

Digital Innovation Management in Developing Economies: Challenges and Emerging Strategies in the Financial Services Sector of South Africa

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ARTICLE INFO

Article details

Submitted by authors 2 May 2024
Accepted for publication 6 Feb 2025
Available online 30 May 2025

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DOI

<http://dx.doi.org/10.7166/36-1-3033>

ABSTRACT

Digital innovations have become increasingly central to economic growth worldwide. This study investigates the challenges, success factors, and emerging strategies related to digital innovation management in developing economies, focusing on South Africa's financial services sector. It reviews the relevant literature, evaluates existing models for innovation management, and introduces a conceptual framework, 'digital innovation management in developing economies' (DIM-DE), that incorporates elements such as dynamic capability development and external collaboration. The research includes qualitative interviews with five financial sector leaders, analysing problems such as talent scarcity and unreliable infrastructure, alongside success factors such as strategic alignment and customer focus. The findings validate the DIM-DE framework, and present strategies such as skills development and operational enhancements. Implications for stakeholders and recommendations for future research are discussed.

OPSOMMING

Innovasies in die digitale ruimte raak wêreldwyd toenemend belangrik vir ekonomiese groei. Hierdie studie ondersoek die uitdagings, suksesfaktore en ontluikende strategieë wat verband hou met digitale innovasiebestuur in ontwikkelende ekonomieë, met 'n fokus op Suid-Afrika se finansiële dienstesektor. Dit bevat 'n relevante literatuurstudie, evalueer bestaande modelle vir innovasiebestuur, en stel 'n konseptuele raamwerk, 'digitale innovasiebestuur in ontwikkelende ekonomieë' (DIB-OE of 'DIM-DE' in Engels) voor wat elemente soos dinamiese vermoë-ontwikkeling en eksterne samewerking bevat. Die navorsing sluit kwalitatiewe onderhoude met vyf leiers in die finansiële sektor in, en analiseer probleme soos talenttekorte en onbetroubare infrastruktuur, tesame met suksesfaktore soos strategiese belyning en kliëntefokus. Die bevindinge valideer die DIM-DE-raamwerk, en stel strategieë soos vaardigheidsontwikkeling en operasionele verbetering voor. Implikasies vir belanghebbendes en aanbevelings vir toekomstige navorsing word bespreek.

1. INTRODUCTION

The digital age has transformed the global business landscape, creating substantial opportunities for companies to enhance growth and competitiveness through digital innovation. This phenomenon serves as a key driver of long-term economic development, improving productivity, jobs, and economic resilience [1]. The positive impacts are supported by data such as the World Bank's company-level adoption of technology (FAT) survey, which illustrates a strong correlation between a company-level technology index and the value added per worker in eleven countries [2].

At a country level, there is a positive correlation between digital adoption and both economic development and labour productivity [3]. A report from the World Bank Group estimates that increasing digital adoption in Africa could add \$1 trillion to the continent's GDP by 2030 and create up to 60 million jobs [4]. This

suggests that substantial opportunities exist to improve productivity and to facilitate economic growth through better use of digital technology. However, although access to technological advances is an important condition for growth, it is not a sufficient one [2].

Despite these advancements, a significant gap – the ‘digital divide’ – exists between companies in developing versus developed (or high-income) countries regarding the effective adoption and use of innovative digital technologies. Figure 1 illustrates this divide by comparing countries across the globe according to the digital competitiveness index (DCI) [5]. This development indicator measures the extent to which countries adopt and explore digital technologies that lead to transformation, assuming that digital transformation takes place mainly at the enterprise level.

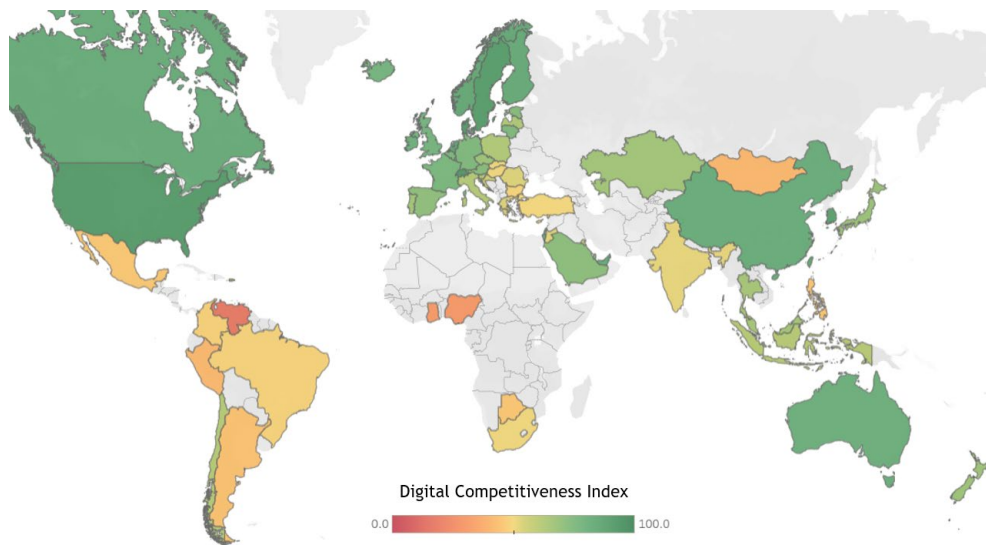


Figure 1: Map showing digital competitiveness index by country
Data source: World Competitiveness Center [5]

A study by Comin and Mestieri [6] suggests that, while *access* to technological innovations in developing countries has improved, the *effective use* of these technologies remains a challenge [6]. This ‘implementation gap’ or ‘utilisation problem’ results in a significant opportunity cost to companies. Recognising and understanding this issue is critical, requiring companies in developing economies to reevaluate their approach to digital innovation management in order to ensure effective use of the potential that these innovations have to offer.

Notably, South Africa ranked 54th out of the 67 countries measured by the DCI [5]. This study investigates the management of digital innovation in South Africa’s financial services sector – defined here as organisations involved in banking, insurance, investments, and related activities that facilitate capital flow and manage financial risks in the broader context of a developing economy – that is, in a nation with relatively lower levels of industrialisation, infrastructure, and per capita income than those of developed countries [2].

Understanding these conditions is important for organisations or professionals seeking strategies to design, implement, and sustain digital innovations in resource-constrained contexts. The aim is to examine the challenges, success factors, and strategies for effective digital innovation management in such environments.

The study is guided by the following research questions:

- I. What are the key challenges faced by companies in developing economies when it comes to implementing and managing digital innovations?
- II. What are the key factors that influence the successful adoption and implementation of digital innovations in organisations?
- III. What strategies could companies in developing economies adopt to overcome the barriers to the effective use of digital technology innovations?

In addressing these questions, the study seeks not only to identify the main barriers and facilitators, but also to examine *how* digital innovation could be effectively managed under the resource constraints that are typical of developing economies. To build this context-specific understanding, we review the relevant literature and evaluate existing innovation management approaches to see how well their principles apply in low-resource settings. Drawing on these insights, a conceptual model for digital innovation management is established. Interviews with industry leaders provide insight into the research questions and validate the conceptual model. Ultimately, this research aims to enhance our understanding of navigating digital transformations in economically challenging environments.

2. LITERATURE REVIEW

This section contextualises the study by reviewing the key literature on digital innovation management, with a focus on the financial services sector in developing economies.

2.1. Digital innovation

‘Digital innovation’ refers to the process of creating and implementing new or significantly improved products, services, processes, or business models, driven by digital technologies and by collaboration in digital ecosystems, resulting in transformative impacts on organisations, industries, and economies [7, 8, 9, 10]. It can be incremental, making modest improvements, or radical, causing significant market disruptions [11, 12]. In addition, innovations can be classified as closed - that is, controlled by one organisation - or as open - that is, involving collaboration among multiple stakeholders [13].

The financial services sector is currently undergoing a significant transformation, largely driven by the integration of emerging digital technologies. Artificial intelligence (AI) and machine learning (ML) stand at the forefront, offering unprecedented predictive and analytical capabilities [14]. JPMorgan Chase, for example, is using AI the better to detect fraudulent activities by analysing transaction data [15]. In addition, generative AI is reshaping the sector by advancing automated content creation, decision-making, and customer interactions. This technology empowers businesses to produce a variety of outputs from extensive datasets, thereby facilitating product customisation and improving risk assessment [16].

The shift towards digital-first financial services is further illustrated by the rise of mobile and digital banking platforms [17] and by large companies strategically transitioning to cloud solutions [18]. The Internet of Things (IoT) is making strides in detailed data collection and product personalisation, allowing for advancements such as tailored insurance premiums based on individual driving patterns [19], and big data and analytics continue to prove valuable for financial decision-making [20]. Blockchain technology promises secure, transparent transaction recording, and fintech innovations continue to democratise access to financial tools [21, 22]. Collectively, these technological advancements mark pivotal shifts in the business landscape, demanding agility and adaptability from companies that seek to capitalise on the opportunities they offer.

2.2. Innovation management

Innovation management has evolved significantly from early 20th century scientific management principles, which were initially focused on operational efficiency [23], to more collaborative and dynamic models. The period from the 1960s to the 1980s was marked by the rise of corporate research and development (R&D) and technology management (TM) [24], with the introduction of stage-gate models [25] and technology roadmaps [26]. Subsequently, the late 20th century saw a shift towards open innovation [13] and knowledge management [27]. The current era is centred on digital innovation and disruptive models, driven by advancements in technologies such as AI and IoT [28], and supported by methodologies such as agile and design thinking [29].

Digital innovation management differs from traditional innovation management by placing digital technologies at the core of product, service, and process development [28]. This focus introduces new challenges for organisations, including the rapid pace of technological change [30], managing the complexity of multiple technologies and stakeholders [10], addressing the digital skill gap in the workforce [2], and heightened cybersecurity risks [2]. Furthermore, changing organisational processes and culture to embrace these digital shifts is often met with resistance [31]. However, strategies have been documented to address these challenges. Examples of these strategies are adopting agile methodologies [32], embracing

open innovation and collaboration [33], investing in developing digital skills [2], and emphasising change management and organisational culture [34].

2.3. Impact of economy on innovation management

Economic context plays a significant role in shaping innovation management practices, impacting the availability of resources, market opportunities, and the competitive environment. Developed economies benefit from established infrastructure and skilled workforces, supporting a focus on advanced technologies and substantial R&D investments [2, 34]. Collaborative efforts between banks, tech giants, academic institutions, and governments are common, creating mature innovation ecosystems [30]. In contrast, developing economies navigate innovation amid multiple constraints, including limited resources, inadequate infrastructure, and a relatively unskilled workforce. These factors shape their innovation strategies towards frugal and incremental innovations that adapt existing technologies to local needs rather than introducing disruptive changes [35, 36]. The informal sector often plays a key role in grassroots innovation [37]. Large, financially stable companies in developing contexts might access global networks, potentially merging the advantages of both economic settings.

In financial services, developing economies offer major opportunities for digital innovation. Digital tools such as mobile banking and microfinance platforms can extend financial services to previously underserved populations, enabling financial inclusion and allowing these economies to bypass traditional developmental stages, a process known as ‘leapfrogging’ [37, 38]. The rapid growth in internet usage and smartphone ownership boosts these opportunities [2]. However, challenges such as resource limitations, regulatory hurdles, and cybersecurity threats impede innovation efforts. The emigration of skilled professionals further depletes local expertise, and the presence of large international companies increases competition, adding to the problems faced by local businesses in developing innovative solutions [30].

3. PROPOSED CONCEPTUAL FRAMEWORK

Building on the insights from the literature review, a conceptual framework designed for digital innovation management in developing economies is proposed. This framework is informed by existing frameworks in the innovation management field, and validated against the answers to the research questions in Section 5.4.

3.1. Overview and evaluation of existing theoretical frameworks for innovation management

The frameworks for this study were selected using a multi-criteria approach, assessing the relevance, applicability, breadth, and depth of each framework. Specifically, the following criteria were considered:

- I. Relevance to digital innovation
- II. Applicability to the financial services sector
- III. Adaptability to developing economies
- IV. Academic and industrial acceptance

Based on these criteria, five frameworks were selected:

- a) **Stage-gate model:** Driven by a phased approach, this model guides new product or service development through sequential stages, separated by assessment ‘gates’ to manage risk and ensure project viability [25].
- b) **Open innovation:** This model shifts from the traditional closed approach and taps into external sources for both idea generation and implementation, promoting collaboration between the company and external entities [13].
- c) **Dynamic capabilities:** In rapidly changing environments, organisations need to adapt. This model focuses on an organisation’s ability to reconfigure its resources and capabilities to address shifting landscapes [40].
- d) **Dual operating system:** This model ensures stability through a traditional hierarchy, while simultaneously promoting agility through a separate network-like structure focused on innovation [41].
- e) **Technology management process framework:** Tailored for technology-driven sectors, this framework aligns technological capabilities with business objectives [26].

These frameworks were evaluated on the basis of their relevance for the financial services sector in developing economies. A summary of this analysis is presented in Table 1.

Each framework reflects distinct strengths in the context of managing digital innovation initiatives in developing economies, but certain gaps are left unaddressed. The stage-gate model offers a sequential, resource-efficient approach to innovation, but may not be suitable in scenarios where rapid decision-making is necessary. The dual operating system model addresses the need to balance agility with structure, but may be difficult to implement when resources are limited. Open innovation channels external resources, ideas, and partnerships effectively, although organisational complexities may be underemphasised. The dynamic capabilities model fosters adaptability in volatile environments, but does not address the practical aspects of managing innovation projects. Last, the technology management process framework aligns technology investments with business objectives, yet may place less immediate emphasis on user-centric outcomes. Viewed together, these observations suggest that selectively combining elements from each could produce a more complete model of digital innovation management in developing contexts.

Building on this comparative analysis, the study selectively adopts strengths from each framework, such as the emphasis on adaptability from dynamic capabilities and the dual operating system, structured risk management from stage-gate, and collaborative focus from open innovation, while also drawing on the technology management process framework's alignment of technical and business objectives. To address the unique resource constraints and infrastructural gaps that are typical in developing economies, we extend these concepts with an additional resilience element. The result is an integrated framework that aims to overcome the limitations identified in Table 1.

Table 1: Evaluation of existing innovation management frameworks

<i>Criteria</i>	<i>Stage-gate model</i>	<i>Open innovation</i>	<i>Dynamic capabilities</i>	<i>Dual operating system</i>	<i>TM process framework</i>
Relevance to digital innovation	Moderate: Provides structure, but may not be agile enough for rapid digital cycles.	High: Emphasises collaboration and external idea sourcing; suitable for digital innovation.	High: Focuses on adaptability, which is crucial for digital contexts.	High: Balances stability with agility; ideal for digital transformation.	High: Specifically designed for technology-driven sectors.
Applicability to financial services	High: Provides structure and risk management, but may need adaptation for faster decision-making in finance.	High: Financial services can benefit from external collaborations, especially with fintech startups.	High: Allows for continuous adaptation to market changes, which is crucial for financial services.	High: Ensures compliance (hierarchical) while fostering innovation (network).	High: Aligns technological capabilities with business objectives, but may need more focus on customer-centricity.
Adaptability to developing economies	High: Its structured approach can help to optimise resources, which is crucial in developing economies.	High: Collaboration can help overcome resource and skill constraints. However, complexity may be involved in managing collaborations.	High: Emphasises adaptability, which is a key need in developing economies.	Moderate: Requires a balance between structure and agility, which might be difficult, especially with the limited resources in developing economies.	Moderate: Needs a certain level of technological infrastructure and expertise.
Academic and industrial acceptance	High: Widely accepted and implemented across industries.	High: Has gained traction in both academia and industry.	High: Recognised for its emphasis on adaptability and change management.	Moderate: While the concept has been discussed in academic circles for over a decade, its widespread implementation is still evolving.	Moderate: Recognised in tech sectors, but less so in traditional industries.

3.2. The ‘digital innovation management in developing economies’ framework

We propose the digital innovation management in developing economies (DIM-DE) framework, illustrated in Figure 2, which synthesises the insights from Section 3.1 and introduces additional resilience-focused measures that are tailored to developing contexts. Rather than functioning as a prescriptive blueprint, the DIM-DE framework provides a flexible, system-level perspective that leaders, practitioners, and industrial engineers can adapt to local circumstances. By integrating the most relevant insights from existing innovation models, it emphasises agility (drawing on dynamic capabilities and the dual operating system), external collaboration (open innovation), structured risk management (stage-gate), and resilience features specific to resource-constrained settings. This holistic approach helps to align strategy, technology, and operations in a way that remains adaptable over time. In practice, organisations can use DIM-DE as a reference for identifying gaps in current innovation processes, prioritising investments, and systematically mitigating risks, ensuring that digital initiatives are both sustainable and impactful in developing economies.

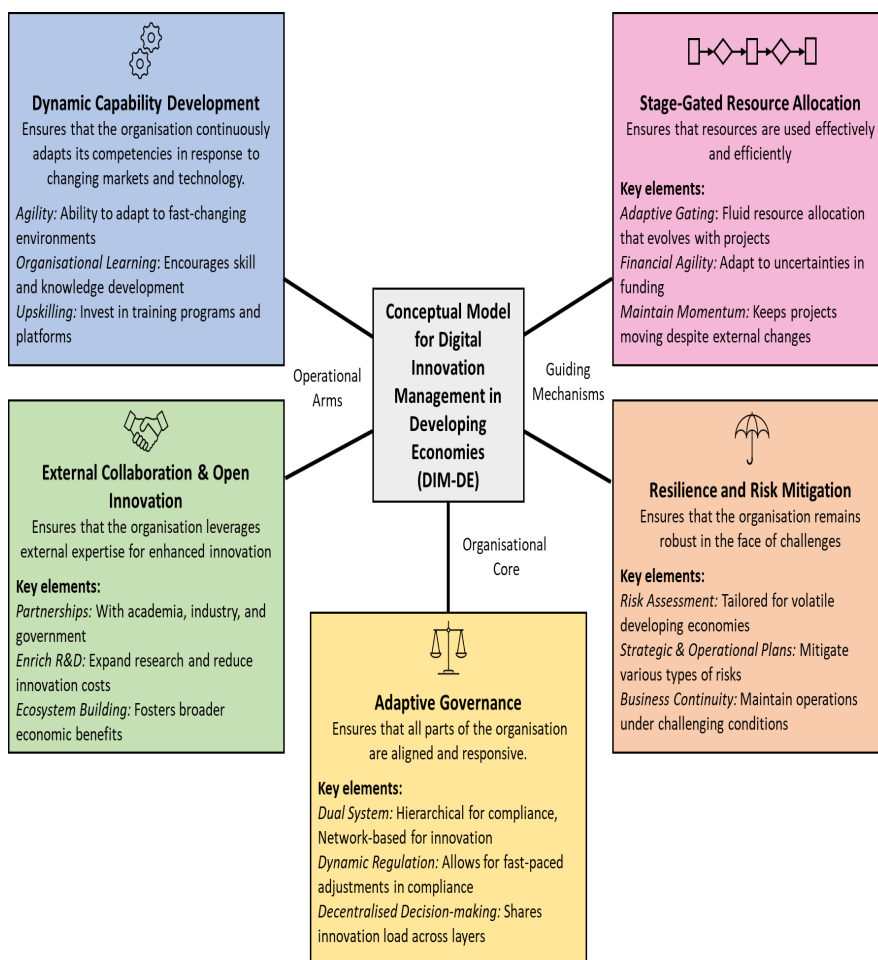


Figure 2: The five components of the DIM-DE model

The model consists of the following five components:

a) Adaptive governance (adapted from dual operating system [42])

In a rapidly evolving digital landscape, balancing compliance and innovation becomes a challenging task, particularly in developing economies such as South Africa. Adaptive governance draws inspiration from Kotter’s dual operating system, which integrates a hierarchical structure for day-to-day operations and a network-based system for innovation [42]. This dual system provides the flexibility needed for innovation while maintaining a structured foundation for compliance and control.

b) External collaboration and open innovation (based on open innovation [13])

Companies in developing economies often lack the full spectrum of resources and skills needed for innovation [13]. This component integrates Chesbrough's open innovation framework, emphasising partnerships with universities, industry peers, and governmental bodies. Such collaborations can enrich research and development, reduce the cost and risk associated with innovation, and accelerate implementation.

c) Dynamic capability development (adapted from dynamic capabilities [40])

The rapidly changing digital landscape in developing economies necessitates agile responses. Integrating Teece's work on dynamic capabilities [40], this component underlines the importance of a company's ability to reconfigure internal and external competencies to address rapidly changing environments. It stresses the need for organisational learning, skill development, and aligning technological investments with strategic business goals.

d) Stage-gated resource allocation (adapted from stage-gate model [25])

Resource allocation becomes significantly challenging in developing economies, given the uncertainties and limited sources of funding. Adapting Cooper's stage-gate model [25], this component introduces the concept of 'adaptive gating'. It calls for a more fluid and dynamic allocation process that can be adjusted as projects evolve or conditions change. This adaptability can help companies to navigate financial and operational uncertainties while maintaining project momentum.

e) Resilience and risk mitigation (new component)

Given the volatility of developing economies – be it political instability, fluctuating currencies, or sudden regulatory shifts – resilience becomes critical. This component focuses on risk assessment methodologies that are tailored to such volatile conditions.

The next sections illustrate how data from industry leaders was gathered and analysed (Section 4), and then demonstrate how the resulting insights (Section 5) both answer the research questions and validate the DIM-DE framework in a real-world context.

4. RESEARCH DESIGN AND METHODOLOGY

The research approach was designed to ensure a systematic and nuanced investigation of the research questions.

4.1. Sampling strategy

A purposive sampling method was adopted, allowing for the selection of specific organisations and individuals that were most likely to provide valuable insights. Focus companies included large financial services companies that have been in operation for over five years and that have undertaken digital innovation initiatives. Participants were selected on the basis of their experience in leadership positions related to digital innovation, technology, or strategy in their respective organisations. The sample size for this study was five participants, allowing for a focused and detailed qualitative analysis. All five participants held senior leadership roles such as chief executive officer, chief financial officer, chief risk officer, and senior solution architect. Each had direct oversight of digital innovation initiatives, ensuring that their insights reflected both the strategic and the operational dimensions of digital innovation in financial services.

4.2. Data collection

Semi-structured, qualitative interviews served as the main method of data collection for this research. The interview questions were designed to align with the study's three main research questions, ensuring that the collected data was directly relevant to the goals of the research. Before starting each interview, written consent for voice recording was obtained from the participants to ensure data accuracy. These voice recordings were initially transcribed using OtterAI software. However, owing to inaccuracies in the automated process, each transcript underwent manual audio review and correction to ensure data precision.

4.3. Data analysis

Data analysis took place at several stages of the research. The data collected from the literature review was analysed by summarising and organising the findings. This involved identifying key themes and concepts related to digital innovation, innovation management, and existing frameworks for digital innovation management, focusing on the context of developing economies. The full transcripts from the qualitative interviews were analysed manually using text coding and thematic analysis centred on the respective research questions. Microsoft Word and Excel were used for the data organisation and analysis.

4.4. Reliability and validity

For reliability, a consistent interview protocol was used with all participants, and each interview recording was reviewed multiple times to verify transcription accuracy. For validity, the interview questions were carefully designed to align with the research questions. The participants were chosen from diverse senior leadership roles to provide multiple perspectives. An industry expert reviewed the research design and interview questions, thus enhancing their validity. Furthermore, the findings from the interviews were cross-checked, when possible, with other sources such as company reports. These procedures aimed to produce results that were both dependable and relevant to the research objectives.

5. RESULTS

The results of the study are organised in line with the three primary research questions, integrating the data from all the participants. Distinct themes and insights emerged, shedding light on the challenges, success factors, and strategies associated with managing digital innovations in developing economies, as was our goal. These key insights are described below and summarised in Figure 3.

5.1. Key challenges in digital innovation management

This section reviews the research findings addressing Research Question I: *What challenges do companies in developing economies face in implementing and managing digital innovations?*

- i) **Talent and skill challenges:** A recurring issue identified by research participants was the scarcity of skilled workers. Three interviewees highlighted difficulties in retaining individuals with essential technical skills, exacerbated when these talents seek opportunities abroad.
- ii) **Infrastructure issues:** Four interviewees emphasised technology infrastructure problems, from unreliable systems to the need for cloud solutions, which raise other issues such as data latency and increased costs. Limited high-speed internet can also be a problem.
- iii) **Funding and resource constraints:** Participants identified difficulty in securing funding for digital innovation, making it difficult for companies effectively to allocate the necessary resources for digital innovation initiatives.
- iv) **Organisational and cultural barriers:** Internal resistance to change, especially during the early stages of implementation, was identified by four participants.
- v) **Policy and regulatory concerns:** While one respondent questioned whether regulations really posed substantial challenges in innovation management, others argued that slow policy adaptation and requirements such as data localisation could sometimes be barriers.
- vi) **Client and market issues:** Slower client technology adoption and a bias for cash transactions pose difficulties. Despite surveys indicating customer interest, actual market adoption lags, suggesting a need for enhanced market research and consumer education.
- vii) **Strategic and implementation gaps:** Three participants highlighted a lack of sufficient planning, with companies often claiming 'strategy' without having concrete plans in place, leading to inefficient projects or outright failures.
- viii) **Technological complexity:** Participants mentioned that older companies face challenges in updating legacy systems. However, multiple participants also cautioned against adopting 'trendy' technology merely to seem innovative.

The interviews made it clear that companies in developing economies face a wide range of challenges when it comes to managing digital innovation. These also often overlap and interact in ways that make them even more difficult to address. We illustrate the challenges and group them in the diagram in Figure 3.

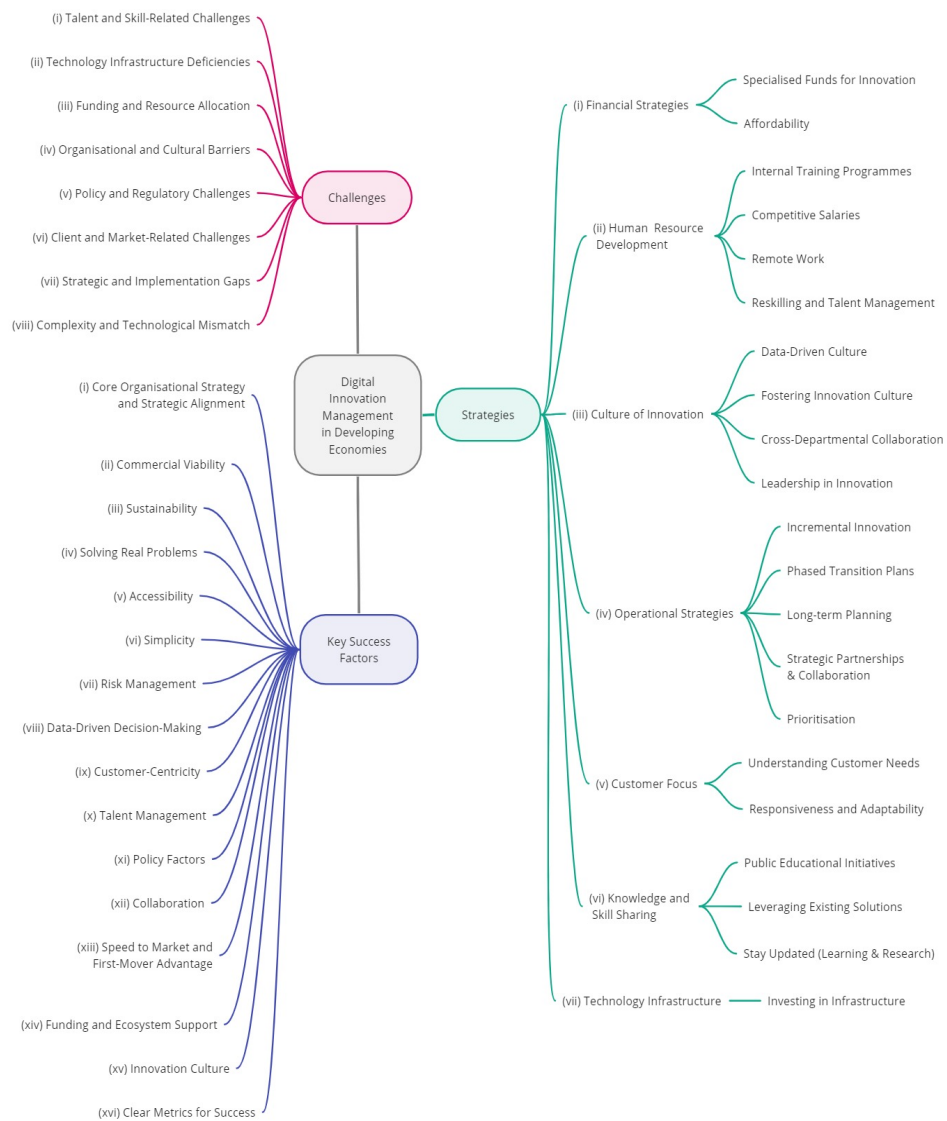


Figure 3: Mind map summarising the key challenges, success factors, and strategies identified by research participants

5.2. Key factors influencing successful adoption

In this section, we address Research Question II: *What are the key factors that influence the successful adoption and implementation of digital innovations in organisations? We summarise the findings as follows:*

- i) **Core organisational strategy and strategic alignment:** Strategic alignment of digital innovations with overarching organisational goals was identified as an essential factor by all respondents. This element allows companies to determine which innovations to prioritise and how to allocate resources effectively.
- ii) **Commercial viability:** Four out of five respondents emphasised the necessity of a digital innovation having a strong commercial rationale. An innovation must not only align with an organisation's goals, but also have a financially sound basis for its implementation.
- iii) **Sustainability and long-term viability:** Participants emphasised that digital solutions need to be cost-effective and sustainable for the long term, especially in developing economies where resources may be limited.

- iv) **Solving real problems:** The importance of addressing actual client problems, or at least substantially improving existing processes, was identified by three participants as a key factor for the successful adoption of digital innovations.
- v) **Accessibility:** Especially relevant in developing economies, the accessibility of the technology to its intended users was identified as an important factor for success. If an innovation is too complex or expensive, its chances of successful implementation are diminished.
- vi) **Simplicity:** Simplicity in design and implementation emerged as a critical factor. For innovations to be adopted widely, they should be easy to understand. This is especially true in environments where familiarity with advanced digital solutions might be limited.
- vii) **Risk management:** Four respondents highlighted the importance of robust risk management frameworks in successful digital adoption. These frameworks help organisations to anticipate potential setbacks and to create strategies to mitigate those risks.
- viii) **Data-driven decision-making:** Linked to risk management, but distinct as a factor, data-driven decision-making was mentioned by three respondents. The use of data analytics and other tools allows for more nuanced decisions, positively influencing the long-term success of digital innovations.
- ix) **Customer-centricity:** Customer-centricity and an understanding of customer behaviour were cited by all participants. Digital innovations must serve customers' needs and improve their interaction with the organisation.
- x) **Talent management:** Talent management emerged as a recurring theme, highlighted by all five respondents. Effective management of human resources, from recruitment to reskilling, is essential for driving digital initiatives.
- xi) **Policy factors:** Government policies and policy responsiveness were identified by two respondents as external factors that can influence the success of innovation initiatives.
- xii) **Collaboration:** Internal and external collaboration were emphasised by three participants. Whether it is through cross-functional teamwork in the organisation or through partnerships with external entities, collaboration significantly boosts the potential for success.
- xiii) **Speed to market and first-mover advantage:** One respondent highlighted that being first to market allows a company to capture the entire market share from the start. While this advantage diminishes over time as competitors enter the market, the first-mover advantage can provide a valuable boost in the adoption phase.
- xiv) **Funding and ecosystem support:** The availability of sufficient early-stage funding and a supportive ecosystem were cited by two respondents as necessary conditions for successful digital adoption. These factors can provide the initial momentum required to get digital projects off the ground and to guide them towards successful implementation.
- xv) **Sub-themes:** A few emerging sub-themes arose. These factors included a culture of innovation and clear metrics for success.

The data suggested an intricate landscape of factors influencing the successful implementation of digital innovations. Each factor provided a unique lens through which to understand the complexities involved in digital innovation management in a developing economy context.

5.3. Strategies for overcoming barriers

Considering the key challenges in innovation management, and the key factors influencing the successful adoption of digital technologies, we now review the findings for Research Question II: *What strategies could companies in developing economies adopt to overcome the barriers to the effective use of digital technology innovations?* Our respondents highlighted the following:

- i) **Financial strategies**
 - Specialised funds for innovation:* Establishing specialised funds can safeguard financial resources specifically for innovation. This strategy could help to address the barrier of lacking initial capital investment to kick-start innovative projects.
 - Affordability:* Making digital solutions more affordable could help to lower the cost barrier and make technology more accessible to a broader user base, encouraging wider adoption.
- ii) **Human resource development**

Internal training programmes: A recurring recommendation was the introduction of internal training programmes aimed at upskilling current employees. This strategy is particularly relevant for companies facing local talent shortages.

Reskilling and talent management: Employee potential could also be maximised through reskilling programmes, thereby managing the existing human resources more effectively.

Competitive salaries: Offering competitive salaries is a key strategy for addressing attraction and retention, potentially overcoming the talent scarcity barrier.

Remote work: Introducing or expanding remote work options could tap into global talent pools, which could help to overcome the challenges of local talent shortages.

iii) Culture of innovation

Data-driven culture: Instituting a culture that emphasises data-driven decision-making could provide a more structured and evidence-based approach to innovation. This would be particularly useful for managing the risks associated with new digital initiatives.

Fostering innovation culture: Several interviewees recommended establishing internal platforms on which employees could propose and collaborate on new projects. This would create fertile ground for grassroots-level innovation in the company.

Cross-departmental collaboration: Innovation should be a company-wide endeavour. By encouraging cross-departmental collaboration, companies could increase the likelihood that innovative solutions would be comprehensive and sustainable.

Leadership in innovation: Having senior leaders who are well-versed in fostering a culture of innovation could guide teams effectively, acting as a compass during the company's innovation journey.

iv) Operational strategies

Incremental innovation: Smaller, more manageable changes can accumulate over time to yield substantial benefits. This approach would reduce the risk and cost associated with larger, more disruptive innovations.

Phased transition plans: Participants recommended structured, step-by-step plans for implementing new digital innovations. A phased approach could make transitions more manageable and less jarring for both employees and customers.

Long-term planning: The need for a long-term view in planning was emphasised, allowing for better resource allocation and reducing the chances of scope creep and budget overruns.

Strategic partnerships and collaboration: Partnering externally could provide access to additional resources and expertise. These partnerships could include agreements with universities, third-party vendors, startups, or other established companies.

Prioritisation: Strategic choices should be made on the basis of both immediate needs and available resources, facilitating the effective allocation of resources.

v) Customer focus

Understanding customer needs: A customer-centric approach is vital. By understanding and addressing customer pain points, companies could develop innovations that were not only novel but also truly needed.

Responsiveness and adaptability: Using agile methodologies could facilitate rapid testing and adaptation, helping companies to adjust their digital offerings more quickly in response to customer needs and market changes.

vi) Knowledge and skill sharing

Educational initiatives: Public educational initiatives could raise general awareness about the benefits of digital innovation, addressing the barrier of limited public understanding.

Leveraging existing solutions: Using pre-existing platforms and solutions could significantly speed up the implementation process. This strategy could overcome barriers related to development time and technical challenges.

Stay updated: Regular time for learning and research is crucial for staying current with new developments in digital technology, helping companies to adapt and remain competitive.

vii) Technology infrastructure

Investing in infrastructure: Companies could actively invest or collaborate with governmental agencies or other companies to improve digital infrastructure such as network coverage, addressing one of the most basic barriers to digital adoption in developing economies.

By thoroughly understanding and applying these multifaceted strategies, companies in developing economies could position themselves better to overcome the various barriers they face by effectively using digital technology innovations.

5.4. Validation of the conceptual framework

Having reviewed the main challenges (Section 5.1), success factors (Section 5.2), and practical strategies (Section 5.3) identified by leaders in innovation management, we were able to connect these empirical observations to the DIM-DE framework by mapping each finding to the framework's core components, validating how DIM-DE aligns with real-world insights from the financial services sector. Table 2 provides a summary of a selection of these mappings.

Table 2: Condensed mapping of interview findings to DIM-DE components

<i>Component</i>	<i>Challenges</i>	<i>Success factors</i>	<i>Strategies</i>
Adaptive governance (balancing compliance & agility)	(iv) Organisational & cultural barriers identified in the interviews emphasise the importance of flexible yet stable oversight. (vii) Strategic & implementation gaps: Problems caused by poor planning highlight the importance of top-level coordination.	(i) Core organisational strategy & strategic alignment: Ensuring new initiatives align with central objectives. (xv) Innovation culture: Leadership support fosters the agility.	(iii) Results highlighted the importance of leadership in innovation to enable adaptive decision-making. (iv) Operational strategies: Participants cited strategies such as long-term planning to maintain day-to-day compliance while allowing for flexibility when conditions shift.
Collaboration & open innovation (engaging partners)	(i) Talent & skill-related: Participants identified shortages of digital expertise, suggesting partnerships to fill gaps. (vi) Client & market: Market uncertainty points to the value of wider stakeholder input in solution design.	(xii) Collaboration: Alliances can improve resource availability and accelerate innovation. (xiv) Funding & ecosystem support: Partnerships expand access to capital and networks.	(vi) Knowledge and skill sharing: Collaborative initiatives enhance overall ecosystem support. (iv) Operational strategies: Participants recommended strategic partnerships & collaboration to share expertise and reduce costs.
Dynamic capability development (building continuous adaptability)	(i) Talent & skill gaps mean that ongoing upskilling is essential to keep pace with emerging technologies. (viii) Complexity & tech Mismatch: Rapidly changing technology requires frequent realignment of capabilities.	(x) Talent management: Developing a skilled, adaptable workforce enables quick responses to emerging technologies. (viii) Data-driven decisions: Interviewees cited the importance of adaptability based on data analytics.	(vi) Stay updated: Participants recommended continual scanning of new tech, enabling adaptability as technologies evolve. (ii) HR development: Participants recommended reskilling and talent management to maintain an adaptable workforce.
Stage-gated resource allocation (allocating resources iteratively)	(iii) Funding constraints: Projects with limited budgets require phased decisions on whether to continue, stop, or pivot. (vii) Strategic gaps: Stage gates avoid misalignment between short-term projects and long-term goals.	(ii) Commercial viability: Gated reviews verify financial soundness at each phase before continuing. (iii) Sustainability: Iterative checkpoints help with the closure of underperforming projects.	(iv) Operational strategies identified, such as prioritisation and incremental innovation, align with this iterative approach.
Resilience & risk mitigation	(ii) Technical infrastructure deficiencies: Outdated systems and unreliable connectivity necessitate contingency measures.	(iv) Risk management: Early threat assessment strengthens confidence. (iii) Sustainability: Participants advocated resilience strategies to withstand disruptions.	(iv) Operational strategies: Participants identified risk mitigation strategies such as phased transition plans to limit exposure when rolling out new technologies in uncertain conditions.

Overall, our interview results indicate that each component of the framework is supported by participant feedback.

i) Adaptive governance

The research results support the adaptive governance element of the DIM-DE framework. The participants emphasised the importance of agile governance in striking a balance between structure and innovation. The suggestion of combining more rigid structures for operational tasks with network-based systems for innovation illustrates how this balance could be achieved.

ii) Collaboration and open innovation

It is evident from the interview data that external partnerships can help to bridge internal talent gaps, accelerate the innovation process, and bring in valuable market insights, emphasising the need for a culture of openness and sharing.

iii) Dynamic capability development

Organisations in developing economies face a pressing challenge in equipping themselves with the necessary skills for digital innovation. The findings suggest an emphasis on continuous learning, organisational strategy, and talent management to address this gap. These results support the dynamic capability development component of the framework.

iv) Stage-gated resource allocation

The importance of efficient and flexible resource allocation is highlighted by the research results, suggesting the 'adaptive gating' method as a promising approach to ensure continuity and responsiveness in resource allocation amid evolving project demands.

v) Resilience and risk mitigation

The data provides insight into the difficulties created by an unpredictable economic environment, and underlines the importance of aligning risk strategies with business objectives. The findings also highlight the important role of technological infrastructure in enhancing resilience.

6. CONCLUSION AND RECOMMENDATIONS

Our research addressed critical questions about the challenges and factors that influence the adoption and management of digital innovations in developing economies, using the financial services sector of South Africa as an example. The findings indicate that companies in these contexts face a complex array of obstacles, including skill shortages, cultural resistance to change, inadequate infrastructure, and funding and resource constraints. These issues are often interconnected, making the adoption of new technologies significantly more difficult.

From the study, it is evident that successful digital innovation depends on several key factors: the alignment of innovations with strategic business goals, the practicality and relevance of these innovations in solving real-world problems, and ensuring that they are user-friendly and economically viable. Equally important is the establishment of a risk-aware culture that promotes data-driven decision-making and prioritises customer needs.

To navigate these challenges, companies should consider diverse strategies. Developing talent through competitive remuneration and continuous training, fostering a culture of innovation, and adopting incremental implementation strategies could all contribute to a more effective digital transformation. Strategic partnerships and a strong focus on customer feedback could also play critical roles in overcoming barriers to technology adoption.

The study provides valuable academic and practical insights into digital innovation management in a less-developed market. Academically, it addresses a research gap by exploring unique local challenges and introducing the DIM-DE model, which could serve as a reference for future studies in this area. Practically, it offers actionable recommendations for companies.

Although the qualitative approach provided rich insights, the small sample of five senior leaders limited the range of perspectives. In addition, the scope was confined to a single sector (financial services) and a single national context (South Africa), which may not have captured the diversity of experiences in other industries or regions. These factors limit the generalisability of the conclusions. In future research, expanding the scope to include a larger sample size and more geographic *locations*, industry sectors, and employee roles could provide broader insights and more generalisable results. Surveys and observations could complement the qualitative interviews and address potential biases, offering a more rounded

perspective. Further studies might explore the application and effectiveness of the strategies identified here, helping to refine our understanding of digital innovation management in developing economies.

By continuing to explore these themes, we could enhance our understanding of digital innovation and its critical role in economic development.

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