Journal of Infrastructure, Policy and Development 2024, 8(14), 9139.
https://doi.org/10.24294/jipd9139

Article

Assessing innovation and entrepreneurship transformations in two South African universities amidst the COVID-19 crisis

Busisiwe Ramabodu[1], Pfano Mashau[2], Tshililo Ruddy Farisani[3,*]

[1] Graduate School of Business and Leadership, University of KwaZulu-Natal, Durban 4000, South Africa
[2] School of Business, Durban University of Technology, Durban 4000, South Africa
[3] Department of Business Support Studies, Central University of Technology, Bloemfontein 3901, South Africa
*** Corresponding author:** Tshililo Ruddy Farisani, farisanitshililo@gmail.com

CITATION

Ramabodu B, Mashau P, Farisani TR. (2024). Assessing innovation and entrepreneurship transformations in two South African universities amidst the COVID-19 crisis. Journal of Infrastructure, Policy and Development. 8(14): 9139. https://doi.org/10.24294/jipd9139

ARTICLE INFO

Received: 14 September 2024
Accepted: 21 October 2024
Available online: 25 November 2024

Abstract: The purpose of the study is to contribute to an understanding of the role universities' innovation and entrepreneurship transforming structures play during a crisis. To suggest the use of the adapted Sustainable Livelihoods Framework (SLF) model that will guide the interdepartmental and intradepartmental collaboration processes concerning innovation and entrepreneurship at the two universities during a crisis like the coronavirus pandemic 2019 (COVID-19). An inductive-deductive, mixed-method approach was adopted, entailing an online survey and semi-structured interviews. The population for the study included employees from two South African Universities, and random sampling and purposive sampling were applied, respectively, for the survey and semi-structured interviews. Survey data were analyzed using SPSS and semi-structured interview data were analyzed using Nvivo 12. The results show that both universities' transforming structures need to improve their intra and inter-departmental collaborative approach to maximize innovation and entrepreneurship during a crisis like COVID-19. The contribution of this article is a suggested model that draws from the Sustainable Livelihoods Framework and Institutional Theory. The model is to guide the interdepartmental and intradepartmental collaboration processes to ensure university transforming structures lead through innovative and entrepreneurial solutions during crises.

Keywords: universities; innovation; entrepreneurship; transforming structures; collaborations; crisis

1. Introduction

For the past few years, starting in late 2019, many countries have been forced to endure one crisis after another. South Africa has experienced additional crises apart from the global Corona virus pandemic 2019 (COVID-19) crisis. Such additional crises are a combination of natural (floods and heatwaves) and manmade (strikes and looting of businesses and other institutions) crises between 2019 and 2023. However, COVID-19 stood out from all such crises because of its lockdowns (Khan et al., 2024; Younis and Elbanna, 2023). The lockdowns that were implemented by different countries had a negative impact on the sustainability of all critical institutions (both private and public alike). COVID-19 forced different institutions and businesses (from Small and Medium-sized Enterprises to big public and private organizations) to innovatively come up with sustainability solutions (Demircioglu and Van der Wal, 2022; González-González et al., 2022; Szeto, 2024). Dzvimbo et al. (2022); Stolze (2021); Uleanya (2023); Yu et al. (2023) corroborate and argue that higher education institutions such as universities have a higher calling to assist all the above-mentioned institutions with support. Uleanya (2023) directly and boldly asserts that "industrial

revolutions are sustained by education". Yu et al. (2023) echo and posit that "The essence of higher education is to cultivate innovative talents for the society". Alenezi (2023) and Belamghari (2022) affirm and posit that innovative solutions make the difference between operating (that meant online working for most institutions during the COVID-19 pandemic) or closing. Beltramino et al. (2023) attest and argue that "Innovation propensity is understood as the tendency of a firm to support creativity and generate new ideas for the introduction of new products/services and creative processes that may result in new products/services or processes".

Like most countries in the world, South African institutions were not spared from the pandemic and related health, economic and social crises between 2019 and to date (Farisani, 2022a; Mashau et al., 2024). All these crises directly and indirectly impacted South African universities because their members are part of the South African communities. Thus, universities in South Africa, like other institutions, were expected to find innovative solutions to such crises (Baporikar, 2015; Farisani, 2022a, 2022b; Hughes et al., 2018; Khan et al., 2024; Uleanya, 2023; Yu et al., 2023). Alenezi (2023); Beltramino et al. (2023); Kliewe and Baaken (2019); Owolabi et al. (2019); Rahman (2021); Romero-Hall and Jaramillo Cherrez (2023) attest while pointing out that new ideas to improve services during a crisis are an integral part of innovation at institutions. Challenges posed by the COVID-19 pandemic on institutions (i.e., Small and Medium-sized Enterprises to big public and private organizations) included moving most of their services online and remaining profitable and sustainable. Farisani (2023) and Smyth and Vinclay (2017) acknowledge the negative impact of crises and assert that the Sustainable Livelihoods Framework (SLF) (see **Figure 1**) is well suited to address such challenges and their impact on the sustainability of institutions. Farisani (2023) and Smyth and Vanclay (2017) argue that SLF assist in understanding strategies, structures and processes to be followed as well as resources needed by institutions such as universities to find sustainable solutions in crises.

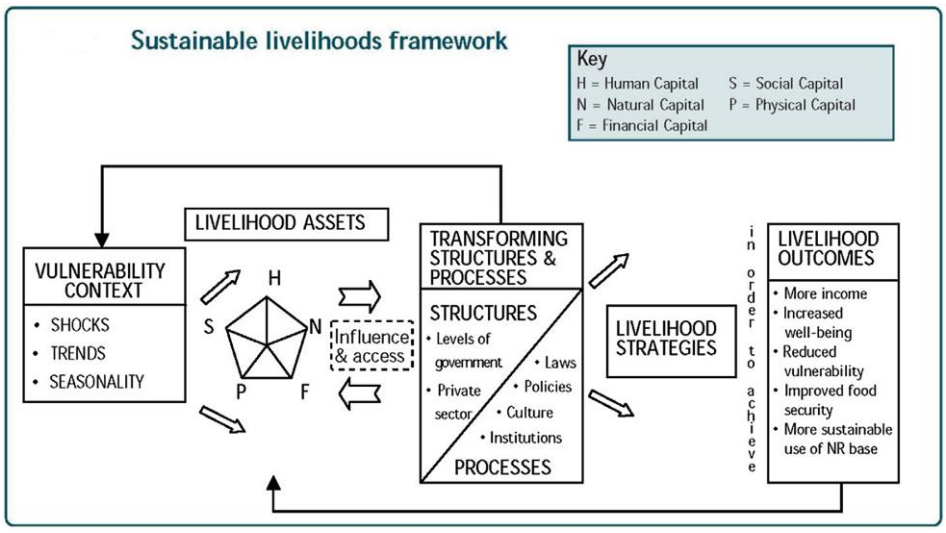

Figure 1. Sustainable livelihoods framework.

Source: Adapted from Department for International Development, 1999, Sustainable livelihoods guidance sheets 1–2, DFID, London.

This article will focus on the role of universities' innovation and entrepreneurship's transforming structures (data were collected using online surveys and semi-structures from Durban and Cape Town-based universities in South Africa) during such crises with the view to suggest a model. An SLF- adopted model to guide the interdepartmental and intradepartmental collaboration process (see **Figure 1**) to ensure university transforming structures lead institutions through innovative and entrepreneurial solutions during crises. Thus, the gap in the knowledge is in understanding the process that streamlines the role of innovation and entrepreneurial transforming structures (departments) expected to provide innovative solutions during a crisis. This study responds to this gap.

The purpose of the study is to contribute to an understanding of the role universities' innovation and entrepreneurship transforming structures play during a crisis. The aim of the study is to suggest an adapted SLF model that will guide the interdepartmental and intradepartmental collaborations processes (see **Figure 1**) concerning innovation and entrepreneurship at the two universities during a crisis like COVID-19.

The research questions are 1) Which stakeholders/structures are responsible for leading the university's institutional entrepreneurial and innovation goal during a crisis? 2) How does university departmental junior staff understand innovation and entrepreneurship as compared to senior university staff members? and 3) How does existing interdepartmental and intradepartmental partnerships contribute to entrepreneurship and innovation in universities during a crisis?

2. Literature review

2.1. Introduction of the literature section

The literature review below first discusses how innovation and entrepreneurship are understood and applied in the university's context during a crisis. The discussion then moves to clarify the stakeholders responsible for leading the university's entrepreneurial and innovation goals during the crisis. And finally, on the Interdepartmental and intradepartmental partnerships' processes that contribute to entrepreneurship and innovation in universities during a crisis. The discussion follows the Institutional Theory and the Sustainable Livelihoods Framework to enrich the discussion and provide insights on institutions of higher learning and how relevant institutions, structures and departments may respond to crisis innovatively and use entrepreneurial approaches to sustain both universities and local livelihoods.

2.2. Innovation and entrepreneurship in universities

Uleanya (2023) points out that the vital role of higher educational institutions in developing communities is underscored by the United Nations Educational, Scientific and Cultural Organization's (UNESCO) 2005 to 2014 declaration. UNESCO declared 2005 to 2014 as the Decade of Education for Sustainable Development. On the other hand, the critical role of South African Universities in the country's socioeconomic prosperity is enshrined in the National Development Plan (NDP) 2030, with innovation cited as an important component. The subject of innovation is multifaceted

in that it could be about new ideas, products or services but also the improvement of existing products and services (Alenezi, 2023; Beltramino et al., 2023; Jakolvjevic, 2019; Marczewska et al., 2024; Owolabi et al., 2019). Innovation at Universities is even more multifaceted, ranging from the product (e.g., course or consulting) offerings, research publications, patenting, entrepreneurship, management processes, as well as technologies. In studies that examined whether University research output leads to innovation, Giglio et al. (2021); Inglesi-Lotz and Pouris (2018); Moruzzi (2021) showed that innovation at universities is indicated by patents, publications, and Research and Development (R&D). In line with the NDP, they argued that patents are closer to implemented innovation and research publications improve human capital and propose innovative solutions that can lead to patenting activities. Hughes et al. (2018) affirm and further define workplace innovation as the processes applied when attempting to implement new ideas. At Universities, these processes, from knowledge creation to entrepreneurial activity (i.e., offering services for profit), rely on the individual employees, their innovation interests and their abilities during a crisis (Roncancio-Marin et al., 2022).

Institutional Theory gives insight into how Institutions may use legislation, policies or rules to bring about or improve those important aspects of innovation such as new ideas, products or services (Farisani, 2023; Owolabi et al., 2019) during a crisis. Legislation, policies and rules fall under the regulative element in Institutional Theory's three pillars, namely regulative, normative (irrelevant to this discussion) and socio-cognitive elements (Farisani, 2022a, 2022b; Scott, 2013). On the other hand, the socio-cognitive element assists in clarifying the sustainable processes for solving crises that affect different institutions, groups or structures. The sustainable Livelihoods Approach enable us to determine which structure, department or institution (see transforming structures and processes in **Figure 1**) is responsible for availing needed resources (see livelihood assets in **Figure 1**) or creating the right conditions/environment (by policies, rules or laws) during a crisis. Therefore, the Sustainable Livelihoods Framework go further than Institutional Theory by clarifying the route that key structures can use to innovatively solve a crisis or contribute to a solution during a crisis. The livelihood asset such as human resources are given the same credibility as financial resources alongside other resources in solving crises.

It is vital that all stakeholders know which transforming structure is responsible for availing required resources or creating the right conditions/environment to allow innovative and entrepreneurial approaches in responding to the crisis. Thus, it is important to understand who the relevant stakeholders or structures are in leading the universities' institutional entrepreneurial and innovation goals at various management and departmental levels during a specific crisis. SLF framework's livelihood asset base also allows the appreciation or shedding of light on the role of key individuals (such as academics or ICT staff) who possess required skills within relevant structures during the crisis.

2.3. Stakeholders responsible for leading the university's institutional entrepreneurial and innovation goal during a crisis

For the discussion in this article and in line with the Sustainable Livelihoods Framework, the stakeholders will be presented with strategic partnerships to ensure innovation and entrepreneurship during crisis in mind. Individual universities in South Africa will be presented as per their local university's intradepartmental stakeholders/structures and interdepartmental stakeholders/structures. University intradepartmental stakeholders are the students, departmental staff and senior managers of the departments. The University's interdepartmental stakeholders are in other Universities, the Department of Higher Education and Technology (DHET), local government/municipality, relevant businesses and local communities close to universities. Yu et al. (2023) highlight the need for strategic partnerships by arguing that the universities need to respond innovatively to "social needs and government policies" as well as to "keep pace with the times".

Baporikar (2015), Farisani (2022a, 2022b) and Yu et al. (2023) posit that Innovation is associated with organizational competitiveness, sustainability as well as the ability to bounce back from crisis. Baporikar's (2015) and Farisani's (2022a, 2022b) assertions are consistent with the Sustainable Livelihoods Framework's approach to institutional competitiveness and sustainability during a crisis. They are consistent in that they clarify the role of relevant stakeholders, organizations or institutions in ensuring stability during a crisis. The sustainable Livelihoods Framework (see **Figure 1**) go further by pointing (see arrows) out how relevant transforming structures (i.e., stakeholders) may intervene by providing resources (resources such as human, natural, financial, physical or social) to encourage innovation and entrepreneurial approach to the crisis.

Alenezi (2023), Echoed Baporikar (2015), Farisani (2022a, 2022b); Hariri and Roberts (2015); Jakolvjevic (2019); Khan et al. (2024); Vu et al. (2024) highlighting the fact that Universities face many challenges (resources and institutional related) that hamper the ability of staff to be innovative i.e., demands for accountability, conflicting demands of teaching and research, budget cuts, rapidly changing environment, and advancements in technology. The myriad of challenges above come from different structures and departments within and outside the university and therefore require collaborative efforts and strategic partnerships.

2.4. Interdepartmental and intradepartmental partnership processes that contribute to entrepreneurship and innovation in universities during a crisis

Sustainable Livelihoods Framework (see **Figure 1**) enable us to innovatively think of strategic partnership processes that will deliver relevant resources to and from relevant stakeholders within and outside the university. that will deliver relevant resources to and from relevant stakeholders within and outside the university to enable individual local universities to react to crises in an entrepreneurial and innovative approach. The flow of resources and ideas between different structures to respond to crises is key in determining strategic partnerships that drive innovative solutions. Alenezi (2023); Abusamra (2022); Echoed Baporikar (2015); Farisani (2022a, 2022b);

Hariri and Roberts (2015); and affirm while pointing out that because crises affect different institutions, innovative solutions must be a collective effort too. Etzkowitz et al. (2022); Ruiz et al. (2020) go further and argue that universities must be part of entrepreneurial and innovative ecosystems in the regions they operate.

Gajdzik and Wolniak (2022); Hughes et al. (2018) corroborate citing the process of innovation.

Hughes et al. (2018) indicated that innovation flows from a combination of problem/opportunity identification to the introduction, adoption or modification of new ideas germane to organizational needs, then to the promotion of these ideas, and lastly to the practical implementation of these ideas as shown in **Figure 2** below.

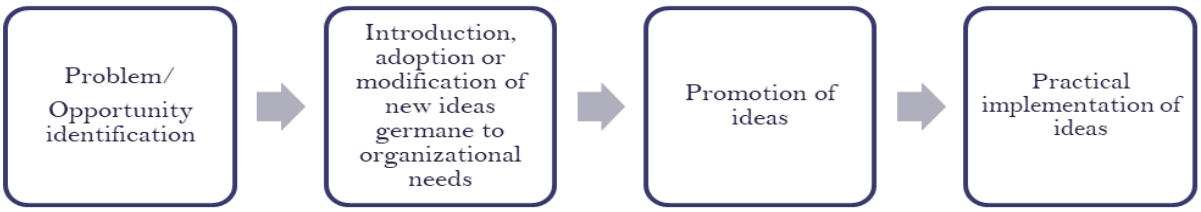

Figure 2. Phase of innovation.
Source: Hughes et al., 2018.

Idea generation is said to be the source of innovation, the creative process here ensures that as many ideas as possible for a specific challenge are collected. Many ideas are best collected from different relevant stakeholders (Garcia-Alvarez-Coque et al., 2019; Tercanli and Jongbloed, 2022). Farisani (2022a) attests to this by pointing out that ideas in Sustainable Livelihoods Framework (see **Figure 1**) are part of social resources between partnerships (transforming structures/departments) needed for entrepreneurial and innovative purposes during a crisis.

3. Methodology

3.1. Research design

This study employed a mixed-method approach, combining both quantitative and qualitative methods, which included an online survey and semi-structured interviews with the leadership of relevant structures in the two institutions/universities. The decision to use this sequential approach was driven by the intricate nature of innovation within universities and the necessity to consider contextual factors. To ensure a comprehensive understanding, semi-structured interviews were conducted with senior leaders overseeing strategy and innovation management activities. Careful consideration was given to the challenges associated with integrating mixed-method data (Creswell, 2013). The mixed-method approach explored various aspects, including the universities' definitions and conceptualizations of innovation, innovation drivers, management strategies, and individual characteristics influencing innovation success, thereby offering insights from both employee and leadership perspectives.

3.2. Sampling and data collection

The study population comprised academic and support staff from two South African coastal research-intensive universities, along with senior officials responsible for innovation and entrepreneurship structures/departments. Sampling methods included random sampling for the survey and purposive sampling for the interviews, guided by research protocols at each university and the need to adhere to COVID-19 protocols at the time. COVID-19 protocols and associated challenges of the crisis made it impossible for wider participation. As a result, a snowballing approach was utilized to enhance survey participation, while administrative staff facilitated survey distribution and identified interview participants based on their roles and functions. Sixty-six responses were obtained from the online survey, and semi-structured interviews were conducted with seven leaders, five from the first university and two from the second. While the interview sample was small, it mainly consisted of senior leaders responsible for strategy and innovation offices. The survey response rate was 47 out of 5100 employees from the first university and 19 out of 5295 from the second, with efforts made to ensure representation from both academic and support staff.

3.3. Data analysis, validity, credibility and ethical clearance

The survey, designed based on literature insights, utilized Likert scales to assess participants' perceptions, attitudes, and capabilities related to innovation. Data analysis was conducted using SPSS for survey responses, while NVIVO supported thematic analysis of interview transcripts. Thematic analysis followed an iterative process, ensuring flexibility and reliability in identifying themes. The study ensured survey reliability through Cronbach's Alpha analysis, yielding a significant value of 0.94. Integration of tools and data analysis was carefully considered, and triangulation was employed to enhance research validity. Ethical standards were adhered to as per the University of KwaZulu -Natal guidelines (HSSREC/00000 1925/2020).

4. Results and findings

4.1. Findings on the understanding of transforming structures' role in innovation and entrepreneurship

The leaders that were interviewed pointed out that they view their role and that of the structures they lead as that of transforming the culture at universities to be more conducive to innovation and entrepreneurship. Participant A's views echoed the majority opinion and posited that their departments or structures' responsibility is understood to be "… to develop a whole culture of innovation at the university and in particular start off by first putting together policy innovation on innovation, intellectual property, commercialization…".

Moreover, the participants understood that creating a conducive environment for innovation and entrepreneurial activity in universities is a collaborative process. Participant B noted that this process takes time, and would require "…catalytic champions of innovation within the organization". Participants acknowledged that the process cannot be driven from the top or through a central admin office, but needs to be driven by everyone i.e., leaders and employees considering their contexts.

Nevertheless, Participant C pointed out that "I'm focusing on cultural change, so culture change cannot be driven through a directorate. It has to be driven through all the senior executive members of the university". Such a view was echoed by Participant D who said, "The academics, must push it themselves. The admin is not going to change that". Participants C and D's views seem to suggest that they differ in their understanding of what transforming structures may and may not do to promote innovation and entrepreneurship in their respective institutions. They did not agree that policies alone can assist to encourage individuals to be innovative or entrepreneurial during a crisis. That conflicting leadership understanding, and approaches provide a summary of the responses given by the leadership of the transforming structures tasked with innovation and entrepreneurship in the two institutions covered in this study. What follows is the summary from other staff members (who do not hold leadership positions) within the innovation and entrepreneurship transforming structures/departments.

4.2. Findings on the individual employee's approach to their responsibilities for leading the university's institutional entrepreneurial and innovation goal during a crisis

To understand the overall approach of the South African coastal universities' approach to their innovation and entrepreneurship responsibilities we examine individual staff's approach to their responsibilities (see **Figure 3** and **Figure 4** below). Responsibilities in their various university departments and structures that are responsible for innovation and entrepreneurship in the Durban and Cape Town universities.

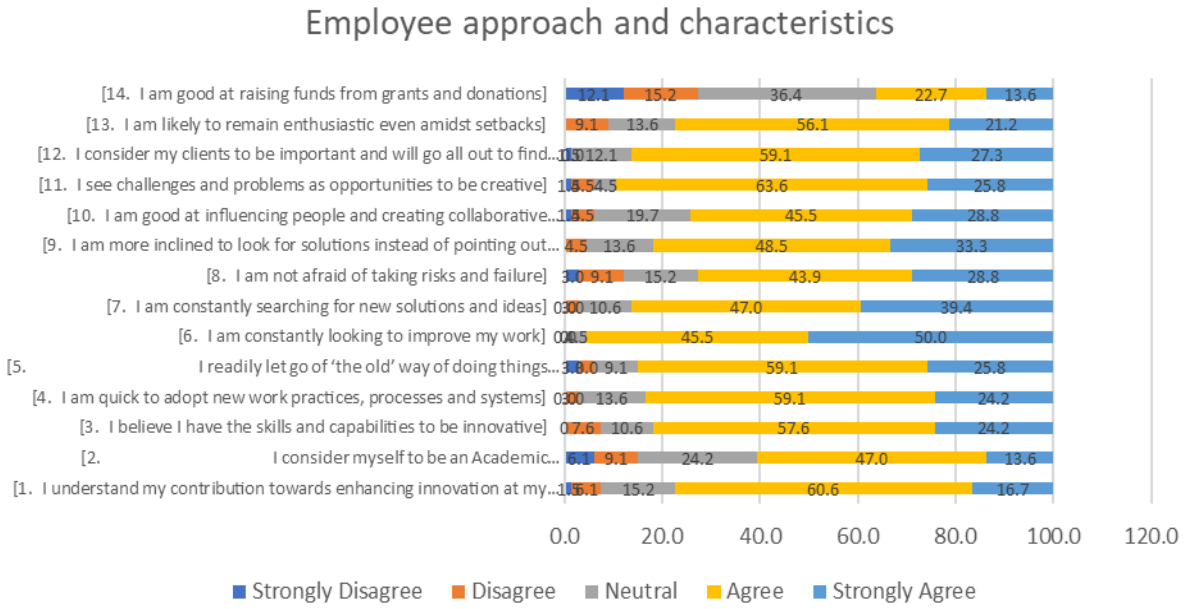

Figure 3. Results for employee approach and characteristics.

Source: Researcher's analysis.

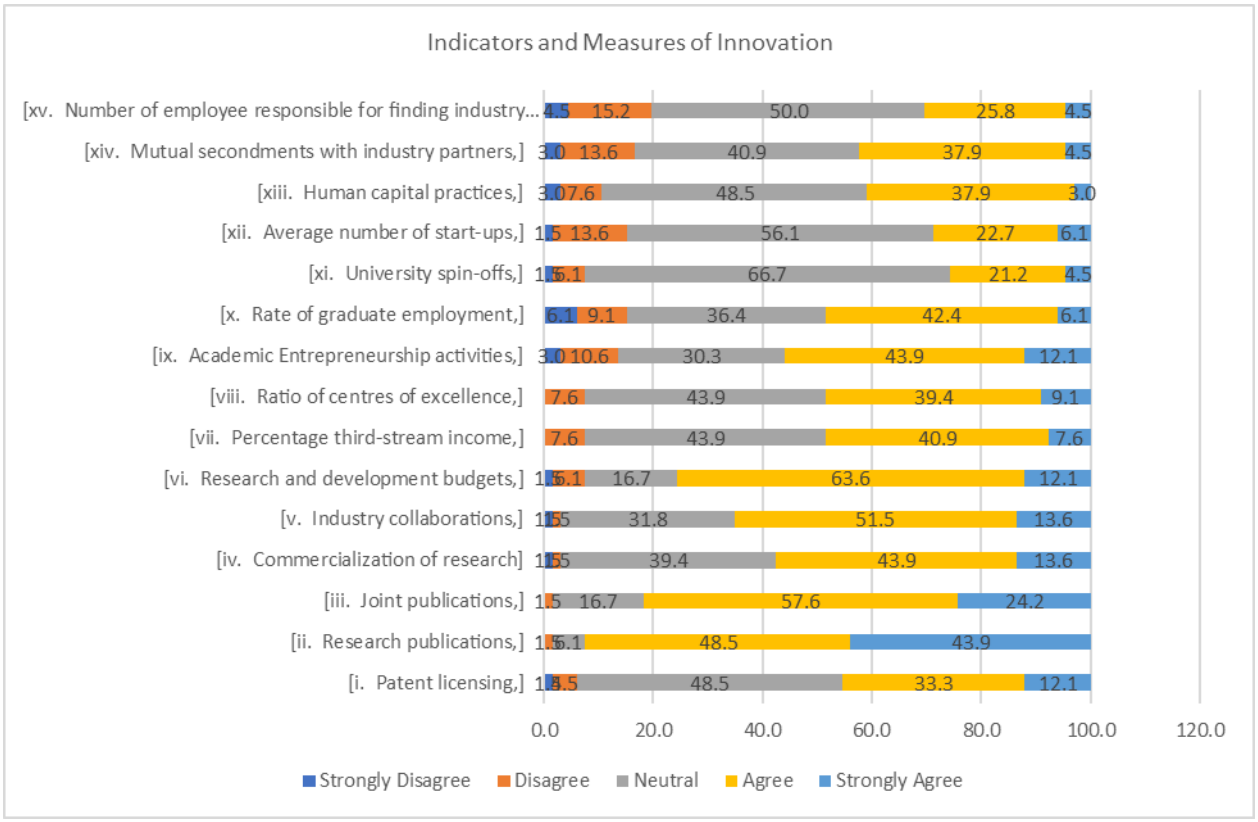

Figure 4. Results for indicators and measures of innovation.
Source: Researcher's analysis.

In examining the staff's understanding of innovation and determining the extent to which staff at universities appreciate and adopt innovative practices; participants were provided with the above statements (see **Figure 3**). The above statements were associated with individual approaches and characteristics that drive innovation to rank their agreeableness to them. The results show that few (22.7% agree and 13.6% strongly agree) respondents can raise funds for innovation and entrepreneurial purposes in their departments. However, the results also show that while the respondents struggle to raise funds, they held a positive view (63.6 % agree and 25.8% strongly agree) that challenges and problems are opportunities to be creative or entrepreneurial. Such results are reinforced by the results that show that the majority of the respondents (48.5% agree and 33.3% strongly agree) see themselves as more inclined to look for solutions instead of pointing out mistakes.

To further understand the views of relevant staff in the transforming structures in charge of university entrepreneurship and innovation during a crisis we examine **Figure 4** and **Figure 5**. We specifically focus on their views on what are the indicators and measures of innovation. The focus was on research publications, patents, industry partnerships, percentage third stream income, graduate employability, entrepreneurship activities, number of staff allocated to manage innovation endeavors and other human capital practices.

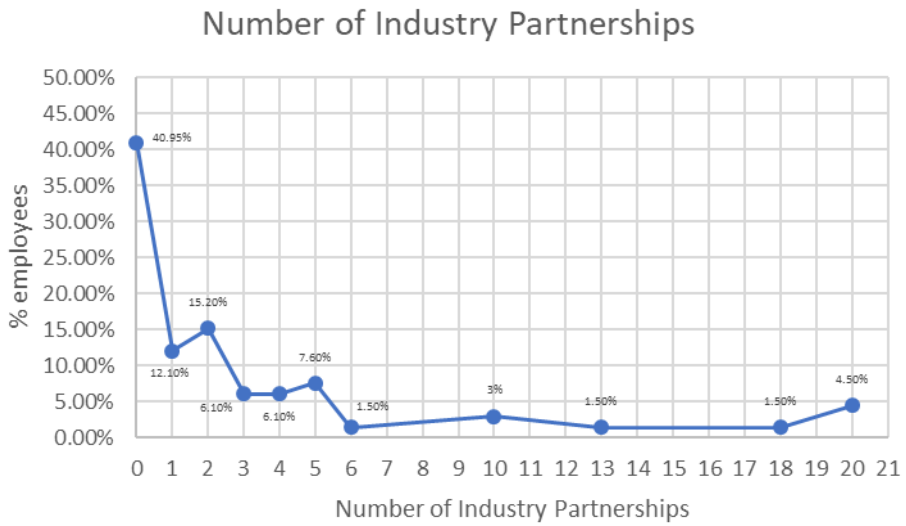

Figure 5. Results for industry partnerships.

Source: Researcher's analysis.

The results of the survey show that the staff in the transforming structures know very well what the indicators and measures of innovation are. **Figure 4** and **Figure 5** below reflects that the top indicators and measures of innovation at universities as specified by most participants ('agree' and 'strongly agree' responses) were "Research publications" (92.4%); "Joint publications" (81.8%); "Research and development budgets" (75.8%); "Industry collaborations" (65.2%) and "commercialization of research" (57.6%). The indicators specified the least (highest 'disagree' and 'strongly disagree' responses were "Number of employees responsible for finding industry partnerships" (19.7%); "Mutual secondments with industry partners" (16.7%); "Average number of start-ups" (15.2%); "Rate of graduate employment" (15.2%); and "Academic Entrepreneurship activities" (13.6%).

The results show that views on some of the measures such as industry partnerships and average number of start-ups were not seen by the participants as indicators and measures of innovation.

There was a significant portion of participants that opted to remain neutral on whether their university utilizes many of the indicators, for example, 66.7% of participants opted to remain neutral on university spin-offs as an indicator; 56.1% for the number of start-ups; 50% for the number of employees responsible for finding industry partnerships and 48.5% for human capital practices and patent licensing. Again, the results show that staff were not comfortable airing their views about such important aspects of their responsibilities. The section below shed more light on the ability of university transforming structures to engage in interdepartmental and intradepartmental partnership processes.

4.3. Findings on the Interdepartmental and intradepartmental partnership processes

This subsection provides more insight (drawing from **Figures 4** and **5**) into understanding the Interdepartmental and intradepartmental partnership processes that contribute to entrepreneurship and innovation in universities during a crisis. This is done by follow-up questions and the results are presented in **Figure 5** below.

On the question of the number of industry partnerships as a career total, **Figure 5** indicates the spread of partnerships employees had established at the time of the study as self-reported. 40.95% of participants indicated that they have not established any industry partnerships. The highest number of industry partnerships was 20 and was indicated by 4.5% of employees. It now becomes clearer as to why the respondents did not want to respond to questions presented in **Figure 4** concerning industry partnerships. Industry partnerships are one of the actual measures of innovation.

5. Discussion of results and findings

5.1. Introduction of the discussion

The discussion of the results and analysis section is presented in line with the research objective and research questions. The discussion starts by focusing on how innovation and entrepreneurship are understood and applied by both the junior staff and the leadership in transforming structures in the university during a crisis. The discussion then focuses on the employee's approach to their responsibilities of promoting innovation and entrepreneurship during a crisis. The discussion also focuses on the Interdepartmental and intradepartmental partnership processes to promote innovation and entrepreneurship before suggesting a model guide for the process universities may use during crises in different institutions.

5.2. How innovation and entrepreneurship are understood and practiced by universities' transforming structures

The findings reveal that the majority of the respondents amongst the leadership view their role within innovation and entrepreneurship transforming structures as that of policy-making during a crisis. Such views are echoed by Participant A who describes the leadership's role as "… to develop a whole culture of innovation at the university and in particular start off by first putting together policy innovation". Such findings are consistent with the Sustainable Livelihoods Framework and Institutional Theory's regulative element. Sustainable Livelihoods framework's approach (see **Figure 1**) advocates for transforming structures to create policies that allow resources needed to respond to crisis or disaster to be released. The findings are also consistent with Institutional Theory's regulative element. Farisani (2023); Owolabi et al. (2019) and Scott (2013) posit that Institutional Theory gives insight into how Institutions may use legislation, policies or rules to bring about or improve those important aspects of innovation such as new ideas, products or services. Thus, SLF envisions policies and rules from relevant departments/structures within institutions to enable staff to be creative. In practice, such policies or rules may provide clauses that reward innovation monetarily and or with time off as a reward and further motivation for innovation.

The findings also revealed that not all respondents interviewed from the two universities' innovation and entrepreneurship structures' leadership agreed. Their views seem to suggest that they differ in their understanding of what transforming structures may and may not do to promote innovation and entrepreneurship in their respective institutions. They did not agree that policies created by the leadership can assist in encouraging individuals to be innovative or entrepreneurial during a crisis.

This is highlighted by Participant D who argues that "The academics, must push it themselves. The admin is not going to change that". Such an approach is consistent with Institutional Theory's socio-cognitive element. Farisani (2022a, 2022b); Smyth and Vinclay (2017) corroborate and highlight the need for collaborative engagements (i.e., intra and interdepartmental) between all stakeholders (including junior staff and external relevant stakeholders). Collaborative engagements between all stakeholders during specific crisis policymaking to ensure that all relevant stakeholders can implement the policies when they are expected to do so. The advantage of a collaborative process is emphasized in the SLF processes by arrows that shed light on the influence and vital links to sustainability (see **Figure 1**).

The results from the junior staff members of the two universities highlight the need for them to be part of policymaking during a crisis and not just implement what has been decided by the leadership. The results show that while the junior staff are expected to perform certain tasks associated with innovation and entrepreneurship such as raising funds (i.e., bringing in financial resources from the external stakeholders to assist in innovation and entrepreneurship processes), they had no idea or seem to have run out of new/innovative ideas on how to do that. These findings are consistent with that of Jakolvjevic (2019). Jakolvjevic (2019) points to the "disappointing" lack of innovation among higher education staff in South Africa.

Alenezi (2023); Beltramino et al. (2023); Hughes et al. (2018); Wang et al. (2022) echo while pointing out that new ideas are central to innovation and entrepreneurship. Moreover, the results show that few (22.7% agree and 13.6% strongly agree) respondents can raise funds for innovation and entrepreneurial purposes in their departments i.e., staff in those transforming structures cannot improve their services or come up with new ideas to do one of their primary tasks. However, the junior staff seemed eager to learn given the opportunity. That is reflected by the results showing that the majority of the respondents (48.5% agree and 33.3% strongly agree) see themselves as more inclined to look for solutions instead of pointing out mistakes. The results are consistent with the Institutional Theory approach advocated by Farisani (2022a, 2022b); and Smyth and Vinclay (2017). Unger et al. (2020) attest and assert that collaborative engagements between all stakeholders during a crisis enrich the understanding of all stakeholders and improve services in an institution.

5.3. Interdepartmental and intradepartmental partnership processes to promote innovation and entrepreneurship

The results of the survey show that while the staff in the innovation and entrepreneurship transforming structures know what the indicators and measures of innovation are, they did not want to give more information about them. They did not want to give much information about areas that they seem to struggle with as innovation and entrepreneurship officials in their respective universities. Many respondents chose to remain neutral on whether their university utilizes many of the indicators, for example, 66.7% of participants opted to remain neutral on university spin-offs as an indicator; 56.1% for the number of start-ups; 50% for the number of employees responsible for finding industry partnerships and 48.5% for human capital practices and patent licensing.

When further follow-up questions were used to repeat the question in different ways, it became clearer that 40.95% of participants had not established any industry partnerships. The highest number of industry partnerships was 20 and was indicated by 4.5% of employees. It then becomes clearer why the respondents did not want to respond concerning industry partnerships. Industry partnerships/collaborations are one of the actual measures of innovation (Farisani, 2022a; Hughes et al., 2018; Yu et al., 2023). They were struggling to get other key stakeholders to assist in their responsibilities such as bringing in key resources (such as financial, physical and human) needed for innovation and entrepreneurship in their respective universities. The findings are consistent with that of Jakolvjevic (2019) and the Sustainable Livelihoods Framework (see **Figure 1**) concerning the flow of resources between institutions to respond to crises (Farisani, 2023; Smith and Vinclay, 2017). This is where partnerships (i.e., partnerships of transforming structures) come in, they avail resources such as financial, human, physical/technology, social and resources when needed to innovatively and entrepreneurially respond to a crisis. Below is a suggested model to guide the process universities may use during a crisis in different institutions.

5.4. Model to guide the collaborative process universities' innovation and entrepreneurship transforming structures may use during a crisis

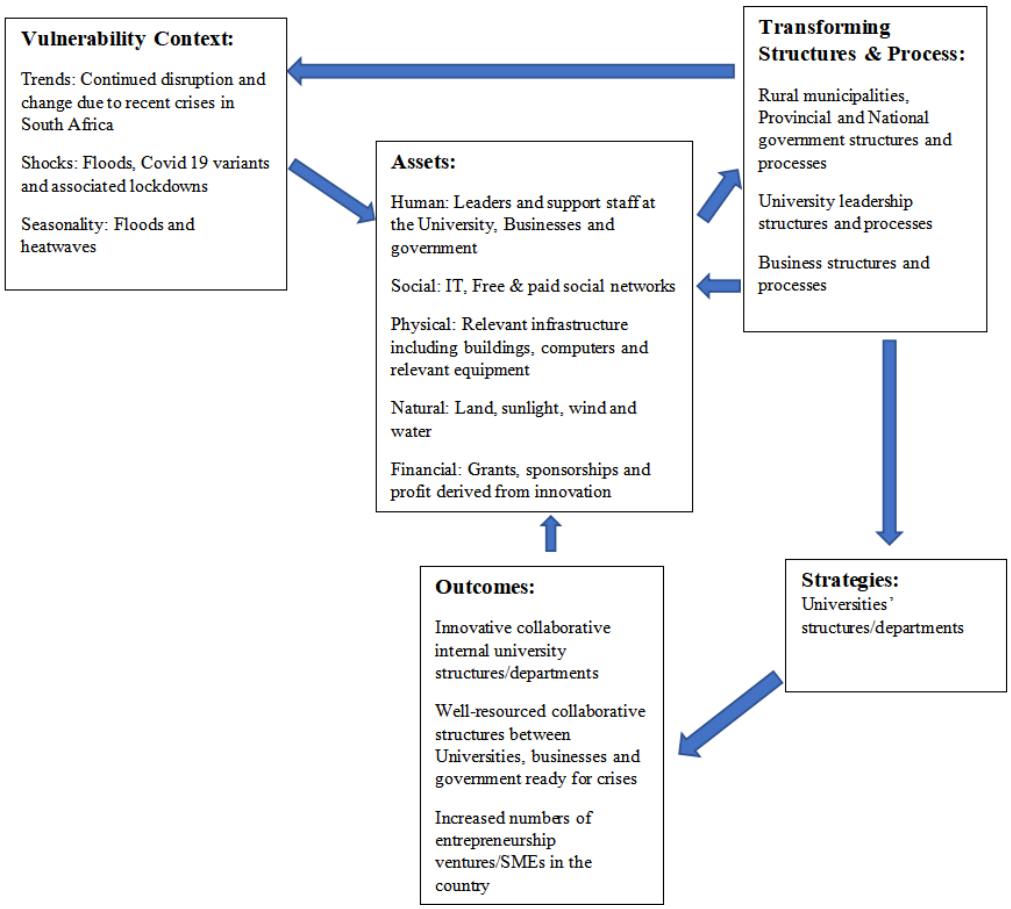

Figure 6. A model to guide the collaborative process universities may use during a crisis.
Source: Researcher's creation.

Both the Sustainable Livelihoods Framework (see **Figure 1**) and Institutional Theory's approaches teach us that various institutions are needed to effectively respond to a crisis. The model below (see **Figure 6**) borrows from both approaches to suggest a model to collectively respond to those crises mentioned under the vulnerability context or any other crisis that threaten the sustainability of key institutions or societies' livelihoods.

In responding to a crisis, the first stage in the suggested process is for universities to understand what kind of resources (see **Figure 2** for the types of assets/resources) they will need to react successfully. Having understood the need, to assess what resources are within the individual university's own departments/institutional structures before deciding on which external institutions/transforming structures to approach and work together as partners. The resources may be human (e.g., health experts if it is a health crisis), physical resources (e.g., technology to predict the weather conditions if it is a weather crisis such as floods or heat waves), social (e.g., local television and radio stations to inform communities about preventing measures or availability of innovative or entrepreneurial solutions during a crisis) or financial (e.g., whether the business community, national or local government should be approached to assist university transforming structure with urgent funding to respond to the crisis innovatively and timely).

When looking at the suggested model above, it is clear that it may be that when universities assess the crisis, the relevant transforming structures (e.g., university's department) may just approach another structure (e.g., local government) to assist with policies and not any of the resources mentioned above. The university transforming structure may just advise the local government to make rules or policies (e.g., declare a state of disaster) to end the impact of natural disasters such as floods. Such an approach might save all relevant stakeholders resources that would have to be deployed if the university's relevant transforming structure did not innovatively use their technology or human experts to predict the impending natural disaster. Thus, using the suggested model, university transforming structures may work with relevant institutions to maximize their resources to bring stability before and after crises and sustain livelihoods. The innovative ideas from transforming structures (from the university) might result in policy (by the government) or entrepreneurial ventures/SMEs (by individuals or businesses) to bring stability or sustain livelihoods. The suggested model is consistent with Khan et al. (2024); Szeto (2024); Uleanya's (2023); Vu et al. (2024); arguments; Yu et al. (2023)'s suggested advice and Dzvimbo et al. (2022) findings. Uleanya (2023) highlight the relationship between innovative higher institutions to sustainable development. Carayannis and Morawska-Jancelewicz (2022); Dzvimbo et al. (2022); Etzkowitz et al. (2022); Szeto (2024) as well as Yu et al. (2023) advocate for strategic partnerships. Yu et al. (2023) posit that universities need to respond innovatively to "social needs and government policies" as well as to "keep pace with the times".

For the universities to keep pace with the time, the universities need to keep up with the industry salaries. Salaries that are being paid by other innovative institutions that might be competing for the same human resources such as engineering and IT professionals. SLF adapted model in **Figure 6** shows (using arrows) that the links between trends, structures and processes is intertwined with the provision of resources.

By attracting and keeping motivated professionals within the university, these institutions can respond timely to the crises such as COVID-19, floods or heat waves. Such contribution from local universities will likely have an impact on grants flowing into these institutions and contributing to their sustainability. Relevant supportive institutions (such as government departments and banks) will have to modify their policies on grants and financial investments to ensure they are following the emerging trends whereby South African universities are leaders of innovation and entrepreneurship during crises.

6. Conclusions

The objective of the study is to suggest an adapted SLF model that will guide the interdepartmental and intradepartmental collaboration processes (see **Figure 1**) concerning innovation and entrepreneurship at the two universities during a crisis like COVID-19. The research questions pursued in this regard are 1) Which stakeholders/structures are responsible for leading the university's institutional entrepreneurial and innovation goal during a crisis; 2) How does university departmental junior staff understand innovation and entrepreneurship as compared to senior university staff members? 3) How does existing interdepartmental and intradepartmental partnerships contribute to entrepreneurship and innovation in universities during a crisis?

Results reveal that leaders and staff in different departments/structures view innovation in different ways and discharge their roles in line with their understanding. The example is that respondents did not all agree that policies created by the leadership can assist to encourage individuals to be innovative or entrepreneurial during a crisis. Such finding underscores the need for collaborative policymaking to ensure adherence/implementation. The results also show that both universities' transforming structures lack both the intra and inter-departmental collaborative approach to maximizing innovation and entrepreneurship during a crisis. The study suggested a model that guide the collaborative process universities' innovation and entrepreneurship transforming structures may use during a crisis. The model (see **Figure 6**) will guide the transforming structures (i.e., both junior and senior officials) to identify the challenges and weaknesses (associated with resources, policies and processes). To identify the challenges and weaknesses internally and externally between themselves and their partners to effectively come up with innovative and entrepreneurial ideas, services or products to assist during a crisis. To assist institutions and sustain livelihoods during a crisis.

The adapted SLF model suggest and recommend to the University administrators and policymakers that the best way to influence national policies during a crisis is to start university internal processes that avail and sustain human resources. Such human resource's innovative performance during crises is understood to influence government policies on financial resources to the universities which in turn assist universities' internal sustainability.

The weakness of the study is that only university respondents (and not the other respondents from institutions such as businesses or government departments) were reached due to COVID-19 restrictions at the time of data collection. It is therefore

recommended that future studies be conducted after the pandemic to include the inputs of other relevant stakeholders identified in this study such as businesses and government departments. Research on the use of recent technological advancement to explore the long-term impact of interdepartmental collaborations on innovation outcomes is also recommended.

Author contributions: Conceptualization, BR, PM and TRF; methodology, BR, PM and TRF; software, BR and PM; validation, BR, PM and TRF; formal analysis, BR, PM and TRF; investigation, BR and PM; resources, BR, PM and TRF; data curation, BR, PM and TRF; writing—original draft preparation BR, PM and TRF; writing—review and editing, BR, PM and TRF; visualization, BR, PM and TRF; supervision, PM and TRF; project administration, BR, PM and TRF; funding acquisition, BR and PM. All authors have read and agreed to the published version of the manuscript.

Acknowledgments: The authors acknowledge the support of their respective universities.

Conflict of interest: The authors declare no conflict of interest.

References

Abusamra, A. (2022). The role of community colleges in developing creativity and innovation skills of vocational students (the university college of applied science as a case study). Dirasat: Human and Social Sciences, 49(2), 583–598.

Alenezi, M. (2023). Digital Learning and Digital Institution in Higher Education. Education Sciences, 13(1), 88. https://doi.org/10.3390/educsci13010088

Baporikar, N. (2015). Drivers of Innovation, In P. Ordoñez de Pablos, L. Turró, R. Tennyson, & J. Zhao (Eds.), Knowledge Management for Competitive Advantage During Economic Crisis (250-270). IGI Global. https://doi.org/10.4018/978-1-4666-6457-9.ch014

Belamghari, M. (2022). Distance learning amidst the COVID-19 Pandemic: Moroccan University students' perceptions. The Teacher Educator, 57(1), 79-95. https://doi.org/10.1080/08878730.2021.2003918

Beltramino, N. S., Valdez-Juárez, L. E., Ingaramo, J. M., et al. (2023). The effects of organizational learning and entrepreneurial orientation on the corporate performance of Argentinean, Mexican, and Ecuadorian MSMEs. Small Business International Review, 7(1), e503. https://doi.org/10.26784/sbir.v7i1.503

Carayannis, E. G., & Morawska-Jancelewicz, J. (2022). The futures of Europe: Society 5.0 and Industry 5.0 as driving forces of future universities. Journal of the Knowledge Economy, 1–27. https://doi.org/10.1007/s13132-021-00854-2

Demircioglu, M., A. & Van der Wal, Z. (2022). Leadership and innovation: what's the story? The relationship between leadership support level and innovation target. Public Management Review, 24(8), 1289-1311. https://doi.org/10.1080/14719037.2021.1900348

Department For International Development. (1999). Sustainable livelihoods guidance sheets 1-2, DFID, London.

Dzvimbo, M.A., Mashizha, T., Zhanda, K., et al. (2022). Promoting sustainable development goals: Role of higher education institutions in climate and disaster management in Zimbabwe. Jàmbá: Journal of Disaster Risk Studies, 14(1), a1206. https://doi.org/10.4102/ jamba.v14i1.1206

Etzkowitz, H., Dzisah, J., & Clouser, M. (2022). Shaping the entrepreneurial university: Two experiments and a proposal for innovation in higher education. Industry and Higher Education, 36(1), 3–12. https://doi.org/10.1177/0950422221993421

Farisani, T. R. (2023). Empowering South African Rural Stakeholders to Participate in the Legal Cannabis Market: A Sustainable Livelihoods Approach. In P. Mashau and J. Nyawo (Eds.), Rapid Innovation and Development in the Global Cannabis Market (139-158). IGI Global. https://doi.org/10.4018/978-1-6684-6346-8.ch008

Farisani, T.R. (2022a). The impact of social and institutional networks in sustaining South African rural small, medium and micro enterprises during the crisis. Acta Commercii, 22(1),a1007. https://doi.org/10.4102/ ac.v22i1.1007

Farisani, T.R. (2022b). Assessing the impact of policies in sustaining rural small, medium and micro enterprises during COVID-19 pandemic in South Africa. Southern African Journal of Entrepreneurship and Small Business Management, 14(1), a505. https://doi.org/10.4102/ sajesbm.v14i1.505

Garcia-Alvarez-Coque, J. M., Mas-Verdú, F., & Roig-Tierno, N. (2019). Life below excellence: Exploring the links between top-ranked universities and regional competitiveness. Studies in Higher Education, 46(2), 369–384. https://doi.org/10.1080/03075079.2019.1637843

Giglio, C., Sbragia, R., Musmanno, R., & Palmieri, R. (2021). Cross-country learning from patents: An analysis of citations flows in innovation trajectories. Scientometrics, 126, 7917–7936. https://doi.org/10.1007/s11192-021-04094-8

González-González, I., Martínez-Ruiz, M. P., & Clemente-Almendros, J. A. (2022). Does employee management influence the continued use of telework after the COVID-19 pandemic?. Small Business International Review, 6(2), e537. https://doi.org/10.26784/sbir.v6i2.537

Hariri, A., & Roberts, P. (2015). Adoption of innovation within universities: Proposing and testing an initial model. Creative Education, 6(2), 186-203. http://dx.doi.org/10.4236/ce.2015.62017

Hughes, D. J., Lee, A., Tian, A. W., et al. (2018). Leadership, creativity, and innovation: A critical review and practical recommendations. The Leadership Quarterly, 29(5), 549-569. https://doi.org/10.1016/j.leaqua.2018.03.001

Inglesi-Lotz, R., & Pouris, A. (2018). Does South African research output promote innovation? South African Journal of Science, 114(9-10), 1-3. https://doi.org/10.17159/sajs.2018/a0286

Jakovljevic, M. (2019). Criteria for Empowering Innovation in Higher Education. Africa Education Review, 16(4), 53-71. https://doi.org/ 10.1080/18146627.2017.1369855

Khan. U., Naseem, S., Khan, AM., et al. (2024). Educational paradigm shift: Long-term ramifications of COVID-19 in the Indian context. Journal of Infrastructure, Policy and Development, 8(8), 4629. https://doi.org/10.24294/jipd.v8i8.4629

Kliewe, T., & Baaken, Th. (2019). Introduction: A brief history of engaged and entrepreneurial universities. In T. Kliewe, T. Kesting, C. Plewa, & Th. Baaken (Eds.), Developing engaged and entrepreneurial universities: Theories, concepts and empirical findings, (pp. 1–17). Springer Nature.

Kuckartz, U., Rädiker, S., Kuckartz, U., et a. (2019). Analyzing (Online) Survey Data with Closed and Open-Ended Questions. Analyzing Qualitative Data with MAXQDA: Text, Audio, and Video (219-229). https://doi.org/10.1007/978-3-030-15671-8_16

Marczewska, M., Weresa, M. A., & Lachowicz, M. (2024). Towards creativity and innovation in universities: Study on Central and Eastern Europe. Journal of the Knowledge Economy, 15(1), 1363-1385. https://doi.org/10.1007/s13132-023-01139-6

Mashau, P., Gwala, R. S., & Farisani, T. R. R. (2024). Redesigning Assessments Post the Corona Virus Pandemic and the Age of Intelligent Technology. In Accessibility of Digital Higher Education in the Global South (pp. 64-78). IGI Global. https://doi.org/10.4018/978-1-6684-9179-9.ch002

Moruzzi, C. (2021). Measuring creativity: An account of natural and artificial creativity. European Journal for Philosophy of Science, 11(1). https://doi.org/10.1007/s13194-020-00313-w

Owolabi, J. D., Faleye, D., Eshofonie, E. E., et al. (2019). Barriers and drivers of innovation in the Nigerian construction industry. Technology, 10(2), 334-339. http://www.iaeme.com/IJMET/issues.asp?JType=IJMET&VType=10&IType=2

Rahman, A. (2021). Using students' experience to derive effectiveness of COVID-19-lockdown-induced emergency online learning at undergraduate level: Evidence from Assam, India. Higher Education for the Future, 8(1), 71-89. https://doi.org/10.1177/2347631120980549

Romero-Hall, E., & Jaramillo Cherrez, N. (2023). Teaching in times of disruption: Faculty digital literacy in higher education during the COVID-19 pandemic. Innovations in Education and Teaching International, 60(2), 152-162. https://doi.org/10.1080/14703297.2022.2030782

Roncancio-Marin, J. J., Dentchev, N. A., Guerrero, M., & Diaz-Gonzalez, A. A. (2022). Shaping the social orientation of academic entrepreneurship: An exploratory study. International Journal of Entrepreneurial Behaviour and Research, 28(7), 1679–1701. https://doi.org/10.1108/IJEBR-07-2021-0600

Ruiz, S.M.d.A., Martens, C.D.P. & da Costa, P.R. (2020). Entrepreneurial university: An exploratory model for higher education. Journal of Management Development, 39(5), 705–722. https://doi.org/10.1108/JMD-08-2019-0363

Scott, W.R. (2013). Institutions and Organizations: Ideas, Interests, Identities. Sage, Thousand Oaks, CA

Smyth, E. & Vanclay, F. (2017). The social framework for projects: A conceptual but practical model to assist in assessing, planning and managing the social impacts of projects. Impact Assessment and Project Appraisal, 35(1), 65–80. https://doi.org/ 10.1080/14615517.2016.1271539

Stolze, A. (2021). A meta-ethnography on HEIs' transformation into more entrepreneurial institutions: Towards an action-framework proposition. Industry and Higher Education, 35(1), 14–27. https://doi.org/10.1177/0950422220922677

Szeto, E. (2024). Transforming a synchronous community of collaborative critical inquiry into co-performing construction of professional development in education. Professional Development in Education, 1-17. https://doi.org/10.1080/19415257.2024.2346093

Uleanya, C. (2023). Rural University Education for Sustainable Development in South Africa: A Review. Africa Education Review, 19(1),1-17 https://doi.org/10.1080/18146627.2023.218039835.

Unger, M., Marsan, G. A., Meissner, D., Polt, W., & Cervantes, M. (2020). New challenges for universities in the knowledge triangle. Journal of Technology Transfer, 45, 806–819. https://doi.org/10.1007/s10961-018-9699-8

Vu, T.D., Vu, P.T., Hoang, C.C, et al. (2024). The key determinants affecting entrepreneurial intention of student: Integrating theory of planned behavior and perceived university support. Journal of Infrastructure, Policy and Development, 8(7), 4655. https://doi.org/10.24294/jipd.v8i7.4655

Wang, C., Mundorf, N., & Salzarulo-McGuigan, A. (2022). Entrepreneurship education enhances entrepreneurial creativity: The mediating role of entrepreneurial inspiration. International Journal of Management Education, 20(2) https://doi.org/10.1016/j.ijme.2021.100570

Younis, H., & Elbanna, S. (2023). Teaching in times of crisis: The impact of the COVID-19 pandemic on higher education. Innovations in education and teaching international, 60(4), 451-462. https://doi.org/10.1080/14703297.2022.2060850

Yu, D. G., Li, Q., Song, W., et al. (2023). Advanced technique-based combination of innovation education and safety education in higher education. Journal of Chemical Education, 100 (2),507–516. https://doi.org/10.1021/acs.jchemed.2c00568