences AC, and (ii) digital skills have a positive moderating effect on the relationship between effectuation and AC. No significant results emerged concerning hypothesis (iii) AC mediates the relationship between effectuation and EO. Drawing upon the findings of this study, we reframe effectuation as a concrete activity that enhances knowledge absorption and enlarges the scope of opportunities, and in turn fosters entrepreneurial actions in organisations. In doing so, we advance the extant understanding of corporate effectuation in the digital era, providing also managerial implications.

Keywords: Corporate Entrepreneurship, Digital Technologies, Effectuation, Absorptive Capacity, Digital Skills

1. Introduction

Effectuation, defined as “the process that takes a set of means as given and focuses on selecting between possible effects that can be created with that set of means” (Sarasvathy, 2001), has been successfully introduced to and then prospered in the field of entrepreneurship (Sarasvathy et al., 2003; Scazziotto et al., 2023). Most existing studies in entrepreneurship view effectuation as an approach to overcome resource constraints and develop businesses starting from the available means (Chandler et al., 2011; Dew et al., 2009). Moreover, a consistent body of research investigates effectuation in the new venture context (Villani et al., 2018; Read et al., 2009). Some studies examine the conditions of whether entrepreneurs mobilise effectual principles (i.e., experimentation approach) when they launch new ventures in emerging industries (Sarasvathy, 2001). Other studies focus on how entrepreneurs process risks and returns in new venture development (Perry et al., 2012). Recently, scholars have started to investigate effectuation in the corporate context (Parker et al., 2021). However, we still know relatively little about when and why effectuation processes are employed in corporate decisions (Johansson and McKelvie, 2012; Von Briel et al., 2018). In addition, most empirical effectuation studies have examined effectuation as a dependent variable (Perry et al. 2012), while the consequences of using effectual reasoning remain underexplored. Further, research concerning the effect of effectuation on other constructs such as learning and Absorptive Capacity (AC) (i.e., ability to identify, assimilate, and exploit knowledge from the environment) is limited (Scuotto et al., 2022; Müller et al., 2021). Indeed, a growing body of literature urges to analyse effectuation in the digital entrepreneurship field (Nambisan, 2017; Ghezzi, 2019). In a digital entrepreneurial process characterised by high uncertainty, effectuation process is a necessary condition (Kraus et al., 2018). Furthermore, digital skills (i.e., the ability to adapt and exploit the possibilities offered by digital technologies) can help to reduce this uncertainty and support effectuation process and experimentation (Ghezzi and Cavallo, 2020; Peart et al., 2020). Here, we reframe effectuation as a behaviour enabling and fostering entrepreneurial actions and learning through experimentation (Wiklund and Shepherd, 2011). More specifically, we propose effectuation as an enabler for the experimentation of new opportunities enabled by digital technologies. Finally, at a broad level, Corporate Entrepreneurship (CE) literature (i.e., entrepreneurship in incumbent organisations) has been dominated by contributions at firm-level (e.g., Rauch et

al., 2009; Urbano et al., 2022), while few studies have explored the phenomenon at individual-level or team-level dimension (Pinchot, 1985). And more, few studies have expressly modelled the individuals' intrapreneurial behaviour in digital context (Pinchot and Soltanifar et al., 2021). Specifically, in this study, we investigate the role of experimentation and digital technologies in CE through the theoretical lens of effectuation (see Figure 1). More specifically, we built a model analysing the role of effectuation on Entrepreneurial Orientation (EO) (i.e., the degree to which an organisation exhibits a sustained pattern of entrepreneurial behaviour), while exploring the role of AC (which captures, transforms, and exploits knowledge) and digital skills that can enable effectuation process. The findings of this study provide several contributions to the existing literature. First, we extend our understanding on the role of effectuation in influencing CE. Effectuation is traditionally viewed in the literature as a behaviour aimed to overcome resource constraints (Sarasvathy, 2001). This study, in contrast, examines the role of effectuation in driving CE through generating and accumulating new knowledge. Second, this study complements prior research by investigating the role of effectuation in the corporate context. Prior studies primarily focus on the context of new ventures. Third, this research explores the role of digital skills as a moderator of the relationship between effectuation and AC, thus revealing boundary conditions in the digital context where firms can enhance the effects of effectuation. Finally, this study offers implications for practice to foster experimentation to innovate in organisations while exploiting the potential of digital technologies.

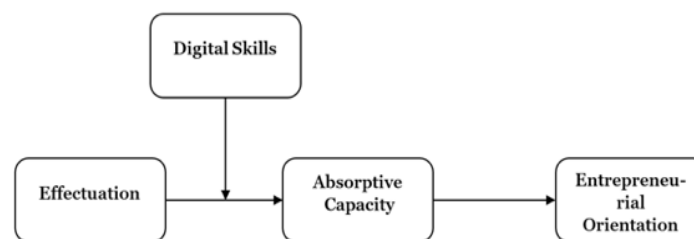


Figure 1: Research framework

2. Theory and hypotheses

2.1 Effectuation and absorptive capacity

The ability of a company to recognise new value and external information, and successfully assimilate and exploit them is known as absorptive capacity (AC) (Cohen and Levinthal, 1990). Effectuation is largely based on experimentation and could lead to processes of learning by doing through trial-and-error experiments which can favour AC routines (Parker et al., 2021). Accordingly, effectuation impacts AC in three main ways: first, effectuation directly affects exploratory learning which is one of the three processes that compose AC (Lane et al., 2006). Exploratory learning is described as the key action directed by effectuation logic to gain new knowledge and reduce uncertainty (Cai et al., 2017). Second, according to the effectuation logic, “action” reflects the experimental dimension defined by Chandler et al. (2011). Accordingly, action is a tool for knowledge acquisition enlarging the knowledge base (Djuricic and Bootz, 2019). Finally, companies which stimulate creativity and experimentation facilitate the effective use of AC in creating novel outcomes (Sakhdari and Burgers, 2018). In sum, in conditions where effectual logic is applied, AC will be stimulated, increasing the ability to capture new relevant knowledge and to pursue new opportunities. Accordingly, we propose:

H1: The use of effectual logic is positively related to individual absorptive capacity.

2.2 Effectuation, absorptive capacity, and entrepreneurial orientation

Corporate Entrepreneurship (CE) could be defined as the process whereby firms pursue innovation, renewal, and venturing (Burgelman, 1983). It usually implies practices as organisational rejuvenation, strategic renewal and domain redefinition (Covin and Miles, 1999). Within CE domain, the concept of Entrepreneurial Orientation (EO) refers to an organisational attribute reflecting how “being entrepreneurial” is manifested in organisations or business units (Covin and Slevin, 1989) through entrepreneurial activities. As informed by literature (Martín-Rojas et al., 2020; Zahra et al., 2009), CE represents a positive function of AC, consisting in the recognition, assimilation, and exploitation of knowledge that corporate entrepreneurs should enhance and foster. The more the capacity to absorb external knowledge the more the individuals will undertake entrepreneurial actions manifesting EO. The literature has provided evidence about the relationship between AC and CE. It is largely

known that AC allows a company to blend new external and internal knowledge (Lane et al., 2006), which is an important condition for enabling CE and foster entrepreneurial actions (Ireland et al., 2009). Even more, AC increases the ability to recognise opportunities proactively instead of reactively (Thorpe et al., 2005) stimulating EO. Thus, adapting the previous considerations at individual level we hypothesise:

H2: Individual absorptive capacity is positively related to individual entrepreneurial orientation.

Integrating H1 and H2 we propose that AC mediates the influence of effectuation on EO, hence effectuation enhances AC which in turn influences EO. The more intensely the effectual logic is adopted by individuals the more likely they will develop and improve the ability to experiment and learn by doing. At the same time, they can develop the ability to build solid networks with external actors. This fosters exploratory learning (Cai et al., 2017), the recognition of opportunities, and the possibility to grab external knowledge improving AC. The action of effectuation becomes a tool for knowledge acquisition (Djuricic and Bootz, 2019). With an enlarged knowledge base and the ability to manage and exploit such knowledge individuals will be able to implement more entrepreneurial actions. Thus, we propose:

H3: Individual absorptive capacity mediates the relationship between effectuation and individual entrepreneurial orientation.

2.3 The moderating role of digital skills

Incumbent firms face the rapid progress of digital technologies and the consequently increased pace of innovation and dynamicity of the markets. Effectuation can be considered as an experimentally driven approach aiming at reducing uncertainty in such complex environments characterised by the pervasiveness of digital technologies. Individuals' ability to manage and exploit digital technologies can help organisations to better understand the possibilities offered by digital technologies (Autio et al., 2017). Digital skills, defined as the ability to develop and use ICT to participate in an environment increasingly dominated by electronically enabled information and the ability to synthesise this information into effective and relevant knowledge (Van Laar et al., 2017), can be helpful to create and reshape the ways resources are used and enlarge the set of solutions to solve problems. Specifically, we argue that digital skills positively moderate the relationship between effectuation and AC for several reasons. First, they can support exchange of information (both external and internal) thereby improving AC (Rehman et al., 2020). Second, digital skills can act as enablers for knowledge management (Joshi et al., 2019). Third, digital skills could even empower effectuation, by enabling a variety of possibilities that represent a significant increase in the number of possible means available for effectuation (Leong et al., 2016). Accordingly, we propose:

H4: Digital skills positively moderates the relationship between effectuation and individual absorptive capacity.

3. Methodology

3.1 Sample and data collection

We test these hypotheses using the survey data from an incumbent firm operating in the sector of energy and gas. The survey was issued to a total of 300 individuals with a final number of 79 responses (26.3% of response rate with 60 valid answers for a final percentage of 20% of valid answers). The questionnaire included all the necessary scales to measure the different variables of the model, and each scale was selected after detailed research aiming at checking its validity and reliability through the literature (Chandler et al., 2011; Bolton and Lane, 2012; van Laar et al., 2017). The variables of interest in this study are: (1) effectuation, (2) individual entrepreneurial orientation, (3) digital skills, (4) individual absorptive capacity. Each scale is composed by different sub-attributes. Specifically:

EFFECTUATION: Experimentation, Flexibility, Affordable Loss, Precommitments.

ENTREPRENEURIAL ORIENTATION: Innovativeness, Risk-Taking, Proactiveness.

DIGITAL SKILLS: Communication, Information Management, Collaboration, Creativity, Problem Solving, Critical Thinking.

ABSORPTIVE CAPACITY: Recognition, Assimilation, Transformation, Exploitation.

3.2 Reliability and construct validity

After data acquisition and cleaning it was necessary to perform some preliminary analysis to guarantee the validity of subsequent results. A first important step consisted into checking for non-response bias. The non-response bias refers to the possibility that people who did not respond to the survey are very different from people who responded creating potential problems for the significance of the sample. Therefore, it was important to test the eventual difference through a t-test. In this case, the non-response bias was tested by comparing two sub-samples: early respondents and late respondents (Borg and Tuten, 2016). In a T-test, the null hypothesis can be expressed as: $H_0: \mu_1 = \mu_2$ (i.e., the two samples' means are equal). To perform the T-test, however, the assumption of homogeneity of variance (i.e., both groups have the same variance), needs to be tested. There were no significant results underlining differences between the means of the two respondents' groups, so it could be possible to move forward without additional considerations. Then, besides the quality check of the sample, it was necessary to test the reliability and validity of the constructs, and as indicator for the reliability, Cronbach's alpha was used (Table 1).

Table 1: Cronbach's alphas of the different scales.

Construct	Items	Alpha	Source
Entrepreneurial Orientation	10	0.817	Bolton D.L. & Lane M.D. (2012)
Individual Absorptive Capacity	14	0.78	Lowik et al. (2012)
Effectuation	20 (12 of effectuation)	0.78 (Experiment.);	Chandler et al. (2011)
		0.85 (Afford. Loss);	
		0.70 (Flexibility);	
Digital Skills	59	0.965	Van Laar et al. (2018)

The value of the different alphas of the scales showed values above the threshold of 0.7 (Cronbach, 1951), confirming their reliability. To validate the different scales, it has been performed a factor analysis, and since all the constructs were taken from the literature it was sufficient to check them through confirmatory factor analysis to understand if there was correspondence among the conceptual scales and the real data. However, confirmatory factor analysis (CFA) works better with larger sample and being the sample used for this study smaller than the level considered sufficient for CFA, traditional indicators revealed a lower level with respect to the standard ones. The average variance extracted (AVE) for all the variables, hence, was extracted analysing the factor loadings of exploratory factor analysis, revealing for each factor a sufficient percentage of variance explained.

4. Results

One of the first steps of the data analysis was to investigate existing relations among all the variables, studying the correlation matrix. Looking at the variables analysed, it is possible to notice a relevant correlation between AC and digital skills and between effectuation and AC. These results encourage the assumption made for the first hypothesis and the last one. The results are shown in Table 2.

Table 2: Correlations' matrix

	MEAN	S.D.	1	2	3	4	5	6	7	8	9	10	11
GENDER	0.4333	0.49	1										
AGE	41.38	9.18	-0.177	1									
TENURE	9.86	9.8	-.332**	.659**	1								
POSITION	1.15	0.48	.289*	-0.075	-0.099	1							
STUDY_TITLE	1.9	1.10	.358**	-0.191	-0.242	0.061	1						
FAMILYBACKGROUND	0.1833	0.39	.281*	0.174	0.046	-0.149	0.004	1					
ENTREP_EXP	0.1167	0.32	.311*	.287*	-0.197	0.103	-0.014	0.23	1				
EFFECTUATION	3.83	1.01	-0.175	0.145	0.012	0.019	-0.002	-0.13	0.02	1			
ENTREPRENEURIAL ORIENTATION	3.39	0.97	0.063	0.076	-0.061	0.128	0.026	0.097	-0.017	0.165	1		
DIGITAL SKILLS	3.34	1.05	.372**	-0.183	-.383**	0.205	.314*	0.06	0.185	.378**	.268*	1	
ABSORPTIVE CAPACITY	3.81	0.99	-0.021	0.095	-0.104	0.046	0.097	0.034	-0.018	.577**	0.198	.563**	1

** The correlation has significance at the level 0.01 (two tales).

* The correlation has significance at the level 0.05 (two tales).

The results of the regression analysis are reported in Table 3. To develop the empirical model, it was adopted the statistical technique of multiple hierarchical regression (Cohen and Cohen, 1983). The regression starts from an initial model containing only the control variables and for each following step an independent variable is added according to specific criteria and a new model is generated. To draw the conclusions the variation of R^2 and the level of significance are analysed for each model. In the first two models reported it is possible to see Individual Absorptive Capacity used as dependent variable to test its relationship with effectuation, according to the first hypothesis. In model 2 the variable of effectuation is added, and the results show that the variable has a great significance ($p < 0.01$) and R^2 variation is significant too (0.287). This allows to conclude that the first hypothesis (H1) is supported: effectuation positively impacts absorptive capacity of individuals.

Then it was immediately tested the role of digital skills, introduced in model 3. The increase of R^2 is consistent (0.133) and the significance is high ($p < 0.001$). Finally, it is tested the interaction of effectuation and digital skills, the product of the two constructs is added in model 4, furtherly increasing R^2 even if with a lower impact and significance level respect to the previous steps of the model. These results bring evidence to support the last hypothesis (H4). The second half of the mathematical framework shows the models designed to study the impact on the dependent variable of EO. Here, data do not enable to confirm the second and the third hypotheses as for H1 and H4. In model 7 is shown the impact of effectuation on EO as a direct effect, R^2 increase sensibly (0.045) but, even if R^2 across all the different models has an increase, the "delta" remains too small to confirm H2 and H3, even more the levels of significance are not satisfactory. Mediation, however, has been checked accordingly to the criteria explicitly indicated in the literature (Baron and Kenny, 1986).

Table 2: Quantitative results of the regression models

Dependent Variable	Absorptive Capacity				Entrepreneurial Orientation			
	MODEL 1	MODEL 2	MODEL 3	MODEL 4	MODEL 5	MODEL 6	MODEL 7	MODEL 8
	B	B	B	B	B	B	B	B
Variables								
CONSTANT	-1.864* (0.911)	-1.186 (0.769)	-1.011 (0.686)	-1.115 (0.683)	-1.583 (0.927)	-1.337 (0.965)	-1.399 (0.941)	-1.321 (0.97)
GENDER	-0.204 (0.338)	0.024 (0.284)	-0.22 (0.261)	-0.276 (0.261)	0.01 (0.344)	0.037 (0.345)	0.072 (0.347)	0.07 (0.35)
AGE	0.05* (0.023)	0.03 (0.02)	0.033 (0.018)	0.035* (0.017)	0.037 (0.024)	0.03 (0.025)	0.032 (0.024)	0.03 (0.025)
TENURE	-0.046* (0.021)	-0.032 (0.018)	-0.021 (0.016)	-0.025 (0.016)	-0.032 (0.022)	-0.026 (0.023)	-0.028 (0.022)	-0.026 (0.023)
POSITION	0.192 (0.294)	0.12 (0.245)	0.024 (0.219)	0.065 (0.219)	0.339 (0.3)	0.314 (0.301)	0.319 (0.299)	0.311 (0.303)
STUDY_TITLE	0.093 (0.131)	0.058 (0.109)	-0.012 (0.099)	-0.033 (0.099)	-0.001 (0.133)	-0.013 (0.134)	-0.01 (0.133)	-0.014 (0.134)
FAMILYBACKGROUND	0.182 (0.374)	0.324 (0.312)	0.241 (0.279)	0.271 (0.276)	0.326 (0.381)	0.302 (0.382)	0.364 (0.381)	0.343 (0.389)
ENTREP_EXPERIENCE	-0.716 (0.528)	-0.649 (0.438)	-0.713 (0.391)	-0.672 (0.388)	-0.693 (0.537)	-0.598 (0.547)	-0.674 (0.536)	-0.632 (0.552)
EFFECTUATION		0.562*** (0.114)	0.349** (0.116)	0.413** (0.123)				
DIGITAL SKILLS			0.486*** (0.128)	0.473** (0.127)				
EFFECTUATION * DIGITAL SKILLS				0.154 (0.106)				
ABSORPTIVE CAPACITY						0.132 (0.141)		
EFFECTUATION							0.152* (0.139)	
MEDIATION (EFFECTUATION AND AC)								0.115 (0.171)
R squared	0.114	0.401	0.534	0.553	0.062	0.098	0.103	0.106
R sq adj	-0.005	0.307	0.45	0.462	-0.041	-0.044	-0.033	-0.055
Δ R squared	0.114	0.287	0.133	0.02	0.062	0.04	0.005	0.003

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; Standard errors in parenthesis

5. Discussion

This study investigates how effectuation impacts CE in incumbent firms, through individuals' absorptive capacity and digital skills. First, this study sheds light on role of effectual behaviour to improve learning capabilities and exploit knowledge in organisations (H1: Effectuation is positively related to individual absorptive capacity). Experiential organisational learning in this way can be stimulated (Cai et al., 2017) and consequently even absorptive capacity, with clear positive consequences on organisational opportunities. Results show a significant increase of prediction of individual AC ($\Delta R^2 = 0.28$, $p < 0.001$) providing strong empirical information. Second, our

study sheds lights on the enabling role of digital skills which characterise the last hypothesis (H4: Digital skills positively moderates the relationship between effectuation and individual absorptive capacity). Given the same effectuation level, an higher level of digital skills could help individuals to recognise and absorb more knowledge and exploit it through new opportunities. All these considerations find an empirical boost in the last hypothesis of the model, which results show a significant increase in the prediction of AC ($R^2 = 0.53$ overall and $\Delta R^2 = 0.133$, $p < 0.001$) after the inclusion of effectuation and digital skills. Finally, we observed that the hypothesis H2 (H2: Individual absorptive capacity is positively related to EO), has not been confirmed by the data gathered. However, the conceptual model developed provides further insights on the impact that a good knowledge system within the firm has on entrepreneurial opportunities. As evidenced in the literature, CE is often defined as a positive function of AC (Zhara et al., 2009; Martin-Rojas et al., 2020), since recognition, assimilation, and exploitation of knowledge foster individuals to undertake more entrepreneurial actions (Ireland et al., 2009). The same is recognised for EO, stressing even the importance of AC in developing EO in dynamic environments (Ruiz-Ortega et al., 2023). All these insights sustain the model developed here, and the results obtained provide a stepping-stone for future research. These results emerged may be useful for future research on CE in the digital era.

6. Conclusions

6.1 Theoretical contributions

Our findings contribute to the existing literature in fourth aspects. First, the findings extend our understanding of the role that effectuation plays in enhancing entrepreneurship in incumbent organisations. (Perry et al., 2012). Second, we uncover the link between effectuation and AC (H1). This study suggests that effectuation is also relevant in the context of incumbent firms. Effectuation can be the source of organisational knowledge base and enables incumbent firms to learn from the set of means available in the organisation and innovate in incumbents. Thus, effectuation may influence organisational learning rather than act only as a mechanism to manage resource constraints in the new venture context. In this study, we reframe effectuation as a behavioral theory that can enhance both external and internal absorption of knowledge with consequent enlargement of the opportunity set to be seized with entrepreneurial actions. Third, we analyse the impact of effectuation on CE mediated by AC (H3). We shed light on the role of effectuation and, in turn, experimentation in supporting CE activities, which is a topic that deserves further studies (Hampel et al., 2020). Fourth, we consider the enabling role of digital skills that update different, but related, research fields, i.e., experimentation and corporate entrepreneurship. This work is one of the first empirical studies in the emerging area of digital corporate entrepreneurship (D'Angelo et al., 2021; Arvidsson and Mønsted, 2018).

6.2 Implications for practice

Our study has two potential practical implications. First, managers of large corporations could leverage effectuation logic to identify, assimilate, and exploit knowledge from the environment (i.e., absorptive capacity) and in turn, create entrepreneurial initiatives in incumbent organisations and become more entrepreneurial (i.e., entrepreneurial orientation). This could be realised by understanding effectuation's principles and applying them in corporate routines. In other words, incumbents can translate and adopt effectuation in concrete experimentation methods such as the lean startup approach (Harms and Schwery, 2020), which, in turn, can enable incumbent firms to acquire and exploit knowledge from experiments and facilitate organisational learning. Second, this work offers insights concerning investment decisions and the promotion of digital technologies usage within companies. In other words, digital skills can act as enabler for AC (Roberts, 2015) in incumbent organisations by facilitating the identification, assimilation, and exploitation of knowledge from the environment. Therefore, managers need to cultivate digital skills of their individuals to improve the effectuation on absorptive capacity. Developing digital skills in the corporate workforce of incumbent organisations may help organisations to learn from experimentation and accelerate organisational learning.

6.3 Future research developments

Overall, this research focuses on effectuation theory, but future studies could investigate other interesting and related theories such as bricolage theory (Backer and Nelson, 2005) and exaptation theory (Dew et al., 2004) in similar empirical contexts. In particular, exaptation is suggested by Welter et al. (2016) to be at the intersection between bricolage and effectuation thus providing a new perspective to look at the entrepreneurship field in the digital age.

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