

ADAPTIVE POLICY MODEL FOR SUSTAINABLE DIGITAL TRANSFORMATION OF MSMEs: A CASE STUDY FROM LHOKSEUMAWE CITY (INDONESIA)

Maryam

*Faculty of Social and Political Sciences, Malikussaleh University,
24355 Lhokseumawe City, Indonesia*

Aiyub

*Faculty of Social and Political Sciences, Malikussaleh University,
24355 Lhokseumawe City, Indonesia*

Maisyura

*Faculty of Social and Political Sciences, Malikussaleh University,
24355 Lhokseumawe City, Indonesia*

Marzuki

*Faculty of Social and Political Sciences, Gadjah Mada University,
55281 Sleman, Indonesia*

Nila Safrida

*Faculty of Social and Political Sciences, Gadjah Mada University,
55281 Sleman, Indonesia*

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Abstract. Digital transformation has become a strategic priority for enhancing the competitiveness and sustainability of Micro, Small, and Medium Enterprises (MSMEs). However, the implementation of digital transformation policies across various regions still shows a partial and uneven level of adoption. Previous research has generally examined structural barriers such as infrastructure limitations, regulations, and institutional capacity or cultural barriers such as low digital literacy, motivation, and resistance to change separately. As a result, the resulting policy recommendations have not been able to explain how these two dimensions interact with one another in policy implementation. This study aims to analyze the interaction of structural and cultural factors in the implementation of digital transformation policies for MSMEs and to develop an Adaptive Policy Model to support the digital transformation of MSMEs in Lhokseumawe City. The study employed a qualitative approach using the case study method, involving 47 purposively selected informants, including MSME operators, local government officials, academics, financial institutions, legislators, community members, consumers, and the media. Data were collected through in-depth interviews, observations, and document analysis, and were subsequently analyzed using NVivo 12. The research findings indicate that the implementation of digital transformation policies is influenced by a mutually reinforcing interaction

between structural barriers including policy fragmentation, unequal access to digital infrastructure, weak institutional capacity, and poor interagency coordination and cultural barriers, such as low digital literacy, resistance to change, and weak motivation among MSME actors. These interactions have resulted in a digital adoption process that is partial, uneven, and unsustainable. Based on these findings, this study developed an Adaptive Policy Model consisting of three mutually integrated stages: policy set-up, policy design, and policy implementation, as well as monitoring and evaluation which emphasizes strengthening institutional coordination, long-term planning, interventions tailored to the capacity of MSMEs, inclusive implementation, and data-driven evaluation as a policy learning mechanism. These findings expand the study of public policy implementation through the development of an adaptive policy model that can serve as a reference for local governments in designing a more effective and sustainable digital transformation for MSMEs.

Keywords: digital adoption, MSMEs, adaptive policy, sustainability, digital transformation.

Reikšminiai žodžiai: skaitmeninių technologijų diegimas, mikro ir MVĮ, adaptyvi politika, tvarumas, skaitmeninė transformacija.

Introduction

Micro, Small, and Medium Enterprises (MSMEs) are widely recognized as the backbone of economic development due to their significant role in generating employment, fostering innovation, and promoting inclusive economic growth. In Indonesia, MSMEs account for about 60% of the national Gross Domestic Product (GDP), contribute 15.69% to non-oil and gas exports, and employ more than 96% of the national workforce (Kemenkeu 2023). Given the significant contribution of MSMEs to the national economy, enhancing their competitiveness has become a strategic priority for Indonesia's development. In this effort, digital transformation serves as a key tool for improving productivity, market access, business resilience, and the sustainability of MSMEs (Darmawan, Hanif, et Sriwardiningsih 2026a; Alfarizi, Widiastuti, et Ngatindriatun 2024).

Digital transformation enables MSMEs to optimize business processes, improve operational efficiency, expand their customer base, develop innovative products and services, and strengthen organizational resilience (Amaral et Peças 2021; Horváth et Szabó 2019; Guo et al. 2020; Khin et Ho 2019; Bhatti et al. 2022; Yang, Gabrielsson, et Andersson 2023). Consequently, governments around the world have introduced various policy initiatives, including the development of digital infrastructure, financial technology (fintech), e-commerce ecosystems, entrepreneurship programs, and regulatory reforms to accelerate the digital transformation of MSMEs (Koesrianti et Tanega 2024; Nanda et Kumar 2023; Kilay, Simamora, et Putra 2022). Nevertheless, digital transformation remains uneven, particularly in developing countries, where many MSMEs continue to face challenges in adopting and sustaining the use of digital technologies (Singh et al. 2025; Díaz-Arancibia et al. 2025; Rupeika-Apoga et Petrovska 2022).

Indonesia illustrates this challenge. Despite the government's efforts to prioritize MSME digitalization through various national programs, the adoption of digital technologies among MSMEs remains relatively limited (B. Hartono et al. 2021a; Angelina et al. 2025). National reports indicate that only a small proportion of MSMEs in Indonesia have successfully integrated digital technologies into their business operations, while the majority continue to rely on conventional production, marketing, and transaction systems (Aryo 2024; Hikam 2022). These findings suggest that digital transformation cannot be understood merely as a matter of technological availability. Rather, it represents a complex public policy challenge involving institutional capacity, governance, stakeholder behavior, and the ability to adapt to social and cultural change (Ly, Ly, et Ma 2026a; Kloth et Nikolarakis 2025).

This complexity is particularly evident in Lhokseumawe City, Aceh Province. According to data from the Lhokseumawe Department of Trade, Industry, Cooperatives, and MSMEs, more than 6,800 MSMEs were registered in the city in 2023 (Lhokseumawe 2023). However, only a small proportion of these enter-

prises have adopted digital technologies in business management, online marketing, and digital payment systems (Unimalnews 2022). Previous studies have also shown that many MSME owners have low levels of digital literacy, limited knowledge of digital marketing strategies, and have yet to make optimal use of digital payment systems such as QRIS (Chalirafi et al. 2022; Hikalmi et al. 2023). As a result, digital transformation has not yet delivered the expected improvements in MSME competitiveness and business sustainability.

The persistence of these challenges has stimulated growing academic debate on the factors that hinder the digital transformation of MSMEs. Previous studies have consistently identified a range of structural barriers, including inadequate digital infrastructure, poor internet connectivity, technological complexity, limited access to finance, and inconsistent policy and regulatory environments (Brink et Packmohr 2023; Sander Chan et al. 2021; Chen, Lyu, et Chen 2024; Pujari et Saha 2023). Other studies have highlighted cultural barriers, including low levels of digital literacy, resistance to organizational change, technology-related anxiety, organizational inertia, and sociocultural norms that are less conducive to innovation (Chouki et al., 2018; Gumrah, 2024; Kallmuenzer et al., 2025; Restrepo-Morales et al., 2024; Ueasangkomsate, 2025). As summarized in Table 1, these two streams of research have made significant contributions to advancing the understanding of the factors influencing the digital transformation of MSMEs.

Table 1. Summary of Previous Studies on Structural and Cultural Barriers

No	Exploration Focus	Emphasized Barriers	Researchers & Year
Structural			
1	Digital infrastructure	Inadequate infrastructure hinders technology adoption	(Brink et Packmohr 2023; Chen, Lyu, et Chen 2024; Wu et al. 2022)
2	Connectivity & devices	Poor internet connectivity and limited devices in rural areas	(Syafuruddin Chan, Jalaluddin, et Asni 2023)
3	Regulations & policies	Inconsistent/inadequate policies, weak legal framework	(Brink et Packmohr 2023; Pujari et Saha 2023)
4	Technological complexity	Systems not compatible, technology too complex for SMEs	(Gibreel et al. 2024; Shahadat et al. 2023)
Cultural			
1	IT skills & knowledge	SMEs lack digital competence, difficult to manage new technology	(Restrepo-Morales et al. 2024; Ueasangkomsate 2025)
2	Resistance to change	Reluctant to abandon old practices, fear of new things	(Chouki et al. 2018; Kallmuenzer et al. 2025; Pakdel, Erol, et Oztel 2025)
3	Organizational culture & inertia	Dependence on legacy systems, risk-averse culture	(Kallmuenzer et al. 2025; Pakdel, Erol, et Oztel 2025)
4	Social norms & gender	Cultural norms & gender inequality affect technology adoption	(Gumrah 2024)

Source: Compiled by the authors based on the reviewed literature (2026)

Nevertheless, the existing literature remains fragmented in at least three important respects. First, structural and cultural barriers are generally examined as independent factors influencing digital transformation. This approach provides only a limited understanding of how these two types of barriers interact throughout the policy implementation process. In practice, inadequate infrastructure can reinforce resistance to digital innovation (Miterev, Blomkvist, et Nilsson 2026; Yordanova 2024). Meanwhile, limited digital capabilities can reduce the effectiveness of government support programs (Gao, Caldarulo, et Porumbescu 2026; Erita et al. 2026; Mohamad et al. 2025). Therefore, the dynamic interaction between structural and cultural barriers remains insufficiently understood.

Second, as shown in Table 1, previous studies have focused primarily on identifying the factors influencing technology adoption rather than explaining how governments should continuously adapt policy interventions in response to changing institutional and sociocultural conditions. Consequently, the existing literature remains largely diagnostic, explaining why digital transformation encounters various barriers while providing limited guidance on how adaptive public policies should be designed to address these challenges sustainably.

Third, empirical evidence on the digital transformation of MSMEs in developing countries remains limited. Most previous studies have been conducted in developed countries, resulting in an insufficient understanding of the dynamics of digital transformation in developing countries. This is further supported by several studies (Fauzi et al. 2023; A. Hartono, Roostika, et Darmawan 2023; Wang et Kurnia 2026), which indicate that research on MSME digital transformation in developing and emerging countries remains limited, with the available empirical evidence remaining fragmented. However, developing countries face distinct institutional, governance, and socioeconomic challenges, underscoring the need for more extensive empirical evidence to inform context-specific policy development (Díaz-Arancibia et al., 2025; Hasbullah et al., 2024; Syed et al., 2023).

These limitations suggest that digital transformation extends beyond technology adoption to encompass the governance capacity to respond to changing implementation contexts. The success of digital transformation depends on the government's ability to adapt policy interventions to evolving institutional, social, structural, and cultural dynamics. Therefore, understanding the adaptive dimension of policy implementation is essential for enhancing the effectiveness and sustainability of MSME digital transformation.

Building on the identified research gaps, this study integrates the context, orientation, power, and actors (COPA) Framework with the Adaptive Policy Framework. The COPA Framework is employed to identify how contextual factors, stakeholder orientations, institutional power relations, and actor interactions shape the implementation of MSME digital transformation policies. These findings subsequently inform the application of the Adaptive Policy Framework to formulate policy responses that adapt to evolving structural and cultural barriers. Unlike previous studies, which have primarily focused on identifying barriers to digital transformation, this study integrates policy implementation analysis with adaptive policy design within a unified analytical framework. Accordingly, this study offers a more comprehensive approach to designing adaptive digital transformation policies. Specifically, this study addresses the following research questions:

- RQ1.** How is the MSME digital transformation policy implemented in Lhokseumawe, and how do structural and cultural factors interact throughout its implementation?
- RQ2.** How should an adaptive policy model be designed to support the sustainable digital transformation of MSMEs?

This study contributes to the advancement of Public Policy and Public Administration scholarship in three ways. First, it extends the understanding of digital transformation policy by explaining how structural and cultural barriers interact throughout policy implementation. Second, it makes a theoretical contribution by integrating the Context, Orientation, Power, and Actors (COPA) Framework with the Adaptive Policy Framework into a unified analytical framework. Third, it develops an Adaptive Policy Model

that provides practical guidance for governments in designing more adaptive, responsive, and sustainable MSME digital transformation policies.

Theoretical Framework

COPA Framework (Context, Orientation, Power, Authority)

This study employs the COPA framework (Contents, Orientation, Power, Authorities) as an analytical lens to understand how policies are designed and implemented to promote MSME digital adoption (Dong et Liu 2020). The framework emphasizes that policy effectiveness is not determined solely by its substantive content, but also by its strategic orientation, the strength of supporting instruments, and the capacity of implementing authorities. This approach enables a more comprehensive policy analysis by considering the interaction between policy design and the dynamics of its implementation. In this study, the contents dimension analyzes the substance of MSME digitalization policies. Orientation assesses their long-term orientation. Power examines regulatory strength and resource support, while authorities evaluate the roles and coordination among key actors. Through the COPA framework, this study aims to provide a comprehensive understanding of policy effectiveness and to propose an adaptive model that addresses structural and cultural barriers simultaneously.

Adaptive Policy Concept

Adaptive policy, as proposed by (Swanson et Bhadwal 2009), views policy not as a rigid final product, but as a dynamic process that continuously adjusts to changes in social, economic, and technological contexts. In this approach, policies are designed to be flexible, responsive to uncertainty, and capable of evolving alongside environmental changes.

This framework consists of three main stages: policy set-up (defining objectives, performance indicators, and risk anticipation), flexible design and implementation, and continuous monitoring and evaluation to enable policy adjustment or re-design when necessary. This approach is relevant to MSME digital transformation because the barriers are both structural and cultural; therefore, policies must be designed in a contextual and adaptive manner to effectively respond to local dynamics.

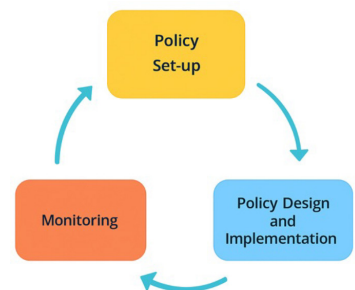


Figure 1. *Phases in Adaptive Policy Management Process.*

Source: (Swanson et Bhadwal 2009)

Methodology

This study employed a qualitative approach using a single-case study design developed by Yin (2018). This design was selected because it enables a comprehensive exploration of existing MSME digital transformation policies while examining the interaction between structural and cultural barriers that shape policy implementation, providing the foundation for developing an Adaptive Policy Model for MSME Digital Transformation. The study was conducted in Lhokseumawe, Aceh Province, Indonesia, which was purposively selected as one of Aceh's major MSME centers and the target of various government digitalization programs, despite its relatively low level of digital technology adoption.

Research informants were selected using purposive sampling (Tongco 2007). The selection of informants considered their capacity, experience, position, and involvement in the formulation, implementation, and utilization of MSME digital transformation policies. A total of 47 informants participated in this study, consisting of MSME owners, MSME community representatives, officials from the Department of Industry, Trade, Cooperatives, and MSMEs, relevant local government agencies, members of the

Regional House of Representatives (DPRK), academics, banking sector representatives, consumers, and local media.

The research data consisted of primary and secondary data. Primary data were collected through semi-structured interviews and observations (Longhurst 2009), while secondary data were obtained through document analysis of various regulations, program reports, planning documents, evaluation reports, statistical data, and other official documents related to MSME digital transformation (Tatsuoka 2012). The interview guide was developed based on the two research questions and the dimensions of the Context, Orientation, Power, and Actors (COPA) Framework to explore policy implementation conditions, actor orientations, power relations, and patterns of interaction among stakeholders.

Data analysis was conducted using NVivo 12 through several stages. The first stage involved importing all interview transcripts, observation notes, and documents into the NVivo software (Suripto 2022). The second stage involved open coding to identify emerging themes from the data. Subsequently, the codes were categorized based on the four dimensions of the COPA Framework, namely Context, Orientation, Power, and Actors, to address Research Question 1 (RQ1). The results were then classified into two main categories, namely structural and cultural barriers, and the relationships between categories were analyzed using the coding query and relationship analysis features in Nvivo (Suripto 2022). In the next stage, all findings were mapped onto the four components of the Adaptive Policy Framework to address Research Question 2 (RQ2) and serve as the basis for developing an Adaptive Policy Model for MSME digital transformation. The detailed stages of data analysis are presented in Table 2.

Table 2. Stages Of Data Analysis

Analysis Stage	Process Conducted	Output/Benefit
Existing Policy Analysis (RQ1)	Creating nodes in NVivo based on the COPA framework (Context, Orientation, Power, Auhority).	Identification of policy implementation status, obstacles, and patterns of interaction among actors.
	Classifying results into two dimensions: Structural and Cultural	Clear mapping of structural and cultural barriers.
	Tracing inter-theme relationships in NVivo	Map of interactions between structural and cultural barriers.
Adaptive Policy Model Design (RQ2)	Mapping RQ1 results into 4 components of the adaptive policy using NVivo nodes	Adaptive policy model for MSMEs based on structural-cultural analysis.
	Formulating policy recommendations	More responsive and contextualized policy recommendations.
	Visualizing the model	Visual representation of the adaptive policy model for better understanding.

Source: Compiled by the authors (2026)

This study ensured the validity of the research findings by applying source and method triangulation through the comparison of information obtained from interviews, observations, and document analysis (Meydan et Akkaş 2024). Member checking was also conducted with several key informants to ensure alignment between the researchers' interpretations and the informants' experiences. All data collection and analysis processes were systematically documented to maintain consistency and enhance the credibility and auditability of the research findings.

Results

Findings from COPA Analysis of Existing Policies

Context

The COPA analysis of the context dimension indicates that the Lhokseumawe City Government, together with various supporting institutions, has implemented a range of policies and programs to promote the digital transformation of MSMEs. These initiatives include digital platform development, business legalization facilitation, mentoring programs, and various digital skills training programs. The existing policies and programs are presented in Figure 2.



Figure 2. Existing Policies
Compiled by the Authors (2026)

Figure 2 shows 12 existing MSME digital transformation policies identified from the field findings. First, the PaDi UMKM platform has been introduced as a digital marketplace to expand market access. However, its adoption remains limited because many MSME owners have not fully utilized the available training programs. In contrast, the implementation of the Online Single Submission (OSS) system has streamlined business licensing and halal certification processes, thereby reducing administrative barriers for MSMEs. In addition, regular mentoring programs organized by the Department of Industry, Trade, Cooperatives, and MSMEs (Disperindagkop), with support from Bank Indonesia, demonstrate relatively strong institutional collaboration in strengthening the capacity of MSME owners.

The findings also identified several digital capacity-building programs that have been implemented on a continuous basis, including training in digital marketing, product digitalization, branding and design, e-commerce, and content creation. These programs indicate that structural support for enhancing MSMEs’ digital capabilities has been established and is routinely provided by local governments and supporting institutions. This finding is consistent with previous studies emphasizing that capacity building is a fundamental prerequisite for the digital transformation of MSMEs (Li et al. 2025; Benzakour et al. 2026). In addition to training programs, the local government provides infrastructure support through public internet access, which serves as a fundamental prerequisite for MSMEs’ digital activities and has been identified in previous studies as a key enabler of digital technology adoption (Maesaroh et al. 2025).

Efforts to strengthen the digital ecosystem are also reflected in policies promoting MSMEs through collaboration with local media, such as Radio Republik Indonesia, as well as through QRIS awareness

programs conducted by the banking sector to encourage the adoption of cashless transactions. Nevertheless, most initiatives remain focused on providing basic facilities and introductory training, resulting in uneven improvements in MSMEs' digital capabilities. This finding reinforces previous studies suggesting that infrastructure provision and training alone are insufficient to achieve sustainable digital transformation without corresponding improvements in organizational capacity and adaptive policy support (Ly et al., 2026; Sidani & Harb, 2025)

In addition to these policies, the study identified two other important findings concerning the existing policy context. First, several informants indicated that no policy has been specifically designed to promote MSME digital transformation at the local level, as existing policies remain primarily focused on business legalization rather than directly strengthening digital capabilities. Second, some MSME owners reported being unaware of the digitalization support programs provided by the government, leading them to adopt digital technologies and marketing strategies independently without structured support. These findings suggest that, despite the availability of various digitalization initiatives, significant gaps remain in policy orientation and the dissemination of information to MSME owners.

Orientation

The findings indicate that stakeholders hold diverse perceptions of the orientation of existing digital transformation policies for MSME development in Lhokseumawe, as illustrated in Figure 3. Several informants perceived that mentoring programs implemented by the local government, Rumah BUMN, and financial institutions have generated tangible benefits, particularly in strengthening branding and expanding access to digitalization. This finding is consistent with previous studies demonstrating that mentoring programs and institutional support play a crucial role in enhancing MSMEs' digital readiness and competitiveness (Woo 2017; Indoria, Chishti, et Junaid 2025; Sharma, Mahajan, et Sharma 2025). These programs were perceived to have helped MSME owners develop their businesses and improve their understanding of digital technologies. Nevertheless, the need for more sustained mentoring and support remained evident.

On the other hand, several stakeholders perceived that the effectiveness of existing policies remains suboptimal, as the long-term benefits of digitalization training have yet to become evident. This view is consistent with concerns expressed by MSME community representatives, who argued that such training should lead to tangible improvements, such as enhanced skills in basic design and digital marketing through social media. However, these expected outcomes have not been widely observed in practice.

Power

The power dimension of the COPA Framework reflects the extent to which a policy possesses the capacity to drive change through the availability of resources, institutional authority, policy instruments, and the implementation capacity of the actors involved (Swanson et Bhadwal 2009) . In the context of MSME digital transformation in Lhokseumawe, the findings indicate that the policy's implementation capacity presents a mixed picture, demonstrating tangible achievements in several areas while simultaneously facing structural and operational constraints that limit its overall effectiveness.

On the positive side, the policy demonstrates a tangible capacity to drive change when it is aligned with the practical needs of MSMEs. Financial institutions, including Bank Syariah Indonesia, have promoted the Quick Response Code Indonesian Standard (QRIS) payment system, which has improved dig-

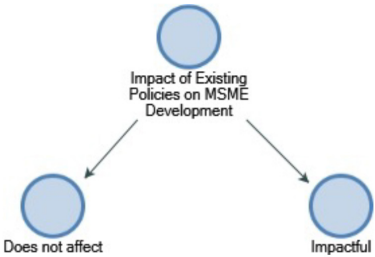


Figure 3. Stakeholders' Perceptions of Policy Impacts
Compiled by the Authors (2026)

ital financial literacy and encouraged the adoption of cashless transactions. Policy effectiveness is also reflected in strengthening branding capacity, where structured mentoring has enabled home-based businesses to develop a more professional identity while improving their packaging, labeling, and marketing capabilities, as well as increasing MSME owners' confidence in expanding market access. This finding is consistent with previous studies showing that sustained mentoring contributes to strengthening business capacity and enhancing MSME competitiveness (Van Coller-Peter et Cronjé 2020; Cenenda et Saurombe 2025). These findings suggest that the power dimension becomes more effective when policy instruments are directed toward strengthening practical, measurable, and sustainable technical competencies.

Conversely, the findings indicate that the power dimension of MSME digital transformation policy implementation in Lhokseumawe continues to face significant limitations in terms of policy capacity and implementation effectiveness. Several training programs were perceived as ceremonial and unsustainable, limiting the extent to which the knowledge acquired could be effectively internalized. Access to these programs was also uneven, with participation concentrated among certain MSME groups while remaining limited in more remote areas. Administrative barriers, including complex registration procedures, stringent eligibility requirements, and limited participation incentives, further reduced MSME engagement. In addition, low levels of digital literacy, particularly among older MSME owners, together with limited internal motivation, weakened their ability to adapt to an increasingly competitive digital ecosystem, consistent with previous studies emphasizing the importance of digital capabilities and organizational readiness for successful MSME digital transformation. (Darmawan, Hanif, et Sriwardiningsih 2026b; Amir, Hamzah, et Maelah 2024; Setiawan et al. 2025)

Policy effectiveness is also constrained by structural and governance-related factors. Inaccurate and incomplete MSME databases often result in poorly targeted programs, while limited transparency and information dissemination create perceptions of exclusivity. Digital transformation policies remain fragmented and insufficiently integrated across stakeholders, further compounded by weak coordination, limited implementation capacity, and shortages of both the quantity and professionalism of human resources. Political dynamics and policy inconsistency resulting from changes in leadership also undermine program continuity, causing several initiatives to stall at an early stage without systematic follow-up. In addition, budget constraints limit the scope of policy interventions, preventing many mentoring programs from being implemented on a sustained basis.

From the perspective of the digital ecosystem, MSMEs also face external pressures in the form of relatively high platform costs and intense competition among online marketplaces, which reduce profit margins and require continuous innovation in promotional strategies. The ongoing digitalization process was perceived as insufficiently comprehensive, as it primarily focused on transferring conventional procedures to digital platforms without fundamentally redesigning existing business processes. Unsustainable programs, weak evaluation mechanisms, and the absence of measurable performance indicators indicate that the policy's implementation capacity has not yet been able to translate the digitalization agenda into substantive changes at the MSME level. This finding is consistent with previous studies emphasizing that the effectiveness of digital transformation depends on continuous evaluation mechanisms and the ability of policies to adapt to changing implementation conditions (Taherdoost 2026). Overall, the "less effective" category reflects a gap between policy capacity and the operational realities faced by MSMEs in navigating digital transformation.

Authority

The actors dimension indicates that the implementation of MSME digital transformation in Lhokseumawe involves a diverse configuration of stakeholders with relatively well-defined roles. The local government, through the Department of Tourism, the Department of Communication and Information (Diskominfo), and the Department of Industry, Trade, Cooperatives, and MSMEs (Disperindagkop), is responsible for formulating policies, facilitating programs, and providing supporting infrastructure.

State-owned enterprises and the banking sector contribute financial support, technological access, and promotional assistance, while supporting institutions, such as Rumah BUMN and MSME communities, provide training and technical guidance. Non-governmental organizations, including Islamic Relief, also contribute through collaborative programs focused on productive economic empowerment. At the local level, institutions such as the Lhokseumawe MSME Center and the Family Empowerment and Welfare Movement (TPPKK) facilitate networking, promotional activities, and community support to enhance the visibility of MSME products.

Nevertheless, the findings indicate that the authority held by the actors has not yet been fully translated into effective policy implementation. Several promotional initiatives and cross-sector collaborations remain limited to conceptual discussions or small-scale projects with uncertain sustainability. Some government agencies were perceived as insufficiently active in consistently supporting digital transformation programs, while the role of the Family Empowerment and Welfare Movement (TPPKK) as a channel for community-based promotion has not been fully utilized. Although efforts have been made to integrate funding between the city government and non-governmental organizations (NGOs) for productive economic development projects, their scale and impact remain limited. These findings suggest that the actors dimension is shaped not only by the formal distribution of roles but also by the effectiveness of coordination, consistency of implementation, and institutional commitment among stakeholders, as emphasized in previous studies on collaborative governance and policy implementation (Nabatchi et Emerson 2021).

Classification of Barriers

Structural Barriers

Based on the identification of existing policies, this study classifies the problems associated with MSME digital transformation into two main dimensions: structural/ and cultural. The structural dimension encompasses various external and systemic factors that hinder the digitalization process of MSMEs, as presented in Table 3. These factors are generally beyond the direct control of MSME owners.

Table 3. Types of Structural Barriers

No	Structural Barrier	Analytical Findings
1	Limited knowledge access	Knowledge transfer is not sustainable.
2	Unequal access	MSMEs in remote areas have difficulty accessing digitalization programs.
3	Digital platform costs	Advertising and subscription fees on platforms are burdensome.
4	Invalid MSME data	Weak data collection.
5	Political dynamics	Programs change following leadership transitions.
6	Non-integrated policies	Lack of coordination between agencies.
7	Limited budget	Funds are insufficient for extensive mentoring.
8	Low implementer performance	Mentors lack competence.
9	Low policy consistency	Programs are sporadic and unsustainable.
10	Limited implementer human resources	Number of mentors does not match demand.
11	Low digital literacy	MSMEs struggle to use online applications.

No	Structural Barrier	Analytical Findings
12	Limited access in remote areas	Digital infrastructure is uneven.
13	Limited information availability	Program dissemination is weak.
14	Complicated registration	Administrative procedures reduce participation.
15	Unsustainable programs	Many programs stop after project completion.
16	Lack of incentives	MSMEs are reluctant to undergo digital transformation.

Source: Compiled by the authors (2026)

Based on the discussion presented in Table 3, structural barriers reflect systemic weaknesses in policy formulation, institutional capacity, and resource availability. These conditions may further widen disparities in access to digital technologies and hinder the acceleration of MSME digital transformation (Maharani, Noerlina, et Nadira 2024).

Cultural Barriers

In addition to structural barriers, MSME digital transformation also faces various challenges stemming from the cultural aspects of business actors. These challenges include behaviors, habits, and mindsets that influence MSMEs’ readiness to adopt digital technologies. Although digital infrastructure is available, some MSMEs still face difficulties in adopting digital technologies due to limited digital literacy, age-related factors, and low motivation to transform. Table 4 presents the various forms of cultural barriers faced by MSMEs in greater detail.

Table 4. Barriers in The Cultural Dimension

No	Cultural Barrier	Analytical Findings
1	Advanced age	Senior MSME actors have difficulty adapting to technology.
2	Low MSME motivation	Many are comfortable with conventional methods.
3	Intense inter-platform competition	Digital competition is high.
4	Incomplete transformation	Digitalization is limited to formality.
5	Lack of coordination	MSME communities are not yet synergized.
6	Not meeting qualifications	Many MSMEs do not meet digital market standards.
7	Misaligned targeting	Programs do not match the specific needs of MSMEs.
8	Lack of transparency	Program implementation is unclear, leading to distrust.

Source: Compiled by the authors (2026)

Table 4 shows that cultural barriers are associated with internal factors among MSME actors, particularly in terms of behavior, mindset, and the ability to adapt to change. These barriers occur at the individual level and include limited digital literacy, age-related factors, and low motivation to adopt digital technologies. Overall, these factors reflect variations in MSMEs’ readiness to respond to the digital transformation process.

Discussion

Interaction between Structural and Cultural Factors in the Implementation of MSME Digital Transformation Policy

The findings indicate that the implementation of MSME digital transformation policy in Lhokseumawe City is influenced not only by structural and cultural barriers as separate dimensions but, more importantly, by the reinforcing interaction between them. Based on the analysis using the Context, Orientation, Power, and Authority (COPA) framework, structural barriers shape the capacity of the policy system to provide digitalization support, while cultural barriers influence MSMEs’ readiness and responses to the various interventions provided by the government. Thus, the success of policy implementation depends not only on the availability of digitalization programs but also on the government’s capacity to manage the relationship between institutional capacity and changes in MSMEs’ behavior.

The findings indicate that various structural barriers, including limited access to information, disparities in digital infrastructure, inaccurate MSME data, budget constraints, inconsistent policies, and weak inter-institutional coordination, have limited the ability of digitalization programs to reach MSMEs evenly. This finding is consistent with (Naayif et al. 2026; Tindaon et Banurea 2026; Sathyanarayana et al. 2026; Maharani, Noerlina, et Nadira 2024), which shows that disparities in technology adoption among MSMEs remain associated with limitations in skills, resources, and policy support. On the other hand, low levels of digital literacy, limited motivation to pursue transformation, resistance to change, and low confidence in the benefits of technology have resulted in the various facilities provided by the government not being fully utilized. This finding is consistent with research on MSMEs in Indonesia, which identifies limited resources, digital skills, and environmental factors as barriers to digital transformation readiness (Abdi et al. 2022; B. Hartono et al. 2021b; Kurniawati, Kohar, et Pirzada 2022). Based on the foregoing discussion, the findings indicate that structural and cultural barriers do not operate as two separate issues but interact with each other, forming a mechanism that shapes the dynamics of MSME digital transformation policy implementation.

These interactions are reflected in several patterns identified in this study, as presented in Table 5.

Table 5. Interaction of Structural and Cultural Barriers in MSME Digital Adoption

Structural Barrier Cluster	Cultural Barrier Cluster	Interaction Pattern	Impact
Limited knowledge access, weak outreach, invalid MSME data	Low digital literacy, senior age factor, failure to meet digital standards	Capacity-information mismatch	MSMEs struggle with digital adoption
Unequal access, limited digital infrastructure in remote areas	Weak community coordination, low motivation	Geographic-social exclusion	Rural MSMEs remain marginalized
High platform costs, budget constraints, lack of incentives	Low motivation, intense inter-platform competition	Cost-motivation trap	Delayed or limited adoption
Political dynamics, non-integrated policies, low policy consistency, non-sustainable programs	Non-comprehensive change, lack of transparency, misaligned targeting	Policy-trust gap	Unsustainable digital transformation
Low implementer performance, limited workforce, complex registration procedures	Low motivation, procedural resistance	Capacity-engagement gap	Limited program impact

Source: Compiled by the authors (2026)

First, limited access to information and mentoring constrains MSMEs' ability to acquire knowledge about digital technologies, thereby contributing to the persistence of low levels of digital literacy. Second, high costs associated with using digital platforms, such as marketplace administration fees, combined with low levels of business owners' motivation, encourage some MSMEs to delay or even refrain from adopting digital technologies. Third, poorly integrated policies and inaccurate MSME databases limit the extent to which various programs can be effectively targeted. These conditions contribute to a perception among some MSME actors that digitalization programs are more oriented toward administrative requirements than toward providing tangible benefits for business development. This perception may subsequently reduce MSME participation in government programs and affect the effectiveness of policy implementation.

These findings indicate that the implementation of digital transformation policy occurs within a reinforcing loop. Weaknesses in structural aspects intensify cultural barriers, while cultural barriers further reduce the effectiveness of government policies. In other words, implementation challenges are not solely attributable to inadequate infrastructure or low levels of digital literacy but result from the interaction between institutional weaknesses and actor behavior that develops simultaneously throughout the policy implementation process.

These findings extend the studies by Brink & Packmohr (2023) and Chen et al (2024), which emphasize the importance of infrastructure, regulatory support, and institutional capacity in advancing MSME digital transformation. Consistent with these studies, this research confirms that structural support constitutes an important foundation for the digital transformation process. However, this study further demonstrates that the effectiveness of such support is closely related to the cultural readiness of MSME actors. The provision of infrastructure, training, and incentive policies does not necessarily result in sustained digital adoption when MSME actors continue to face limited digital literacy, low motivation, or limited trust in government interventions.

These findings also complement the studies by Restrepo-Morales et al., (2024) and Ueasangkomsate (2025) which identify digital literacy and resistance to change as important barriers to technology adoption. Rather than viewing these cultural factors as independent barriers, this study demonstrates that cultural barriers are also associated with the conditions of policy implementation. Low motivation, limited participation, and low acceptance of digitalization may develop in the context of inconsistent or inadequate policy support. Therefore, the findings indicate that structural and cultural factors should not be understood as separate determinants but as two interconnected dimensions of the policy implementation system, in which each can reinforce the influence of the other.

The main contribution of this study to the public policy literature lies in demonstrating that the dichotomy between structural and cultural barriers is insufficient to explain the complexity of MSME digital transformation policy implementation. Previous studies have generally examined these two dimensions separately, whereas this study shows that they interact with and reinforce each other, forming a reinforcing mechanism throughout the policy implementation process. This interaction contributes to partial, uneven, and unsustainable policy implementation. These findings extend the understanding of digital transformation policy implementation by positioning the relationship between institutional capacity and actor behavior as an integral part of policy effectiveness.

Based on these findings, Research Question 1 can be answered by stating that the implementation of MSME digital transformation policy in Lhokseumawe City is shaped by the reciprocal interaction between structural and cultural barriers. Structural barriers constrain the government's capacity to provide an enabling environment for digitalization, while cultural barriers influence MSMEs' acceptance and utilization of various policy interventions. These two dimensions do not operate independently but reinforce each other, ultimately resulting in partial, uneven, and unsustainable policy implementation. Therefore, the findings indicate that effective policy implementation is closely associated with the capacity of policies to respond simultaneously to structural and cultural dynamics.

Adaptive Policy Model for MSMEs Digital Transformation

This study proposes the Adaptive Policy Model for MSME Digital Transformation as a cyclical policy framework that is responsive to evolving conditions in the field. This approach is consistent with the adaptive policy perspective, which views policy as an ongoing process that requires continuous adjustment in response to changing contexts, learning, and uncertainty during implementation (Nugroho 2026a; Coco, Colapinto, et Finotto 2024). In the context of digital transformation, an adaptive approach is particularly relevant because technological changes and institutional conditions evolve dynamically, requiring governments to continuously adjust policies in response to changing circumstances (Nagarajan et al. 2026). The proposed model consists of four interconnected stages policy set-up, policy design, policy implementation, and monitoring and evaluation which together form a dynamic policy cycle. A visualization of the Adaptive Policy Model is presented in Figure 4.

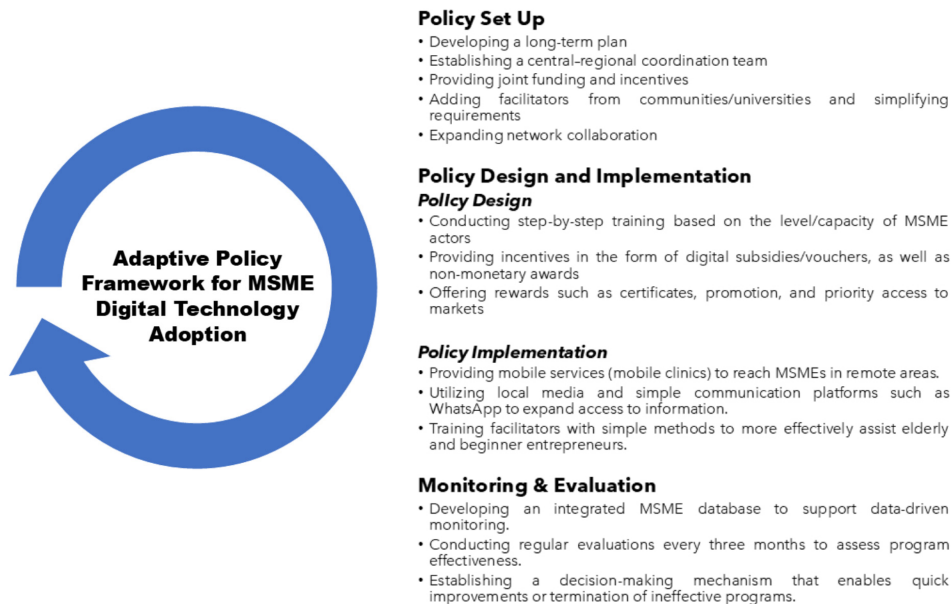


Figure 4. Visualization of the Adaptive Policy Model

Source: Compiled by the authors (2026)

Policy Set Up

The policy set-up stage focuses on establishing a strong, long-term institutional framework that is resilient to short-term political dynamics. An effective set-up should ensure effective coordination across levels of government and among relevant actors. This approach is consistent with (Salamanca-Cano et Durán-Díaz 2023), who argue that collaboration and the involvement of diverse stakeholders, including public organizations, the private sector, and civil society, are essential for effective policy implementation. Several key measures are required at this stage: developing a long-term strategic plan that ensures policy continuity across leadership transitions; establishing inter-agency coordination teams to strengthen synergies and avoid program duplication; providing joint funding mechanisms and incentives to encourage active participation; involving additional facilitators from local communities and higher education institutions; simplifying regulatory requirements to facilitate broader MSME participation; and establishing partnerships with various stakeholders to expand support networks for MSMEs.

Policy Design and Policy Implementation

The policy design stage focuses on formulating policy interventions that correspond to the actual needs of MSME actors. An appropriate policy design can enhance the effectiveness and relevance of programs for diverse groups of MSMEs. (Bouckaert, Peters, et Verhoest 2022; Azis 2024). Several measures should be undertaken at this stage, including developing tiered training curricula based on the capacity levels of MSME actors, providing incentives in the form of subsidies and digital vouchers to reduce cost barriers, and offering non-monetary rewards, such as certificates, promotional opportunities, and priority access to markets, to provide non-financial motivation.

The Policy Implementation stage addresses several factors that have contributed to shortcomings in previous policy implementation, including limited access to information, inappropriate training methods, and limited digital literacy among older MSME actors. Adaptive implementation should therefore emphasize the principles of accessibility, simplicity, and inclusiveness (Nugroho 2026b). At this stage, several measures should be undertaken, including providing mobile services to reach MSMEs in remote areas, utilizing local media and simple communication platforms such as WhatsApp to expand access to information, and training facilitators using simple methods to enable them to provide more effective support to elderly and novice MSME actors.

Monitoring and Evaluation

The monitoring and evaluation (M&E) stage serves as a feedback mechanism to ensure that policies remain relevant to changing conditions on the ground. This approach is consistent with (Prutsch et al. 2014) and (Jacobson et al. 2014), who emphasize that effective adaptive management depends on systematic monitoring and evaluation. Several measures should be undertaken at this stage, including: developing an integrated MSME database to support data-driven monitoring, conducting quarterly evaluations to assess program effectiveness, and establishing decision-making mechanisms that enable timely adjustments or the discontinuation of programs that are not performing effectively.

Conclusion

This study aims to analyze how structural and cultural factors interact in the implementation of MSME digital transformation policy in Lhokseumawe City and to formulate an adaptive policy model capable of addressing these challenges. The findings indicate that the implementation of MSME digital transformation policy is influenced not only by structural and cultural barriers independently but also by the dynamic interaction between the two. Structural barriers, including policy fragmentation, unequal access to digital infrastructure, limited institutional capacity, and weak inter-agency coordination, reduce the effectiveness of policy implementation. Meanwhile, cultural barriers, including low digital literacy, resistance to change, and limited motivation among MSME actors, further constrain the effectiveness of digitalization programs. The interaction between these two dimensions results in MSME digital transformation that remains partial, uneven, and unable to generate sustained digital adoption.

Based on these findings, this study develops an Adaptive Policy Model consisting of three main components: policy set-up, policy design and implementation, and monitoring and evaluation. Unlike previous studies that generally examine structural and cultural barriers separately, the model developed in this study integrates both dimensions into a single adaptive policy framework. The model enables policies to be continuously adjusted in response to changes in the implementation context, institutional capacity, and the behavioral dynamics of MSME actors.

Theoretically, this study contributes to the public policy literature by demonstrating that the success of MSME digital transformation depends not only on the availability of technology or digital infrastructure but also on the government's capacity to design policies that are adaptive, integrated, and responsive

to the interaction between structural and cultural factors. These findings extend the understanding of digital transformation policy implementation from a technology adoption-oriented approach toward an approach that emphasizes policy adaptation in addressing the complexity of implementation at the local level. Practically, the proposed adaptive policy model can serve as a reference for local governments in designing more inclusive, coordinated, and sustainable MSME digital transformation programs. Although this study focuses on the context of Lhokseumawe City, the proposed model has the potential to be adapted to other regions facing similar challenges. Future research should examine the application of this model across different institutional and regional contexts to further strengthen its validity and generalizability.

Research Limitations

This study has several limitations that should be considered in future research. First, the empirical scope is limited to the Lhokseumawe area, so the findings cannot yet be generalized to regions with different socio-economic characteristics and levels of digital infrastructure. Second, the proposed adaptive policy model remains conceptual and has not been empirically tested to measure the effectiveness of its implementation in practice.

Future Research Agenda

Future studies should expand the geographical scope of the research to examine whether the findings remain consistent across different socio-economic contexts and levels of digital infrastructure, thereby strengthening the model's external validity. In addition, the proposed adaptive policy model, which is still conceptual, needs to be tested empirically through quantitative or mixed-method approaches to assess its effectiveness and sustainability in real implementation contexts.

Data Availability Statement

The data used to support the findings of this research are available from the corresponding authors upon request.

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Maryam, Aiyub, Maisyura, Marzuki, Nila Safrida

ADAPTYVUSIS POLITIKOS MODELIS TVARIOMS MVĮ SKAITMENINĖMS PERTVARKOMS: LHOKSEUMAWA MIESTO (INDONEZIJA) ATVEJIS

Anotacija. Skaitmeninė transformacija tapo strateginiu prioritetu, siekiant didinti mažų ir vidutinių įmonių (MVĮ) konkurencingumą ir tvarumą. Tačiau skaitmeninės transformacijos politikos įgyvendinimas įvairiuose regionuose vis dar pasižymi daliniu ir netolygiu jos diegimu. Ankstesniuose tyrimuose dažniausiai atskirai nagrinėtos struktūrinės kliūtys, tokios kaip infrastruktūros trūkumas, reglamentavimo problemos ir institucinis pajėgumas, arba kultūrinės kliūtys, tokios kaip žemas skaitmeninis raštingumas, motyvacijos stoka ir pasipriešinimas pokyčiams. Todėl pateiktos politikos rekomendacijos nepakankamai paaiškina, kaip šios dvi dimensijos sąveikauja įgyvendinant politiką. Šio tyrimo tikslas – išanalizuoti struktūrinių ir kultūrinių veiksnių sąveiką įgyvendinant MVĮ skaitmeninės transformacijos politiką ir sukurti adaptyviosios politikos modelį, skirtą MVĮ skaitmeninėms pertvarkoms Lhokseumavės mieste (Indonezija) remti. Tyrime taikytas kokybinis požiūris ir atvejo analizės metodas. Tyrime dalyvavo 47 tikslingai atrinkti informantai, įskaitant MVĮ atstovus, vietos valdžios pareigūnus, akademinės bendruomenės atstovus, finansų institucijų atstovus, įstatymų leidėjus, bendruomenės narius, vartotojus ir žiniasklaidos atstovus. Duomenys buvo renkami atliekant išsamius interviu, stebėjimą ir dokumentų analizę, o vėliau analizuojami naudojant „NVivo 12“ programinę įrangą. Tyrimo rezultatai rodo, kad skaitmeninės pertvarkos politikos įgyvendinimui įtakos turi tarpusavyje stiprinanti struktūrinių ir kultūrinių kliūčių sąveika. Struktūrinės kliūtys apima politikos fragmentaciją, netolygų prieinamumą prie skaitmeninės infrastruktūros, silpnus institucinius gebėjimus ir nepakankamą institucijų tarpusavio koordinavimą, o kultūrinės kliūtys – žemą skaitmeninį raštingumą, pasipriešinimą pokyčiams ir silpną MVĮ atstovų motyvaciją. Ši sąveika lėmė dalinį, netolygų ir netvarų skaitmeninių technologijų diegimo procesą. Remiantis šiais rezultatais, tyrime sukurtas adaptyvusis politikos modelis, apimantis tris tarpusavyje integruotas stadijas – politikos parengimą, politikos projektavimą ir politikos įgyvendinimą, taip pat stebėseną ir vertinimą. Modelyje pabrėžiama institucijų koordinavimo stiprinimo, ilgalaikio planavimo, MVĮ gebėjimams pritaikytų intervencijų, įtraukiojo įgyvendinimo ir duomenimis grindžiamo vertinimo, kaip politikos mokymosi mechanizmo, svarba. Šie rezultatai papildo viešosios politikos įgyvendinimo tyrimus, sukuriant adaptyvųjį politikos modelį, kuris gali būti naudojamas kaip orientyras vietos valdžios institucijoms formuojant veiksmingesnę ir tvaresnę MVĮ skaitmeninės pertvarkos politiką.

Maryam – Senior Lecturer, Department of Public Administration, Faculty of Social and Political Sciences, Universitas Malikussaleh, Indonesia.

E-mail: maryammar@unimal.ac.id

Aiyub – Senior Lecturer, Department of Public Administration, Faculty of Social and Political Sciences, Universitas Malikussaleh, Indonesia.

E-mail: drs.aiyub@unimal.ac.id

Maisyura – Lecturer, Department of Management, Faculty of Social and Political Sciences, Universitas Malikussaleh, Indonesia.

E-mail: maisyura@unimal.ac.id

Marzuki – Student, Department of Public Policy and Management, Faculty of Social and Political Sciences, Gadjah Mada University, Indonesia.

E-mail: marzuki2000@mail.ugm.ac.id

Nila Safrida – Student, Department of Public Policy and Management, Faculty of Social and Political Sciences, Gadjah Mada University, Indonesia.

E-mail: nilasafrida@mail.ugm.ac.id

Maryam – vyresnioji lektorė, Viešojo administravimo katedra, Socialinių ir politinių mokslų fakultetas, Malikussaleh universitetas, Indonezija.

El. paštas: maryammar@unimal.ac.id

Aiyub – vyresnysis lektorius, Viešojo administravimo katedra, Socialinių ir politinių mokslų fakultetas, Malikussaleh universitetas, Indonezija.

El. paštas: drs.aiyub@unimal.ac.id

Maisyura – lektorė, Vadybos katedra, Socialinių ir politinių mokslų fakultetas, Malikussaleh universitetas, Indonezija.

El. paštas: maisyura@unimal.ac.id

Marzuki – studentas, Viešosios politikos ir vadybos katedra, Socialinių ir politinių mokslų fakultetas, Gadjah Mada universitetas, Indonezija.

El. paštas: marzuki2000@mail.ugm.ac.id

Nila Safrida – studentė, Viešosios politikos ir vadybos katedra, Socialinių ir politinių mokslų fakultetas, Gadjah Mada universitetas, Indonezija.

El. paštas: nilasafrida@mail.ugm.ac.id

