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### Mapping Innovation Maturity of University-Promoted IT Startups: Case of Zanzibar

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*Innovation Maturity,  
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Model (TIM).*

The establishment of information technology (IT) start-ups within academic settings is receiving increased attention due to its potential to enhance the relevance of university curricula and to tackle youth unemployment. These start-ups, often nurtured by university programs, play a critical role in fostering entrepreneurship and innovation among students and graduates. This study examines the innovation maturity of IT start-ups in Zanzibar that are supported by universities, utilizing the Technology Innovation Model (TIM) as a framework for assessment. A quantitative survey was conducted with 52 students and graduates out of 120 individuals actively engaged in university-supported IT start-ups. The findings indicate that the majority of these start-ups remain in the early stages of innovation, with a significant portion (71.4%) struggling with market adaptability and over 65 per cent relying solely on personal funding, which poses a challenge to their financial sustainability. Although innovation is highly valued within these start-ups, only 61.2 per cent engage in actual innovation activities, signalling a gap between the recognition of innovation's importance and its implementation. University support emerged as a vital factor for success, with 50 per cent of the start-ups acknowledging its importance. However, the study also highlights challenges such as weak industry collaboration and regulatory barriers that impede the growth and scalability of these start-ups. Based on these findings, the study advocates for the strengthening of mentorship programs, diversification of funding sources, and the improvement of regulatory frameworks and policies to create a more conducive environment for the growth of IT start-ups in Zanzibar. These interventions could support the development of a more robust startup ecosystem, contributing to economic growth and youth employment.

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## INTRODUCTION

Innovation is globally recognised as a vital driver of youth entrepreneurship and a solution to unemployment. Acknowledging its significance, both developed and developing nations are reforming curricula to prioritise skills over knowledge through competency-based education. This approach aims to equip learners with the essential 21<sup>st</sup>-century skills needed to thrive in a competitive labour market. Universities play a pivotal role in this effort by fostering and supporting student-led start-ups and empowering students to develop innovative ideas, products, and services. Such initiatives are crucial for cultivating the next generation of innovators and entrepreneurs in the rapidly evolving digital economy (Choi et al., 2018), with a focus on business, science, healthcare, education, social, and technological sectors.

Universities worldwide are establishing incubators, accelerators, and tech hubs to foster start-up growth, offering essential resources such as mentorship, workspace, funding, and networking opportunities (Pauwels et al., 2016). These initiatives are designed to equip students with the skills necessary to navigate the competitive job market and successfully scale their ventures. The research underscores the significant role that university-backed programs play in fostering innovation and commercialization, with notable examples including Darktrace, a leading digital security company, and several MedTech firms emerging

from academic ecosystems (Breznitz and Zhang, 2019; Rajeev et al., 2017). Such programmes are instrumental in bridging the gap between academic research and market-ready solutions, thereby strengthening entrepreneurial ecosystems globally (Spigel & Harrison, 2022).

African universities are also playing a vital role in nurturing entrepreneurship through innovation hubs and university-incubator collaborations, with notable examples in Egypt, Kenya, Nigeria, and South Africa. For instance, the American University in Cairo has supported 46 start-ups (Breznitz and Zhang, 2019; Rajeev et al., 2017; Okrah et al., 2018). Across the continent, more than 640 tech hubs, including university-linked programmes, make significant contributions to promoting innovation and supporting start-ups. These hubs serve as crucial environments for fostering entrepreneurial ventures and advancing technological development in Africa, helping bridge the gap between academic research and real-world solutions.

Tanzania's start-up ecosystem is rapidly expanding, with numerous active start-ups across sectors such as agricultural e-commerce, tech-based education, and mobile payments. In Zanzibar, the focus of this study, the Zanzibar Development Vision 2050 explicitly emphasises the need to prioritise innovation, including the development of IT start-ups. As a result, there is growing recognition of the potential within Zanzibar's start-up ecosystem.

Entrepreneurs, policymakers, and stakeholders are increasingly viewing IT start-ups as key drivers of innovation and economic growth, with the power to transform the region's economic landscape and foster development.

As part of this ecosystem, universities in Zanzibar are adapting to meet market demands by integrating mandatory innovation and entrepreneurship courses into their curricula across all disciplines. These initiatives aim to prepare graduates to launch their own start-ups, addressing the growing youth unemployment issue while also contributing to economic growth. The efforts are further supported by a broader innovation ecosystem, which includes established incubation programmes like the Zanzibar Tourism Business Incubator (ZATOBI), Wastex Lab Hub, and Zanzibar Business Information Technology (ZBIT). These incubators focus on sectors such as tourism, the Internet of Things (IoT), and agriculture, helping students turn their ideas into viable businesses.

Many of these student-led start-ups have successfully secured funding, won awards, and showcased their innovations at exhibitions nationwide. These ventures are expected to create employment opportunities for recent graduates while fostering a culture of innovation and entrepreneurship among young people. However, despite their early successes, many IT start-ups struggle to achieve growth. This study aims to assess the innovation maturity of university-supported IT start-ups in Zanzibar, identifying key areas for improvement and long-term development.

Assessing the innovation maturity of these start-ups is essential for understanding their progress in product development, market readiness, and scalability. This process provides valuable insights into critical factors such as funding, mentorship, and technological infrastructure, which are key elements enabling start-ups to thrive and drive economic growth. In regions with high youth unemployment or underdeveloped start-up

ecosystems like Zanzibar, mapping innovation maturity helps create an environment that supports sustainability and long-term success. By leveraging a maturity model, universities and government institutions can allocate resources more effectively and develop targeted strategies to address the specific needs of IT start-ups.

## LITERATURE REVIEW

Innovation maturity has emerged as a critical framework for assessing the development and scalability of IT start-ups. Structured models, such as the Technology Innovation Model (TIM), offer a systematic approach to understanding innovation adoption and market readiness. TIM is widely utilised to identify gaps in technological capabilities, product development, and business sustainability. Originally conceptualised by Forrest (1991), TIM has been extensively applied across various industries, including manufacturing, services, and technology, to analyse the factors influencing innovation success. Leadership, organisational culture, and collaboration have been identified as essential drivers of innovation maturity (Wilson & Sy, 2021).

In the IT sector, TIM serves as a framework for analysing and guiding the development of start-ups by outlining the stages of technological innovation and identifying key success factors. By leveraging TIM, researchers and practitioners can systematically assess a start-up's progress, anticipate potential challenges, and implement strategies to drive innovation and growth (Metcalf et al., 2021). TIM has also been applied in evaluating the role of incubation programmes in fostering innovation maturity among university-based IT start-ups. Pauwels et al. (2016) identified key incubation success factors, including tailored mentorship, network access, and structured business development support. Similarly, Giones and Miralles (2020) highlighted digital infrastructure and interdisciplinary collaboration as catalysts for

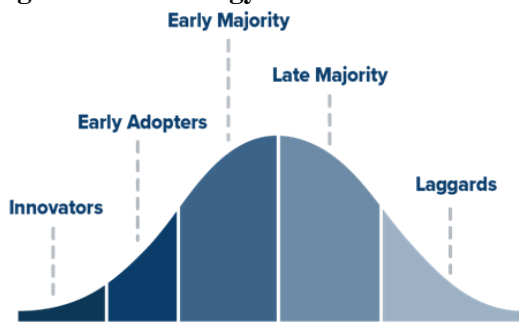
enhancing the maturity levels of IT start-ups in academic settings.

Recent research has also examined the broader entrepreneurial ecosystem and its role in fostering IT start-up growth. Autio et al. (2018) explored how digital and spatial affordances contribute to the development of entrepreneurial ecosystems, influencing start-up success. Additionally, Spigel and Harrison (2022) analysed the role of institutional support in entrepreneurial ecosystems, demonstrating how favourable environments can accelerate the maturity process of start-ups.

According to the TIM model, IT start-ups must progress through multiple growth stages to achieve maturity. This process depends on an organisation's ability to innovate, its level of sophistication and efficiency, and its capacity to manage the innovation pipeline effectively (Metcalf et al., 2021). Effective management of both internal and external resources and successful execution of projects are fundamental to achieving innovation maturity (Huda & Hussin, 2017). Moreover, access to venture capital has been shown to play a crucial role in innovation strategies, affecting how start-ups develop and implement new technologies (Block et al., 2021; Brown & Mason, 2021).

This study employs the TIM model (Figure 1) to assess the innovation maturity of IT start-ups in Zanzibar. Wilson and Sy (2021) used TIM to evaluate the overall health and growth potential of IT businesses. The model outlines a three-phase lifecycle: creation, acceptance, and commercial dissemination of new technologies. The creation phase focuses on research, development, and prototyping to explore new ideas and test their feasibility. The acceptance phase involves early adopters engaging with the innovation and providing essential feedback that drives iterative improvements. During this phase, regulatory approvals, user trials, and initial market penetration play a critical role. Finally, in the commercial dissemination phase, the innovation reaches broader markets, achieving scalability and widespread adoption. At this stage, start-ups prioritise commercialisation strategies, competitive positioning, and building sustainable business models to ensure long-term success. The findings by Wilson and Sy (2021) align with Mazzucato's (2020) argument that mission-driven innovation strategies are essential for scaling start-ups and achieving long-term impact.

**Figure 1: Technology Innovation Model Lifecycle**



As start-ups enter the innovation landscape, the TIM model categorises participants based on their roles in technology adoption and market integration. These categories include innovators, early adopters, early majority, late majority, and laggards. Innovators are eager to experiment with new

technologies as soon as they become accessible, often without considering the cost or potential consequences. Early adopters take fewer risks than innovators but are still willing to embrace new technology early. The early majority tend to be more pragmatic, focusing on the usefulness of

technology rather than early adoption. The late majority only adopt the technology once it has been established as a standard, emphasising cost-effectiveness rather than early innovation. Laggards, the last group to embrace new technology, often resist change until external pressures necessitate adoption (Rogers, 2003).

To assess the progress, potential, and overall health of a start-up, several key business-related characteristics are evaluated. These include the start-up's goals and objectives, market validation, team composition, financial health, intellectual property, and customer acquisition strategies. Additionally, factors such as adaptability to technological advancements, customer endorsements, revenue growth, and user acceptance are critical indicators of success (Huda & Hussin, 2016). These elements collectively provide a comprehensive picture of an innovative start-up's current status and future prospects.

## METHODOLOGY

This section outlines the methodological approach used to map the innovation maturity of university-promoted IT startups in Zanzibar.

### Research Design and Approach

A descriptive research design was adopted to enable a structured investigation into the innovation maturity of IT startups within the university ecosystem. The research employed a quantitative approach, with primary data collected directly from the field to ensure an objective and statistical analysis of the findings.

### Study Area

The study was conducted in Zanzibar, Tanzania, specifically at three Zanzibar-based universities: The State University of Zanzibar (SUZA), Zanzibar University (ZU), and the Karume Institute of Science and Technology (KIST). SUZA and KIST are government-owned, while ZU is privately owned. These institutions were selected for their

significant role in promoting entrepreneurship, particularly in science and technology. Through incubation programs and innovation hubs, they support student-led startups and foster the growth of IT-based enterprises in the region.

### Population and Sampling

According to records from the higher learning institutions included in the study, approximately 120 students and graduates were engaged in business activities within university-originated IT startups, either as founders or employees. Therefore, the study employed simple random sampling, a probability-based technique that ensures equal representation and minimizes bias in respondent selection. The sample size was determined using Yamane's (1973) formula:

$$n = \frac{N}{1 + N(e)^2}$$

Where: n = sample size, N = population size, and e = desired level of precision (margin of error). Using this formula and a precision level of 0.05, the sample size was calculated to be 52.

### Data Collection Tool

A structured questionnaire served as the primary data collection instrument. It consisted of closed-ended questions, primarily formatted using a Likert scale (Kothari, 2004) to assess various dimensions of innovation maturity. The questionnaire was designed to gather information on four key aspects: respondents' demographic details, innovation within IT startups, external factors influencing IT startups, and the overall innovation status of IT startups. To ensure efficient and time-saving data collection while maintaining participant anonymity and data security, the questionnaire was distributed electronically via Google Forms.

### Data Analysis

Descriptive statistical methods were applied to analyze the collected data. The analysis involved the



use of frequencies, percentages, and means to summarize responses and draw meaningful insights. Microsoft Excel was employed as the primary tool for data analysis, facilitating efficient processing and presentation of results. This methodological framework ensured a rigorous and structured approach to assessing the innovation maturity of IT startups, providing a foundation for reliable and insightful findings.

## RESULTS

This section presents the study's findings aimed at identifying the innovation status of IT startups promoted by universities and higher learning institutions in Zanzibar. The findings are categorized into two main areas: Innovation within IT startups and external attributes of IT startups.

### Innovation within IT Start-ups

The study assessed innovation within IT start-ups using eight key components: start-up duration, the importance of innovation, encouragement and support for innovation, engagement in innovation activities, level of creativity, operational funding, market adaptability, and technological change.

The findings revealed that 48.2 per cent of start-ups had been in operation for less than one year, while 32.7 per cent had been operating for one year, and 18.6 per cent had been in the two-to-five-year range. These results suggest that most IT start-ups struggle to reach maturity. Regarding the importance of innovation, the findings indicate that it is highly valued, with 42.9 per cent considering it extremely important and 28.6 per cent rating it as very important.

Encouragement and support play a crucial role in fostering innovation, enabling start-ups to differentiate themselves, compete effectively, and contribute to economic growth and societal progress. The study shows that 28.6 per cent of respondents consider encouragement and support very important, while 12.3 per cent rate it as extremely important. These findings reflect the

perceptions of start-up founders and staff members regarding the significance of encouragement and support in driving start-up success.

Active participation in innovation activities is crucial for IT start-ups, as it helps attract customers and sustain market presence. The findings show that 61.2 per cent of start-ups engage in innovative activities, highlighting a lack of widespread innovation culture among the start-ups. To stand out, compete successfully, and drive economic and societal progress, every start-up should prioritise fostering a strong culture of innovation.

Creativity is another key factor that enables start-ups to differentiate themselves, compete effectively, and contribute to economic and societal growth. The study found that 67.3 per cent of IT start-ups emphasised creativity in their business.

Market and technological adaptability emerged as a critical area of concern, presenting both opportunities and challenges for start-up growth. The findings indicate that 71.4 per cent of IT start-ups struggle to adapt to market and technological changes, leaving them at a disadvantage in maintaining a competitive edge, which is crucial for long-term success. This inability to pivot or innovate in response to shifting market demands and technological advancements often hinders their growth potential.

Additionally, the study highlighted significant challenges related to management and operational funding. A majority of the start-ups surveyed (65.3%) reported that their operations rely heavily on personal contributions from founders or members. This heavy dependence on internal funding underscores the difficulty many start-ups face in securing external financial support. As a result, financial sustainability becomes a major hurdle, with many start-ups struggling not only to grow but even to survive without sufficient capital.

These findings emphasise the need for start-ups to develop strategies for better market and

technological adaptability while also addressing funding gaps to ensure long-term viability and growth.

### External Attributes of the Start-ups

To assess the start-ups' level of interconnectedness with the external environment, eleven key components were examined: support and mentorship from universities, entrepreneurial skills, sources of operational funding, IT start-up support, work locations for start-ups, products and services offered, market awareness, regulatory and legal frameworks, industry collaboration, R&D collaboration, and partnerships with the Zanzibar Technology Business Incubation (ZTBI).

Support and mentorship from universities play a critical role in the growth and success of IT start-ups, providing the essential information and resources needed for success in the industry. The findings revealed modest support from universities, as reported by half of the start-ups surveyed. However, regarding entrepreneurial skills, less than half of the start-up members (47%) possessed the necessary skills to drive innovation and develop new products and services.

Start-up growth relies on a steady income to survive. Expenses include paying bills, covering operating costs, and investing in technology development. However, the financing trend for start-ups appears bleak, with 65.3 per cent of operational costs coming from individual contributions, presenting a significant barrier to growth. On the other hand, government support is essential for fostering innovation and ensuring substantial growth. The research reveals that only 40 per cent of start-ups receive any form of government assistance.

The workplace also plays a crucial role in the start-up ecosystem, with a better work environment encouraging collaboration, stronger organisational culture, and higher productivity. Despite this, the results show that 59.2 per cent of start-ups operate

from home, lacking a conducive working environment.

A start-up's level of innovation is reflected in the type and quality of products or services it provides to customers. These offerings serve as key indicators of a start-up's commitment to innovation, problem-solving ability, and adaptability to market demands. While many start-ups perceive themselves as innovative, the results show that 72 per cent were unable to bring their products or services to market, highlighting their early stage of innovation.

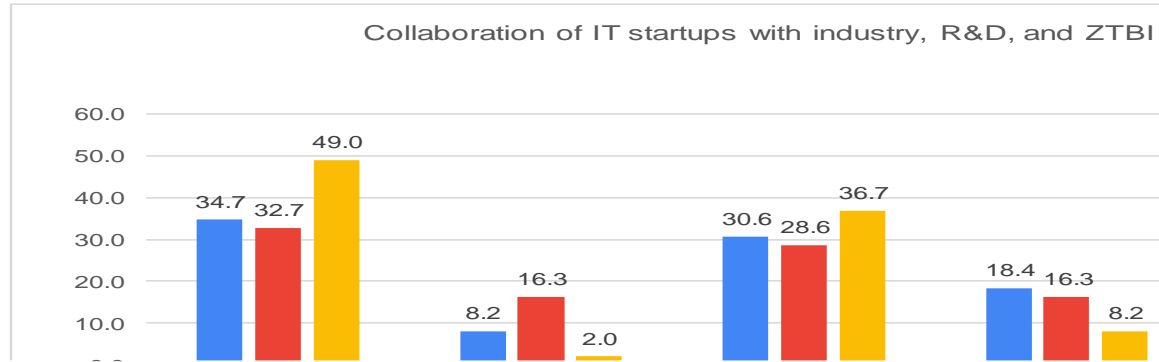
For start-ups to sustain themselves in the market and maximise their chances of success, intelligent decision-making combined with strong market awareness is essential. However, the study reveals that market awareness among start-ups is alarmingly low, with 44 per cent identifying it as a major hindrance and 18 per cent considering it a significant obstacle. This lack of awareness restricts their growth and limits their ability to compete and mature.

The regulatory and legal framework is crucial for start-ups, offering structure, protection, and ensuring compliance with the law. It helps manage risks, safeguard inventions, and maintain the confidence of both clients and investors. However, the majority of start-ups surveyed indicated that the regulatory and legal framework posed significant barriers to growth, with 56 per cent reporting it as a major hindrance.

Collaboration between start-ups and external stakeholders is a key driver of start-up growth. This study analysed collaboration between start-ups and industry, start-ups and research institutions, and start-ups and the Zanzibar Technology Business Incubation (ZTBI), the primary incubation centre in Zanzibar. Across all three types of collaboration, the results indicate limited engagement (Figure 2), with the majority of start-ups reporting no external collaboration: 34.7 per cent for industry, 32.7 per cent for R&D, and 49 per cent for ZTBI. This was

followed by a group that reported moderate collaboration with the three categories of external stakeholders.

**Figure 2: Collaboration between Startups and Industry, R&D, and ZTBI**



This trend clearly indicates that start-ups lack essential channels to access knowledge, resources, and opportunities that could accelerate innovation, enhance competitiveness, and increase their chances of success and long-term growth.

## DISCUSSION

This study analysed the innovation maturity mapping of university-promoted IT startups, examining a total of 52 startups. Using the Technology Innovation Model (TIM) as a framework, the study provides insights into the innovation maturity of these startups and identifies critical internal and external factors that influence their development and scalability. The findings highlight the challenges and opportunities faced by IT startups promoted by universities and higher learning institutions in Zanzibar.

### Innovation within IT Start-ups

Innovation maturity is essential for the sustainable growth of IT start-ups (Forrest, 1991; Metcalf et al., 2021). The study reveals that the majority of start-ups in Zanzibar remain in their early stages, struggling to transition into maturity. This aligns with previous research indicating that many university-supported start-ups face difficulties in reaching commercialisation due to limited resources and market adaptability (Pauwels et al., 2016;

Giones & Miralles, 2020). According to the Technology Innovation Model (TIM), start-ups must progress through various stages of growth, requiring both internal capabilities and external support systems (Wilson & Sy, 2021).

One of the critical internal factors influencing innovation within IT start-ups is the availability of operational funding. The study found that most start-ups rely on personal contributions, which is consistent with previous studies indicating that access to external funding remains a major barrier to innovation (Brown & Mason, 2021; Block et al., 2021). Without sufficient financial backing, start-ups struggle to invest in research, development, and market expansion, ultimately limiting their ability to move from the creation phase to commercial dissemination (Huda & Hussin, 2017).

Additionally, market and technological adaptability emerged as a significant challenge for IT start-ups in Zanzibar. A majority of start-ups reported difficulties in responding to market demands and integrating technological advancements. This is concerning, as prior research emphasises that start-ups must be agile and responsive to market trends to achieve sustainable growth (Autio et al., 2018). Digital and spatial affordances play a crucial role in shaping entrepreneurial ecosystems, but the findings suggest that many start-ups in Zanzibar



lack access to such resources, similar to the findings by Spigel and Harrison (2022).

### External Attributes of the Start-ups

External attributes, including support from universities, government assistance, and collaboration with industry stakeholders, play a significant role in the success of start-ups. The study found that university mentorship is limited, which corroborates findings by previous studies emphasising the importance of incubation programmes and structured mentorship in fostering innovation maturity (Pauwels et al., 2016). Furthermore, as highlighted by Mazzucato (2020), the low level of industry collaboration and regulatory challenges hindered start-ups from leveraging external expertise, capital, and market opportunities.

The limited engagement of start-ups with the Zanzibar Technology Business Incubation (ZTBI) is particularly noteworthy. While incubators play a crucial role in supporting start-up growth by providing access to networks, funding, and business development support (Wilson & Sy, 2021), the findings indicate a lack of collaboration with ZTBI, suggesting that start-ups may be missing out on critical resources necessary for innovation success.

### CONCLUSION

This study underscores the importance of innovation maturity in university-promoted IT start-ups and highlights the significant barriers hindering their growth in Zanzibar. Using the Technology Innovation Model (TIM) as a framework, the findings suggest that start-ups struggle to progress through the innovation lifecycle due to financial constraints, limited market adaptability, and weak external collaborations. While innovation is highly valued among start-up founders, the lack of structured support, mentorship, and funding hampers their ability to achieve scalability and commercial success.

To foster a more robust start-up ecosystem, several recommendations emerge from this study. First, universities and government institutions should enhance mentorship programmes and provide structured support mechanisms to improve innovation maturity. Second, greater emphasis should be placed on securing diverse funding sources, including venture capital and government grants, to alleviate financial challenges. Third, industry collaborations should be strengthened to facilitate knowledge exchange, resource sharing, and market integration. Finally, policymakers must address regulatory barriers to create a more conducive environment for start-up growth.

By implementing these recommendations, IT start-ups in Zanzibar can better navigate the innovation process, increase their market competitiveness, and contribute more effectively to economic development. Future research should explore how digital infrastructure and policy interventions can further support innovation maturity and long-term sustainability in emerging start-up ecosystems.

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