Strategic pathways for entrepreneurial-intended universities: Insights from global best practices

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Abstract

Purpose: In the past decade, numerous higher education institutions worldwide have embarked on a strategic transformation towards becoming entrepreneurial hubs with the potential to significantly reshape economic landscapes. Despite this shift, the specific determinants and pathways of this transformation remain inadequately explored and empirically unvalidated. This study undertakes a comprehensive systematic review of global literature on established entrepreneurial university models, identifying key indicators critical for advancing entrepreneurial agendas within academic institutions.

Method: These indicators were further subjected to empirical validation through a quantitative methodology, utilizing data from a randomly selected sample (n = 520) assessed via a 5-point Likert scale questionnaire. Ordinal regression analysis was employed to examine the predictive influence of the identified variables on entrepreneurial transformation.

Findings: Results indicated that all three indicators—entrepreneurial support, entrepreneurship education, and research enterprise—were statistically significant predictors at the p = 0.00 level. Entrepreneurial support demonstrated the highest predictive strength, followed by entrepreneurship education, while research enterprising exhibited the least influence.

Originality / relevance: These findings emphasize the need for stakeholders to channel investments towards areas of high predictive potential to accelerate the entrepreneurial transformation of universities. Future research should focus on context-specific and regionally adaptive indicators to further refine strategies and ensure alignment with the unique institutional characteristics, ultimately enabling more effective policy formulation and implementation in the entrepreneurial academic landscape.

Keywords: Entrepreneurial university, rural-based higher institution, transformative indicators, economic development

Voies stratégiques pour les universités à vocation entrepreneuriale : Aperçus des meilleures pratiques mondiales

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Objectif : Au cours de la dernière décennie, de nombreuses institutions d'enseignement supérieur à travers le monde ont entrepris une transformation stratégique visant à devenir des pôles entrepreneuriaux capables de remodeler de manière significative les paysages économiques. Malgré cette évolution, les déterminants spécifiques et les trajectoires de cette transformation restent insuffisamment explorés et empiriquement non validés. Cette étude réalise une revue systématique exhaustive de la littérature mondiale sur les modèles d'universités entrepreneuriales établis, identifiant les indicateurs clés pour faire progresser les agendas entrepreneuriaux au sein des institutions académiques.

Méthodologie : Ces indicateurs ont ensuite été soumis à une validation empirique à l'aide d'une méthodologie quantitative, utilisant des données provenant d'un échantillon aléatoire (n = 520) évalué à travers un questionnaire à échelle de Likert à 5 points. Une analyse de régression ordinale a été employée pour examiner l'influence prédictive des variables identifiées sur la transformation entrepreneuriale.

Résultats : Les résultats ont montré que les trois indicateurs — soutien entrepreneurial, éducation à l'entrepreneuriat et entreprise de recherche — étaient des prédicteurs statistiquement significatifs au niveau p = 0,00. Le soutien entrepreneurial a démontré la plus grande force prédictive, suivi de l'éducation à l'entrepreneuriat, tandis que l'entreprise de recherche présentait la plus faible influence.

Originalité/pertinence : Ces résultats soulignent la nécessité pour les parties prenantes de concentrer leurs investissements sur les domaines à fort potentiel prédictif afin d'accélérer la transformation entrepreneuriale des universités. Les recherches futures devraient privilégier les indicateurs contextuels et adaptés aux spécificités régionales pour affiner les stratégies et garantir leur adéquation aux caractéristiques institutionnelles propres à chaque établissement, permettant ainsi une élaboration et une mise en œuvre plus efficaces des politiques dans le paysage universitaire entrepreneurial.

Mots-clés : université entrepreneuriale, établissement d'enseignement supérieur en milieu rural, indicateurs de transformation, développement économique.

Introduction

The concept of an entrepreneurial university has gained global prominence for its strategic role in driving knowledge creation, innovation, and economic development (Fayolle & Redford, 2014; Pugh, Lamine, Jack, & Hamilton, 2018). Such institutions serve as catalysts for fostering entrepreneurial mindsets and actions, which are vital for enhancing competitiveness, wealth creation, and job generation. Recognizing these critical roles, universities worldwide have increasingly sought to position themselves as entrepreneurial-driven organizations, capable of cultivating business acumen and expanding their socio-economic impact both locally and globally (Larty, Jack, & Lockett, 2016; Ierapetritis, 2019; Wegner, Thomas, Teixeira, & Maehler, 2019; Hahn, Minola, Bosio, & Cassia, 2020). While there is no universally accepted framework for achieving this transformation, recent scholarship has identified numerous indicators that guide universities in their journey towards becoming entrepreneurial hubs (Dada, Jack, & George, 2015; Larty et al., 2016). However, there is a notable gap in the literature concerning rural-based universities, particularly in understanding how these indicators align with the unique challenges and opportunities faced by such institutions. Using the University of Venda context as case analysis, this paper addresses these knowledge gaps by exploring specific strategies that can effectively transform a rural-based institution into an entrepreneurial university. Drawing on a comprehensive review of existing literature, this study seeks to distil key insights that are relevant not only to the University of Venda but also to other universities across the country and potentially beyond.

In the subsequent sections, we present an overview of the intersection between entrepreneurship and higher education, followed by an exploration of the core functions of an entrepreneurial university. This includes a summary of global indicators identified as essential for fostering entrepreneurship in higher education. We then outline the methodology employed in this study, and present the findings, which demonstrate how these global indicators align with the University of Venda's entrepreneurial ecosystem. The paper concludes with a discussion of the results, providing recommendations for policy, practice, and further research to guide rural universities in their pursuit of entrepreneurial excellence.

Entrepreneurship imperatives

In recent decades, entrepreneurship has emerged as a critical driver of sustainable development, addressing the complex interplay of social, economic, and environmental challenges in an increasingly globalized world. It is widely recognized for its capacity to foster innovation and enhance productivity by optimizing the use of available resources (Ha & Hoa, 2018; Malecki, 2018; Szerb & Trumbull, 2018; Ogbari, Olokundun, Ibidunni, Obi & Akpoanu, 2019; Madzivhandila & Musara, 2020). Entrepreneurial knowledge and skills are fundamental in the creation of new products and services that not only meet economic demands but also stimulate job creation and economic growth (Pierrakis, 2018; Otchia, 2019; Iwara, 2020). In this context, Pierrakis (2018) and Otchia (2019) emphasize the importance of sustained investment in entrepreneurship, highlighting its central role in shaping future technologies and industries. This perspective aligns with Yudaeva's (2013) earlier assertion that the entrepreneurial sector holds the key to the future, positing that job creation and the fulfilment of global needs in the 21st century will be primarily driven by entrepreneurial initiatives.

Therefore, scaling up investments in entrepreneurship education, skills development, and capacity building is crucial for fostering economic resilience and prosperity. This strategic emphasis on entrepreneurship offers a significant opportunity for economic policymakers, particularly in nations facing severe economic challenges, such as South Africa, where leveraging entrepreneurial capacity may serve as a critical pathway for sustainable economic recovery and long-term growth.

Entrepreneurial university in the globalized world

Higher education is globally recognized as a crucial driver of knowledge generation and dissemination, serving as a fundamental channel through which entrepreneurial capacity is stimulated, thereby promoting economic growth (Audretsch, 2014; Carree, Della Malva, & Santarelli, 2014; Lehmann & Stockinger, 2018). Empirical studies have consistently demonstrated that economies renowned for their successful entrepreneurial ecosystems—such as the USA, Sweden, Germany, Canada, and China—actively integrate entrepreneurship into their institutions of higher learning, fostering entrepreneurial skills and innovation at a significant scale (Blenker, Dreisler, Faergemann, & Kjeldsen, 2008; European Commission, 2012, 2013; van Dijk & Mensch, 2015; Yue, 2017). Their successes, combined with the strategic objective of enhancing societal impact through entrepreneurial initiatives, have inspired a global shift toward entrepreneurial universities (Pugh, Lamine, Jack, & Hamilton, 2018). African countries, too, are increasingly recognizing the value of this approach.

In Africa, nations such as Nigeria, Zimbabwe, Uganda, and Kenya have incorporated entrepreneurship into higher education curricula, aiming to facilitate knowledge transfer and skill development (FRN, 2013; Olorundare & Kayode, 2014; Rambe et al., 2015; Onuma, 2016; van Zyl, 2018). For example, institutions like Midlands State University and Zimbabwe Ezekiel Guti University in Zimbabwe, as well as the University of Calabar in Nigeria, have made entrepreneurship courses compulsory and, in some instances, complemented them with practical skill-building initiatives. Despite these efforts, however, the outcomes remain inconclusive, as these countries continue to grapple with high rates of graduate unemployment and sluggish economic development (Longe, 2017; Mwenje, 2021; Njeru & Wanderi, 2021). This concern merits further scientific interrogations with practical interventions.

In South Africa, universities have established entrepreneurial incubation systems, such as the Johannesburg Business School Centre for Entrepreneurship, the DUT Centre for Entrepreneurship & Innovation, and the UCT Bertha Centre for Social Innovation & Entrepreneurship. While these initiatives foster entrepreneurship, their narrow reach—often enrolling only a small percentage of students—limits their capacity to develop robust entrepreneurial ecosystems across broader academic and student communities. Thus, a more comprehensive approach to cultivating entrepreneurial universities in South Africa is needed.

The University of Venda (Univen), like many other South African institutions, is striving to become an entrepreneurial hub. Beginning in 2018/19, Univen actively encouraged entrepreneurial initiatives among its academics and students, laying the groundwork for its 2021-2025 Strategy and Integrated Entrepreneurship, Innovation, and Biodiversity Plan (UIEIBP). This plan consolidates the university's internal and external networks with the overarching goal of enhancing its contribution to South Africa's economic development. Univen’s approach is particularly noteworthy because, unlike most entrepreneurial universities, it operates in a rural context, aiming to benefit not only students and staff but also grassroots communities—a rarity in South African higher education. Netshilinganedza (2020) perceive this community-centred entrepreneurship model as a potential catalyst for sustainable livelihoods among students and rural populations.

Despite these promising developments, Univen's entrepreneurial transformation remains in its infancy. The lack of empirical research on specific indicators, frameworks, and models required to successfully transition rural-based universities into entrepreneurial institutions poses a significant challenge. Without such foundational knowledge, Univen's transformation risks falling short of its potential, motivating the current study which explores the necessary conditions and strategies that can support the evolution of rural universities, like Univen, into fully-fledged entrepreneurial institutions.

Entrepreneurial university strategic merits

The conceptualization of an entrepreneurial university varies across academic discourse, but a central theme consistently emerges: the pursuit of economic development. Audretsch and Keilbach (2008) stress that an entrepreneurial university fosters entrepreneurial intentions, leads innovative thinking, and establishes institutions and capital that support entrepreneurship. Building on these ideas, recent studies have expanded the scope of an entrepreneurial university's roles, identifying key functions such as the development of curricula that impart both theoretical and practical entrepreneurial knowledge, the commercialization of research projects (Baldini, Fini, Grimaldi, & Sobrero, 2014), and the creation of specialized units dedicated to technological and practical skills transfer (Johnstone & Huggins, 2016; Manimala, 2017). Additionally, these institutions play a significant role in cultivating entrepreneurial mindsets through various initiatives that promote entrepreneurial behavior (Amjad, Rani, & Sa'atar, 2020). Moreover, entrepreneurial universities actively engage with external stakeholders—public and private organizations—positioning themselves as key actors in community development and economic enhancement (Etzkowitz, Webster, Gebhardt, & Terra, 2000).

This perspective aligns with Guerrero and Urbano (2012), who emphasize the importance of sustained partnerships, collaborations, networks, and interactions with both public and private sectors to link education and research directly to economic growth; suggesting that an entrepreneurial university is characterized by several key determinants: the facilitation of knowledge transfer, the provision of business development support services, and the identification of sustainable enterprises for both students and local communities. We can attest that these processes resonate with the University of Venda's entrepreneurship promotion aspirations and strategies, even though little is known about contextual scientific frameworks effectively guiding its transformation efforts.

Entrepreneurial university indicators

A review of the literature on the determinants of entrepreneurial universities reveals three overarching indicators that are integral to their development and success. As outlined in Table 1, the first indicator is entrepreneurship education, which entails the integration of entrepreneurship-focused courses and curricula aimed at building foundational knowledge, as well as the establishment of incubation systems that foster practical skills development. The second indicator, entrepreneurial support initiatives, emphasizes the university's role in promoting experiential learning through internships and mentorship programs, facilitating entrepreneurship competitions and networking opportunities, and providing seed funding to support the creation of new enterprises. The third and final indicator is research enterprising, which highlights the importance of promoting and advancing solution-oriented research in specialized areas, as well as the subsequent implementation, commodification, and commercialization of research outputs. Together, these indicators provide a comprehensive framework through which universities can systematically enhance their entrepreneurial capacity and contribute to broader economic and social development.

Table 1: Key Global Indicators of Entrepreneurship Promotion in Higher Education

Indicators	Initiatives	Motivation	Source
Entrepreneurship education	*Course/curriculum for knowledge building*	Develop and expand the availability of entrepreneurship-related courses tailored either for all students or specifically targeted groups, ensuring that the offerings are strategically aligned with institutional goals.	Dahlstrand and Berggren (2010), Bellotti et al. (2012), Hoppe et al. (2017).
		The instruction of entrepreneurship is critical, as it equips individuals with foundational knowledge and key concepts that are instrumental for successfully navigating entrepreneurial ventures.	Taatila (2010), Hoppe et al. (2017), Durán-Sánchez et al. (2018), Bergmann et al. (2018).
	Incubation system for skills development	Foster a collaborative framework that supports multidisciplinary projects, facilitating synergies, innovation, and breakthroughs while cultivating a dynamic environment that promotes creativity and entrepreneurial advancement.	El-Khasawneh (2008), Sudana, Apriyani, Supraptono and Kamis, (2019).
		Establish an integrated system led by subject-matter experts, encompassing a diverse array of activities such as entrepreneurial capacity-building programs—both in soft skills and technical expertise—alongside opportunities for internal and external networking, business marketing strategies, and resource mobilization to support enterprise development.	El-Khasawneh (2008), Bøllingtoft (2012), Ebbers (2014), Bennett et al. (2017).
	Entrepreneurship awareness programmes	Organize diverse entrepreneurship initiatives through high-impact events such as conferences, workshops, and seminars, aimed at fostering knowledge exchange and entrepreneurial development.	Bellotti et al. (2012), Rahman et al. (2012).
		Appoint dedicated faculty entrepreneurship officers and academic mentors to offer expert guidance, while also coordinating the various entrepreneurial initiatives available to students.	Walter et al. (2013).
			Sousa et al. (2017), Fernandez-Alles et al. (2018).

		Increase the frequency of targeted promotional efforts and events that facilitate networking, knowledge-sharing, and entrepreneurial interaction, creating a vibrant ecosystem for emerging innovators.	
Entrepreneurial support initiatives	*Internship and mentorships*	Integrate aspiring entrepreneurs into real-world market systems, providing them with opportunities to serve, learn, and apply their entrepreneurial knowledge in practical, dynamic environments. Establish a comprehensive support system that connects students with experienced mentors and key stakeholders in entrepreneurship development, ensuring access to critical resources, including potential seed funding for enterprise start-ups.	Netshandama et al (2021) Russell et al. (2008), Bergmann et al. (2018), Lehmann and Stockinger (2018).
	Entrepreneurship competition platforms	Facilitate structured channels that foster the convergence of individuals into a dynamic entrepreneurial community, encouraging collaboration and idea exchange. Enable both internal and external stakeholders to contribute to and compete within the ecosystem, thereby cultivating and enriching a vibrant entrepreneurial environment.	Quirke and Davies (2002). Lehmann and Stockinger (2018)
	Provision of seed enterprise funding	Facilitate access to financial literacy programs and entrepreneurship agencies to support funding opportunities. Provide financial backing for student-driven innovative ideas, nurturing them into successful ventures. Allocate seed funding strategically, aligned with the entrepreneurial aspirations and intentions of graduates.	Van Looy et al. (2011), Radebe (2019), Chinomona et al. (2020). Rasmussen and Borch (2010), Bergmann et al. (2018).

Research enterprising	*Deepening and motivating solution-driven research in the niche*	Pursue more context-specific, relevant, and rigorous entrepreneurship research to deepen and expand the knowledge base.	Durán-Sánchez et al. (2018).
		Encourage active engagement in scholarships, with a focus on understanding specific societal needs and identifying best practices for tailored solutions.	Von Graevenitz et al. (2010), Liñan et al. (2011), Durán-Sánchez et al. (2018).
	Implementing, commodification and commercialising research outputs	Strive to bridge the gap between academic research and practical application by leveraging experiential projects that allow students to actively engage in entrepreneurial training and learning.	Dahlstrand and Berggren (2010).
		Transition from traditional, transmission-based teaching models to experiential learning approaches that emphasize real-world applicability and equip students with practical, actionable techniques.	Taatila (2010).
		Ensure adequate institutional support so that research outcomes can effectively translate into viable new ventures and entrepreneurial initiatives.	Hoppe et al. (2017).
		Take a proactive role in the commodification and commercialization of the outcomes generated from the research activities of the faculty, staff, and students, fostering a culture of innovation and entrepreneurship.	Berggren (2011), Etzkowitz (2013) Cerver Romero et al., 2020.

***Source**: Authors elaboration based on literature review*

Model Specification

The dependent variable in this study was defined as the entrepreneurial university (EU). To operationalize this variable, the primary roles and functions of an entrepreneurial university, as identified in the extant literature, were utilized as measurement criteria. These roles include the promotion of entrepreneurship training, the provision of enterprise development support services, and the fostering of sustainable business ventures both among students and within local communities. Consequently, it is proposed that the development and performance of an EU are contingent upon the recurring factors outlined in Table 1. Symbolically, this relationship can be expressed as follows:

EU=f(EE, ES, RE).....1

Where:

F = Function

EE = Entrepreneurship Education

ES = Entrepreneurial Support Initiatives

RE = Research Enterprising

Study Area

The University of Venda, one of two public and rural-based universities in South Africa's Limpopo Province, serves a student population of approximately 16,000. As a rural-based Historically Disadvantaged Institution (HDI), it primarily attracts students from middle- and low-income backgrounds within the Vhembe District (Netshandam et al., 2021). This district, situated in the northernmost part of the country and bordering Botswana, Mozambique, and Zimbabwe, is predominantly rural and continues to face significant deficits in basic infrastructure and services (Chauke et al., 2013; Mudimeli, 2019). Despite the district's contribution to 4.4% of South Africa's agricultural output, 8.4% of its subtropical fruit, and 6.3% of its citrus production, it remains economically challenged, with persistently high rates of enterprise failure, unemployment, and poverty (Vhembe District Municipality, 2018; Stats SA, 2018; Iwara, 2020), ultimately motivating the need for a successful entrepreneurial institution that can foster sustainable solutions in the area. The region, rich in biodiversity and natural resources, possesses substantial potential for sustainable business development. However, these economic difficulties highlight the urgent need for targeted entrepreneurial support. Establishing resourceful entrepreneurial institutions that focus on capacity building is essential to fostering sustainable livelihoods for students, academics, and grassroots communities in such marginalized areas.

Methodology

In this study, an illustrative case study design was employed, utilizing a mixed-method survey approach. This design was chosen for its ability to integrate and analyse both quantitative and qualitative data within a single study, providing a robust framework for addressing the research questions. Through this dual methodology, we were able to unpack a set of entrepreneurial university indicators from the literature and subsequently test their relevance within the context of the University of Venda. The qualitative methodology facilitated the extraction of global indicators from existing literature, while the quantitative methodology allowed for the examination of their applicability and alignment with the unique realities of the University of Venda.

To systematically synthesize the entrepreneurial research, the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were employed. PRISMA offers a rigorous, evidence-based framework that ensures accuracy and transparency in reporting systematic reviews and meta-analyses by focusing on both pull and push factors influencing a phenomenon (Moher et al., 2010; Hlongwane et al., 2020). The application of PRISMA involved four distinct stages.

The first stage, identification, involved sourcing 117 scholarly articles on entrepreneurial universities from databases such as Thomson Reuters' Web of Science, Google Scholar, Academic Search Complete, ERIC, and MEDLINE. In the second phase, materials were screened and consolidated, with non-peer-reviewed sources, abstracts, and publications before 2001 being excluded, yielding 81 peer-reviewed, English-language articles. During the third phase, the full texts of these selected articles were reassessed for eligibility, and in the fourth phase, the accepted data were uploaded into Atlas.ti v8 for thematic qualitative analysis. Atlas.ti, known for its capacity to handle large textual datasets (Smit, 2002), enabled efficient coding, annotation, and thematic clustering, ultimately generating a framework that visually connected key insights. Based on this analysis, the results were categorized into different themes for interpretation. A 5-point Likert scale was then developed to assess the significance of the recurring factors identified in the literature, with 1 representing the least significant and 5 representing the most significant.

Data collection involved both online surveys (via Google Forms) and one-on-one interviews, drawing responses from 800 participants randomly selected from the University's undergraduate and postgraduate student population, academic and non-academic staff, grassroots community members, and entrepreneurship agencies within the Vhembe District. This diverse sampling approach was crucial given the ongoing reconfiguration of South African universities into community-driven and people-centered institutions. Engaging stakeholders from various sectors enabled a co-design approach to institutional framework development, ensuring that the generated knowledge was broad, diverse, and pertinent to addressing collective challenges. Out of the 673 returned questionnaires, 153 were deemed invalid due to insufficient knowledge of entrepreneurial university concepts, leaving 520 valid responses from participants with strong backgrounds in the subject matter.

Given the non-normal distribution of the dataset, an ordinal regression model—selected for its suitability for non-parametric analysis—was applied to the data. Ordinal regression is particularly valuable for predicting outcomes where the variable exists on an ordinal scale, meaning only the relative ordering between values is significant (Gutiérrez et al., 2015). The coefficients from the regression analysis were interpreted as changes in the log odds of being in a higher category of the dependent variable, for each unit increase in the independent variable. This provided a nuanced understanding of how each entrepreneurial university indicator influenced the likelihood of progression to a higher category of entrepreneurial activity, accounting for the various independent variables.

Result

A total of 520 respondents participated in this case study. Youths, defined as individuals aged between 18 and 35, made up 57.7% of the sample, with the remaining percentage comprising adults aged 36 and above. The gender distribution was nearly even, with females representing 50.8% of the respondents, while males accounted for the remaining 49.2%. In terms of educational and occupational demographics, undergraduate students formed the largest group, constituting exactly 50.0% of the sample, followed by postgraduate students at 17.7%. Academic staff made up 9.4%, and non-academic staff represented 5.0% of the participants. Grassroots community members contributed 11.7%, while respondents affiliated with entrepreneurship agencies accounted for 6.2% of the total responses.

Table 2: Participant Demography

		Frequency	Percent
Age Category	Youth	300	57.7
	Adult	220	42.3
	Total	**520**	**100.0**
Gender	Female	264	50.8
	Male	256	49.2
	Total	**520**	**100.0**
Designation	Undergraduate	260	50.0
	Postgraduate	92	17.7
	Academic Staff	49	9.4
	Non-academic staff	26	5.0
	Grassroots community members	61	11.7
	Entrepreneurship agents	32	6.2
	Total	**520**	**100.0**

Test of Normality

The Test of Normality indicated that the data deviated from a normal distribution. Specifically, the Kolmogorov-Smirnov test values for all variables were statistically significant at p = 0.00, as detailed in Table 3. According to Mishra et al. (2019), data is considered normally distributed if the significance value exceeds 0.05. Furthermore, the critical ratios for skewness and kurtosis—calculated as skewness or kurtosis divided by their respective standard errors—fell outside the range of -1.96 to +1.96, reinforcing the conclusion that the data did not follow a normal distribution.

Table 3: Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk						
	Statistic	df	Sig.	Statistic	df	Sig.	Skewness	Std. Error	Kurtosis	Std. Error
EU_LOG	.135	520	.000*	.909	520	.000*	-1.289	.107	3390	.214
EE	.227	520	.000*	.737	520	.000*	-2.8131	.107	5.185	.214
ES	.203	520	.000*	.813	520	.000*	-1.774	.107	4.039	.214
RE	.294	520	.000*	.677	520	.000*	-1.697	.107	1.667	.214

a. Lilliefors Significance Correction

*Statistically significant at the 0.05 level or less.

Model adequacy and reliability

The assessment of model fit, including the test of parallel lines and goodness-of-fit measures, was conducted to evaluate sample adequacy, variable appropriateness, and overall model fitness. As presented in Table 4, the model fitting information revealed a significant level of 0.00, indicating that the ordinal regression analysis appropriately fits the dataset. Additionally, the non-significant results from the Pearson Chi-Square (p = 0.281) and Deviance Chi-Square (p = 1.00) tests further affirmed the model's fit to the data. The Test of Parallel Lines yielded a probability value of 1.000, which exceeds the 0.05 threshold, thus confirming that the proportional odds assumption was upheld. This result

suggests that the explanatory variables were consistent across the different thresholds of the outcome variable.

Table 4: Model adequacy and reliability

Model Fitting Information	Model	-2 Log Likelihood	Chi-Square	df	Sig.
	Intercept Only	1649.386			
	Final	1324.628	324.758	3	**.000***
Model Test of Parallel Lines[a]	Model	-2 Log Likelihood	Chi-Square	df	Sig.
	Null Hypothesis	1324.628	**.470**		
	General	1278.494[b]	46.134[c]	112	**1.000**
Model Goodness-of-Fit			Chi-Square	df	Sig.
	Pearson		3112.003	3067	**.281**
	Deviance		1128.563	3067	**1.000**

Link function: Logit. *Statistically significant at the 0.05 level or less.

Ordinal regression analysis

Table 5 displays the Pseudo R-Square statistics, with the Nagelkerke value calculated at 0.470 from the ordinal regression model applied to a dataset of 520 observations and eight independent variables. This indicates that approximately 47% of the variation in the dependent variable, entrepreneurial university, can be attributed to the independent variables—entrepreneurship education, entrepreneurial support, and research enterprising, assuming all other factors remain constant.

Table 5: Ordinal Regression Model Pseudo R-Square

Cox and Snell	.464
Nagelkerke	**.470**
McFadden	.139
Link function: Logit.	

The ordinal regression model used to investigate the relationship between the entrepreneurial university and the three predictor variables, based on a survey dataset of 520 observations, is specified as follows:

$$\widehat{Eu}_i = 14.103 + 6.278\widehat{EE}_i + 10.506\widehat{ES}_i + 1.684\widehat{RE}_i$$

Entrepreneurship education emerged as a significant predictor of the entrepreneurial university with a p-value of 0.00. For each one-unit increase in entrepreneurial education, there is a predicted increase of 6.70 in the log odds of achieving a higher level of entrepreneurial status. Similarly, entrepreneurial support Initiatives also proved to be a significant predictor (p=0.00), with each one-unit increase in the parameter associated with a predicted increase of 10.50 in the log odds of attaining a higher level of entrepreneurial engagement. Research enterprising was likewise a significant predictor (p=0.00), where each one-unit increase in it corresponds to a predicted increase of 1.68 in the log odds of progressing to a higher level of entrepreneurial university status.

Table 6: Ordinal Regression Model – Dependent and Independent Variables (n=520)

Parameter Estimates								
							95% Confidence Interval	
		Estimate	Std. Error	Wald	df	Sig.	Lower Bound	Upper Bound
Threshold	[Dependent_LOG = 1,20]	2.263	1.209	3.507	1	.061	-.105	4.632
	[Dependent_LOG = 1,80]	3.186	.922	11.955	1	.001	1.380	4.993
	[Dependent_LOG = 2,00]	3.934	.797	24.358	1	.000	2.372	5.496
	[Dependent_LOG = 2,40]	5.221	.707	54.603	1	.000	3.836	6.606
	[Dependent_LOG = 2,60]	5.476	.699	61.375	1	.000	4.106	6.846
	[Dependent_LOG = 3,00]	6.259	.690	82.200	1	.000	4.906	7.613
	[Dependent_LOG = 3,20]	7.138	.696	105.079	1	.000	5.773	8.503
	[Dependent_LOG = 3,40]	7.984	.710	126.575	1	.000	6.593	9.374
	[Dependent_LOG = 3,60]	8.825	.727	147.447	1	.000	7.401	10.250
	[Dependent_LOG = 3,80]	9.550	.743	165.072	1	.000	8.093	11.006
	[Dependent_LOG = 4,00]	10.304	.761	183.299	1	.000	8.812	11.795
	[Dependent_LOG = 4,20]	11.167	.781	204.679	1	.000	9.637	12.697
	[Dependent_LOG = 4,40]	12.019	.797	227.272	1	.000	10.456	13.581
	[Dependent_LOG = 4,60]	12.999	.813	255.772	1	.000	11.406	14.592
	[Dependent_LOG = 4,80]	**14.103**	.828	290.036	1	**.000****	12.480	15.726
Location	EE	**6.278**	.880	50.854	1	**.000****	4.552	8.003
	ES	**10.506**	1.065	97.342	1	**.000****	8.419	12.594
	RE	1.684	.409	16.965	1	**.000****	.883	2.485

Link function: Logit.

**Statistically significant at the 0.01 level.

*Statistically significant at the 0.05 level.

In the context of the University of Venda, the analysis indicates that the three estimated variables—entrepreneurial support initiatives, entrepreneurship education, and research enterprising—are positive predictors of an entrepreneurial university. Among these, entrepreneurial support demonstrates the highest predictive power, followed by entrepreneurship education, with research enterprising being the least influential of the three variables. The model effectively fulfilled its intended purpose for this study by facilitating the inference of key typologies of indicators that the institution should derive from global best practices to advance its entrepreneurial university agenda.

Discussion of findings

Three indicators—entrepreneurship education, entrepreneurial support initiatives, and research enterprising—have emerged as pivotal for advancing the University of Venda's entrepreneurial university agenda.

Entrepreneurship education

Entrepreneurial education comprises several key initiatives, including the development of courses and curricula for knowledge building, awareness programs, and incubation systems for skill development. The critical importance of entrepreneurship course and curriculum development as a predictor for entrepreneurial universities is well-documented in the literature (Dahlstrand & Berggren, 2010; Bellotti et al., 2012; Hoppe et al., 2017; Wahidmurni et al., 2019). For the University of Venda, adopting

such initiatives is essential for advancing its entrepreneurial agenda. Entrepreneurship education at the higher learning level is crucial as it fosters a positive entrepreneurial climate, equipping students with both theoretical knowledge and practical skills that are vital for their ventures. This approach not only enhances labor market readiness but also prepares students for the complexities of a competitive, knowledge-based economy (Fernández-Nogueira et al., 2018). Offering entrepreneurship as a compulsory course across various disciplines—rather than limiting it to business schools—ensures that all students gain the necessary skills and knowledge, addressing the limitations of current practices where such courses are confined to specific faculties (Sam & Van der Sijde, 2014).

Bergmann et al. (2018) advocate for broader entrepreneurship offerings, emphasizing that exposure to entrepreneurship increases students' intentions and motivation to start businesses. This view aligns with Durán-Sánchez et al. (2018), who argue that entrepreneurship education is critical for fostering entrepreneurial spirit and equipping young people with innovative skills and attitudes. Restricting such education to a select group deprives other potential entrepreneurs of valuable knowledge. Despite these justifications, there is no evidence of South African universities mandating entrepreneurship courses for all students, which limits entrepreneurial skill development. Taatila (2010) underscores the necessity for institutions to adapt their pedagogy to include entrepreneurship fundamentals, thereby producing a larger cohort of academically educated entrepreneurs who can contribute to the entrepreneurial landscape.

Similarly, incubation systems play a significant role in entrepreneurial university development, as recognized by Bøllingtoft (2012), Bennett et al. (2017), and Sudana et al. (2019). These systems, characterized by expert guidance and multifaceted support activities—such as training, networking, marketing, and resource mobilization, create a conducive environment for entrepreneurial ventures and innovation (El-Khasawneh, 2008). For the University of Venda, located in a resource-rich yet socio-economically challenged region, a robust incubation system is crucial for providing entrepreneurial support to students, staff, and the local community. The Vhembe District, despite its natural resources and agricultural output, faces issues such as infrastructure deficiencies, poverty, and high unemployment, which further justify the need for an effective incubation system (Iwara, 2020). Sudana et al. (2019) emphasize that incubation systems equip academics with the theoretical and practical knowledge necessary to guide student entrepreneurs and enhance their resilience. This support extends beyond knowledge acquisition to include nurturing high-potential ideas and spin-off businesses, thus reinforcing the relevance of incubation systems in fostering a robust entrepreneurial agenda (Dahlstrand & Berggren, 2010; Karimi et al., 2010).

Awareness programs also play a pivotal role in stimulating entrepreneurship by providing platforms for gaining insights into entrepreneurial practices. These programs, which include syllabus development, academic debates, conferences, workshops, and seminars, can be delivered through both online and physical engagements (Rahman et al., 2012; Bellotti et al., 2012; Sousa et al., 2017). They enable networking and interaction among students and community members, thereby igniting entrepreneurial spirit and intentions (Sousa et al., 2017; Fernandez-Alles et al., 2018). Faculty entrepreneurship officers and academics can coordinate these activities to create an environment conducive to entrepreneurial exploration and development.

Entrepreneurial support initiative

Entrepreneurial support initiatives were examined through various dimensions, including the provision of seed enterprise funding, internship and mentorship programs, and the enhancement of entrepreneurship competition platforms. Seed funding is crucial, as research indicates that a lack of financing is a major deterrent for young people, particularly graduates, considering entrepreneurial activities (Rasmussen & Borch, 2010; Karimi et al., 2010; Radebe, 2019; Chinomona, Popoola &

Popoola, 2020). This argument is substantiated by recent studies conducted in the University of Venda area, which highlight the urgent need for policy reforms and practical measures to financially motivate students, academics, and community members towards entrepreneurship (Iwara, 2020; Netshilinganedza, 2020; Netshandama et al., 2021). The absence of adequate funding opportunities negatively impacts on entrepreneurial-minded students, deterring them from pursuing ventures in the business sector (Rasmussen & Borch, 2010; Karimi et al., 2010). In South Africa, prospective entrepreneurs, particularly young people, face challenges such as insufficient information on financing, barriers to accessing venture capital, stringent security requirements, and difficulties with business standardization and formalization—issues that an entrepreneurial institution like the University of Venda should address within its institutional framework.

Supporting these arguments, many advanced economies not only facilitate mentorship and skills development programs for students but also provide financial backing to entrepreneurial-minded individuals, nurturing their innovative business ideas (Dahlstrand & Berggren, 2010; Van Looy et al., 2011; Urban & Ratsimanetrimanana, 2019). This financial support plays a significant role in fostering a robust business climate among young people, as evidenced by the successful entrepreneurial ventures in countries such as Canada, China, Sweden, and the USA. These economies have seen significant contributions from young entrepreneurs in terms of wealth creation and job generation (Hao, 2009; Fan, 2012; van Dijka & Mensch, 2015; Rizzi, 2016; Yue, 2017). In line with Bergmann et al. (2018), it is evident that the extent to which entrepreneurship support is institutionalized within higher education correlates positively with the entrepreneurial climate among students, influencing the likelihood of graduates engaging in entrepreneurial activities. Therefore, direct mentorship, frequent internship placements, and policies centered around seed funding are essential in positioning the University of Venda as a pivotal institution for fostering successful entrepreneurs, thereby contributing to South Africa's economic development.

Research enterprising

Research Enterprise intercepts two pivotal areas: first, the deepening and motivation of solution-driven research in specialized fields, and second, the implementation, commodification, and commercialization of resultant research outputs. This discussion extends beyond the university's institutional research culture, ethics, approach, and relevance. Addressing these concerns involves critical questions: What type of research is the university conducting? How is this research being conducted? For whom is the research being conducted? What value propositions are being offered? Answering these questions is essential for realizing the initiatives associated with Research Enterprising.

To advance and stimulate solution-driven research, engaged scholarship—where academics collaborate with grassroots community members and development agencies—is crucial. Such collaboration fosters the co-creation of knowledge and a nuanced understanding of the entrepreneurial landscape, directly sourced from community insights. This approach provides a deeper understanding of societal challenges and needs, guiding the development of targeted support strategies to uplift grassroots communities (Durán-Sánchez et al., 2018; Iwara, 2020). This is essential as universities exist not only for their own benefit but also to serve and understand their surrounding communities, which can guide the development of adaptable frameworks for engagement. Contextual and collaborative research lays a robust foundation for achieving the institution's entrepreneurial goals and identifying specific support channels that foster higher success rates. Therefore, it is imperative that the University of Venda, aiming to become a rural-based, community-centric entrepreneurial institution contributing to South Africa's economic development, engages in comprehensive research that unites knowledge holders from grassroots communities and development agencies.

Moreover, societal issues and entrepreneurship practices vary contextually (Von Graevenitz et al., 2010), suggesting that a generalized research approach or entrepreneurial model may not yield relevant outcomes for the Vhembe District and South Africa at large (Iwara, 2020). Therefore, it is vital to evaluate whether the research produced by the university is sufficiently relevant to be commodified and commercialized for wealth creation. Engaging with grassroots stakeholders enables a detailed and context-specific examination of initiatives that address local issues, enhancing the relevance, usability, and implementability of research outcomes. Additionally, the relevance and quality of research significantly influence the university's ability to patent, license, and commercialize intellectual property, as well as to establish spin-offs from faculty, staff, and student research activities. Thus, transitioning to an entrepreneurial university requires a paradigm shift from traditional, generalized research to more applied, robust, and solution-oriented research that actively engages with and responds to societal needs.

Conclusion and recommendations

This study was conducted to identify key indicators that will enable the entrepreneurial-ented institutions of higher learning to excel in their transformation aspirations. By examining global strategies for entrepreneurial universities, several key initiatives emerged, which can be categorized into three main domains: entrepreneurship education, entrepreneurial support initiatives, and research enterprise. Firstly, there is a strong emphasis on the need for the institution to redefine its pedagogy to incorporate and centralize entrepreneurship education. This approach is anticipated to significantly increase the number of academically educated entrepreneurs, thereby fostering innovative approaches to entrepreneurship within societies. Essential components of this strategy include making entrepreneurship a compulsory module, implementing awareness programs, and establishing incubation systems. Secondly, the focus shifts to building an institutional framework designed to nurture, motivate, and fund students' innovative ideas. Key elements of this framework include creating competition platforms for entrepreneurial engagement and expanding internship and mentorship programs that facilitate practical skills development through placements in functional firms. Lastly, there is a critical need to transition from traditional, generalized research methods to a more applied, context-specific, robust, community-engaged, and solution-driven research paradigm. This shift is expected to enhance both the relevance and quality of research outputs, thereby enabling the university to generate intellectual property, patent, license, and create commercial spin-offs from the research activities of its faculty, staff, and students. Overall, these strategies will enable any entrepreneurial-intended institution of higher learning, including the University of Venda to better serve its communities, generate internal wealth, and contribute to the development of graduate entrepreneurs, thereby supporting the country's economic growth.

Recommendations include:

- Prioritizing investments in indicators with higher potential for success, such as entrepreneurial support initiatives, which demonstrate the greatest predictive power.
- Conducting further studies to explore the underlying narratives that shape participants' perceptions of each variable to gain deeper insights into their choices.
- Investigating why research enterprise, as an indicator, has the lowest predictive power to understand and address its limitations.

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