

How do university management levels differ in perception of their institution's entrepreneurial orientation?

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Abstract

Unlike resource-based economies that rely on capital, labour, and land, a knowledge-based economy depends predominantly on knowledge as a production factor. Universities play a critical role in this transition, evolving to become entrepreneurial institutions that drive socio-economic development. Despite this understanding, the South African government, entrepreneurship scholars, and other stakeholders have not fully developed an understanding of the role of universities in this significant economic transformation, prompting this study.

The quantitative study used the modified ENTRE-U scale, the most comprehensive tool for evaluating universities' entrepreneurial orientation. It used a cross-sectional survey with a self-administered questionnaire containing 30 response items. This study significantly contributes to corporate entrepreneurship and entrepreneurial universities, enriching the ENTRE-U scale and enhancing the understanding of factors constituting entrepreneurial universities. The five factors generated through factor analysis contribute to scholarship on universities' entrepreneurial orientation. The study provides an improved understanding of the differences in the perceptions of different management levels of South African universities regarding the entrepreneurial orientation at their institutions.

The study also enhances the theoretical understanding of entrepreneurial universities as catalysts for economic development, aiding public policymakers in aligning resource allocation towards universities and the knowledge sector in the journey towards 2030.

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1. Introduction

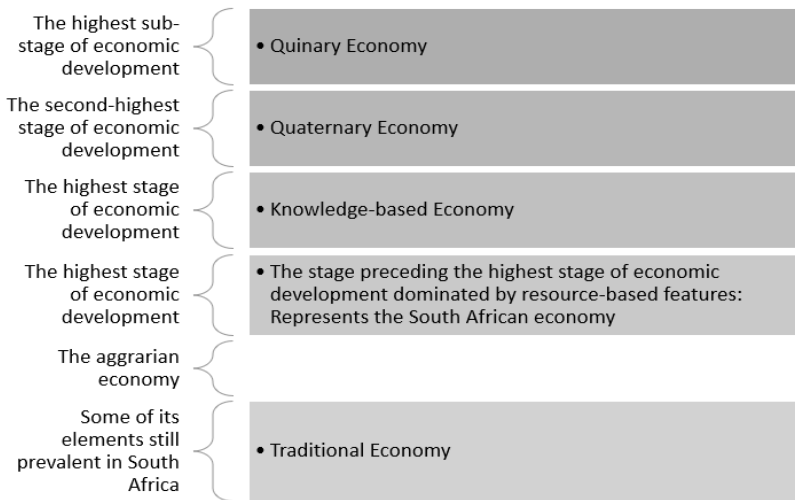
Scholarly evidence in the literature demonstrates that universities with high levels of entrepreneurial orientation (EO) are central to the advancement of society. Jessop (2021:153) and Aalbers and Whelan (2021:369) suggest that the nature of advancement that arises from an entrepreneurial university may be manifested in different developments. Such development ranges from increased national income levels (GDP) to the commercialisation of university knowledge and the positive impact on local, regional, and national economic growth. In support of this logic, Mazzucatto (2021:12), Mazzucatto, Kattel and Ryan-Collins (2020:423) and Abu-Rumman (2019:7) believe that entrepreneurial university-inspired innovation and entrepreneurship are the key drivers of sustainable economic development in all economies, irrespective of the stage of development.

This view seems to enjoy the support of other economic development and entrepreneurship scholars such as Semprebon, Porse, Gurak and Demeto (2020:315), as Ali and Cottle (2021:783) and Bong, Kwon and Park (2021:7). In a comprehensive empirical study that compares the role of entrepreneurial universities in the Global South, Semprebon *et al.* (2020:320) conclude that South Africa's dream of achieving knowledge-economy status by 2030, expressed in the National Development Plan ([NDP] 2012:10), depends hugely on its capacity to innovate. According to Semprebon *et al.* (2020:320), entrepreneurial universities inject entrepreneurial culture and practices into their traditional research and teaching missions. In so doing, they advance a knowledge-based economy. O'Brien and Cooney (2019:386) state that society conventionally proceeds from a traditional economy to a knowledge-based economy via the resource-based phase of economic development. Figure 1 below provides a diagrammatic representation of the conventional stages of economic development conceptualised by O'Brien and Cooney (2019:386).

Lehmann, Meoli, Paleari and Stockinger (2020:2) extend O'Brien and Cooney's (2019) model and argue that economic development is a dynamic process requiring entrepreneurial universities as its key driver. To operationalise their economic development mosaic, Lehman *et al.* (2020:3), supported by Borsi and Dory (2020:618), propose a model that places entrepreneurial universities at the centre of economic transformation from a traditional into a knowledge-based economy, including the quaternary and quinary sub-stages. This is evident in Figure 2, further below. The comparison of the figures illustrated the critical objective of this paper, which is to develop a clear understanding of how university management

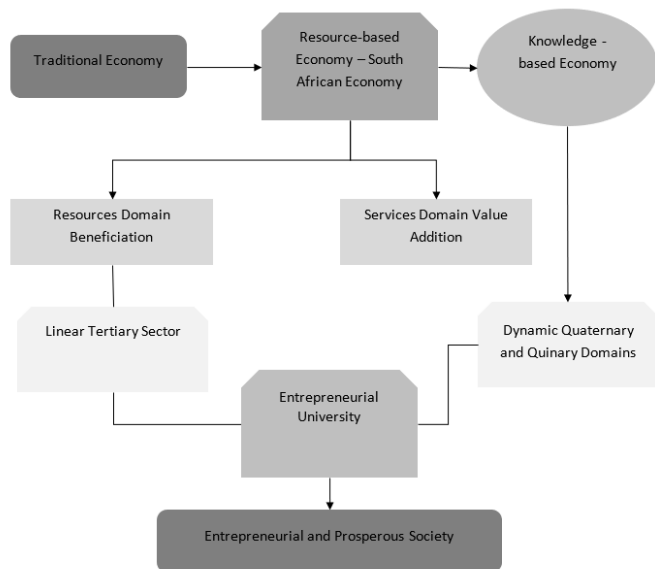
structures view their institutional entrepreneurial orientation. This inspection determines whether universities fulfil their entrepreneurial economic development role in South Africa, as postulated by Lehman *et al.* (2020:3) and Borsi and Dory (2020:618).

Figure 1. Conventional stages of economic development: resource-based



Source: O’Brien and Cooney (2019:386)

Figure 2. Dynamic view of economic development: entrepreneurial universities



Source: Lehmann *et al.* (2020:3)

1.1 South Africa: Economic Development Background

South Africa is an emerging economy that seeks to achieve the status of a developed economy by 2030. This noble goal jostles with myriad social ills afflicting the country. There

is a dire situation as unemployment, poverty, and inequality constitute the apex of social-economic challenges the country faces. South African public policymakers hope to achieve full employment, reduce inequality and eradicate poverty through the country's national economic blueprint, the National Development Plan (NDP 2030).

The South African government partially supports Mazzucato (2021:12), Semprebon *et al.* (2020:29) and Lehmann *et al.* (2020:4) as its 2019–2024 Medium-Term Strategic Framework (MTSF) (2020:18) echoes the NDP (2012:12) and posits that innovation will drive the transition towards a knowledge-based economy. However, the government does not emphasise the role of entrepreneurial universities in leading the transition towards a knowledge-based economy. Abramo, Apponi and D'Angelo (2021:5) define a knowledge-based economy as heavily dependent on high and complementary levels of demand and supply of knowledge products and services. This implies that organisations and their respective employees possess the dynamic knowledge resources to sense, innovate and supply products and services that meet the needs of their knowledge-inspired customers; these organisations include universities.

Therefore, South African universities are expected to act entrepreneurially to contribute to achieving the national objectives outlined in these policy documents without betraying their traditional missions. This expectation also receives strong intellectual justification from scholarly evidence presented by Thomas and Pugh (2020:1633) and Abu-Rumman (2019:8). Their evidence reveals that entrepreneurial universities always drive economic transformation from a resource-based into a knowledge-based economy (Thomas & Pugh, 2020:1633; Abu-Rumman, 2019:8). This evidence further places a strategic responsibility on South Africa's university leaders and policymakers to create and promote an environment that stimulates EO in universities to ensure that universities in South Africa fulfil their full potential to go beyond their traditional roles as merely academic teaching and research institutions.

1.2 Extant of the Research Problem and Relevance to South Africa

The transition to a knowledge-based economy, emphasising the role of universities, has been studied at the country level. Wong, Ho, and Singh found that universities like the National University of Singapore (NUS) play a crucial role in a country's economic growth through research, technology commercialisation, and fostering entrepreneurial mindsets. The authors argue that universities transitioning to be highly entrepreneurial in newly industrialised

economies like Singapore do face unique challenges, such as rigid bureaucratic control, lower research output, and limited commercialisation capacity. Furthermore, they note that the NUS is moving towards an "entrepreneurial university" model, which involves closer interaction with industry and government, commercialisation of research, and active contributions to private enterprise development (Wong, Ho & Singh, 2007: 954-955).

In addition, developing economies face unique challenges in the transition to an entrepreneurial university model, as conceptualised in the study by Farsi, Imanipour and Salamzadeh (2012), who posit an entrepreneurial university as distinct, fostering an entrepreneurial culture at various levels encompassing applied research, knowledge transfer and socio-economic collaborations, within the developing economy spectrum. The study identifies political behaviour, lobbying, and resistance to change as significant challenges within the developing country context, potentially hindering the success of the transition as entrepreneurial universities (Farsi, et al., 2007: 202)

In the context of technology transfer, entrepreneurial universities act as knowledge producers and disseminators in commercial output through technology transfer, which is crucial for economic growth, employment creation, and competitiveness in a knowledge-based economy. The development of entrepreneurial universities is influenced by external environmental and internal factors, which impact their teaching, research, and entrepreneurial missions. (Guerrero & Urbano, 2012:54-55; Klofsten, Fayolle, Guerrero, Mian, Urban & Wright, 2019:149).

Countries that have pursued optimising universities' entrepreneurial propensity will benefit from economic gains. Furthermore, the challenges associated with transitioning from traditional university missions, teaching and research have been studied. But there remains a need of scholarly research on the transformation of universities into entrepreneurial institutions from the management perspective - as internal stakeholders - who influence such a transition (Klofsten et al., 2019:149; Etzkowitz, Dzisah & Clouser, 2021:44; Petersen & Kruss, 2021:12).

Knudsen, Frederiksen and Goduscheit (2021:212), Wojcik (2020:879) and Xiaolan (2021:318) believe that this scarcity is more pronounced in South Africa than in other Sub-Saharan African leading economies such as Kenya and Nigeria. They also suggest that South Africa is lagging behind its BRICS partners. Odei and Anderson (2021:120), He, Nazari, Zhang and Cai (2020:8) and Maula and Stam (2020:1075) feel that this denies South Africa

an opportunity to accelerate its efforts to transform into a developed economy, as expressed in the NDP (2012:12).

Therefore, it was imperative to conduct a study that analyses the perceptions of the different management levels of South African universities to understand whether they appreciate their responsibility and are committed to rallying behind the national economic blueprint and pursuing concurrent excellence in their three missions of teaching, research and economic development, as entrepreneurial universities.

1.3 Study Objectives

Research Objectives:

1. To overall evaluate the transformation of South African universities into entrepreneurial institutions
2. To investigate the difference in perception of university management regarding their institutions' entrepreneurial orientation
3. To assess the alignment of South African universities with the National Development Plan (NDP).

This study is unique because it focuses on the differences in the perceptions of different levels of South African management. It also adds intellectual value as it has enhanced the validity and reliability of the ENTRE-U scale as a measurement tool to assess the entrepreneurial orientation of universities. This study has significant managerial implications for South African universities and public policymakers' different management levels. The research question that the study sought to answer was:

Does the executive, senior, and middle-level management at South African universities perceive their university's EO in the same way?

This article thus analyses the differences in perceptions of the different management levels of South African public universities. This cross-sectional study utilised the adapted ENTRE-U scale to collect data from respondents. The study conducted the Tukey Test to analyse the differences in perceptions of the different management levels of South African universities. This article includes the following sections: literature review, research methodology, results and analysis, managerial implications and contribution, and conclusion and recommendations.

2. Literature review

The literature reviewed in this study focuses on several areas related to entrepreneurial universities, starting with operational definitions, the evolution of entrepreneurial universities, entrepreneurial universities in South Africa, the measurement and operationalisation of entrepreneurial universities using the ENTRE-U scale, and the antecedents of entrepreneurial universities, focused on entrepreneurial orientation construct.

2.1 Definitions of an entrepreneurial university

Researchers define the entrepreneurial universities construct in different ways. Definitions that rose to prominence in the literature are summarised in Table 1.

Table 1: Definitions of entrepreneurial university

Author	Definition
Etzkowitz (1983:199)	Universities that transact partnerships with private companies to create a market for their inventions.
Charisman, Hynes and Fraser (1995)	A university that relies on the innovative talents of its faculty and students to create and launch new ventures.
Dill (1995)	A university that generates and transfers its technological innovations into the market through its autonomous entrepreneurial units.
Clark (1998)	A university that adopts an entrepreneurial posture across its activity chain as its source of sustainable competitive advantage.
Ropke (1998)	A university that invokes entrepreneurial behaviour in all its activities, including entrepreneurial activities pursued by employees and students, internal institutional processes and organisational interactions with the broader university EE.
Subotzky (1999)	The unique features of an entrepreneurial university are its economic proximity to the industry, an expanded role in mobilising external resources for the faculty, entrepreneurial executive governance, and institutional planning ethos.
Kirby (2002); (2006)	Universities that adopt an EO when pursuing risky and innovative entrepreneurial opportunities. Universities that respond to socio-economic challenges by investing resources in creative and risky entrepreneurial opportunities.
Etzkowitz (2003)	A university that institutionalises an institution-wide entrepreneurial culture that helps incubate entrepreneurial ideas and ventures initiated by

Author	Definition
	students and faculty.
Kirby and Hadidi (2019)	An entrepreneurial university generates economically valuable knowledge that generates third-stream revenues for the university through unique academic products and services and intellectual property rights such as patents and licences.
Abu-Rumman (2019)	It is a university that markets itself as a knowledge seller without being different from other universities.

Source: Adapted from Kirby and El-Kaffas (2021:4)

The definitions provided in Table 1 demonstrate that different scholars emphasise different dimensions of an entrepreneurial university. Although Machlop developed the concept of an entrepreneurial university (1962:25), it was the seminal work of Etzkowitz (1983:200, 2003:110), Clark (1998:8), and Audretsch (2014:314) that gave it eminence as a scholarly construct.

According to Tang and Chau (2020:97), Tatarski, Barkanlic, Sanchez-Garcia, Esteve, Brkic, Petrovic and Okanovic (2020:11), the notion of an entrepreneurial university transcends the presumed traditional roles of universities in society: teaching and research. In cementing this view, Pedro, Leitao, and Alves (2020:65) believe universities have begun to play an entrepreneurial role in society. This new role means they produce and commercialise economically valuable knowledge that contributes to economic growth and societal development in general. The entrepreneurial role that Tang and Chau (2020:34) and Pedro *et al.* (2020:65) refer to stems from prior research conducted by Etzkowitz (1983:201, 2003:112), Clark (1998:9) and Audretsch (2014:314).

In this study, the ENTRE-U scale was used to measure the perceptions that different management levels of South African universities have of them being entrepreneurial universities. The scale questions the interface between faculty and the external university environment. It also asks questions about the support that universities provide to faculty who seek to pursue entrepreneurial opportunities. The instrument further asks questions about the entrepreneurial standing of universities in society and industry. These matters exceed the boundaries of conventional knowledge commercialisation. It is, however, proper to explore the different dimensions of the ENTRE-U scale in detail next.

2.2 Entrepreneurial orientation

EO has been demonstrated to be a multi-dimensional construct. The literature has provided several definitions of EO, and therefore, it is prudent to give a few of these definitions:

- Khandwalla (1977:26) views EO as an organisational-level strategy that promotes the proactive pursuit of innovative and risky opportunities.
- Mintzberg (1973:46) approaches EO as a firm-level strategy which ensures that an organisation creates and sustains an entrepreneurial culture in which employees take risks and actively pursue innovative opportunities.
- Miller (1983:770) maintains that EO exists when an organisation promotes ‘innovativeness, proactiveness and risk-taking’ as key elements of its decision-making strategy.
- Covin and Slevin (1989:30) address EO as an organisation’s strategic posture that promotes the investment of organisational resources to explore and exploit risky opportunities in ‘hostile environments’.
- Lumpkin and Dess (1996:132) regard EO as firm-level multi-dimensional strategic decision-making ‘processes, practices and activities that lead to new entry’. Lumpkin and Dess (1996:154) further suggest that in addition to the three conventional dimensions of innovativeness, proactiveness and risk-taking identified by prior researchers, EO also consists of two dimensions of ‘competitive aggressiveness and autonomy’. This is the most comprehensive characterisation of EO and was adopted by this study.
- Riviezzo, Santos, Linan, Napolitano and Fusco (2019:233) define EO as ‘the strategic rooting of entrepreneurial values’ that harness all the organisational resources towards the proactive pursuit of entrepreneurial opportunities for the benefit of the organisation and other stakeholders and
- Stolze (2021:15) believes that EO is how an organisation can motivate its employees to discover and innovate opportunities that continuously create substantial economic value.

2.3 The ENTRE-U scale

Cunningham and Menter (2021:344), Venkataraman (2019:7), and Selig and Baltes (2019:5) agree that the ENTRESALE that was developed by Khandwalla (1977:23) is to measure EO mainly in the private sector and under hostile environments. In testing an organisation’s

innovativeness, the ENTRESALE deals with product lines, product changes and R&D leadership. Proactiveness is addressed through new techniques, competitive posture, risk-taking propensity, environmental boldness and decision-making style.

Cunningham and Menter (2021:345), Centobelli, Cerhione and Shashi (2019:176) and Asim, Li, Makhdoom and Zafar (2019:165) conclude that the ENTRESALE fails to reliably and validly test EO in non-European and non-American cultural settings. Other scholars such as O'Reilly, Robbins and Scanlan (2019:244) stand with Cunningham and Menter (2021:345) on the inappropriateness of the ENTRESALE for measuring EO in different organisational and cultural settings. As a result of these inadequacies, Todorovic *et al.* (2011:134) developed the globally renowned ENTRE-U scale to measure the EO of universities. The ENTRE-U scale consists of four factors discussed in the following sub-sections.

Before discussing the four factors, it is necessary to indicate that this study relied on the overall reliability of the ENTRE-U scale. The robust and overall results by Todorovic *et al.* (2011) showed that Cronbach's alpha values are above the acceptable threshold of 0.7 for most constructs, indicating good internal consistency and reliability. However, University Policies showed slightly lower reliability. These numbers reflect the overall robustness of the ENTRE-U scale, suggesting that the scale is a reliable and valid measure of entrepreneurial orientation in university departments, especially in predicting commercialisation outcomes like patents and spinouts. The Cronbach's Alpha results (Todorovic *et al.*, 2011:133) are

- Research Mobilization (RM): $\alpha=0.859$
- Unconventionality (UC): $\alpha=0.835$
- Industry Collaboration (IC): $\alpha=0.859$
- University Policies (UP): $\alpha=0.745$

2.3.1 Research Mobilisation

Research Mobilisation (RM) seeks to establish the extent to which universities attempt to include other external stakeholders in generating knowledge. According to Todorovic *et al.* (2011:129), this dimension demonstrates that knowledge creation is moving away from individual focus towards group and community focus. This means entrepreneurial universities ought to encourage the participation of external stakeholders in their knowledge-creation endeavours. In support of this logic, Hunady, Orviska and Pisar (2019:139) and

Bizri, Hammoud, Stouhi and Hammoud (2019:389) note that knowledge is one of the most valuable resources an organisation can have and exploit to succeed.

Drawing on resource-based and dynamic capabilities theories, popularised by Barney (1991:104) and Grant (1991:125) Hunady *et al.* (2019:140), Martinez-Climent, Costa-Climent and Oghazi (2019:9) and Wanzenbock and Frenken (2020:56) indicate that an organisation competing in the knowledge-based sector ought to mobilise research knowledge as a resource and convert it into a competitive capability, giving the organisation a competitive edge over its rivals. Notably, the expectations around RM fit the economic development mosaic (Lehman *et al.*, 2020:3; Borsi & Dory, 2020:618) that places entrepreneurial universities at the centre of economic transformation from a traditional into a knowledge-based economy, including the quaternary and quinary sub-stages as explained earlier.

2.3.2 Unconventionality

Unconventionality focuses on how universities use less traditional channels of research. This means entrepreneurial universities are expected to explore and exploit innovative channels of knowledge creation to benefit their stakeholders. Serenko (2019:1261) believes that for an organisation to satisfy its stakeholders, there should be a proper stakeholder management and programme benefits optimisation strategy. Such a strategy will help crystallise vital organisational stakeholders and the benefits they will reap upon successfully executing the programme. Serenko's (2019:1260) line of thought lends credence to the basic tenets of lexicology propagated by eminent scholars such as Machlup (1962:12), Drucker (1968:95) and Etzkowitz (1983:202). These authors believe an entrepreneurial university can best serve society by defining and aligning the interests of different stakeholders such as the state, business and community.

Okolie, Nwajiuba, Eneje, Binuomote, Ehiobuche, Hack-Polay (2020:67) and Degl'Innocenti, Matousek, and Tzeremes (2019:3) reinforce the helixicology logic as they insist that entrepreneurial universities typically rely on unconventional channels to develop and diffuse their economic knowledge across the innovation value chain. Okolie *et al.* (2020:68) and Demirkan, Yang and Jiang (2019:19) believe that the culture of innovativeness and creativity embedded in entrepreneurial universities is the foundation block of the knowledge economy. Todorovic *et al.* (2011:130) postulate that unconventionality goes beyond risk-taking because it explores innovative – and not necessarily risk – avenues. It is equally important to highlight

that this dimension relates to process innovation and examines product and service innovation. For example, a South African university may test its ability to raise research funds from sources other than the National Research Foundation (NRF).

2.3.3 Industry Collaboration

The industry collaboration dimension tests the degree to which university faculty and students engage in collaborative projects with industry partners. Such an engagement is deemed desirable because it will likely lead to industry-useful knowledge. Martin, Warren-Smith and Lord (2019:286) and Moussa, Kesting and Clauss (2019:28) suggest that universities must generate and exploit knowledge that has been co-created with the industry and other players. Through their notion of a multiple-helix ecosystem, Dal-Soto, de Souza and Benner (2021:260) and Mao, Yu, Zhou, Harms and Fang (2020:10) are convinced that entrepreneurial universities will derive economic and societal relevance by collaborating with the government and society in knowledge creation.

They (Dal-Soto *et al.*, 2021:260) suppose that such knowledge will meet the stakeholders' needs and contribute to the long-term success of local, regional and national economies. Yoshioka-Kobayashi (2019:426) and Yang, Dess, and Robins (2019:578) align themselves with Dal-Soto *et al.* (2021:260), as they also emphasise the importance of knowledge-creation partnerships between universities and the industry. In line with this thinking, Todorovic *et al.* (2011:132) maintain that collaborative research projects and programmes yield more economically advantageous research output than non-collaborative research projects. Todorovic *et al.* (2011:131) also provide intellectual credence to the established co-creation marketing and strategy principle.

According to scholars in the EO research domain, collaboration between universities and industry is influenced by several factors. Meng, Li and Rong (2019:256) state that such factors range from policy considerations to institutional relevance and legitimacy. Orazbayeva *et al.* (2019:1730) and Yun, Song and Kim (2021:11) suggest that universities that are not amenable or accustomed to the local sub-cultures may find it challenging to forge fruitful partnerships with industry members. This means that university leaders must pay attention to both the internal and external environments of the university and the potential industry partners to forge meaningful collaborations to develop and reap entrepreneurial opportunities.

2.3.4 University Policies

According to Todorovic *et al.* (2011:133), the university policies dimension relates to the responsiveness of the university culture to innovative ideas. The dimension establishes how university policies allow middle or lower-level managers to generate and pursue entrepreneurial ideas and opportunities. Kuratko *et al.* (2019:37), Kreiser, Anderson, Kuratko and Marino (2020:1175), and Lee, Howe and Kreiser (2019:136) state that tolerance of ambiguity and failure is the cornerstone of an effective organisational entrepreneurship environment.

An entrepreneurial environment requires top managers to encourage lower-level managers and employees to explore and exploit entrepreneurial opportunities. Top managers should not penalise lower-level managers for undertaking unsuccessful, risky projects. Kreiser *et al.* (2020:1176) and Martinez and Sterzi (2021:265) provide further legitimacy to this dimension by suggesting that entrepreneurial policies reinforce the entrepreneurial abilities of university employees. Kreiser *et al.* (2020: 1176) support Todorovic *et al.* (2011:128) by stating that university policies should institutionalise a university-wide 'integrated proactive and innovative risk-taking' entrepreneurship ecosystem.

According to Kreiser *et al.* (2020:1177) and Guerrero, Heaton and Urbano (2020:4), such an ecosystem integrates all university employees' entrepreneurial ideas and initiatives, irrespective of their positions in the organisational hierarchy. The authors also conclude that an integrated and favourable entrepreneurship ecosystem promotes a healthy and coordinated interface between university policies and systems. These include a web of variables such as what Nonaka (1994:34) and Hameed, Zaman, Waris and Shafique (2021:12) describe as 'tacit and explicit knowledge', reward systems, leadership and governance mosaics, and the country's public policies and imperatives. Hameed *et al.* (2021:13) recommend that entrepreneurial universities develop and implement policies that reinforce and strike a balance between entrepreneurial behaviour and national outcomes. It is evident from the literature that university policies ought to encourage risk-taking and delegate decision-making to lower-level managers across the organisation.

These four factors have been validated to accurately test and predict the EO of university departments across different settings. On this foundation, this study used the ENTRE-U scale to test the EO of South African universities.

2.4 Theoretical framework of the study

The theoretical basis of entrepreneurial orientation and the use of the ENTRE-U scale to test the four factors in this study are based on direct links evident from prior literature, between the EO theory and the ENTRE-U scale. Cunningham and Menter (2021:345), Centobelli, Cerhione, and Shashi (2019:176), and Asim, Li, Makhdoom, and Zafar (2019:165) provided the basis for reviewing the original ENTRESALE, following which Todorovic *et al.* (2011:134) developed the globally renowned ENTRE-U scale to measure the EO of universities very precisely.

This study examines the differences in perceptions of executives, senior managers, and middle-level managers regarding the entrepreneurial orientation (EO) of South African public universities. It is based on research conducted by Todorovic *et al.* (2011:132), which introduced the Entre-U scale as a tool to measure the entrepreneurial orientation of universities. Although initially focused on departments, Todorovic *et al.* (2011:132) concluded that the ENTRE-U scale consists of four valid factors that represent the entrepreneurial orientation of universities overall.

2.4.1 Linking the ENTRE-U scale to EO and Corporate Entrepreneurship

Hamdi, Indarti, Manik and Lukito-Budi (2022:12) suggest that the four factors of the ENTRE-U scale have a high degree of correlation with the five dimensions of EO as conceptualised by Lumpkin and Dess (1996:136). In support of Hamdi *et al.* (2022:12), Abramo, Apponi, and D'Angelo (2021:1406) believe that research mobilisation and university policies correlate with proactiveness and autonomy. In contrast, unconventionality and industry collaboration correlate highly with innovativeness, risk-taking and competitive aggressiveness (Abramo *et al.*, 2021:1406).

Abramo *et al.* (2021:1407) further suggest that these factors also correlate with internal environmental factors that Kuratko *et al.* (2014:120) validated to support corporate entrepreneurship in an organisation. In support of Abramo *et al.* (2021:1407), France (2019:23) insists that all four factors are closely related to all the stimuli provided by top management support, such as giving employees time and latitude to explore and exploit reasonably risky opportunities on behalf of the institution, as Asmawi and Mohan (2011) argue in the list that they provide on how certain aspects of organisational culture can enhance corporate entrepreneurship.

All these internal organisational stimuli form part of university policies and research mobilisation practices that determine whether university employees and students are motivated to initiate innovative collaboration with industry innovators and other stakeholders in society in general. In generating the study hypotheses, it was essential to consider the theoretical contributions of these different scholars in this field.

On this basis, the study generated and tested the following null hypotheses:

H1₀: There are no statistically significant differences between university managers' perceptions of unconventional university policies and practices at different management levels.

H2₀: There are no statistically significant differences between the perceptions of university managers regarding industry collaboration.

H3₀: There are no statistically significant differences between the perceptions of university managers regarding RM – students.

H4₀: There are no statistically significant differences between the perceptions of university managers regarding RM – faculty.

H5₀: There are no statistically significant differences between the perceptions of university managers regarding entrepreneurial standing.

The study hypotheses were tested using the adapted ENTRE-U scale, using the following research methods discussed next.

3. Research methodology

This was an empirical study investigating the EO of South African universities. This study aimed to answer the following research question: **Does the executive, senior, and middle-level management at South African universities perceive their university's EO in the same way?**

3.1 Research approach

This study was framed around positivist empirical research, associated with quantitative research methods such as surveys and statistical data analysis procedures.

3.2 Data Collection and Sample

Data was collected through a self-administered survey based on the modified ENTRE-U scale. The original ENTRE-U scale was adapted to suit the South African circumstances.

The most discernible adaptations from the original scale include double-barrelled and ambiguous questions that were tested by pre-testing the measurement instrument in piloting the survey questionnaire with respondents that fit the file of the study target respondents. Based on the pilot test, the necessary adaptations were made to improve the sample's comprehension. Vesci, Feola, Parente and Radjou (2021:356) advise researchers to treat variables as factors that may change in different contexts. There are, however, variables that remain the same, irrespective of context. This study consists of key variables that are included as:

- Research mobilisation.
- Unconventionality.
- University-industry collaboration; and
- University policies.
- University standing

The study sample was aimed at all universities in South Africa, and opted to use a self-administered electronic survey sent via email or delivered in person to executive, senior and middle university management across the levels as follows:

- Executive: Deputy vice chancellor or equivalent level,
- Senior Management: Dean/deputy dean or equivalent level, and
- Middle Management: HOD/senior professor, professor or equivalent level.

Seale, Heywood, Leask, Sheel, Durham, Bolsewicz and Kaur (2021:7) and Kim *et al.* (2019:332) conclude that the anonymity of participants and universities improves the response rate of such surveys and for that reason, no demographic data was collected other than the management level of the respondents and their faculty. A response rate of 80% was achieved, and the results show that 132 senior managers and 337 middle-level managers responded to the survey. According to the results, 34.1% of senior managers omitted to specify their faculties. In the universities that participated, faculties included business schools, medical schools, engineering and built environment, commerce, pharmacy, humanities and science.

It must be noted that the survey scale was inverse, with a score of 1 being positive (agree) and a score of 4 being negative (strongly disagree). Therefore, the lower the score, the higher the perception of an effective EO at an institution.

3.3 Data Analysis

Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) were used to generate and confirm the study's stable factors. The factor analysis process confirmed unconventional entrepreneurial policies and practices, industry collaboration, research mobilisation students, research mobilisation faculty, and entrepreneurial standing, which are the five stable factors that best characterise the entrepreneurial orientation of South African universities. Furthermore, the main statistical procedure used to verify the hypotheses was Tukey's HSD test. Yi, Amenuvor, and Boateng (2021:12) posit that Tukey's HSD test is the best statistical test for testing differences. This test yields the best results when applied to samples of different sizes—in this study, there were more middle-level managers than participants from senior and executive levels. Therefore, the Tukey's HSD test was conducted.

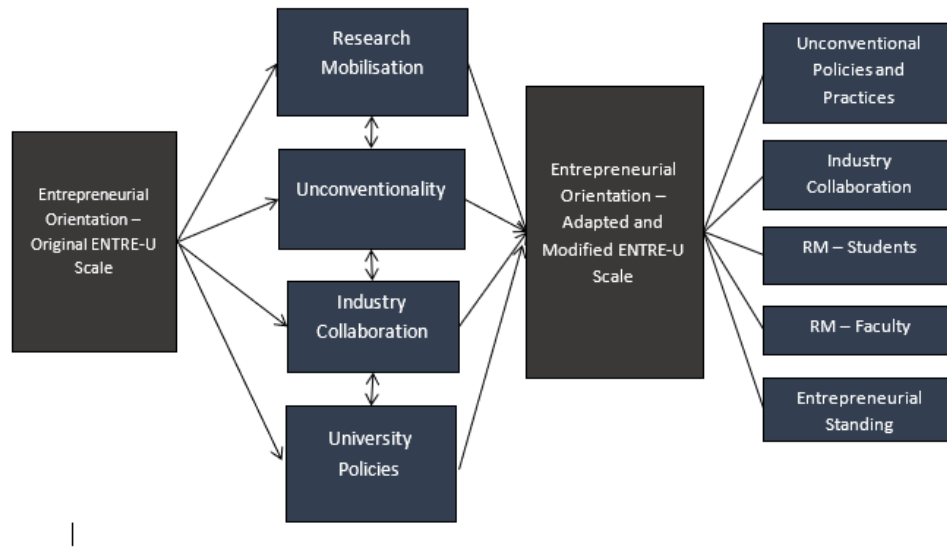
4. Results and analyses

The results of the factor analysis and Tukey's HSD test are now presented before the findings are discussed in more detail and depth concerning the literature.

4.1 Factor analysis results

The instrument's adaptation to South African conditions strengthened its validity, and the rotation and generation of the additional fifth factor solidified it as a valid instrument that can successfully measure the EO of South African universities. Humble (2020:49) proposes that a researcher should always conduct a CFA on retained factors to statistically confirm their validity. Gomez et al. (2020:114) suggest that factor analysis is the most appropriate statistical analysis technique that strengthens the reliability and validity of the study as the inferences from the data are based on rigorous extraction and confirmation of all critical variables forming the construct under study. Based on this motivation, this study opted for factor analysis as an analysis technique.

Figure 3. Four-factor convert to five-factor entrepreneurial orientation models



Source: Researcher's construction

Figure 3 sheds light on the factor analysis process, expanding the four original factors to five, which is appropriate next to explain the factor loadings and the instrument's reliability. The Cronbach's alpha values support the conclusion that the modified and adapted ENTRE-U scale was reliable. The entrepreneurial standing score of 0.676 did not threaten the modified and adapted ENTRE-U scale's overall reliability and results. This study thereby generated five factors, all with eigenvalues greater than 1, which confirmed the factors because the eigenvalue is the most popular factor retention criterion when values are above 1 (Kim & Mueller, 1978:13; Tome-Fernandez *et al.*, 2020:5). The factor extraction and confirmation process provided the constitution EO of entrepreneurial universities as follows:

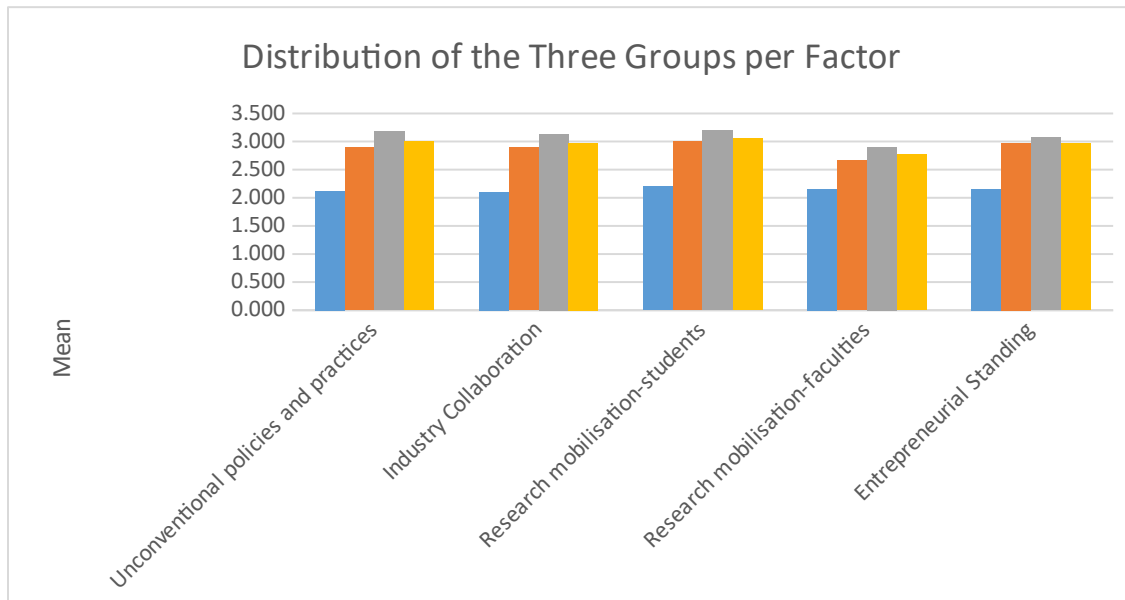
- Factor 1: Unconventional policies and practices.
- Factor 2: Industry collaboration.
- Factor 3: Research Mobilisation – students.
- Factor 4: Research Mobilisation – faculty, and
- Factor 5: Entrepreneurial standing.

The CFA results conducted on EFA results confirmed the adequacy and stability of the five factors and confirmed adding a factor to the original ENTRE-U scale.

4.2 Distribution of perceptions of the factors and university EO

Figure 4 provides a graphical presentation of the descriptive results for the combined scores of different management levels concerning the five factors of EO.

Figure 4. Distribution amongst the sample



Source: Researcher's construction

Figure 4 demonstrates how different levels of management individually and collectively perceive the EO levels of South African universities. Accordingly, in the graph, executives perceived South African universities as more entrepreneurial (showing lower mean scores of 2.122, 2.102, 2.199, 2.156, 2.156) than the other groups. In contrast, senior and middle-level managers viewed universities as less entrepreneurial, with higher mean scores. As a result of the perceptions of middle and senior managers, the combined means (3.003, 2.972, 3.052, 2.772, 2.959) are weighted upward and paint a less entrepreneurial picture of South African universities. This is an initial indication of the misalignment between the executive-level perceptions and the perception of middle- and lower-management to lower-management of EO in their institutions, and this variance in their EO is presented next.

4.3 Variance in EO perceptions amongst various management levels

The combined Tukey's HSD test results in Table 2 display a significantly high level of variability among the three samples. These support the researcher's decision to accept and reject specific hypotheses outlined in the succeeding paragraphs.

Table 2: Combined Tukey's HSD test results

Multiple Comparisons							
Tukey's HSD Test							
Dependent Variable	Respondent Description (I)	Respondent Description (J)	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Factor 1: Unconventional Policies and Practices	Deans	HODs	-.28717*	.05015	.000	-.4051	-.1693
		Executives	.76644*	.08171	.000	.5744	.9585
	HODs	Deans	.28717*	.05015	.000	.1693	.4051
		Executives	1.05361*	.07468	.000	.8781	1.2291
	Executives	Deans	-.76644*	.08171	.000	-.9585	-.5744
		HODs	-1.05361*	.07468	.000	-1.2291	-.8781
Factor 2: Industry Collaboration	Deans	HODs	-.24240*	.04902	.000	-.3576	-.1272
		Executives	.78639*	.07986	.000	.5987	.9741
	HODs	Deans	.24240*	.04902	.000	.1272	.3576
		Executives	1.02879*	.07299	.000	.8572	1.2004
	Executives	Deans	-.78639*	.07986	.000	-.9741	-.5987
		HODs	-1.02879*	.07299	.000	-1.2004	-.8572
Factor 3: RM Students	Deans	HODs	-.19848*	.06568	.007	-.3529	-.0441
		Executives	.79913*	.10701	.000	.5476	1.0506
	HODs	Deans	.19848*	.06568	.007	.0441	.3529
		Executives	.99761*	.09780	.000	.7677	1.2275
	Executives	Deans	-.79913*	.10701	.000	-1.0506	-.5476
		HODs	-.99761*	.09780	.000	-1.2275	-.7677
Factor 4: RM Faculty	Deans	HODs	-.23892*	.07158	.003	-.4072	-.0707
		Executives	.50768*	.11662	.000	.2336	.7818
	HODs	Deans	.23892*	.07158	.003	.0707	.4072
		Executives	.74660*	.10659	.000	.4961	.9971
	Executives	Deans	-.50768*	.11662	.000	-.7818	-.2336
		HODs	-.74660*	.10659	.000	-.9971	-.4961
Factor 5: Entrepreneurial Standing	Deans	HODs	-.09899	.07668	.401	-.2792	.0812
		Executives	.81576*	.12493	.000	.5221	1.1094
	HODs	Deans	.09899	.07668	.401	-.0812	.2792

Multiple Comparisons							
Tukey's HSD Test							
Dependent Variable	Respondent Description (I)	Respondent Description (J)	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
		Executives	.91475*	.11418	.000	.6464	1.1831
	Executives	Deans	-.81576*	.12493	.000	-1.1094	-.5221
		HODs	-.91475*	.11418	.000	-1.1831	-.6464

*. The mean difference is significant at the 0.05 level.

Source: Researcher's construction

4.3.1 Null Hypothesis 1

H_{1o}: There are no statistically significant differences between the perceptions of university managers at different levels regarding **unconventional university policies and practices**.

With the Sig. (2-tailed) value less than 0.05 (that is, 0.000); the researcher concludes that there is a statistically significant difference between the perceptions of university managers regarding unconventional policies and practices and industry collaboration. The mean difference between the perceptions of deans and HODs regarding unconventional policies and practices and industry collaboration is -0.28717, which implies that the mean score of deans is less than that of HODs.

The mean difference between perceptions of deans and executives regarding unconventional policies and practices and industry collaboration is 0.7664, which implies that the mean score of deans is more than that of executives. The mean difference between perceptions of HODs and executives regarding unconventional policies and practices and industry collaboration is 1.05361, which implies that the mean score of HODs is more than that of the executives.

In conclusion, the most significant difference in perceptions is between HODs and executives, followed by the difference between deans and executives. The difference between deans and HODs is the smallest. Therefore, the researcher rejects the null hypothesis that there is no statistically significant difference between university managers' perceptions of unconventional university policies and practices. The researcher also concludes that there is a statistically significant difference between their perceptions.

This finding implies that executives strongly believe that university policies and practices encourage entrepreneurial behaviour and actions of university employees. However, senior and middle-level managers perceive university policies and practices as bureaucratic and antithetical to entrepreneurial behaviour. The overarching implication is that executives must initiate an entrepreneurial climate audit and transformation initiatives to transform university policies and practices. Should the transformation initiatives reveal university policies and practices to be entrepreneurial, they will help transform or align the perceptions of all university managers.

4.3.2 Null Hypothesis 2

H_{2o}: There are no statistically significant differences between the perceptions of university managers regarding **industry collaboration**.

The results show a Sig. (2-tailed) value of less than 0.05, a statistically significant level of difference between the perceptions of university managers regarding industry collaboration. The researcher, therefore, rejects the null hypothesis that there is no statistically significant difference between the perceptions of university managers regarding industry collaboration. Accordingly, the researcher concludes that there is a statistically significant difference between the perceptions of university managers regarding industry collaboration.

This finding implies that university executives must introduce university-wide initiatives that institutionalise industry collaboration as part of the university's entrepreneurial milieu. When executives embark on such initiatives, the implication is that senior and middle-level managers should support and complement the executives. This implies that there should be multi-dimensional and multi-directional short, medium and long-term measures that managers at various levels pursue to institutionalise industry collaboration in the South African higher education landscape.

4.3.3 Null Hypothesis 3

H_{3o}: There are no statistically significant differences between the perceptions of university managers regarding **RM – students**.

The results in Table 3 reveal a Sig (2-tailed) value of less than 0.05, which is a statistically significant level of difference between university managers' perceptions of RM students.

Therefore, the researcher rejects the null hypothesis that there is no statistically significant difference between their perceptions of RM students. Accordingly, the researcher concludes that there is a statistically significant difference between their perceptions of RM students.

The implication is that university executives should initiate strategic didactic and pedagogical interventions to ensure their perceptions are aligned with senior and middle-level managers. This implication is premised on the fact that senior and middle-level managers enjoy a greater degree of proximity to students. Therefore, their perceptions carry more weight in this study.

4.3.4 Null Hypothesis 4

H4_o: There are no statistically significant differences between the perceptions of university managers regarding **RM – faculty**.

The results demonstrate a Sig. (2-tailed) value of less than 0.05, which is a statistically significant difference between the perceptions of university managers regarding RM – faculty. The researcher, therefore, rejects the null hypothesis that there is no statistically significant difference between the perceptions of university managers regarding RM – faculty. Accordingly, the researcher concludes that there is a statistically significant difference between the perceptions of university managers regarding RM – faculty.

This finding implies that university executives should initiate university-wide measures that support RM – faculty as a factor that can enhance the EO of South African universities. This means university executives have deployed resources to promote faculty research that solves societal and industry challenges. Senior and middle-level managers should equally embrace opportunities that executives create to conduct and commercialise research that benefits society and industry. However, this implication should be preceded by the fulfilment of another implication: the alignment of perceptions and expectations of managers at different levels regarding RM – faculty.

4.3.5 Null Hypothesis 5

H5_o: There are no statistically significant differences between the perceptions of university managers regarding **entrepreneurial standing**.

The results show a Sig. (2-tailed) value of less than 0.05, which is a statistically significant difference between university managers' perceptions of entrepreneurial standing. Therefore,

the researcher rejects the null hypothesis that there is no statistically significant difference between their perceptions of entrepreneurial standing. Accordingly, the researcher concludes that there is a statistically significant difference between their perceptions of entrepreneurial standing.

This finding implies that university executives should orchestrate adequate university resources to enhance the university's entrepreneurial standing in society and industry. This includes availing resources to create and commercialise economically valuable knowledge that solves industrial and societal challenges. This implication requires a new entrepreneurial mosaic to be infused across different management levels in South African universities. The envisioned entrepreneurial paradigm will ensure that managers at various levels embrace and support efforts to improve entrepreneurial standing as an essential factor in enhancing the EO of universities.

4.4 The scholarly significance of the study findings

The study shows that public universities are trying to shift from traditional approaches to entrepreneurial ones, known as Mode 3 entrepreneurial universities. According to Riviezzo et al. (2019:234), Ragmoun, and Alfalih (2021: 697), and Prokop (2021:5), in Mode 3, entrepreneurial universities pursue entrepreneurial outcomes more aggressively and proactively compared to Mode 2. This progression is necessary to take the steps towards the university model as described by Lehmann et al. (2020:3), where economic development is a dynamic process requiring entrepreneurial universities as its key driver.

Additionally, Riviezzo et al. (2019:235) and Pesotsky et al. (2021:964) suggest that entrepreneurial universities maintain their traditional missions of producing competent graduates for the labour market and providing sound scientific knowledge for society. The entrepreneurial domain reinforces the two traditional missions of the entrepreneurial university. Therefore, it was essential to investigate how South African university managers perceive this complex strategic exercise.

The study is significant at a public policy level because it highlights the crucial role that South African public universities are expected to play in the country's aspiration to become a knowledge economy by 2030. Da Cruz, Ferreira, and Kraus (2021:10) suggest that

entrepreneurial universities have been at the forefront of the economic transformation efforts of countries that have successfully transitioned into knowledge economies.

5. Managerial implications and contribution

This study has several implications for South African university managers, public policymakers and other stakeholders, as follows:

Executives: The study implies that executives should create a university-wide positive environment that promotes entrepreneurial orientation. Executives must ensure adequate resources are mobilised and deployed to institutionalise entrepreneurial orientation as universities' strategic posture.

Senior Managers: This management level is responsible for effectively communicating the entrepreneurial aspirations of universities within their faculties and business units. They are also responsible for creating a supportive environment for employees and students in their faculties to behave entrepreneurially.

Middle-level Managers: This is a crucial management layer for institutionalising entrepreneurial orientation in South African universities; they interact more frequently with junior employees and students within their departments, and middle managers have a responsibility to help communicate the universities' and faculty's entrepreneurial policies and programmes. They must demonstrate the entrepreneurial mission does not negate the other teaching and research missions. They are the most critical pillars that practically demonstrate the integration of the polyvalent missions of education, research, entrepreneurship, and civic engagement.

Policy Makers: As demonstrated above, the study requires policymakers to ensure that universities play their role as drivers of socio-economic development towards 2030. This may require policymakers to review the current policies related to South African universities' funding, knowledge creation, and valorisation responsibilities.

Stakeholders: Key societal stakeholders, such as civil society and entrepreneurs, have an instrument to help them better engage with South African university managers and public policymakers.

The study also has limitations. It was a cross-sectional study, meaning it might have secured deeper insights if it had been longitudinal. It is also important to note that the

survey might have benefitted more from higher levels of participation from South African university managers.

6. Conclusions and recommendations

6.1 Conclusion

It is crucial to state that despite its challenges, the study has significantly contributed to the discourse on the entrepreneurial orientation of South African universities. The study provides an enhanced understanding of the differences in the perceptions of different management levels of South African universities regarding the entrepreneurial orientation at their institutions.

The study adopted the ENTRE-U scale as an appropriate instrument to measure different dimensions of entrepreneurial orientation of South African universities. The adapted instrument may also be applied to measure the entrepreneurial orientation of universities in other jurisdictions in Africa and the rest of the developing world.

6.2 Recommendations

Based on the study findings and implications, the study makes the following recommendations:

- University executives must ensure adequate resources are mobilised and deployed to institutionalise entrepreneurial orientation as a university's strategic posture.
- Incentivise faculty to collaborate with industry and external partners, rewarding contributions that lead to commercialisation and societal impact.
- A transformational leadership strategy at the executive level is essential to align internal and external factors, creating an ecosystem-wide approach to enhance the university's entrepreneurial capacity.
- Facilitate spinout creation and streamline the patenting process with administrative support and resources, encouraging research commercialisation.
- University executives should initiate strategic didactic and pedagogical interventions to align their perceptions with senior and middle-level managers because senior and middle-level managers enjoy greater proximity to students.
- Middle managers have a responsibility to help communicate the universities' and faculty's entrepreneurial policies and programmes. They must demonstrate the entrepreneurial mission does not negate the other teaching and research missions.

For future studies,

- The modified and adapted ENTRE-U scale operationalised in this study has laid the scholarly foundation for further independent research focusing on universities' international entrepreneurial orientation.
- There is an opportunity to extend this study across other universities in South Africa to enlarge the sample and compare entrepreneurial orientation across universities.
- There is an opportunity to conduct longitudinal research and use the ENTRE-U scale to examine the ongoing nature of how South African universities are developing into entrepreneurial institutions.

7. Ethical consideration

Asplund, Bjork, Magnusson and Patrick (2021:6) and Asiaei, Barani, Bontis and Arabahmadi (2020:810) advise researchers to observe certain research ethics and protocols that are in line with the nature and purpose of the study. This study adhered to this advice and observed the following ethical protocols:

- The nature and purpose of the study were conveyed to potential respondents through a standard covering letter.
- The standard introductory letter ensured that respondents participated voluntarily and provided informed consent.
- Participants participated anonymously, and their anonymity was guaranteed; and
- Anonymity and confidentiality have also been extended to institutions; hence, the names of the universities have not been revealed in this study.
- Study conclusions: Seale et al. (2021:8) caution researchers against committing 'ecological fallacy', which refers to the error of extending conclusions beyond the results generated through rigorous statistical tests and procedures. This researcher confined the conclusions to those scientifically generated through several statistical tests to describe and analyse the collected and collated data. The tests included Cronbach's alpha test for internal consistency and factor analysis tests for validity. The factor analysis tests were EFA and CFA for extracting and confirming factors.

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