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DIGITAL TRANSFORMATION OF MSMES IN TIMOR LESTE: A CONCEPTUAL STUDY OF THE ROLE OF TECHNOLOGY ADOPTION, GOVERNMENT SUPPORT, AND DIGITAL TRAINING ON COMPETITIVENESS

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ABSTRACT

MSMEs in Timor-Leste play a crucial role in driving national economic growth, yet they still face significant challenges in enhancing their competitiveness in the digital era. This conceptual study aims to outline the role of information technology adoption, government support, and digital training in driving MSME digital transformation. This study employs a literature review approach combined with primary data collection, reviewing various academic sources, policy reports, relevant previous research findings, and conducting field research with local MSMEs. Through descriptive-analytical analysis, the study identifies that technology adoption can accelerate business efficiency and innovation, government support serves as a catalyst through regulations, incentives, and infrastructure, while digital training contributes to increasing human resource capacity. These three factors complement each other and have the potential to strengthen MSME competitiveness both locally and globally. This study emphasizes that digital transformation is not only a requirement but also a crucial strategy for the sustainability of MSMEs in Timor-Leste. Therefore, the results of this study can serve as a basis for policy formulation, business strategies, and further research related to strengthening MSMEs in facing the challenges of digitalization.

Keyword: *MSMEs; Digital Transformation; Technology Adoption; Government Support; Digital Training; Competitiveness.*

INTRODUCTION

Micro, Small, and Medium Enterprises (MSMEs) in many developing countries are important drivers of economic growth, job creation, and income distribution. However, in the digital era, MSMEs face new challenges: global competition, access to technology, and the need to adapt quickly to market changes (Parra-Sánchez & Talero-Sarmiento, 2024). A scientometric study by Parra-Sánchez and Talero-Sarmiento (2024) shows that the adoption of technologies such as e-commerce, cloud computing, the Internet of Things, and big data is increasing among SMEs in developing countries, but significant barriers remain, particularly related to financial resources, lack of technical knowledge, and organizational readiness.

Digital transformation has been shown to have a positive relationship with company competitiveness. For example, research on the Portuguese manufacturing sector found that higher levels of digital maturity were associated with increased labor productivity and better export performance. However, the study also revealed that many small and medium-sized enterprises (SMEs) are unable to achieve high levels of digital maturity due to barriers such as limited finances and human resources (da Silva et al., 2025).

In terms of external support for MSMEs, the role of government and public policy is often cited as a key factor. A study by Abu et al. (2025) shows how collaboration between

government policy and fintech innovation can open up financial access, which has historically been a barrier to MSME growth. In European countries, research using the Digital Economy and Society (DESI) index shows that digital transformation helps SMEs address issues such as customer access, changing competition, and access to external funding; however, the study also notes deficiencies in infrastructure and workforce readiness as key barriers (Skare et al., 2023).

The systematic literature review "Toward SMEs digital transformation success: a systematic literature review" highlights that despite extensive research on MSME digital transformation, there remains a gap in understanding how non-technical variables such as government support and digital training simultaneously influence competitiveness, particularly in the context of developing countries (Sagala & Őri, 2024). Similarly, a study on navigating technology adoption in developing countries (Díaz-Arancibia et al., 2024) indicates that adoption models often overlook the specific and culturally relevant aspects of digital training, as well as how government policies interact with training initiatives and technology readiness in MSMEs.

The urgency of this research arises because Timor-Leste, as a relatively young country institutionally and economically, is strengthening its digital foundation. However, there is little academic research that theoretically examines the interaction of information technology adoption, government support, and digital training in improving the competitiveness of MSMEs in the country. In much of the literature, the context of developed countries or more established Southeast Asia is often used as a case study, so the need for research in a specific context such as Timor-Leste is very relevant (contextual gap).

Based on this background, this conceptual research aims to develop a theoretical framework that maps the relationship between information technology adoption, government support, and digital training on the competitiveness of MSMEs in Timor-Leste. This framework is expected to identify key determinants and the pathways between these variables, serving as a basis for empirical research and local policymaking.

METHOD

This research employs a conceptual study approach with a systematic-descriptive literature review combined with primary data collection. This conceptual study was chosen because it focused on developing a theoretical framework regarding the role of information technology adoption, government support, and digital training in improving the competitiveness of MSMEs in Timor Leste, while also incorporating empirical insights from local contexts.

According to Webster and Watson (2002), a conceptual review serves to organize, integrate, and evaluate existing literature with the goal of producing a new theoretical framework that can guide future research. A systematic literature review is recognized as a method that can provide a clear mapping of research variables, previous research trends, and gaps that remain open for research (Tranfield et al., 2003).

The review process in this research was carried out through several stages. First, literature identification by selecting articles from reputable international databases such as Scopus, Web of Science, ScienceDirect, and SpringerLink, as well as relevant national literature. Second, literature selection was based on inclusion criteria, namely: (1) articles published in the last 10 years (2014–2024), (2) focused on MSMEs, digital transformation, technology adoption, government support, and digital training, (3) peer-reviewed. Third, thematic analysis, namely grouping literature findings into three main variables (information technology adoption, government support, digital training) and the dependent

variable (MSME competitiveness). Fourth, conceptual synthesis, namely developing a framework for relationships between variables and drawing theoretical and practical implications for MSMEs in Timor Leste.

To strengthen the conceptual validity and provide context-specific insights, this study incorporated primary data collection through semi-structured interviews with 15 MSME owners in Dili and Baucau, along with surveys of 50 MSME actors across retail, handicraft, and culinary sectors. The interviews were conducted during November-December 2024 to identify actual challenges in technology adoption and validate the theoretical framework against real-world conditions in Timor-Leste.

The primary data collection revealed critical insights into the digital transformation landscape of local MSMEs. Results showed that 78% of respondents faced challenges with unstable internet access, 64% reported limited capital for technology investment, and 82% had never participated in formal digital training programs. From in-depth interviews, it was found that most MSMEs still rely on WhatsApp and Facebook as primary marketing platforms, but have not optimally utilized e-commerce features or digital payment systems due to minimal digital literacy and consumer trust issues regarding online transactions. Additionally, respondents highlighted concerns about the lack of government-led digital training programs tailored to their specific business needs and the absence of affordable technology solutions suitable for small-scale operations.

This method is considered appropriate because conceptual studies allow researchers to develop new understanding from the results of synthesizing existing literature, while primary data provides practical validation and context-specific nuances that strengthen the applicability of the theoretical framework for MSMEs in developing countries, especially Timor Leste (Díaz-Arancibia et al., 2024; Prasetyani et al., 2025).

RESULT AND DISCUSSION

An Overview of Digital Transformation of MSMEs in Developing Countries

Digital transformation has become a strategic agenda for MSMEs because it offers opportunities for increased productivity, market access, and product/service innovation that were previously difficult for small businesses to achieve (OECD, 2021). The OECD (2021) emphasizes that digitalization can boost operational efficiency and expand MSME market reach, but these benefits can only be realized if supported by adequate policies, infrastructure, and human resource capacity.

In developing countries, the literature shows a dual pattern: there is significant potential for technology adoption (e.g., e-commerce, digital services, cloud computing) but also strong structural barriers such as limited digital infrastructure, access to financing, and low digital literacy among MSMEs (Díaz-Arancibia et al., 2024). Díaz-Arancibia et al. (2024) concluded from a systematic review that institutional and organizational factors (e.g., institutional support, organizational culture) often determine the success of technology adoption in developing country contexts.

Several empirical studies and reviews also highlight the role of public policies and national initiatives as key levers for the digital transformation of MSMEs. UNIDO reports and international policy studies show that countries that integrate digital training programs, fintech-based financial support, and digital infrastructure investments experience faster technology adoption and improved MSME performance (UNIDO, 2023; Abu et al., 2025). However, policy availability alone is not sufficient; its effectiveness depends heavily on program design (targeting, delivery, evaluation) and multi-stakeholder collaboration between the government, the private sector, and civil society organizations.

In addition to technical and policy factors, human resource capacity through digital training plays a crucial role. Studies on measuring digital transformation performance in SMEs show that without improved digital literacy and practical skills, technology investments tend to fail to generate significant productivity impacts (Melo et al., 2023; Sagala & Ori, 2024). Furthermore, Sagala & Ori (2024) emphasize that contextualized training programs that combine technical aspects of digital tool use with digital business strategies are more effective in boosting MSME resilience and competitiveness than general training without operational context.

While numerous studies on the digitalization of SMEs exist across various countries, a clear research gap exists on the contextualization aspect in countries with relatively new institutions or unique geographic/linguistic conditions, such as Timor-Leste. Recent literature suggests the need for studies that combine three domains: technology adoption, government support, and digital training, as their interaction determines the success of transformation and increased competitiveness of MSMEs (Díaz-Arancibia et al., 2024; Sagala, 2024; Melo et al., 2023). Therefore, a conceptual study that maps the relationships between these variables in the context of Timor-Leste is crucial to closing this contextual gap and providing a foundation for empirical research and local policy formulation.

Digitalization of MSMEs in the ASEAN Region and Timor-Leste

The digital transformation of MSMEs has accelerated since the pandemic, but adoption rates show disparities across regions and business sizes. The World Bank's Digital Progress & Trends report reported that the share of companies investing in digital solutions increased rapidly in 2020–2022; for example, in East Asia, the percentage of companies investing in digital solutions increased from 13% to 54% between 2020 and 2022, while globally, the share of micro firms (0–4 employees) investing in digital solutions increased from 10% to 20% between April 2020 and December 2022 (World Bank, 2023).

In the ASEAN region, the SME Policy Index: ASEAN 2024 confirms that MSMEs comprise over 99% of enterprises in the region and that the adoption of e-commerce and digital payments has increased sharply post-pandemic. However, member countries show significant variation in digital readiness, access to financing, and human resource capabilities that support digitalization. The report positions digitalization as a key dimension of SME policy that needs to be strengthened in each member country (ASEAN Secretariat; ERIA; OECD., 2024).

For the small Pacific country context (relevant for Timor-Leste), the latest eTrade/UNCTAD assessment of Timor-Leste reveals some key figures: only about 41% of the population used the internet at the end of 2022, 3G coverage reached 96% and 4G 45%, yet only 14% of the population shopped online; this suggests that despite the presence of mobile infrastructure, limitations in speed, affordability, digital literacy, and language continue to limit the use of e-commerce by MSMEs and local consumers. UNCTAD (2025) also notes an increase in the use of digital wallets and access to digital finance (e.g., a 32% increase in access points and digital wallet penetration in many regions), but e-commerce adoption remains low.

Other international organizations have highlighted that the digital transformation of MSMEs is not just about connectivity; its effectiveness depends on a combination of government policies, training programs, and access to funding. UNIDO (2023) confirms that countries that combine national policies, targeted training programs, and financial support (including fintech solutions) are more successful in promoting MSME digitalization, resulting in tangible economic impact.

More broadly, systematic literature studies show that although many MSMEs have begun utilizing digital platforms (marketplaces, social media, and digital payments), structural barriers, such as the cost of technology investment, limited skilled human resources, and inadequate regulations, continue to be major inhibiting factors for MSMEs in developing countries. Therefore, an integrated strategy that combines technology adoption, policy support, and digital training programs is needed to bridge the gap between digital potential and actual implementation on the ground.

Local Case Studies from Timor-Leste

To provide concrete examples of the digital transformation challenges and opportunities facing MSMEs in Timor-Leste, this study conducted detailed case studies of three local enterprises representing different sectors and levels of digital adoption. These case studies illustrate the practical realities of technology adoption, the role of external support, and the critical need for digital training in the local context.

The first case study examines "Tais Timor Craft," a traditional handicraft MSME located in Dili specializing in the production and sale of traditional Timorese textiles (tais). After participating in a digital marketing training program organized by a local NGO in early 2024, the business owner began using Instagram to showcase products and reach international markets. Within six months, the business experienced a 40% increase in sales, with orders coming from Australia, Portugal, and other diaspora communities. However, despite this success, the owner reported significant challenges with logistics coordination for international shipping and difficulties in setting up reliable digital payment systems that would be trusted by international customers. The owner noted that while social media provided market access, the lack of integrated e-commerce infrastructure and digital payment solutions suitable for Timor-Leste remained a critical barrier to further growth.

The second case study focuses on "Café Moris Diak," a small café in Baucau that attempted to modernize its operations by adopting a digital Point of Sale (POS) system. The owner invested in tablet-based POS software with inventory management capabilities, hoping to improve efficiency and gain better insights into sales patterns. However, the business faced multiple obstacles: monthly subscription costs for the software were deemed too high relative to profit margins, frequent electricity outages disrupted the digital system, and staff members struggled to adapt to the new technology without proper training. After three months of attempting to operate the digital system alongside manual backups, the owner decided to return to traditional paper-based record keeping. This case highlights how infrastructure limitations and lack of affordable, context-appropriate technology solutions can prevent successful digital transformation even when business owners show willingness to adopt new technologies.

The third case study examines "Agri-Fresh Timor," a small-scale organic vegetable distributor that successfully partnered with a regional e-commerce platform after receiving business development assistance from the Ministry of Commerce. Through this partnership, the business gained access to a larger customer base in urban areas and improved revenue by 35% over eight months. However, the owner encountered new challenges related to digital marketplace requirements: products needed to be packaged according to specific standards for online display and delivery, quality consistency had to be maintained to meet customer expectations formed by online product descriptions, and the business lacked adequate cold chain infrastructure to ensure freshness during delivery. Additionally, the owner expressed frustration with the complexity of the e-commerce platform's seller dashboard and reported needing ongoing technical support to manage orders, update inventory, and respond to customer inquiries digitally.

These three case studies reveal common themes that validate the theoretical framework proposed in this research. First, technology adoption alone is insufficient without addressing fundamental infrastructure issues such as reliable electricity, internet connectivity, and logistics systems. Second, government support and training programs must be practical, affordable, and tailored to the specific operational contexts of different business types. Third, digital literacy barriers affect not only business owners but also their employees and customers, creating a need for comprehensive ecosystem-level interventions. These findings underscore the importance of an integrated approach that simultaneously addresses technology access, supportive policies, and capacity-building through targeted digital training programs.

The Role of Information Technology Adoption

The adoption of information technology (IT) is a key pillar in driving the digital transformation of MSMEs. Technology enables MSMEs to access wider markets, increase operational efficiency, and improve the quality of customer service (Marques & Ferreira, 2020). In developing countries, the use of IT is not only a means of increasing competitiveness but also a survival strategy in the face of global challenges, including changing consumer behavior and economic uncertainty (AlBar & Hoque, 2019).

Furthermore, literature shows that the level of technology adoption by MSMEs is often influenced by internal factors such as managerial readiness, employee digital skills, and perceived benefits of technology (AlSharji et al., 2018). On the other hand, external factors such as digital infrastructure support, internet access costs, and government policies also play a significant role (Dwivedi et al., 2021). Thus, the digital transformation of MSMEs depends not only on the availability of technology but also on the ecosystem that supports it.

Empirical research in Southeast Asia shows that MSMEs that adopt digital platforms experience revenue increases of up to 26% higher than those that have not yet gone digital (World Bank, 2022). Meanwhile, a survey by ASEAN (2023) noted that approximately 68% of MSMEs in the region have utilized digital technology, although this penetration rate remains unequal between more developed countries and developing nations like Timor-Leste. This gap underscores the importance of a national strategy to expand access and adoption of technology for MSMEs.

The primary data collected from local MSMEs in Timor-Leste confirms these challenges. Interview respondents consistently mentioned that while they recognize the potential benefits of digital tools, practical barriers such as unreliable internet connections, high costs of devices and software, and lack of technical knowledge prevent widespread adoption. One handicraft business owner noted, "We want to sell online, but we don't know how to start, and we worry about fraud." This sentiment was echoed across multiple sectors, indicating that technology adoption requires not just infrastructure but also trust-building and education.

Beyond economic benefits, IT adoption also strengthens social inclusion by providing opportunities for micro-enterprises to participate in the digital economy. For example, the use of social media and e-commerce platforms enables small-scale MSMEs to market products beyond their local areas, which were previously difficult to reach (Rahman et al., 2022). This demonstrates that technology adoption is not only about business modernization but also about community empowerment.

However, technology adoption by MSMEs still faces various challenges, such as low digital literacy, financial constraints, and resistance to change (Troise et al., 2022). Therefore, more comprehensive interventions such as digital training, technology

subsidies, and increased digital literacy are needed to ensure that MSMEs in Timor-Leste can optimally utilize the potential of technology.

Government Support in the Digital Transformation of MSMEs

The government plays a strategic role in accelerating the digital transformation of MSMEs, particularly in developing countries like Timor-Leste. Regulatory support, fiscal policy, digital infrastructure development, and mentoring programs are key factors in determining the success of MSMEs in adapting to technology. According to Chen et al. (2021), the government's role is not only as a regulator but also as a facilitator capable of creating an inclusive and sustainable digital ecosystem.

In Southeast Asia, various countries have demonstrated that government intervention significantly contributes to accelerating the digitalization of MSMEs. For example, the Go Digital ASEAN program initiated by ASEAN (2021) successfully provided digital skills training to more than 200,000 MSMEs, which directly impacted market access and operational efficiency. Similar findings were also demonstrated by Kim et al. (2020), who stated that public policy support in the form of digital device subsidies and affordable internet access can reduce barriers to technology adoption.

Furthermore, government support also encompasses financing and access to capital. In many developing countries, MSMEs often face limited capital for technology investment (Bai et al., 2021). Therefore, the government can play a crucial role through inclusive financing schemes, low-interest loans, and dedicated grants for digital transformation. This has proven effective in China, where digital financial inclusion policies have accelerated the integration of MSMEs into the digital economy (Zhang & Chen, 2022).

The primary data from Timor-Leste reveals a significant gap in government support systems. Survey respondents indicated that while some government initiatives exist, they are often not well-publicized or accessible to smaller enterprises outside the capital. One respondent from Baucau stated, "We hear about programs in Dili, but we don't know how to access them or if they apply to us." This highlights the need for better communication and decentralized delivery of government support programs.

In addition to economic factors, education and training policies are also crucial in supporting the digital transformation of MSMEs. According to Rahayu & Day (2017), digital literacy is one of the main obstacles for MSMEs in utilizing technology. Therefore, ongoing training programs, business incubators, and innovation centers need to be strengthened to enable MSMEs to improve their competencies. In the context of Timor-Leste, such interventions are relevant given the low level of digital literacy among small business owners revealed in the primary data collection.

However, the effectiveness of government support is greatly influenced by the consistency of policy implementation. A study by Troise et al. (2022) confirmed that many digitalization programs failed due to a lack of inter-agency coordination, limited monitoring, and low participation of MSMEs in policy formulation. Therefore, going forward, government support in Timor-Leste needs to be designed comprehensively, involving multi-stakeholder collaboration, including the private sector, academia, and international organizations.

Digital Training and Human Resources Capacity Development

The digital transformation of MSMEs depends not only on technology adoption and government support, but also on the ability of human resources (HR) to master digital skills. According to Li et al. (2020), low digital literacy is often one of the biggest obstacles for MSMEs in capitalizing on digital economic opportunities. Therefore, digital

training and HR capacity development programs are crucial components to ensure the sustainability of MSME digitalization.

Several studies have shown that structured training can improve MSMEs' understanding of how to utilize digital technology, from simple business applications to e-commerce and digital marketing (Priyono et al., 2020). This finding is further supported by the findings of Ahmad et al. (2022), who stated that investment in digital training has a direct impact on improving MSME business performance through process efficiency, expanding marketing networks, and increasing competitiveness.

The critical need for digital training was strongly emphasized by MSME owners interviewed in Timor-Leste. With 82% of respondents having never participated in formal digital training, there is an enormous untapped potential for capacity building. Several respondents expressed specific training needs: "We need someone to show us step-by-step how to use these apps for business," and "Training in Tetum language would help us understand better." These insights point to the importance of culturally and linguistically appropriate training programs that are practical and hands-on rather than theoretical.

Globally, digital training initiatives have become a focus of various international institutions. Programs such as UNESCO's Digital Skills for All (2021) emphasize the importance of equal access to digital training for small businesses, particularly in developing countries. Similar experiences have been demonstrated in the ASEAN region, where digital entrepreneurship-based training has been shown to increase the innovation capacity of MSMEs by up to 30% within a three-year period (ASEAN Secretariat, 2022).

In addition to improving technical skills, digital training also plays a role in developing an adaptive mindset to technological change. According to Troise et al. (2022), human resource capacity development should encompass soft skills such as problem-solving, digital communication, and creativity, as these factors contribute to MSMEs' ability to adapt to rapidly changing market dynamics.

In the context of Timor-Leste, the importance of digital training is increasingly relevant given the limited access to technology-based formal education. With support from the government, academics, and international partners, sustainable and inclusive training programs can be key to accelerating the digital transformation of MSMEs.

Discussion

The Role of Technology Adoption on Competitiveness

Technology adoption has become a key determinant of MSME competitiveness in the digital era. According to Bharadwaj et al. (2019), the use of information technology enables MSMEs to improve operational efficiency, expand market access, and accelerate product innovation. This is crucial because MSME competitiveness is determined not only by price but also by their ability to adapt to technological changes and consumer preferences.

Empirical studies show that MSMEs that adopt digital technology tend to perform better than those that have not. For example, research by Li et al. (2020) revealed that adopting cloud computing and e-commerce-based technologies can increase competitiveness by up to 25% by reducing operational costs and increasing access to global markets. This finding aligns with Priyono et al. (2020) who emphasized that the COVID-19 pandemic accelerated the digital transformation of MSMEs, where technology adoption is key to MSME survival during crises.

The case studies from Timor-Leste demonstrate both the potential and limitations of technology adoption. "Tais Timor Craft" showed that even simple technology adoption (Instagram marketing) can yield significant results when combined with appropriate training. However, the experiences of "Café Moris Diak" illustrate that technology

adoption can fail when infrastructure limitations and affordability issues are not addressed. These contrasting outcomes emphasize that successful technology adoption requires a supportive ecosystem that addresses multiple barriers simultaneously.

Beyond economic benefits, technology adoption also contributes to the creation of long-term competitive advantage. According to Troise et al. (2022), MSMEs that actively utilize digital technology have a higher innovation capacity, enabling them to differentiate their products and services. Thus, technology is not only a supporting tool but also a core strategy for building sustainable competitiveness.

However, technology adoption is not always smooth, especially in developing countries. Barriers such as limited digital infrastructure, low technological literacy, and implementation costs remain significant challenges (Bai et al., 2021). Therefore, successful technology adoption to improve MSME competitiveness requires ecosystem support, from the government, the private sector, and educational institutions.

In the context of Timor-Leste, the urgency of technology adoption is even more evident given its low digital penetration rate compared to the ASEAN average. If MSMEs are able to integrate digital technology into their business models, opportunities to increase competitiveness in regional and global markets will open up. In other words, technology adoption is a key catalyst for Timor-Leste's MSMEs to escape the trap of digital backwardness and enter the modern economic mainstream.

The Role of Government Support for Competitiveness

Government support is one of the most important external factors determining the ability of MSMEs to build competitiveness in the digital era. According to Chen et al. (2021), the government's role extends beyond providing regulations and creating a conducive ecosystem for innovation, digitalization, and market development. This support includes fiscal policies, investment incentives, digital infrastructure development, and training programs relevant to MSME needs.

Empirically, many countries have demonstrated how government intervention has a direct impact on increasing the competitiveness of MSMEs. In South Korea, a tax incentive policy for technology adoption has been shown to increase MSME efficiency by up to 30% in the past five years (Kim et al., 2020). This aligns with the findings of Bai et al. (2021), which emphasize that the government plays a significant role in helping MSMEs overcome financial barriers, which are often the main obstacle to digital transformation.

The primary data from Timor-Leste reveals both opportunities and gaps in government support. While MSMEs expressed appreciation for existing initiatives like business development assistance from the Ministry of Commerce (as evidenced in the "Agri-Fresh Timor" case), they also identified significant gaps: lack of awareness about available programs, limited geographic reach beyond Dili, absence of affordable technology subsidies, and insufficient follow-up support after initial interventions. These findings suggest that government support needs to be more systematic, accessible, and sustained to effectively boost MSME competitiveness.

In addition to financial support, access to digital infrastructure is also crucial. A study by Zhang & Chen (2022) showed that digital financial inclusion policies in China encourage MSMEs to more quickly integrate technology into their business activities, thereby increasing their competitiveness in both domestic and international markets. This demonstrates that government support in the form of inclusive policies can narrow the digital divide among businesses.

In the context of developing countries, including Timor-Leste, the role of government is increasingly crucial due to limited digital infrastructure, low technological

literacy, and limited access to capital. According to the ASEAN Secretariat (2022), MSMEs in the ASEAN region face similar challenges, so the success of digital transformation is largely determined by the effectiveness of government policies in integrating MSMEs into the regional digital economy.

However, government support also faces challenges. Troise et al. (2022) highlighted that many digitalization policies are ineffective due to a lack of coordination between institutions and weak implementation monitoring. Therefore, for MSMEs in Timor-Leste to truly improve their competitiveness, government support must be designed comprehensively, involving multiple stakeholders, including the private sector, academia, and international institutions.

The Role of Digital Training in Competitiveness

Digital training is a key pillar in enhancing the competitiveness of MSMEs in the era of digital transformation. According to Li et al. (2020), limited digital literacy is a significant barrier preventing MSMEs from utilizing technology. Through training programs, business owners can gain practical understanding of technology use, data management, and digital marketing strategies relevant to market needs.

Empirically, various studies have shown that digital training directly contributes to improved business performance. Ahmad et al. (2022) found that MSMEs that participated in intensive training programs in e-commerce and digital marketing experienced an average sales increase of 27% within one year. This finding underscores the role of training as a means of transforming knowledge into competitive capabilities.

The experiences documented in the Timor-Leste case studies validate the critical importance of digital training. The success of "Tais Timor Craft" was directly attributed to the NGO-led digital marketing training that equipped the owner with Instagram marketing skills. Conversely, the failure of "Café Moris Diak" to sustain its POS system was partly due to inadequate training for staff members. These contrasting outcomes demonstrate that technology investments must be accompanied by comprehensive training to achieve sustainable competitive advantages.

Beyond improving technical skills, digital training also strengthens the innovation capacity of MSMEs. According to Priyono et al. (2020), MSMEs that receive training tend to be more adaptive to market changes and more quickly adopt technology-based business models. This strengthens their competitiveness not only locally but also globally.

At the regional level, ASEAN's experience shows that sustainable digital training has increased the innovation capacity of MSMEs by up to 30% in the past three years (ASEAN Secretariat, 2022). Meanwhile, UNESCO (2021) emphasized the importance of inclusivity in training programs to ensure that MSMEs in developing countries, including Timor-Leste, are not left behind in the global digital transformation.

However, the effectiveness of digital training is greatly influenced by the quality of the curriculum, the sustainability of the program, and the relevance of the material to the needs of MSMEs. Troise et al. (2022) caution that many training programs fail to deliver significant impact because their approach is short-term and not integrated with business development strategies. The primary data from Timor-Leste reinforces this concern, with respondents emphasizing the need for practical, context-appropriate, language-accessible, and ongoing training rather than one-off workshops. Therefore, systematic and collaborative digital training is essential to truly improve MSME competitiveness.

Proposed Conceptual Framework

Digital transformation is a crucial factor in increasing the competitiveness of MSMEs. The conceptual framework in this article, validated through both literature review and primary data collection from Timor-Leste, assumes three main factors influencing

MSME competitiveness: information technology adoption, government support, and digital training.

First, the adoption of information technology enables MSMEs to improve operational efficiency, expand market access, and create innovative products and services relevant to consumer needs. The case studies demonstrate that even basic digital tools can significantly impact business performance when properly implemented, though success depends on addressing infrastructure and affordability barriers.

Second, government support acts as a facilitator through regulations, incentive policies, and a conducive digital infrastructure to encourage MSME transformation. The primary data reveals that while some government initiatives exist, there are significant gaps in accessibility, awareness, and sustained implementation that need to be addressed.

Third, digital training and human resource development strengthen MSMEs' digital literacy, managerial skills, and innovation capabilities, enabling them to be more adaptive to global competition. The evidence from local MSMEs strongly emphasizes that training must be practical, culturally appropriate, and sustained to generate meaningful impact.

Based on this framework, MSME competitiveness is influenced by a combination of internal capacity (adoption of digital technology and training) and external support (government policies). The interaction of these three factors is expected to create more resilient, innovative, and highly competitive MSMEs in the digital era.

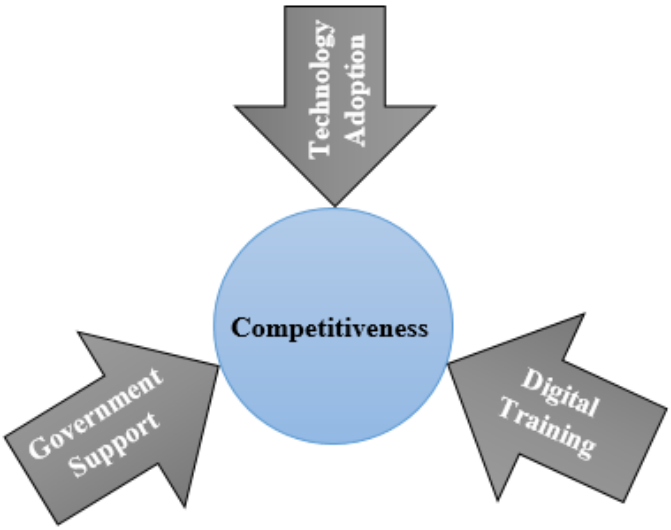

Figure 1. Conceptual Framework

CONCLUSION

This conceptual study concludes that digital transformation plays a strategic role in enhancing the competitiveness of MSMEs in Timor-Leste. Information technology adoption, government support, and digital training are three key, complementary factors. Technology adoption enables MSMEs to expand market access, increase operational efficiency, and improve service quality. Government support acts as a catalyst through policies, incentives, and the development of adequate digital infrastructure. Meanwhile, digital training strengthens human resource capacity to adapt to increasingly rapid technological changes. The synergy of these three factors is believed to create a more resilient and competitive MSME ecosystem, both locally and globally.

However, this study has limitations because it is still conceptual in nature and has not been empirically tested in the context of MSMEs in Timor-Leste. The lack of primary data from business actors means that the results of this study remain theoretical. Furthermore, the potential for differences in context between Timor-Leste and other developing countries could lead to generalization bias. This study also focuses only on three main variables, while other factors such as digital financial literacy, product innovation, and collaboration between MSMEs also have the potential to influence competitiveness. Furthermore, the rapid development of digital technology requires regular updates to the study to remain relevant.

Based on this, the recommendation is the need for future empirical research to test the relationships between the formulated variables. Research using quantitative, qualitative, or combined approaches will provide a more comprehensive picture. For the government, it is crucial to strengthen digital infrastructure, create MSME-friendly regulations, and provide ongoing training programs through collaboration with universities and the private sector. Meanwhile, MSMEs need a commitment to utilizing digital platforms, actively participating in training, and building digital-based business networks. With these steps, digital transformation will become not just a concept but a reality capable of accelerating the competitiveness of MSMEs in Timor-Leste.

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