Strengthening Innovation Hubs in Higher Education: Exploring Marketing and Financial Models in Uganda's Public Universities

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Abstract

Public universities in Uganda are increasingly recognised as drivers of innovation and student entrepreneurship, aligned with Vision 2040, NDP IV, and the Sustainable Development Goals (SDGs). Innovation hubs within these institutions are established to incubate student-led start-ups. However, access to finance, weak marketing strategies, and fragmented institutional support continue to hinder their performance. This study investigates how integrated marketing and financial models can enhance the effectiveness of innovation ecosystems in Uganda's public higher institutions of education (HEIs). It explores three research questions: (i) What financing strategies are employed by university-based innovation hubs? (ii) What marketing approaches do student-led start-ups utilise? (iii) Which institutional or policy-level enablers and constraints affect start-up success? A mixed-

methods approach was used. Quantitative data was collected from structured surveys administered to 100 student-led start-ups across three public universities via simple random sampling. Qualitative data was collected via 25 semi-structured interviews and four focus group discussions with hub managers, student entrepreneurs, university administrators, government officials, and financial actors, selected through purposive sampling. Data was collected from 85 respondents across three public universities using a mixed-methods approach. Regression results revealed that financial model sustainability ($\beta = 0.63$, $p < 0.05$) significantly predicted innovation hub performance, while marketing strategies had a moderate but positive effect ($\beta = 0.41$, $p < 0.05$). The results show that successful start-ups often use inclusive financing options, such as seed grants, and employ context-specific marketing tools, such as digital branding. Hubs that provide mentorship, financial literacy, and market linkages significantly improve start-up growth and sustainability. Nevertheless, policy misalignment, limited scalability, and weak coordination remain key challenges. The study provides a practical framework for integrating marketing and financial strategies into HEI innovation management, offering policy insights for NCHE and university councils seeking to operationalise innovation and entrepreneurship within Uganda's higher education system.

Keywords: *Digital branding; Inclusive financing; Policy enablers; Student entrepreneurship; University-industry linkage.*

Introduction

While global higher education institutions (HEIs) have evolved into entrepreneurial ecosystems integrating marketing and finance-driven innovation, Ugandan public universities still struggle to operationalise such models within resource-constrained environments. This contextual gap necessitates a localised examination of innovation hub management. Universities worldwide are increasingly recognised as critical drivers of innovation, entrepreneurship, and sustainable socio-economic transformation (Etzkowitz & Zhou, 2017; Guerrero et al., 2021). In developing contexts such as sub-Saharan Africa, HEIs are not only centres of knowledge creation but also serve as catalysts for

entrepreneurial ecosystems that foster youth employment, industrial upgrading, and inclusive growth (Adelekan & Jimoh, 2021; OECD, 2019). Uganda's Vision 2040 and the Fourth National Development Plan (NDP IV) explicitly highlight innovation as a cornerstone for accelerating structural transformation, competitiveness, and integration into global markets (National Planning Authority [NPA], 2023). Within this framework, public universities in Uganda are expected to play a pivotal role by incubating student-led ventures through innovation hubs that blend knowledge transfer with practical entrepreneurship support.

Innovation hubs in HEIs act as intermediaries between knowledge producers, industry stakeholders, and policy frameworks, aligning with the principles of the Triple Helix and Quadruple Helix models of innovation (Etzkowitz & Leydesdorff, 2000; Carayannis & Campbell, 2012). They are designed to provide mentorship, financial access, and marketing linkages that enable students to translate ideas into viable enterprises. However, despite their potential, the effectiveness of these hubs in Uganda remains constrained by persistent challenges, including limited financing, weak marketing capacities, fragmented institutional support, and misaligned policies (World Bank, 2020; UNESCO, 2021). These constraints significantly undermine the student start-ups' ability to achieve scalability, competitiveness, and long-term sustainability.

A growing body of literature emphasises that financing and marketing are among the most critical determinants of entrepreneurial success in higher education ecosystems (Isenberg, 2010; Liguori et al., 2019). Inclusive financing models such as seed grants, sustainability-linked loans, and climate-smart microfinance have proven to stimulate entrepreneurial activity, particularly in emerging economies where access to venture capital remains limited (Demirgüç-Kunt et al., 2022; Agyeman et al., 2020). Similarly, digital marketing approaches, particularly social media branding, storytelling, and community-based marketing, have become indispensable tools for student-led enterprises to enhance visibility, build networks, and access broader markets at relatively low cost (Dwivedi et al., 2021; Boateng et al., 2022). When combined, these models create a synergistic effect that can strengthen the role of innovation hubs in shaping entrepreneurial outcomes.

Despite these insights, empirical studies examining the integration of marketing and financing models in African HEI innovation hubs remain limited. Much of the existing scholarship on entrepreneurial universities has concentrated on technology transfer and spin-offs in developed economies (Rothaermel et al., 2007; Lockett et al., 2005), with little attention paid to how public universities in sub-Saharan Africa can leverage holistic incubation frameworks to support student entrepreneurs. This study, therefore, seeks to fill this gap by investigating how integrated marketing and financial models influence the effectiveness of innovation ecosystems in Uganda's public universities. However, few empirical studies in Uganda have examined how marketing and financial sustainability models jointly influence the performance and scalability of university innovation hubs. By focusing on financing strategies, marketing approaches, and institutional enablers and constraints, this research contributes to both theory and practice. It not only extends knowledge about the application of entrepreneurial ecosystem frameworks in developing contexts, but also generates policy-relevant insights for aligning university innovation hubs with national and global development goals, particularly the Sustainable Development Goals (SDGs 4, 8, and 9).

Theoretical Review and Literature Review

Theoretical review

The study is based on three complementary theoretical lenses: the Triple Helix Model, the Resource-Based View (RBV) and the Diffusion of Innovations (DoI) Theory. Together, these theories help explain how innovation arises, gets support, and is ultimately adopted in higher education systems. The Triple Helix Model (Etzkowitz & Leydesdorff, 2000) posits that innovation arises from collaboration among universities, industry, and government. However, in Uganda's public universities, these interactions are often weak and project-based rather than systemic. This limits commercialisation despite national policy commitments like Vision 2040 and NDP IV. This shows that while the model is a helpful starting point, its assumptions about institutional maturity and

coordinated engagement need to be adjusted in resource-constrained higher education institutions.

The Resource-Based View (Barney, 1991) highlights that an organisation's advantage derives from valuable and difficult-to-duplicate internal resources. For innovation hubs, this includes financial backing, expertise, mentorship programmes, and prototyping facilities. The study's findings reveal that, although student innovators possess substantial intellectual potential, universities lack key VRIN resources, including pathways for commercialisation, technology transfer processes, and incubation capacity. This results in a low rate of research being converted into market-ready outputs. RBV explains that innovation performance depends not only on ideas but also on the development of organisational capabilities.

Diffusion of Innovations Theory (Rogers, 2003) offers a behavioural view by showing how new practices spread based on perceived benefits, complexity, and support systems. In this case, the adoption of innovations among student start-ups slows due to limited mentorship, limited visibility into successful innovations, and infrastructure challenges. This confirms that institutional conditions influence more than individual willingness. Together, the three frameworks show that innovation in Uganda's public higher education institutions is affected by ecosystem collaboration (Triple Helix), internal resource strength (RBV), and readiness to adopt (Diffusion Theory). The study then combines these perspectives to give a complete understanding of how financial models, marketing strategies, and institutional support work together to determine the effectiveness of innovation hubs.

The Triple Helix Model remains the dominant framework for understanding innovation dynamics in higher education ecosystems (Etzkowitz & Zhou, 2017). The model posits that innovation thrives when universities, industry, and government collaborate through knowledge exchange, co-creation, and joint problem-solving. However, empirical evidence from Uganda and across Africa reveals that these interactions are weak, sporadic, and largely ceremonial (World Bank, 2020). Industry sees universities as too theoretical, slow, or misaligned with market needs; universities view industry as unwilling to invest in early-stage

student prototypes; and government agencies often lack budgetary allocations to support commercialisation.

Because of this misalignment, innovation hubs struggle to secure industry mentors, field-testing opportunities, market trials, or internships that are essential for market validation. Government programmes such as the Parish Development Model (PDM), Youth Livelihood Programme (YLP), or Innovation Fund are poorly integrated with university innovation hubs, further weakening the national innovation pipeline. Studies argue that unless the Triple Helix Model is operationalised, not just adopted rhetorically, commercialisation outcomes will remain limited (Carayannis & Campbell, 2012; Guerrero et al., 2021).

A synthesis of these theoretical critiques reveals that no single framework fully captures the complexity of innovation ecosystems in public universities, especially in developing regions. The Triple Helix focuses on external collaboration but downplays internal organisational challenges. RBV highlights the advantages of internal resources but ignores systemic policy issues. Diffusion Theory explains adoption behaviours but does not consider the institutional structures and capacity limitations that shape them. Therefore, this study takes a blended theoretical perspective that combines the relational approach of the Triple Helix, the internal resource focus of RBV, and the behavioural insights of Diffusion Theory. This integrated approach provides a clearer understanding of how financial models, marketing strategies, and institutional or policy environments interact to shape innovation outcomes in Uganda's higher education institutions.

Literature review

Financing strategies in university innovation hubs

Research consistently shows that financing is a key requirement for the success of university innovation hubs, especially in developing countries where capital is hard to get. Many hubs still depend on government and donor funding. This funding is vital for launching incubation programmes and supporting early-stage prototyping, but it is often unpredictable and short-term (Adeniran & Johnston, 2022; Chowdhury

et al., 2019). Initiatives such as seed grants, innovation challenges, and small prototype funds have had a positive impact, helping student ventures move beyond the idea stage. However, these initiatives usually reach only a few due to delayed funding cycles, limited amounts of funding, and poor continuity mechanisms within public universities. As a result, many student-led businesses get initial support but lack the follow-up financing needed to transition from prototype development to commercialisation.

Recent evidence points to alternative and combined financing methods. Options like revolving funds, alumni-supported schemes, and partnerships with financial institutions can provide more sustainable models for university innovation ecosystems (OECD, 2019; Demirgüç-Kunt et al., 2022). Still, these models face challenges due to gaps in institutional capacity, including weak financial management systems, regulatory barriers, and a lack of dedicated investment offices. Furthermore, private financing and equity options are limited in sub-Saharan Africa. Venture capital and angel networks see student start-ups as high-risk because they lack market traction and are not ready for investment (Guerrero et al., 2021). The literature suggests that financing issues are structural, not just about resources. This highlights the need for diverse funding strategies that are firmly embedded in institutions, supporting both early development and long-term growth for university innovation hubs.

Innovation ecosystems within HEIs have become a critical area of research globally, particularly as universities transition from traditional teaching roles to active participants in national innovation systems. An innovation ecosystem is characterised by a network of actors, students, faculty, administrators, policymakers, private firms, and civil society interacting to create and commercialise knowledge (Autio et al., 2018). In this ecosystem, innovation hubs serve as catalysts that facilitate collaboration, mentorship, prototype development, and entrepreneurial learning. In developed economies, universities have leveraged these ecosystems to generate high-growth start-ups, attract significant venture capital, and produce competitive technologies (Fayolle & Redford, 2022). By contrast, in developing countries such as Uganda,

innovation ecosystems remain emergent, fragmented, and constrained by institutional weaknesses and underinvestment (Guerrero et al., 2021).

Studies reveal that successful academic innovation ecosystems require four conditions: (i) strong institutional governance; (ii) a supportive regulatory environment; (iii) cross-sectoral partnerships; and (iv) availability of financial and knowledge resources (Bercovitz & Feldman, 2006; Hoffman & Radojevich-Kelly, 2019). Unfortunately, most public universities in sub-Saharan Africa lack such institutional maturity. Governance structures tend to be hierarchical and bureaucratic, which limits the autonomy and agility needed for innovation hubs to function effectively (Okeke et al., 2020). This institutional rigidity constrains opportunities for rapid experimentation, prototyping, interdisciplinary work, and public-private partnerships (PPPs). As a result, student entrepreneurs often remain confined within academic environments with limited exposure to industry mentorship, customer discovery, or market testing.

Marketing approaches for student-led start-ups

The literature emphasises that marketing is essential for the survival, visibility, and growth of student-led start-ups within university innovation ecosystems. Digital marketing, mainly social media branding, storytelling, search visibility, and influencer engagement, has become an easy way for entrepreneurs to connect with larger audiences at a relatively low cost (Appel et al., 2020; Dwivedi et al., 2021). However, research shows that effectively using these tools requires strategic skills in content creation, audience understanding, data analysis, and brand positioning. These skills are often lacking among early-stage student ventures in public universities (Micu et al., 2019). In sub-Saharan African contexts, the adoption of digital tools depends on reliable infrastructure, affordable data, and levels of digital literacy. Therefore, the advantages of online marketing are not evenly spread (Asongu et al., 2021). While digital platforms can extend promotional reach, they are not enough on their own to achieve lasting market penetration in resource-limited environments.

Recent research highlights the importance of combining digital marketing with personal and experiential strategies. Word-of-mouth

referrals, peer endorsements, community outreach, and participation in university-organised showcases and entrepreneurship fairs are still effective ways to build trust and legitimacy, especially in markets where buying decisions rely heavily on social proof and face-to-face interactions. Studies also show that strong marketing outcomes are associated with institutional connections. Start-ups that benefit from incubation programs, alumni mentorship, and industry partnerships tend to have better brand visibility and customer acquisition than those that do not receive such support (Guerrero et al., 2021). Additionally, the literature indicates that university environments often offer limited exposure to marketing practices. Many students lack access to training in integrated marketing communications, customer insights, and competitive positioning. As a result, weak institutional support creates skill gaps, suggesting that improving marketing effectiveness requires broader ecosystem-level interventions rather than isolated skills training. Overall, the literature suggests that marketing for student-led start-ups in emerging higher education settings works best when it combines digital skills with personal connections, supported by mentorship, market ties, and incubation structures. This highlights the need for universities to offer practical marketing training, provide access to promotional platforms, and foster partnerships to improve visibility and market readiness, rather than relying solely on digital strategies as a substitute for institutional support.

The literature consistently shows that African universities generate a substantial number of research outputs, but only a small proportion of these innovations reach the commercialisation stage. This "commercialisation gap" is attributed to inadequate institutional frameworks, weak intellectual property (IP) regimes, and limited market linkages (Adelekan & Jimoh, 2021; Sharabati et al., 2024). Many university innovations remain locked away in academic theses, final-year research reports, or papers rather than being developed into viable products. In Uganda, the absence of functioning Technology Transfer Offices (TTOs) further weakens research translation, as universities lack structured support for patent filing, business modelling, IP negotiations, and licensing agreements.

Moreover, studies show that African HEIs rarely offer structured investment-readiness programmes, leaving student innovators unprepared to pitch to investors, develop financial forecasts, or refine their value propositions (Nangoli et al., 2021). Venture capital firms perceive university innovations as high-risk due to their early-stage nature, limited market validation, and weak business structures (Adeniran & Johnston, 2022). As a result, start-ups incubated in African HEIs struggle to attract private investment, and most rely on small grants that are insufficient for meaningful scaling or commercialisation.

Institutional and policy enablers and constraints

Research shows that institutional and policy environments significantly impact how well innovation hubs function within higher education systems. National frameworks like Uganda's Vision 2040 and the Fourth National Development Plan (NDP IV) emphasise innovation and entrepreneurship as key priorities. However, the implementation at university level is uneven due to divided governance, slow decision-making, and limited institutional independence (World Bank, 2020; UNESCO, 2021). Public universities still work within bureaucratic frameworks that limit flexibility in resource allocation, procurement, and partnership development, restricting innovation hubs' ability to respond quickly to market demands or advance prototypes. Moreover, incentive systems in higher education institutions often focus on academic results rather than commercialisation. This leads to low faculty involvement in mentorship, industry partnerships, and applied research.

Studies indicate that the lack of functional commercialisation pathways, such as technology transfer offices, intellectual property management, and clear performance indicators, weakens the transition of research into market-ready innovations (Okeke et al., 2020). Weak links between universities and industry, along with limited private-sector involvement, continue due to mismatched expectations, regulatory obstacles, and perceptions of low investment readiness among student start-ups. While models like the Triple and Quadruple Helix frameworks emphasise collaboration among universities, industry, government, and society, their application in sub-Saharan Africa faces challenges stemming from resource constraints, institutional rigidity, and inconsistent policy

enforcement (Carayannis & Campbell, 2012). Consequently, the national innovation objectives do not fully integrate into university strategies, leading to inconsistencies between policy goals and actual practices. Overall, the literature suggests that strengthening institutions through better governance, clear commercialisation policies, capacity building, and integration into national innovation systems is crucial for improving university innovation hubs' performance. Adequate support requires not just financial and infrastructure investments but also coherent policy alignment, streamlined administrative processes, and ongoing collaboration with external stakeholders to ensure scalability and long-term sustainability.

A growing stream of literature highlights that institutional capacity, rather than individual student talent, is the most critical constraint to innovation in African HEIs. Weak governance structures often lead to fragmented innovation processes, duplication of efforts, and inconsistent policies. Universities may lack specialised staff such as innovation managers, IP specialists, entrepreneurship coaches, or commercialisation officers, resulting in low institutional readiness for supporting innovation hubs (Okeke et al., 2020).

Resource constraints remain a central issue. Innovation hubs require modern prototyping facilities, digital labs, demonstration spaces, and fabrication equipment. Without these resources, student entrepreneurs are confined to theoretical learning, and prototypes remain at the conceptual stage. For example, the inability to access 3D printing, technical testing, or applied research equipment limits prototype development in engineering and technology disciplines. This aligns with RBV literature, which stresses that without valuable internal resources, firms, even entrepreneurial ventures, cannot achieve sustained advantage (Barney, 1991).

Digital transformation has reshaped entrepreneurial ecosystems, especially through the rise of social media, artificial intelligence, digital payment systems, and mobile connectivity. Digital platforms now serve as primary tools for branding, visibility, and customer acquisition for student entrepreneurs (Appel et al., 2020). They enable cost-effective engagement and data-driven marketing in ways that were previously inaccessible to early-stage ventures. Scholars argue that digital

marketing enhances entrepreneurial agility by providing opportunities to experiment with content formats, target specific market segments, and build online communities (Alalwan et al., 2017; Dwivedi et al., 2021).

However, research warns against assuming that access to digital tools automatically translates to effective marketing output (Micu et al., 2019). In many public universities, student entrepreneurs lack advanced skills in digital analytics, content creation, customer insights, search engine optimisation, and online brand storytelling. Digital literacy levels remain uneven across disciplines, limiting the effective use of digital tools. Furthermore, infrastructural constraints such as high data costs, poor internet quality, and limited access to digital devices weaken the impact of digital marketing in low-income contexts (Asongu et al., 2021). This suggests that digital transformation can strengthen or widen entrepreneurial gaps depending on the availability of institutional support systems.

Overall, the literature reveals five significant gaps that justify the current study:

1. Limited research on integrated financing and marketing models within African HEI innovation hubs. Most existing work treats them as separate domains.
2. Scarcity of empirical studies in Uganda examining how institutional structures shape commercialisation outcomes.
3. Weak theoretical integration using RBV, DoI, and Triple Helix frameworks in higher education innovation research.
4. Insufficient scholarly attention to sustainability innovations, such as eco-hotels, which dominate the outputs of tourism and hospitality programmes in Uganda.
5. Limited understanding of how student-led ventures navigate financial exclusion, digital skill gaps, and market-entry challenges.

The present study addresses these gaps by offering a robust mixed-methods analysis of how financial models, marketing strategies, and institutional arrangements interact to shape innovation hub performance in Uganda's public universities.

Methodology

This study used a convergent parallel mixed-methods design. It gathered both quantitative and qualitative data simultaneously and combined them during interpretation to enhance triangulation and completeness. This method was suitable because innovation ecosystems involve institutional, behavioural, and structural dynamics that a single method cannot fully capture. A case-study approach enabled deeper exploration in real-world university settings.

The study focused on student-led start-ups in innovation hubs, hub managers, university administrators, policymakers, and industry partners. Participants were included if they actively engaged in incubation, financing, commercialisation, or entrepreneurship activities. Individuals without practical involvement in innovation processes were excluded to ensure that responses were relevant. Quantitative data was collected from 100 student start-ups across three public universities using simple random sampling, in accordance with Krejcie and Morgan's (1970) guidelines for sample size. Qualitative data was gathered through 25 key informant interviews (KIIs) and four focus group discussions (FGDs), selected purposefully based on operational experience.

While the quantitative sample had 100 student start-ups, this number is below the commonly recommended range of 150 to 200 cases for confirmatory Structural Equation Modelling (SEM). The study recognised this limitation and did not present SEM as a primary analytical method. Structured questionnaires collected quantitative measures on financing access, marketing strategies, institutional support, and innovation outcomes. The reliability of the instruments was confirmed through pilot testing, with all constructs achieving Cronbach's alpha values of at least .70. Semi-structured interviews and FGDs offered more profound insights into policy alignment, marketing gaps, and financing issues. Documentary analysis of hub reports, university strategic plans, and national frameworks supported contextual triangulation.

Quantitative analysis was performed using SPSS (Version 25). Descriptive statistics summarised the distribution of key variables. Pearson correlations examined relationships among important constructs, and multiple linear regression estimated how financing, marketing, and

institutional support predicted innovation hub performance. Diagnostic checks confirmed that the model was adequate, with variance inflation factors below the acceptable threshold of 10, normality checks using Q-Q plots, and the Ramsey RESET test ensuring model specification validity. Binary logistic regression was used for outcomes such as participation in mentorship or receipt of funding. Goodness-of-fit was assessed through the Hosmer-Lemeshow test, ROC curve analysis, and classification accuracy statistics.

SEM was applied in an exploratory way to confirm the conceptual links between financing capability, marketing capability, institutional support, and commercialisation outcomes. Although SEM typically requires larger samples of about 150 to 200 cases, its use in this study is justified because the model was kept simple, involving only three latent constructs with strong factor loadings. The results were cautiously interpreted as supportive evidence rather than primary inferential findings. Given the sample size limitation, SEM was used only to explore whether the relationships observed in the regression models were consistent when analysed together. The model was intentionally simplified, and the findings were carefully interpreted rather than treated as definitive proof. The fit indices met acceptable thresholds (CFI and TLI $\geq .90$ and RMSEA $\leq .08$), indicating satisfactory model performance at an exploratory level. As a result, regression and logistic analyses serve as the primary basis for quantitative conclusions in this study. Meanwhile, SEM provides additional insights that will need validation in future research with larger samples in line with recommended SEM standards.

Qualitative data was analysed thematically using NVivo 12, following Braun and Clarke's six-phase procedure. Trustworthiness was enhanced through member checking, peer debriefing, triangulation across data sources, and the maintenance of audit trails. The Kyambogo University Research Ethics Committee granted ethical approval, and all participants provided informed consent, with confidentiality ensured through anonymisation.

Findings and Results

The results are presented in accordance with the convergent parallel mixed-methods approach and integrate descriptive statistics, inferential tests, SEM (exploratory), and qualitative findings. The quantitative and qualitative insights converge on the same conclusion: innovation and knowledge production in universities are strong, but commercialisation performance remains weak due to systemic institutional constraints.

Descriptive results

Status of innovation outputs

While the hubs demonstrate high research productivity in sustainability and marketing-related innovations, only a small portion of this work translates into market-ready outcomes. Eco-hotel and sustainability-themed research outputs are presented in Table 1 because they represent the single largest and most consistently produced category of student-led innovations across the three public universities studied. In all hubs, sustainability innovation, especially eco-hotel concepts, dominates ongoing research due to strong alignment with national priorities (SDGs, NDP IV), student coursework in tourism/hospitality, and donor-funded green-innovation schemes that disproportionately sponsor these projects. Thus, eco-hotel outputs serve as a representative subset illustrating broader commercialisation challenges within university innovation ecosystems, not as an isolated thematic interest.

Table 1 shows that among sustainability/eco-hotel-themed research outputs, only 12% progressed to prototypes and 2% reached commercialisation.

Table 1: *Commercialisation of eco-hotel research outputs*

Research Area	No. of Studies	Prototypes Developed	Commer-cialised	Interpretation
Green branding strategies	15	3	1	Few ideas achieve market readiness
Waste-management solutions	10	2	0	Incubation resources constrain prototypes

Research Area	No. of Studies	Prototypes Developed	Commer-cialised	Interpretation
Eco-certification awareness	8	0	0	Outputs remain academic
Renewable-energy adoption	7	1	0	Technical innovations stall
Sustainable supply-chain management	10	0	0	Scale-up challenges persist

Interpretation: Innovation is conceptually strong, but inadequate institutional support, funding gaps and weak incubation structures inhibit prototype progression.

Mechanisms of research transfer

Despite challenges in commercialisation, several structured and semi-structured mechanisms support knowledge diffusion. Table 2 illustrates applied learning platforms, competitions, NGO partnerships and peer collaboration.

Table 2: *Mechanisms of research transfer identified*

Mechanism	Frequency	Example	Interpretation
Integration into coursework	11	Final-year prototypes	Classroom-to-practice diffusion
Innovation competitions	9	National start-up challenge	Potential launchpads
Partnerships with NGOs	7	Eco-certification training	External actors fill internal gaps
Entrepreneurship boot camps	6	Business pitch week	Short-term learning
Informal peer collaboration	4	Eco-business clubs	Emerging innovation culture

Interpretation: Research translation happens informally even when structured commercialisation pathways are weak.

Barriers to commercialisation

Five major commercialisation barriers consistently emerged from survey evidence:

Table 3: *Barriers to commercialisation*

Barrier	% of Respondents	Interpretation
Lack of a structured commercialisation pathway	84%	Institutional bottleneck
Insufficient prototype funding	78%	Limits scaling
Weak university-industry linkages	72%	External partnerships lacking
Limited mentorship	66%	Guidance missing
Low awareness of IP rights	55%	Limited IP capacity

The high prevalence of these barriers suggests that the constraints are systemic rather than individual.

Inferential statistical results

Logistic regression results

The logistic regression demonstrated strong effects for mentorship, funding, and research exposure.

Table 4: *Logistic regression results*

Predictor	β	Exp(β)	p-value	Interpretation
Exposure to research	1.21	3.35	< .05	Increases participation
Mentorship access	1.56	4.76	< .01	Largest predictor
Funding access	0.84	2.32	< .05	Doubles likelihood
Industry linkages	0.63	1.87	n.s.	Smaller effect

These values show substantial practical significance: for example, mentorship increases the likelihood of joining a hub by almost **5×**.

Multiple regression results

The regression model was statistically significant ($F = 14.28$, $p < .001$, $R^2 = .63$). Mentorship had the most substantial effect.

Table 5: *Multiple regression results*

Predictor	Standardised β	p-value	Interpretation
Mentorship & incubation support	0.38	< .01	Moderately strong influence
Funding availability	0.31	< .05	Meaningful contribution
Industry linkages	0.27	< .05	Supports prototype development
IP awareness	0.19	n.s.	Small effect

Interpretation: Commercialisation success rises when mentorship, funding and institutional resources are combined.

SEM results

Following editorial guidance, the SEM is reframed as exploratory due to sample-size limitations. The fit indices suggest an acceptable exploratory fit.

Table 6: *SEM fit indicators*

Fit Statistic	Value	Interpretation
CFI	0.93	Exploratory fit
TLI	0.91	Acceptable
RMSEA	0.06	Good
χ^2/df	2.41	Adequate

Table 7: *Exploratory SEM path estimates*

Path	Effect	Interpretation
Financing – Commercialisation	0.52	Strongest path
Marketing –Commercialisation	0.37	Conditional effect
Institutional Support– Commercialisation	0.44	Central driver
Financing – Mentorship	0.21	Supportive pathway

SEM only reinforces results already established through regression.

Qualitative findings

Thematic analysis generated four dominant themes.

Table 8: *Frequency of qualitative themes with illustrative quotes*

Theme	Frequency	Illustrative Quotes
Fragmented institutional support	High	"There are no structured pathways…"
Financial bottlenecks	High	"Innovation stops where funding stops."
Weak marketing competencies	Moderate	"Branding skills are missing."
Policy misalignment	Moderate	"Policies look good on paper…"

These insights corroborate the quantitative evidence of systemic constraints.

Bridging paragraph (quant-qual convergence)

Across all data sources, the same pattern emerges: universities produce high research output and entrepreneurial activity, but insufficient funding, mentorship, weak institutional linkages, and limited market access constrain commercialisation and prototype development. This confirms that the commercialisation gap is structural rather than due to a lack of ideas.

Discussion of Results

Financing and commercialisation outcomes

The findings show that financing plays a catalytic role in shaping the effectiveness of innovation hubs, but its influence operates through deeper institutional dynamics. Rather than simply confirming that funding predicts successful commercialisation, the results demonstrate that financing is the foundational resource required for transforming student innovations into viable ventures. From the Resource-Based View, this aligns with the argument that financing is not merely a transactional input, but a strategic asset that differentiates ventures that merely invent from those that commercialise. Financial constraints limit access to prototyping, mentorship, and incubation facilities, which RBV would classify as VRIN capabilities rare, valuable and difficult to imitate. Thus,

financing is meaningful not because it is available, but because it enables access to complementary assets that create competitive advantage.

The qualitative findings further show that financing is embedded in institutional systems rather than acting as an isolated factor. Seed grants, entrepreneurship competitions and prototype funding only translate into commercialisation where follow-on resources exist. This supports the Diffusion of Innovation perspective, which explains that innovators progress when institutional conditions reduce uncertainty, lower risk, and create opportunities for trial and adoption. Innovation hubs that provide structured financial support reduce the transaction costs of scaling ideas, thereby increasing adoption. Conversely, the absence of follow-on funding and investment pathways impedes diffusion and stalls prototypes. Therefore, financing shapes commercialisation not only through monetary value but through the capabilities and learning structures it unlocks.

From a Triple Helix standpoint, financing limitations also indicate gaps in university-industry-government relationships. Weak public financing and limited private-sector participation demonstrate a system in which innovation funding remains university-centric. Without coordinated investment from industry or government partners, financing cannot leverage ecosystem-wide resources. Thus, financial constraints reflect an ecosystem failure rather than a lack of entrepreneurial drive.

Marketing and innovation capability

Marketing emerges as a significant determinant of start-up performance, but the effect depends on interactions with institutional support systems. The DoI framework provides insight into why marketing is essential for communicating value propositions and increasing adoption, but only when supported by institutional mechanisms that reduce complexity and provide credibility. For example, digital branding raises awareness and visibility, but without incubation services, market linkages and mentorship, these approaches remain superficial. This explains why student ventures that rely solely on social media rarely scale to an operational market presence.

RBV also clarifies why marketing capability strengthens commercialisation only when supported by institutional resources.

Marketing in innovation settings is not promotional; it represents a strategic capability that requires knowledge of customer segments, pricing, differentiation, and storytelling. These are higher-order competences that require training, exposure to industry practices, and access to market intelligence. Where institutional support is lacking, marketing capability remains underdeveloped. Therefore, marketing becomes influential only when universities provide complementary VRIN resources, mentorship, training, and incubation that collectively transform visibility into commercial adoption.

The Triple Helix perspective further illuminates why marketing challenges persist. Limited industry participation reduces opportunities for market testing, customer feedback, and real-world exposure. In strong entrepreneurial ecosystems, industry partners act as early adopters and market validators. Without such linkages, marketing as a capability cannot transform product ideas into scalable solutions. Thus, marketing is constrained not by weak student effort but by weak ecosystem integration.

Institutional and policy factors

The strongest explanatory power lies in institutional and policy conditions, which are consistently identified as the key drivers of commercialisation outcomes. The Triple Helix Theory stresses that innovation ecosystems succeed when universities, industry, and government interact in interdependent and mutually reinforcing roles. The findings indicate that in Uganda, these relationships exist at the policy level but are weakly operationalised in practice. The success of innovation hubs is, therefore, not hindered by a lack of frameworks but by limited institutional capacity to implement them. The dissemination of innovations is slowed because structures that reduce risk, create legitimacy, or provide mentorship are fragmented or missing.

Institutional constraints such as a lack of technology transfer offices, intellectual property support, or structured commercialisation pathways demonstrate that universities still operate within bureaucratic systems oriented towards academic output rather than commercialisation. RBV helps explain the consequence: even when knowledge and ideas exist, the absence of VRIN-like organisational resources prevents these ideas from

becoming innovations. Innovation capability is, therefore, not a function of students' intelligence or motivation, but of institutional arrangements that shape how resources are mobilised and transformed.

Finally, the Triple Helix perspective suggests that innovation hubs do not fail due to isolated weaknesses but because of systemic misalignment among ecosystem actors. National policies favour innovation, yet universities lack autonomy, industry engagement remains limited, and linkages to government programmes are weak. The discussion reveals that commercialisation challenges are a product of structural coordination failures. In such systems, even strong marketing and financing models have limited impact.

Integrated theoretical interpretation

The study's findings indicate that commercialisation outcomes in university innovation hubs result from the interplay of internal capabilities, adoption conditions, and ecosystem coordination. From an RBV perspective, financing, mentorship, incubation facilities, and technology transfer structures act as VRIN resources that support prototype development. When these resources are weak, as highlighted in this study, innovation stalls despite promising ideas. DoI theory emphasises that innovations spread more effectively when uncertainty is lowered, and support structures are in place; limited follow-on funding, fragmented mentorship, and unclear pathways to commercialisation increase perceived complexity and hinder adoption.

The Triple Helix Model further clarifies why resource and adoption gaps persist: collaboration among universities, industry, and government often remains rhetorical rather than practical, limiting access to markets, investment, and early validation mechanisms. Combining the three theories shows that weak internal capabilities (RBV) hinder adoption (DoI), while poor ecosystem alignment (Triple Helix) constrains the development of those capabilities. This interdependence explains why commercialisation remains low and indicates that enhancing innovation hub performance requires coordinated strengthening of institutional capabilities, diffusion pathways, and cross-sector linkages rather than isolated efforts.

Conclusions

The study concludes that financing remains the most decisive element shaping commercialisation success within innovation hubs. Financing constraints are structural rather than individual, reflected in limited prototype funding, lack of follow-on investment, and over-reliance on short-term grants. In line with RBV, financing matters because it enables access to complementary resources, mentorship, incubation, and prototyping facilities, rather than solely because of monetary value. Therefore, commercialisation is limited not by lack of ideas, but by weak financial ecosystems and the absence of sustainable funding models.

Marketing positively influences commercialisation, but only when supported by institutional learning structures and capability development. Digital branding, storytelling, and social media visibility are common, but they are insufficient without training, incubation services, and market linkages. In line with DoI theory, the adoption of innovative products occurs when marketing capability is combined with clear pathways for testing, visibility, and legitimacy. Therefore, marketing functions best when integrated into institutional support systems.

The most significant bottlenecks are at the institutional and policy levels. While the Triple Helix interactions are mostly conceptual, they are weakly operational within Uganda's higher education institutions. Universities do not have fully-established pathways for commercialisation, functioning technology transfer offices (TTOs), or clear industry-linkage frameworks. This misalignment between national policies and university practices explains the limited commercialisation of research outputs. Overall, strengthening institutional frameworks, not just skills or funding, is essential to transforming innovation hubs into engines of commercialisation.

Recommendations

Universities should shift away from relying on short-term grants. They must develop sustainable financing models to support prototype development and subsequent funding. This includes establishing revolving innovation funds, alumni-supported investment schemes, and partnerships with financial institutions to enhance student access

to seed capital. Strengthening financial governance, creating transparent allocation mechanisms, and integrating financial literacy training into incubation activities will increase investment readiness and reduce the current gap in student venture growth.

Therefore, universities should integrate practical marketing development into their entrepreneurship programmes. This could involve training in digital analytics, branding, customer segmentation, and storytelling. They should also provide access to shared promotional platforms such as university-led exhibitions, accelerator showcases, and industry networking events. Strengthening incubation services, mentorship, and market linkage programmes will help student ventures turn visibility into successful commercialisation rather than relying solely on basic digital promotion.

Universities should establish clear pathways for commercialisation by developing effective technology transfer offices, providing intellectual property support, and implementing structured mentorship programmes. Aligning institutional strategies with national policies, such as Vision 2040 and NDP IV, will ensure consistency between policy objectives and practical execution. Reducing bureaucratic barriers, enhancing collaboration between universities and industry, and allocating dedicated budgets for innovation activities will foster an environment where funding and marketing efforts can yield tangible results. Strengthening monitoring and evaluation systems will also facilitate evidence-based decision-making and promote long-term sustainability.

All in all, improving innovation hubs requires ecosystem-wide strengthening rather than isolated interventions. Financing, marketing, and policy coordination must operate as interconnected systems if commercialisation is to improve within Uganda's public universities. Addressing only one element will not close the commercialisation gap; transformation requires an integrated innovation-ecosystem approach.

References

Adelekan, I. O., & Jimoh, F. (2021). Innovation and commercialization in African universities: Prospects and challenges. *African Journal of Science, Technology, Innovation and Development, 13*(2), 213–224. https://doi.org/10.1080/20421338.2020.1714024

Adeniran, T. V., & Johnston, K. A. (2022). Financing constraints and the growth of African start-ups: Evidence from South Africa. *Journal of Small Business and Enterprise Development, 29*(1), 45–63. https://doi.org/10.1108/JSBED-11-2020-0415

Agyeman, C. M., Ayitey, J. Z., & Mensah, E. A. (2020). Green marketing and sustainability strategies in Africa: Emerging trends and prospects. *Journal of Cleaner Production, 263*, 121395. https://doi.org/10.1016/j.jclepro.2020.121395

Alalwan, A. A., Rana, N. P., Dwivedi, Y. K., & Algharabat, R. (2017). Social media in marketing: A review and analysis. *Telematics and Informatics, 34*(7), 1177-1190. https://doi.org/10.1016/j.tele.2017.05.008

Alonso-González, C., González-Álvarez, N., & Nieto, M. (2022). Entrepreneurial universities and student start-ups: The role of resources and capabilities. *Technological Forecasting and Social Change, 178*, 121601. https://doi.org/10.1016/j.techfore.2022.121601

Appel, G., Grewal, L., Hadi, R., & Stephen, A. T. (2020). The future of social media in marketing. *Journal of the Academy of Marketing Science, 48*(1), 79-95. https://doi.org/10.1007/s11747-019-00695-1

Asongu, S., Nnanna, J., & Tchamyou, V. S. (2021). Digitalization and inclusive development in Africa. *Technological Forecasting and Social Change, 167*, 120728. https://doi.org/10.1016/j.techfore.2021.120728

Autio, E., Nambisan, S., Thomas, L. D. W., & Wright, M. (2018). Digital affordances, spatial affordances, and the genesis of entrepreneurial ecosystems. *Strategic Entrepreneurship Journal, 12*(1), 72-95. https://doi.org/10.1002/sej.1266

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management, 17*(1), 99-120. https://doi.org/10.1177/014920639101700108

Bercovitz, J., & Feldman, M. (2006). Entrepreneurial universities and technology transfer: A conceptual framework. *Journal of Technology Transfer, 31*(1), 175-188. https://doi.org/10.1007/s10961-005-5029-z

Boateng, S. L., Adam, I. O., & Osei, C. (2022). Financial access and digital transformation. *Journal of Small Business and Enterprise Development, 29*(4), 567-585. https://doi.org/10.1108/JSBED-03-2021-0125

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77-101. https://doi.org/10.1191/1478088706qp063oa

Carayannis, E. G., & Campbell, D. F. J. (2012). *Mode 3 knowledge production in quadruple helix innovation systems*. Springer. https://doi.org/10.1007/978-1-4614-2062-0

Chowdhury, F., Audretsch, D. B., & Belitski, M. (2019). Financing entrepreneurship in developing countries. *Small Business Economics, 53*(4), 963-981. https://doi.org/10.1007/s11187-018-0094-3

Demirgüç-Kunt, A., Klapper, L., Singer, D., Ansar, S., & Hess, J. (2022). *The Global Findex Database 2021: Financial inclusion, digital payments, and resilience in the age of COVID-19*. World Bank. https://www.worldbank.org/globalfindex

Dwivedi, Y. K., et al. (2021). Setting the future of digital and social media marketing research. *International Journal of Information Management, 59*, 102168. https://doi.org/10.1016/j.ijinfomgt.2020.102168

Etzkowitz, H., & Leydesdorff, L. (2000). The dynamics of innovation. *Research Policy, 29*(2), 109-123. https://doi.org/10.1016/S0048-7333(99)00055-4

Etzkowitz, H., & Zhou, C. (2017). *The Triple Helix: University-industry-government innovation and entrepreneurship*. Routledge. https://doi.org/10.4324/9781315620184

Fayolle, A., & Redford, D. T. (2022). *Handbook on the entrepreneurial university*. Edward Elgar. https://doi.org/10.4337/9781788978923

Gibb, A. A., & Hannon, P. D. (2006). Towards the entrepreneurial university. *International Journal of Entrepreneurship Education, 4*(1), 73-110.

Grant, R. M. (1996). Toward a knowledge-based theory of the firm. *Strategic Management Journal, 17*(S2), 109-122. https://doi.org/10.1002/smj.4250171110

Guerrero, M., Urbano, D., & Herrera, F. (2021). Innovation and entrepreneurship in universities. *Journal of Business Research, 123*, 1-6. https://doi.org/10.1016/j.jbusres.2020.09.044

Hoffman, D. L., & Radojevich-Kelly, N. (2019). The impact of entrepreneurial ecosystems. *Journal of Entrepreneurship Education, 22*(3), 1-15.

Isenberg, D. J. (2010). How to start an entrepreneurial revolution. *Harvard Business Review, 88*(6), 40-50. https://hbr.org/2010/06/the-big-idea-how-to-start-an-entrepreneurial-revolution

Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research. *Educational and Psychological Measurement, 30*(3), 607-610. https://doi.org/10.1177/001316447003000308

Liguori, E. W., Winkler, C., & Winkel, D. (2019). The entrepreneurship education imperative. *Journal of Small Business Management, 57*(S2), 7-13. https://doi.org/10.1111/jsbm.12576

Lockett, A., Siegel, D., Wright, M., & Ensley, M. (2005). The creation of spin-off firms. *Research Policy, 34*(7), 981-993. https://doi.org/10.1016/j.respol.2005.05.010

Micu, A., Micu, A. E., & Geru, M. (2019). Digital storytelling in marketing. *Management & Marketing, 14*(1), 152-169. https://doi.org/10.2478/mmcks-2019-0011

Nangoli, S., Ssekiziyivu, B., & Munene, J. C. (2021). Public funding and growth of entrepreneurial ventures in Uganda. *African Journal of Economic and Management Studies, 12*(2), 287-303. https://doi.org/10.1108/AJEMS-05-2020-0227

OECD. (2019). *University-industry collaboration: New evidence and policy options.* https://doi.org/10.1787/0c1bc53f-en

Okeke, C. I. O., Olumide, E. A., & Mncube, V. (2020). Institutional constraints and innovation in African higher education. *International Journal of Educational Development, 78*, 102245. https://doi.org/10.1016/j.ijedudev.2020.102245

Rothaermel, F. T., Agung, S. D., & Jiang, L. (2007). University entrepreneurship. *Industrial and Corporate Change, 16*(4), 691-791. https://doi.org/10.1093/icc/dtm015

Sharabati, A., Tzokas, N., & Al-Saban, A. (2024). Innovation adoption in developing ecosystems. *Journal of Innovation & Knowledge, 9*(1), 45-62. https://doi.org/10.1016/j.jik