ICMEM

The 9th International Conference on Management in Emerging Markets

Conceptual Model of Banyumas MSME Resilience Against Contemporary Business Model Disruption

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Abstract *- Micro, Small, and Medium Enterprises (MSMEs) in Banyumas face increasing disruption due to the emergence of modern business models driven by digital transformation. This study aims to develop a conceptual framework that enhances MSME resilience by identifying key adaptation strategies using a system dynamics approach. By mapping feedback loops through Causal Loop Diagrams (CLDs), the research identifies critical factors such as digital literacy, strategic partnerships, and technology investment that reinforce resilience. The study also highlights barriers like limited infrastructure and public digital literacy, which hinder transformation. Through system dynamics conceptual model, the model evaluates potential interventions including training programs, policy incentives, and collaborative ecosystems. The research lays a foundation for a predictive system dynamics model, guiding policymakers and stakeholders toward sustainable MSME development in Banyumas. Future stages will involve empirical validation, AI integration, and real-world implementation to build a decision-support tool that ensures adaptability amid digital disruption.*

Keywords *- MSMEs, Resilience, Modern Business Models, Digital Disruption, Business Adaptation.*

I. INTRODUCTION

Micro, Small, and Medium Enterprises (MSMEs) are a cornerstone of economic activity in Banyumas, playing a critical role in job creation, income distribution, and regional innovation [1]. However, the increasingly digital and globalized economic environment presents significant challenges to their sustainability [2]. Business models driven by data, technology, and evolving consumer behavior have disrupted traditional paradigms and forced MSMEs to innovate or risk marginalization [3].

Resilience in this context refers to the ability of MSMEs to foresee, respond to, and recover from disruptions while maintaining core operations and long-term competitiveness [4]. Key factors include financial agility, digital readiness, innovation, market diversification, and supply chain robustness [5]. In Banyumas, where many MSMEs are still reliant on manual processes and limited technological tools, this resilience is regularly tested by the acceleration of modern economic dynamics [6].

Disruptive forces such as e-commerce, automation, and platform-based economies require MSMEs to adopt digital tools and modern operational strategies [7].

Unfortunately, digital literacy, access to infrastructure, and limited regulatory support often hinder this transition. Hence, a structured framework is needed to guide MSMEs in developing their capacity to survive and thrive amid disruption. Modern business models prioritize efficiency, scalability, and customer-centric strategies, leveraging digital platforms, data analytics, automation, and e-commerce to enhance operational performance and extend market reach. Business frameworks such as platform-based economies (e.g., online marketplaces), subscription-based services, and gig economy structures have transformed conventional business transactions. While these innovations present opportunities for growth and collaboration, they simultaneously pose challenges for traditional MSMEs, particularly in areas such as digital literacy, financial constraints, and regulatory compliance.

The emergence of modern business models has engendered various forms of disruption that threaten MSME sustainability. Digital transformation has intensified competition, making it increasingly difficult for conventional MSMEs to compete with technology-driven enterprises. The expansion of e-commerce has diminished the relevance of brick-and-mortar establishments, necessitating MSME adaptation to online sales channels. Furthermore, automation and artificial intelligence have optimized production and service delivery, exacerbating efficiency disparities between traditional and technologically advanced businesses. Supply chain innovations, including just-in-time logistics and digital payment systems, further compel MSMEs to modernize their operations to remain competitive.

Given these pressing challenges, it is imperative to develop a conceptual model that elucidates the mechanisms through which Banyumas MSMEs can enhance their resilience against modern business disruptions. This study seeks to identify key resilience

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determinants, adaptation strategies, and policy recommendations aimed at equipping MSMEs with the necessary capabilities to navigate an increasingly dynamic business environment. A comprehensive understanding of resilience mechanisms will enable policymakers, business practitioners, and stakeholders to foster an inclusive and sustainable economic ecosystem for Banyumas MSMEs.

Previous studies have explored various strategies to enhance the resilience of Micro, Small, and Medium Enterprises (MSMEs) in Indonesia amidst modern business disruptions. For instance, research has identified digitalization as a critical factor, recommending MSMEs to adopt appropriatemdigital strategies to minimize failure risks and achieve successful digital transformation [5]. Additionally, the application of the OODA Loop concept—Observe, Orient, Decide, Act—has been suggested to help MSMEs navigate competitive business environments, particularly in the post-pandemic era [20]. Furthermore, empirical studies have highlighted the positive impact of digital transformation policies on MSME resilience, especially during economic disruptions [22]. However, there remains a gap in research specifically focusing on the development of a conceptual model tailored to the unique context of Banyumas MSMEs. Such a model would address their specific challenges and opportunities in enhancing resilience against modern business model disruptions. This study aims to fill this gap by proposing a comprehensive framework that considers local dynamics, cultural factors, and the specific needs of Banyumas MSMEs, thereby contributing to both academic literature and practical applications in regional economic development. This research proposal will focus on developing a conceptual model as a foundational framework for the subsequent development of a system dynamics model by identifying key resilience factors, and conducting preliminary data collection.

Then, From 2026 to 2030, the research will focus on refining and implementing a system dynamics model for Banyumas MSME resilience. In 2026, In 2026, a system dynamics model will be formulated by mapping causal relationships and defining key variables. In 2027, empirical data will be collected, and the model will be validated and calibrated using quantitative analysis. By 2028, simulations and scenario analyses will be conducted to test policy interventions and predict market disruptions. In 2029, the model will be implemented in real cases, with impact assessments guiding further refinements.

Finally, in 2030, AI and machine learning will be integrated to enhance predictive accuracy, along with the development of an interactive decision-support dashboard. This roadmap aims to create a data-driven, sustainable framework for strengthening Banyumas MSMEs against modern business disruptions. The track record of cooperation and collaboration that has been carried out together with our partner, namely ASPIKMAS, is in previous research related to the title A System Dynamics Approach to ERP Adoption in SMEs: A Case Study of Banyumas.

Moreover, community service activities have also been conducted in the form of training and mentoring on digital-based marketing strategies. The utilization of digital marketing strategies is currently essential for MSMEs to cope with increasingly intense competition. Lecturers and students provide insights on how to leverage social media and e-commerce to expand market reach and enhance sales potential for MSMEs.

This study aims to fill the research gap by proposing a conceptual model that reflects the specific challenges and opportunities of Banyumas MSMEs, building upon system dynamics to analyze and simulate resilience strategies [8].

II. LITERATURE REVIEW

Enterprise Resource Planning (ERP) systems are increasingly viewed as essential digital infrastructure for SMEs, enabling streamlined business processes, real-time decision-making, and strategic planning [12], [13]. However, ERP adoption in developing countries is hindered by high costs, limited digital skills, and change resistance [14], [15]. Previous studies emphasize organizational readiness, leadership support, and external institutional aid as key enablers of ERP success [16], [17].

System Dynamics has proven effective in modeling complex decision-making environments, offering insights into feedback structures and policy interventions [18], [19]. The use of Causal Loop Diagrams (CLDs) provides clarity in understanding how reinforcing and balancing loops affect ERP adoption and resilience-building [20]. Research conducted in Banyumas demonstrated the potential of CLDs to capture ERP dynamics tailored to local SME conditions [21].

Beyond ERP, MSME resilience is linked to digital literacy, adaptive leadership, and market diversification [22]. Evangelista et al. stressed the significance of digital transformation in strengthening business sustainability [23]. Ratinawati et al. highlighted the OODA Loop as a strategy for MSME agility post-pandemic [24], while Syakoer et al. pointed to the role of digital policy in fostering SME robustness during economic disruption [25].

Despite existing frameworks, limited research addresses MSME resilience using an integrated system dynamics model grounded in regional context. This study fills this gap by proposing a framework specific to Banyumas.

III. METHODOLOGY

This research adopts the System Dynamics methodology, a modeling approach suitable for understanding complex feedback-driven systems such as MSME adaptability [9]. Specifically, the study utilizes Causal Loop Diagrams (CLDs) to map the reinforcing and balancing feedback loops that affect resilience.

Primary data collection involved semi-structured interviews with MSME actors, local policymakers, and digital ecosystem enablers, a method proven effective for gathering qualitative insights into organizational behavior [10]. Secondary data includes literature, and government reports relevant to MSME resilience, digital transformation, and regional development [1], [3].

The initial mental model was built by synthesizing expert knowledge and empirical findings. Similar approaches have been successfully applied to map ERP and technology adoption in other MSME settings [9]. This mental model was then converted into a CLD using Vensim PLE, a widely used tool for system dynamics modeling [11].

Model validation was conducted through Focus Group Discussions (FGDs) involving stakeholders from academia, government, and business communities. The CLD structure was revised iteratively to reflect real-world dynamics observed in Banyumas [12]. In subsequent phases (2026–2030), simulation, calibration, implementation, and AI integration are planned to make the model more predictive and decision-supportive.

Validation of the CLD was conducted through Focus Group Discussions (FGDs) with SME representatives, industry professionals, and academic researchers. These discussions ensured that the model accurately reflected systemic dynamics and interdependencies among variables, thereby enhancing its reliability for further analysis. The validation process also involved iterative refinements of feedback structures and causal linkages based on expert inputs, aligning the model with observed patterns of SME resilience.

The final CLD was employed to simulate various resilience-building scenarios, enabling an assessment of potential interventions. For example, the model explored the impact of financial aid programs, digital literacy training, and adaptive business strategies in strengthening SME resilience and mitigating barriers to modernization. These simulations provided actionable insights into effective strategies for fostering SME adaptability and sustainability in contemporary business landscapes.

To support the construction and analysis of the CLD, this study utilized tools such as Vensim PLE, which facilitated the visualization of feedback loops and the identification of key leverage points within the system. Through these analyses, the study not only captures the systemic complexities of SME resilience but also offers a foundation for formulating well-informed policy recommendations.

In conclusion, applying the CLD methodology is expected to provide a comprehensive understanding of the causal relationships influencing SME resilience. By identifying key reinforcing and balancing feedback loops, this study aims to propose actionable policy recommendations, such as targeted financial incentives and capacity-building initiatives, to enhance SME adaptability in the face of modern business model transformations. This modeling effort is expected to provide policy insights and strategic recommendations aligned with prior findings on the critical importance of digital transformation for SME survival and resilience [4], [10].

IV. FINDINGS AND DISCUSSION

A. SYSTEM STRUCTURE OVERVIEW

To understand the dynamic behavior of MSMEs in response to digital disruption, a system structure model was developed. This model outlines the interaction between external environmental forces, policy interventions, internal enterprise dynamics, and stakeholder roles, serving as the foundation for identifying feedback mechanisms discussed in the subsequent causal loop analysis (Figure 1). The system is organized into five key domains:

1. External Factors

This domain encompasses macro-environmental forces that shape the readiness and urgency of MSMEs to adapt. These include:

- Level of technological disruption: The pace at which digital technologies displace traditional business models.
- Consumer behavior shift to digital platforms: Changes in customer preferences demanding online engagement.
- Public digital literacy rate: The community's baseline digital competency, affecting both demand and support ecosystems.
- Access to financing and local digital infrastructure, which act as enabling or limiting conditions for transformation.

2. Policy Intervention

Policy serves as a catalyst for system change. The Ministry and supporting institutions may apply various levers, such as:

- Digital literacy and training programs
- Digital transformation incentives (e.g., technology subsidies, software access)
- Financial access support for working capital
- Strategic partnerships with e-commerce platforms and tech providers

These interventions aim to remove structural bottlenecks, enable access to resources, and stimulate internal process change within MSMEs.

3. Process Structure

This core system component reflects how MSMEs operate and evolve. The process structure includes:

- Digital adoption behavior
- Participation in digital markets
- Revenue and productivity generation
- Financial flexibility and resilience building
- Technology investment decisions

These elements interact as dynamic processes, evolving over time based on internal capacity and external incentives.

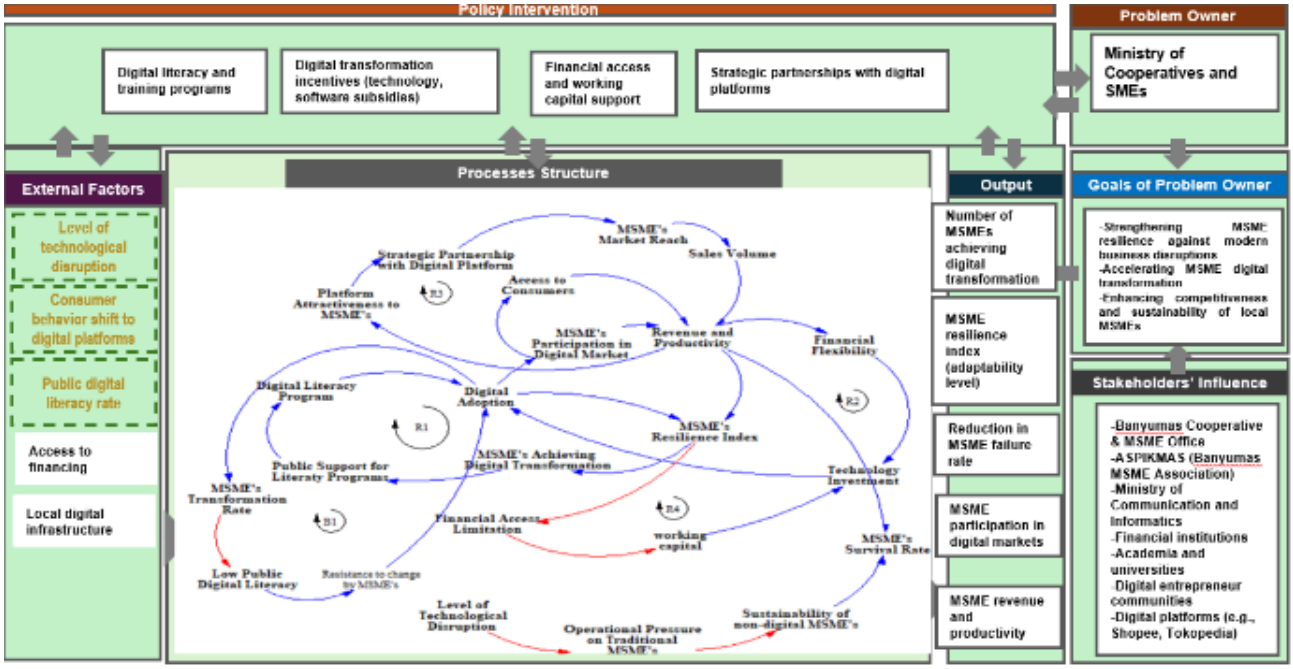

Figure 1 System structure model of interaction between external environmental forces, policy interventions, internal enterprise dynamics, and stakeholder roles.

4. Output Indicators

To assess the success of interventions and adaptations, the following output metrics are monitored:

- Number of MSMEs achieving digital transformation
- MSME resilience index (adaptability level)
- Reduction in failure rate
- MSME participation in digital markets
- Growth in MSME revenue and productivity

These outputs serve as both performance indicators and feedback signals for policy adjustment.

5. Stakeholder Influence and Governance

Aside from the Ministry, other influential stakeholders include:

- Banyumas Cooperative and MSME Office
- ASPIKMAS
- Ministry of Communication and Informatics
- Financial institutions
- Academic institutions
- Digital entrepreneurs and e-commerce platforms

These actors contribute through funding, policy advocacy, infrastructure provision, knowledge transfer, and market access.

B. PROBLEM OWNER AND STRATEGIC OBJECTIVES

The primary problem owner in this study is the Ministry of Cooperatives and SMEs of Indonesia, which plays a central role in driving national strategies for MSME development, resilience, and digitalization. The Ministry's position is reinforced by its authority to coordinate stakeholders, implement policy interventions, and allocate resources. At the regional level, local institutions such as the Banyumas Cooperative Office and ASPIKMAS (Banyumas MSME Association) are also crucial actors in operationalizing national policies and engaging directly with MSMEs on the ground.

The goals of the problem owner in this context include:

- Strengthening MSME resilience against business disruptions brought by modern digital transformation.
- Accelerating digital adoption and transformation among local MSMEs.
- Enhancing competitiveness and sustainability of MSMEs through systemic support and inclusive innovation.

These goals form the basis for the system structure and policy intervention strategies analyzed in this study.

C. SYSTEMIC INTERDEPENDENCIES

The system diagram reveals strong interdependencies between domains. For example, shifts in consumer behavior may create demand-side pressure on MSMEs, while inadequate digital literacy can hinder supply-side readiness. These forces converge within the process structure, where MSMEs either adapt—through digital transformation—or stagnate due to structural and behavioral barriers.

System dynamics thinking is essential here, as the consequences of one variable (e.g., improved public literacy) may ripple across other components (e.g., transformation rate, platform engagement). While the structure outlines "what" is connected, it does not explain "how" these elements evolve over time.

Stakeholders in Banyumas who contributed valuable insights and data throughout the research process.

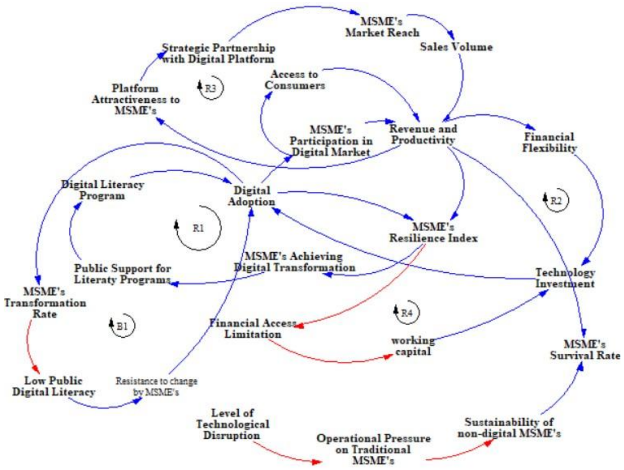

Figure 2

This section presents the findings derived from the development of a Causal Loop Diagram (CLD) that maps the systemic dynamics influencing the resilience of MSMEs (Micro, Small, and Medium Enterprises) in Banyumas Regency amid modern business disruptions. The model reveals several interrelated variables and feedback structures—both reinforcing and balancing—that shape MSMEs' capacity to adapt and transform in the digital era.

1. Reinforcing Feedback Structures

R1 – Digital Literacy Loop

The first reinforcing loop (R1) illustrates the impact of digital literacy initiatives on MSME transformation. Government and institutional investments in digital literacy programs increase public support and awareness, which in turn promotes digital adoption among MSMEs. As more MSMEs successfully undergo digital transformation, they contribute to positive perceptions of literacy programs, leading to continued and expanded program implementation.

Pathway:

Digital Literacy Program → Public Support for Literacy Programs → Digital Adoption → MSMEs Achieving Digital Transformation → MSMEs' Transformation Rate → Digital Literacy Program

This loop underscores the importance of capacity building and digital education as a driver of sustained digital engagement within local MSME ecosystems.

R2 – Market Participation and Financial Resilience Loop

Reinforcing loop R2 highlights the economic dimension of resilience. MSMEs that participate in digital markets gain access to broader consumer bases, leading to increased revenue and productivity. This improved financial performance enhances financial flexibility, enabling investments in digital technologies. These investments strengthen overall resilience and further promote digital adoption.

Pathway:

MSMEs Participation in Digital Market → Revenue and Productivity → Financial Flexibility → Technology Investment → MSMEs' Resilience Index → Digital Adoption → MSMEs Participation in Digital Market

The loop suggests a self-reinforcing cycle in which digital participation and financial capability feed each other, creating momentum toward resilience and competitiveness.

R3 – Strategic Partnership Loop

Loop R3 captures the strategic importance of partnerships between MSMEs and digital platforms (e.g., e-commerce providers). These partnerships increase platform attractiveness, which enhances MSMEs' market reach. Expanded reach leads to increased sales volumes and revenues, improving productivity and resilience. Higher resilience levels, in turn, further strengthen the value and engagement in digital partnerships.

Pathway:

Strategic Partnership with Digital Platforms → Platform Attractiveness to MSMEs → MSMEs' Market Reach → Sales Volume → Revenue and Productivity → MSMEs' Resilience Index

This loop illustrates how collaboration and ecosystem-based strategies amplify digital performance and resilience among MSMEs.

R4 – Capital and Survival Loop

Loop R4 emphasizes the role of resilience in enabling access to capital and technological upgrades. Higher resilience levels improve MSMEs' survival rates, which enhances their ability to maintain or acquire working capital. This capital facilitates further investments in digital technology, thereby boosting digital adoption and transformation.

Pathway:

MSMEs' Resilience Index → MSMEs' Survival Rate → Working Capital → Technology Investment → Digital Adoption → MSMEs Achieving Digital Transformation → MSMEs' Resilience Index

This feedback mechanism explains how enterprise-level adaptation leads to systemic improvements in survival and innovation capacity.

2. Balancing Feedback Structures

B1 – Literacy Constraint Loop

The only identified balancing loop (B1) illustrates how low levels of public digital literacy can act as a barrier to transformation. When digital literacy in the community is low, MSMEs exhibit greater resistance to change. This resistance hampers digital adoption and slows the rate of transformation across the sector.

Pathway:

Low Public Digital Literacy → Resistance to Change by MSMEs → Digital Adoption → MSMEs Achieving Digital Transformation → MSMEs' Transformation Rate

This loop acts as a constraint to the reinforcing loops. It highlights the need to address socio-cultural and educational barriers to ensure inclusive digital transformation.

External Disruption Pressure

Beyond the internal feedback loops, the CLD also incorporates the effects of external technological

disruption. A higher level of disruption increases operational pressure on traditional MSMEs. If they fail to adapt, their sustainability is threatened, ultimately lowering survival rates and resilience.

Pathway:

Level of Technological Disruption → Operational Pressure on Traditional MSMEs → Sustainability of Non-Digital MSMEs → MSMEs' Survival Rate → MSMEs' Resilience Index

This segment of the diagram illustrates the urgency of proactive adaptation in the face of evolving technological ecosystems.

3. Implications

The interplay between reinforcing and balancing loops emphasizes that resilience is not only a function of internal capability but also of system-level alignment among policy, infrastructure, partnerships, and market readiness. While digital transformation can be accelerated through policy interventions and strategic investments, overcoming inertia in low-literacy environments is essential to unlock the full potential of these feedback mechanisms.

4. Actor Analysis

The actor analysis identifies the key stakeholders involved in enhancing MSME resilience in Banyumas against the disruptions caused by modern business models. Each actor's role, perception of the problem, and strategic objectives are presented in Table 1. This analysis supports the development of a system structure model and highlights leverage points for policy and collaborative intervention.

Table 1 Actor's role, perception of the problem, and strategic objectives

Actor	Roles/Responsibilities	Problem Perception	Objectives
MSMEs (Micro, Small, and Medium Enterprises)	• Adopt digital technologies and modernize business operations- Participate in digital markets- Invest in innovation and productivity	• Lack of digital literacy • Financial limitations • Fear of failure and resistance to change	• Improve competitiveness and resilience • Enhance market access and adaptability through digital transformation
Ministry of Cooperatives and SMEs (Problem Owner)	• Develop and implement national strategies for MSME development- Provide policy guidance and national funding mechanisms	• Fragmented transformation efforts across regions • Inadequate digital infrastructure and support systems	• Strengthen MSME resilience nationally- Accelerate inclusive digital adoption and sustainable MSME growth
ASPIKMAS (Banyumas MSME Association)	• Coordinate training and mentoring • Bridge communication between MSMEs and policymakers • Advocate local MSME needs	• Low participation in digital programs • Limited access to promotional and support channels	• Empower MSMEs through capacity building and advocacy • Encourage platform-based and ecosystem-centric growth
Banyumas Cooperative Office	• Execute regional MSME development programs • Facilitate public • private collaboration • Monitor implementation of digital support policies	• Disconnection between policy design and ground execution • Uneven distribution of MSME support	• Align regional programs with national resilience objectives • Strengthen local infrastructure and support systems
Ministry of Communication and Informatics	• Expand digital infrastructure and connectivity • Promote digital inclusion and literacy campaigns	• Digital gap in rural MSME communities • Limited internet penetration and access to digital tools	• Improve digital readiness of MSMEs- Enable broad access to platforms and smart solutions
Financial Institutions	• Provide financial services and MSME loans- Support working capital and tech investment	• High perceived risk of MSMEs- Inadequate credit evaluation tools for digital business models	• Increase financial inclusion • Design flexible and MSME-friendly financial products
Digital Platform Providers (e.g., Shopee, Tokopedia)	• Offer access to national and global digital markets- Provide training and seller support services	• MSMEs lack knowledge to optimize platform features • Inconsistent digital engagement and performance	Improve MSME onboarding and retention • Strengthen MSME presence and performance on platforms

Actor	Roles/Responsibilities	Problem Perception	Objectives
Academic Institutions	• Conduct research and provide insights into MSME behavior- Support model validation and simulation	• Lack of data-driven policy design- Fragmented understanding of MSME dynamics	• Develop evidence-based frameworks and models- Assist stakeholders in adaptive and anticipative planning

D. EXPLANATION OF ACTOR DYNAMICS

MSMEs are the central actors in the system, directly affected by external pressures and internal capacity limitations. Their transformation is the ultimate goal of all interventions.

The Ministry of Cooperatives and SMEs functions as the central coordinating authority and problem owner, responsible for driving national strategies and aligning policy responses with local needs.

ASPIKMAS acts as a field-level facilitator and support system, strengthening the knowledge and readiness of MSMEs through direct engagement.

The Banyumas Cooperative Office ensures the implementation of interventions at the regional level, acting as a policy executor and integrator of localized support.

The Ministry of Communication and Informatics addresses infrastructure and digital literacy, both crucial enablers of technological adoption.

Financial institutions hold significant leverage as gatekeepers to financial flexibility, one of the key factors determining MSME adaptability and resilience.

Platform providers not only offer market access but also define the new norms of competitiveness through digital interface performance standards.

Academic partners (including the research team) contribute by offering system thinking tools, models, and simulations to support strategic decisions and policy-making.

V. CONCLUSION

This study provides a comprehensive conceptual model illustrating how Banyumas MSMEs can enhance their resilience against disruptions from modern digital business models. Using system dynamics and Causal Loop Diagrams, it identifies multiple reinforcing feedback structures—such as digital literacy, financial flexibility, strategic partnerships, and capital access—that collectively promote adaptability. A balancing loop related to public digital literacy highlights the critical need for inclusive education and support systems. Policy interventions, stakeholder collaboration, and technological investment emerge as key enablers. The findings offer strategic insights for government institutions, financial entities, and digital platform providers to co-develop a robust digital ecosystem. Ultimately, the proposed roadmap supports MSMEs in achieving long-term sustainability and competitiveness amid evolving economic dynamics.

ACKNOWLEDGMENT

The authors would like to express their deepest gratitude to Telkom University – Purwokerto Campus Directorate for the continuous support, research facilities, and academic environment that made this study possible. This research was carried out as part of the institutional commitment to advancing innovation, digital transformation, and community empowerment through applied research and collaboration. The authors also extend sincere thanks to all colleagues, experts, and MSME

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