

Cultivating Entrepreneurial Mindsets: Building Knowledge-centric-Empowered Institutional Practices

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Abstract: Entrepreneurial universities feature as innovative support systems. Therefore, universities should aim their focus on incorporating knowledge and skills within a curriculum to promote entrepreneurial mindsets. The change in Higher Education is inevitable, and ultimately future graduates must be able to compete in a global world that has moved from the third to the fourth industrial revolution (Mabunda, 2020; Mhlanga, 2021). The objective was to identify critical knowledge and skills suitable for an Entrepreneurial university's curriculum in order build capacity and produce knowledge driven graduates with the capability to generate ideas and innovation in the digital era. Data was collected using an online structured questionnaire from the Innovation, Sustainability and Visionary Leadership Group and South African Business Innovation Community (Innovation Summit). The data collected was analysed quantitatively using inferential statistical analysis. Based on the results, judgement and decision, critical and analytical thinking were identified as knowledge and skills suitable for an Entrepreneurial university's curriculum. Furthermore, skills and knowledge such as design thinking, and Information and Communication Technologies were identified, along with entrepreneurship, creativity, originality and innovation. The research aim was fulfilled by presenting the intervention keys to identify relevant skills and knowledge suitable for commercialisation dynamics of entrepreneurial universities. The ability to have sound judgement and decision making, along, critical thinking, creativity, originality and innovation were identified as the critical skills and knowledge required. The value of the study is its intervention keys which identifies critical knowledge and skills relevant in the entrepreneurial university's curriculum at a given time. This can help in assisting students to be more innovative, entrepreneurial and be able to convert business ideas into commercial products or services.

Keywords: Knowledge-centric, Innovation, Critical thinking, Entrepreneurial universities, Signification frameworks

1. Introduction

Universities are higher education institutions (HEIs) that are typically required and tasked to generate knowledge through research, innovation and teaching. HEIs play a significant role in ensuring knowledge creating, while fostering innovation development. Furthermore, knowledge creation and innovation development play a significant role within the HEIs and the economy of a country (Kruger & Steyn, 2020; Mhlanga, 2021; Song & Wu, 2021). The application of ideation process is significant as it enables the generation ideas that have the potential to be commercialised and contribute to the economy (De Koker & Du Plessis, 2020: 02). Many innovative ideas often die-out in the dreams and the minds of innovators during their academic residency as students. Hence, Entrepreneurial universities are currently the focus for higher education (Farsi, Imanipour & Salamzadeh, 2012:194). The "business of South African universities" should be to invest in graduates with the necessary entrepreneurial knowledge and skills to participate in the country's economy and transform society (Nkoana & Dichaba, 2017:191-192; DHET, 2020). According to Matli and Ngoepe (2021:1) "poverty remains an obstacle for many young people in the world, this hinders then in furthering their studies or developing their ideas into businesses".

Universities that fail to adapt to the ever-changing economy and focus more on being entrepreneurial universities are contributing to the cycle of poverty in South Africa. This study was geared towards identifying knowledge and skills required in a university's curriculum to facilitate the process of innovation and commercialisation of students' business ideas and innovation and furthermore to foster an entrepreneurial mindset and ultimately produce knowledge-driven and innovative graduates.

2. Research Aims and Objectives

The aim of this study was to identify critical knowledge and skills suitable for an Entrepreneurial university's curriculum in order build capacity and produce knowledge-driven and innovative graduates.

- To determine essential aspects in the Higher Education curriculum, develop innovative graduates.
- To identify relevant key skills and knowledge for Higher Education curriculum to produce graduates ready to develop business innovation.

3. Literature Review

The ability for Higher Education Institutions to extend their approach in university-acquired knowledge and develop capacities that are required for graduates to be effective practioner's and produce innovation is imperative. This enables graduates to experience not only theoretical knowledge but practical and authentic knowledge in environments that are fertile for knowledge-driven innovation (Moalosi, Letsholo, Matake, & Ollyn, 2022: 04).

4. Significance of Knowledge and Skills for Innovative Graduates

It is critical for graduates to exit the university system with the knowledge and understanding of various structures and operations of companies and the design processes embedded within them. Hence, skills such intellectual and cognitive thinking, problem solving and design thinking are essential in the curriculum. These are key transferable skills, enable graduates to criticise processes and the designs, allowing the development of new products and services with respect to the environment, quality, time standards and costs (Moalosi, *et.*, 2022: 08). Furthermore, knowledge of soft skills is essential in developing knowledge-driven and innovative graduates, soft skills such as meta—cognitive skills (creative skills), learning to learn, and self-regulation are critical. Also, practical skills and knowledge such Information and Communication Technology devices are as essential as the soft skills (Moalosi, *et.*, 2022: 09). It argues that soft skills such as interactive thinking, quantitative reasoning and communication build the foundation of essential knowledge required for a graduate to be an effective and efficient citizen.

The 4th industrial revolution has created a demand for new skills and jobs; therefore, institutions of higher learning need to adapt to the changes in the job market by continuing to review the curriculum and aligning it to the news emerging markets. This can be achieved through imbedding knowledge and skills such as emotional intelligence, stress tolerance, technology design and programing across various disciplines (Nguyen-Quoc, Thanh Le, Thuy Do, and Jarvis, 2026: 183). These skills and knowledge have the capability to develop graduates that are knowledge-driven and innovative (Moalosi, *et.*, 2022: 10). The ability to generate effective and novel innovative solutions can be fostered through knowledge brokerage initiatives, such access to new information and knowledge sources and having the ability to combine them with pre-existing knowledge. It is worth noting that workers in highly skills jobs that are characterised by fast technological changes also face a rapid depreciation of knowledge. This forces them to continue to seek and acquire new information to have their technical knowledge matching the current markets. Therefore, Higher Education institutions need to produce graduates who are not only creative but are knowledge-driven and understand the significance of knowledge brokerage (Van Wetten, Gerards & De Grip, 2020: 03).

5. Strategic Knowledge Management for Innovation

Strategic knowledge is significant as it allows for the exchange of ideas, which in turn enables the creation of innovation furthermore, strategi knowledge enables innovators to identify reources required such technology and intellectual property (Yoshikuni, Dwivedi & Dwivedi, 2025: 943). Knowledge management plays a vital and critical role in the process of creating innovation within organisations. It includes the process of acquiring, developing and sharing and the application of knowledge to improve organisation performance and the ability to produce commercialisable innovation. In this case, two key dimensions of knowledge management, such as knowledge exploration and knowledge exploitation are critical in driving innovation. To ensure effective innovation, it is crucial for organisations and innovators to manage and integrate internal and external sources of information and knowledge (Mubarak, Jucevicius, Shabbir, Petraite, Ghobakhloo, 2025: 04).

6. Entrepreneurial Activities Associated with Commercialisation of Innovation

The entrepreneurial activities that are associated with Commercialisation of Innovation essentially start with the generation of ideas and the launch of products (Datta *et al.*, 2013:148). Therefore, it is significant for universities to address Col through entrepreneurship and understanding what constitutes an entrepreneurial university (Rani & Kumar, 2024:323). Universities play a major role in the spill-over of innovations from various inventors, thus it is significant for university structure to be geared towards enhancing entrepreneurial activities, innovation, and commercialisation (Puerta-Sierra & Puent-Diaz, 2023: 443). Universities should facilitate Col through various methods to foresee the introduction of innovative inventions into the market (Gulbranson & Audretsch, 2008:250).

In South Africa, many factors contribute to the challenge universities face in producing graduates with the desired skillsets. For example, secondary education often produces school leavers lacking basic knowledge of the principles of a sustainable economy. It is important for young South Africans to have the necessary insight in their role in the cycle of supply and demand and “build an innovation mindset from primary school level” (Kruger & Steyn, 2020).

7. Challenges Associated with Entrepreneurial Universities

Establishing an entrepreneurial university involves many challenges, essentially related to the changes of culture and intellectual entrepreneurship (Huyghe & Knockaert, 2015). One of the challenges of an entrepreneurial university is creating a culture that promotes the practices of enterprise, and the challenge is basically creating an environment that is based on structure, commitment, accountability, authority, and psychological ownership (Chugh, 2013; Jameson & O'Donnell, 2015:74). This is of the fact that everyone, all support units within an institution, will have to internalise the entrepreneurial agenda and create a culture that is based on sound and efficient acts of entrepreneurial conduct. Institutional change is difficult as it also requires a change in relationships and practices, therefore, it is essential that the institution instils the change and mind-set to achieve the desired outcome (Chugh, 2013; Huyghe & Knockaert, 2015; Jameson & O'Donnell, 2015:74). An entrepreneurial university must be clear with its mission, values, vision, and strategy, and it must ensure that all individuals and units are supported to drive the entrepreneurial agenda (Jameson & O'Donnell, 2015:74). In the move to creating an entrepreneurial university, it is essential that academic activities are closely associated with the entrepreneurial activities (Jameson & O'Donnell, 2015:74). Individuals need to be willing to share the responsibility, risks, and rewards that come with it (Ropke, 2000:75). Below is a design of the entrepreneurial challenges to university organisations (Ropke, 2000):

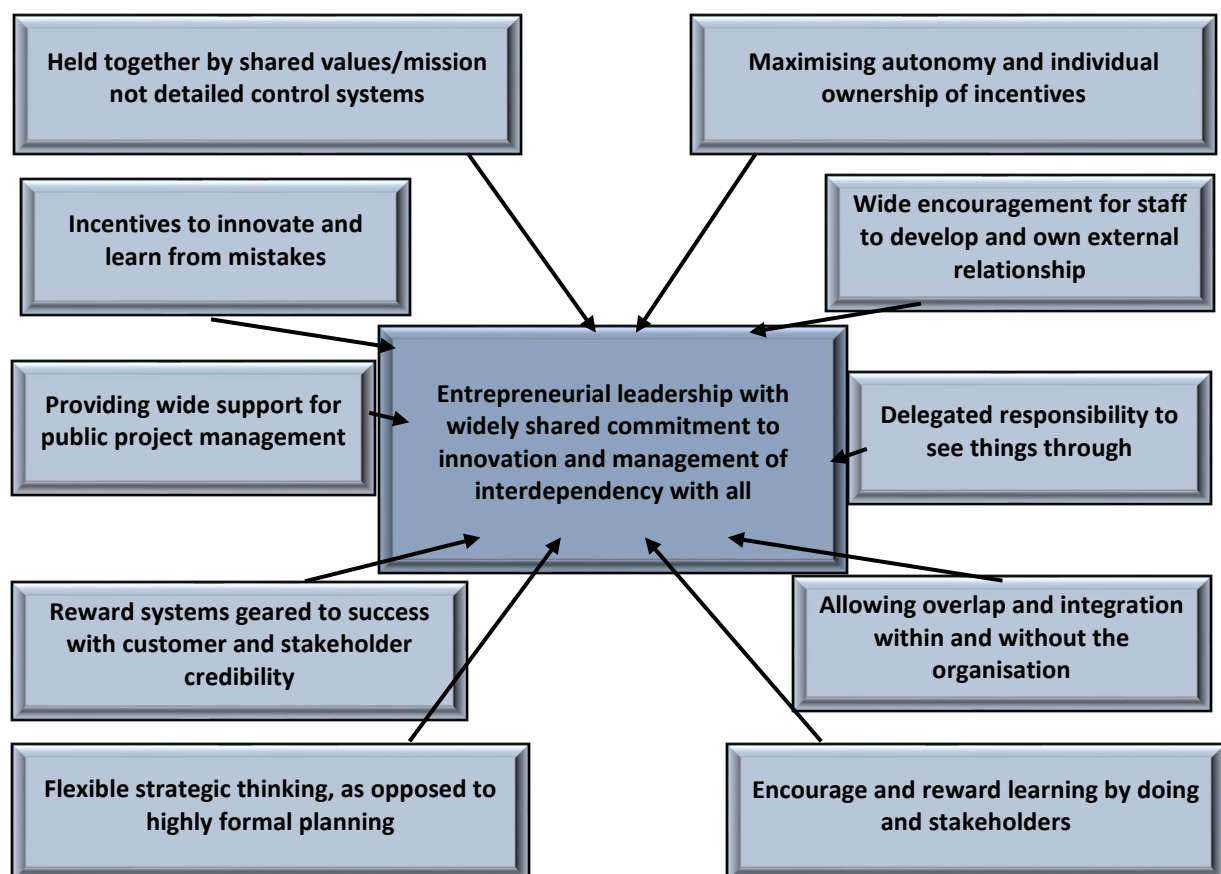


Figure 1: Entrepreneurial challenges to university organisation design (source adopted from Ropke, 2000:3)

According to Ropke (2000:3), the topic of universities contributing to the economic development of societies is nothing new and it will remain topical in future. Historically there has been many arguments that certain opportunities in various industries have not been properly engaged due to the lack of university involvement in the teaching of innovation and commercialisation in their curriculum (Ropke, 2000). For example, in Germany,

the strong relationship between universities and industries has been the main reason why many German-based industries have been successful (Ropke, 2000). The ability of universities to work closely with industries will constitute them becoming entrepreneurial universities (Ropke, 2000:3). A university must become entrepreneurial itself, which means it must become an entrepreneur (Ropke, 2000:3). The university members should all turn to entrepreneurs and function as entrepreneurs, and the university needs to build relations with its environment, from government agencies to various industry bodies (Ropke, 2000:3). An entrepreneurship culture is linked to the role of researchers and academics in enhancing commercialisation in an HEI. The next section will further elaborate on the various stages of commercialisation in addition to the above-mentioned components.

8. Methodology

This study utilised a Signification framework methodology which refers to the process of creating an underlying structure used for the representation of meaning that is generally applied in sensemaking, sensegiving, knowledge sharing, leadership, narrative, and decision making (Deprez & Hanchar, 2017; Magoma, 2018; Namvar et al., 2021). The research methodology was based on a signification framework that had five sensemaking elements. The elements of the signification framework were aimed at determining the presumed, predicted, perceived, prized, and produced value of facets related to the study's unit of analysis. A signification framework was used for this study in order to interpret the data collected. By analysing commercialisation dynamics, the researcher would then be able to develop a SIM system to facilitate the process of innovation and commercialisation of an entrepreneurial university's innovators' commercialisable ideas. The research strategy was action research. The action research strategy was best suited for this research taking into consideration the practical application of a signification framework's intervention keys. The sampling method for this research project was non-probability sampling. The intervention keys that had to be created had to be informed by data collected from a representative group or population. Data was collected using an 5 point scale online questionnaire, from the South African Business Innovation Community (Innovation Summit), and the Innovation, Sustainability and Visionary Leadership Group in the first and second cycle of the action research strategy. An online questionnaire was distributed to 100 participants, and a response was obtained from 69 participants. The population sample ranged from, company representatives, Managing Directors, academics, company founders, board member, Chief Executive Officers, government representatives, Chief Operating Officer, entrepreneurs, creative director, learning manager, filmmaker and editor, lead consultant, mentor, business analyst chief of section, mentor and Ambassadors from the Vice Chairperson in the Northern Lights Northern Conference of South Africa's Youth Committee, business development, marketing and sales. A pilot test of the questionnaire was performed to increase the practicality, reliability, and validity of the research. The techniques for data analysis were descriptive statistical analysis of questionnaire data. Content analysis was characterised by sensemaking and sensegiving techniques; however, this study did not make use of the Cognitive Edge (2021) SenseMaker® SaaS. Signification frameworks that utilise SenseMaker® SaaS comprise of three different types of questions: triads, dyads, and multiple-choice questions (Sochacka, 2021). Data was analysed using presumed, predicted, perceived, prized, and produced values to create stacked graphs and radar plots.

The researcher opted to perform statistical analysis by using MS excel analytics and visualisation tools to create figures. The quantitative data was collected from the South African Business Innovation Community (Innovation Summit), and the Innovation, Sustainability and Visionary Leadership Group using an online questionnaire. The researcher adhered to the UJ code of academic and research ethics (UJ, 2007), as described in the next section. The researcher's highest priorities were research ethics and good conduct. The first step was to apply for research ethics approval and clearance from the UJ College of Business and Economics Research Ethics Committee (CBEREC). The research project obtained CBEREC clearance code 01, which meant that the rating of the most recent application was approved.

9. Results and Discussion

This section presents and interprets the results from the quantitative data that was collected from the Innovation, Sustainability and Visionary Group and the Entrepreneurial and Innovation Group using a structured online questionnaire. The data was collected using an online questionnaire (Survey Monkey), and questionnaire was divided into section A and section B; and 56 response rates for section A, and 69 response rates for section B. The data was analysed using statistical analysis for research in the social sciences which allows researchers to analyse complex statistics (Frey, 2017:2). The analysis was conducted using descriptive statistical analysis technique. Next, the results obtained from the questionnaire. The next question on, Table 1, asked, in your opinion, how relevant are the following aspects of the Higher Education curriculum in aid of the development

of innovative graduates? As described in research design and methods section, research participants were given the signification framework terminology, that is, PRODUCE means “to lead to or cause (a specific thing) to happen or exist”. Question 9 refers to produce, that is, to lead to or cause a specific thing to happen or exist. The four options given to respondents were: totally irrelevant, somewhat irrelevant, somewhat relevant, totally relevant, and 9 components shown on the category axis.

Table 1: Critical Knowledge areas of the Higher Education curriculum to PRODUCE innovative graduates (own source developed for this study)

	<i>Totally irrelevant</i>	<i>Somewhat irrelevant</i>	<i>Somewhat relevant</i>	<i>Totally relevant</i>	<i>Total</i>
a) Ideation development	0	8	17	43	68
	0.0%	11.8%	25.0%	63.2%	100.0%
b) Collaboration	1	7	23	38	69
	1.4%	10.1%	33.3%	55.1%	100.0%
c) Value creation	0	2	23	44	69
	0.0%	2.9%	33.3%	63.8%	100.0%
d) Information and communication technology	1	5	18	45	69
	1.4%	7.2%	26.1%	65.2%	100.0%
e) organisational culture	1	10	30	27	68
	1.5%	14.7%	44.1%	39.7%	100.0%
f) Product development	1	4	22	41	68
	1.5%	5.9%	32.4%	60.3%	100.0%
g) Design thinking	2	3	12	52	69
	2.9%	4.3%	17.4%	75.4%	100.0%
h) Strategic information management	1	5	24	38	68
	1.5%	7.4%	35.3%	55.9%	100.0%
i) Emotional intelligence	5	10	21	33	69
	7.2%	14.5%	30.4%	47.8%	100.0%

Based on the results presented in table 1 it is significant to note that aspects such as ideation development, information and communication technology, value creation and design thinking are relevant and significant as they can aid in the development of innovative graduates. The aspects of the HE curriculum of most significance to produce innovative graduates are ideation development, information and communication technology, value creation, and design thinking. The researcher was able to develop the PRODUCE element of this study's signification framework (*cf figure 2*).

The last question of the questionnaire was, to what extent would you like the following aspects to be considered relevant in the Higher Education curriculum to ensure the readiness of graduates to develop business innovation? As mentioned above and described in the methods section, the research participants were given the signification framework terminology where the element PRODUCE means “to lead to or cause (a specific thing) to happen or exist”. To facilitate research participants' ease of understanding of the signification framework terminology, the researcher replaced the phrase “to produce graduates ready to develop business innovation” with the phrase “to ensure the readiness of graduates to develop business innovation”. Four options were given to the respondents: to no extent, to some extent, to a moderate extent, to a great extent. The results on each of these components are illustrated in Table 3.

Table 2: Knowledge considered relevant in the Higher Education curriculum to produce graduates ready to develop innovative and knowledge driven graduates (own source developed for this study)

	<i>To no extent</i>	<i>To some extent</i>	<i>To a moderate extent</i>	<i>To a great extent</i>	<i>Total</i>
a) Strategic information management	0	8	23	38	69
	0.0%	11.6%	33.3%	55.1%	100.0%
b) Artificial intelligence	1	15	19	34	69
	1.4%	21.7%	27.5%	49.3%	100.0%
c) Entrepreneurship	0	5	14	50	69
	0.0%	7.2%	20.3%	72.5%	100.0%
d) Advanced business management	0	11	22	35	68
	0.0%	16.2%	32.4%	51.5%	100.0%
e) Systems analysis and evaluation	0	11	18	39	68
	0.0%	16.2%	26.5%	57.4%	100.0%
f) Big data and analytics	0	11	26	30	67
	0.0%	16.4%	38.8%	44.8%	100.0%
g) Analytical thinking and innovation	0	5	14	49	68
	0.0%	7.4%	20.6%	72.1%	100.0%
h) Creativity, originality and initiative	0	2	13	54	69
	0.0%	2.9%	18.8%	78.3%	100.0%
i) Technology design and programming	0	9	25	34	68
	0.0%	13.2%	36.8%	50.0%	100.0%
j) Critical thinking and analysis	0	4	11	52	67
	0.0%	6.0%	16.4%	77.6%	100.0%
k) Leadership and social influence	1	11	17	39	68
	1.5%	16.2%	25.0%	57.4%	100.0%
l) Complex problem solving	0	3	16	49	68
	0.0%	4.4%	23.5%	72.1%	100.0%
m) Emotional intelligence	2	7	21	39	69
	2.9%	10.1%	30.4%	56.5%	100.0%

Analysis of the aspects of the Higher Education curriculum considered most relevant to produce graduates ready to develop business innovation enabled the researcher to develop this study's signification framework PRODUCE element. Based on the results in table 3, it is significant to note that aspects such as creativity, originality and initiative, critical thinking and analysis, analytical thinking and innovation, complex problem solving, and entrepreneurship are relevant, and more emphasis should be reflected in the Higher Education curriculum on these aspects. Furthermore, noteworthy is that artificial intelligence was rated the lowest in the to a great extent scale, especially since the 4IR is driven by artificial intelligence, as described by Mhlanga (2021), which has direct impact on innovation, and infrastructure development. Based on these results, the researcher was able to develop the PRODUCE element of this study's signification framework (cf figure 5).

10. Discussion of the Study

This section will outline the intervention as per study's objectives, the below intervention keys are proposed in to ensure that universities are able to produce graduates with the capability to think critically and have the capability to produce innovation. The five elements of the signification framework in figure 1 are:

INTERVENTION KEY



Figure 2: Intervention keys (own source developed for this study)

- Presume: To suppose that (—) is the case based on probability or likelihood, for example, business innovation experts in Africa believe that a shift in value is the likely result of newly added components
- Predict: To say or estimate that (—) will happen in the future or will be a consequence of (a specific thing), for example, competition will increase because of innovation
- Prize: To value (—) as extremely highly valuable, for example, business leadership is most advantageous in a competition business environment
- Perceive: To interpret or regard (—) in a particular way, for example, innovators are energised by the action and buzz of creativity
- Produce: To lead to or cause (—) to happen or exist, for example, active teaching leads to active learning

On figure 2 it is important to note the balancing rod, safety net, and intervention key linked to each of the five elements of this study's signification framework.

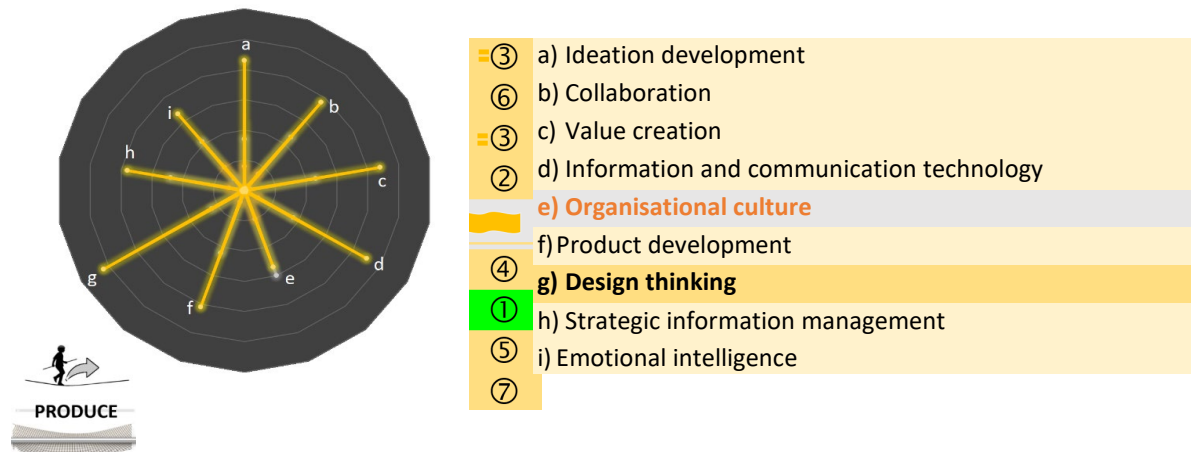


Figure 3: PRODUCE Intervention key – Curriculum for development of innovators (own source developed for this study)

Application 1: If design thinking is at the top of the list of most relevant teaching and learning priorities as part of a balanced mix of other module outcomes such as ideation development, collaboration, value creation, ICT, organisational culture, product development, strategic information management, and emotional intelligence, then the HEI curriculum is most likely producing (developing) students with the ability to innovate, which means that an intervention is not necessary.

Application 2: Greater emphasis on the relevance of organisational culture than on design thinking would raise a flag for an entrepreneurial university, signaling the need for intervention.

Next, figure 4 demonstrates one last **PRODUCE** Intervention key; this key differs from the previous key – looking at those aspects to be considered relevant in the HEI curriculum to ensure the readiness of graduates to develop business innovation.

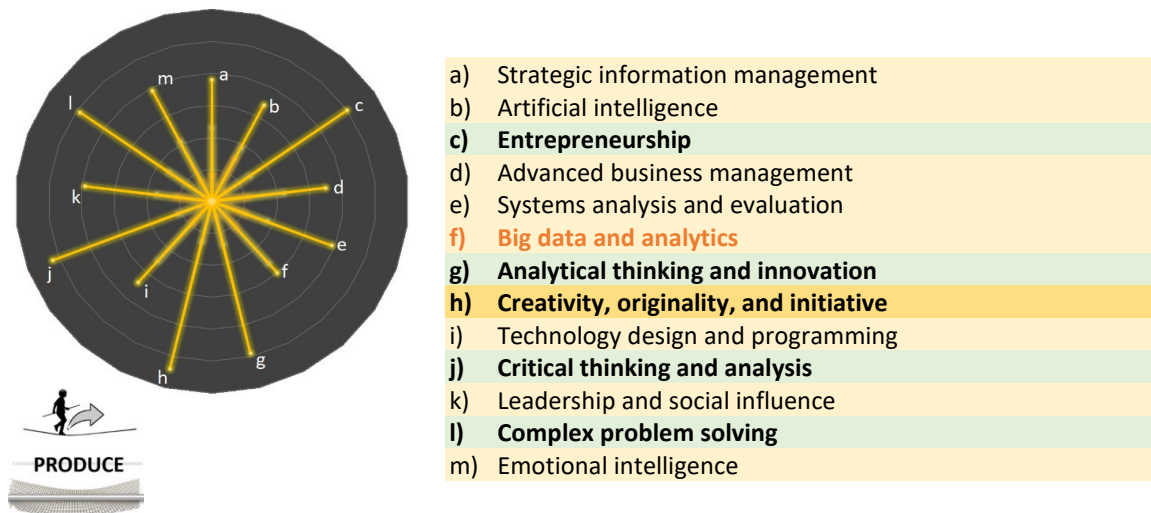


Figure 4: PRODUCE Intervention key – Relevance of HEI curriculum (own source developed for this study)

Application 1: If HEI curriculum gives highest priority to fostering creativity, originality, and initiative, but fails to include entrepreneurship, analytical thinking and innovation, critical thinking and analysis, and complex problem solving in equal measure in all its teaching and learning activities, then the likelihood decreases of producing graduates that can develop business innovation. In this case an intervention will be necessary, for example, programme review to align module outcomes.

Application 2: Although big data and analytics are relevant in the 4IR, it does not necessarily mean that its inclusion in the curriculum of an entrepreneurial university will produce readiness of graduates to develop business innovation. An overemphasis on one aspect of the curriculum on the expense of other relevant aspects indicates that an intervention is needed.

The above discussion of intervention key application demonstrates the signification framework as it applies to HEIs. The intervention keys demonstrate how the signification framework for the SIM system for commercialisation dynamics of an entrepreneurial university promotes the process of CoI, whether the type of innovation is a product or service. As mentioned above, the signification framework recognises the complexities of CoI.

11. Conclusion

The governing thought or central argument of this study was the significance of critical knowledge and skills suitable for an Entrepreneurial university's curriculum in order build capacity and produce knowledge-driven and innovative graduates. This was achieved through the development of intervention keys of Strategic Information Management to unlock the innovation and commercialisation dynamics of entrepreneurial universities, thereby creating a safety net for knowledge-driven and innovative graduates. This research article focused on the critical knowledge and skills universities should incorporate within their curriculum to become an entrepreneurial institution, also noting that the study was only limited to the context of entrepreneurial universities. Knowledge and skills such as ideation development, Information and Communication Technology, product development, value creation and design thinking were deemed crucial to produce knowledge-driven and innovative graduates. Furthermore, critical thinking, complex problem solving, entrepreneurship, design thinking, creativity, originality, and initiative were identified as the most prominent, also technology design and programming, and analytical thinking.

Finally, and in conclusion, research on knowledge and skills identified should be conducted to test the developed intervention keys for innovation and commercialisation dynamics of entrepreneurial institutions as an intervention. After testing, the intervention keys will be implemented with other universities and in the business industry, this will ultimately aid universities in developing knowledge-driven graduates capable of shaping industries through innovation in a practical approach. Future research should furthermore be focused on how the signification framework can advance existing models of entrepreneurial universities and knowledge-driven curriculum design.

Ethics Declaration: This research required ethical clearance and was obtained through the University of Johannesburg's College of Business and Economics Research Ethics Committee (UJCBEREC).

AI Declaration: I would like to declare that I did not use any AI tools for this research paper, nor to enhance grammar or contents.

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