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Socio-Economic Improvement of MSMEs through Digital Transformation in Metro City

Elita Yuni Setiyarini[1*], Titin Rosdyanti[2], Meli Yana Puspita Sari[3]
Universitas Dharma Wacana, Lampung, Indonesia[1,2,3]
elitayunisetiyarini@dharmawacana.ac.id[1*], titinrosdyanti@dharmawacana.ac.id[2], meliyanapuspitasari22@gmail.com[3]

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Abstract
Purpose: This study analyzes the impact of digital transformation on the socioeconomic welfare of MSMEs, including income growth, access to resources, quality of life, and business sustainability.
Methodology/approach: This study used a mixed-methods explanatory sequential approach. The research population comprised 23,854 MSMEs in Metro City. This study employed a mixed-methods approach. Quantitative data were gathered from 100 respondents, selected via convenience sampling using the Slovin formula, and analyzed using Structural Equation Modeling (SEM). Qualitative insights were obtained through in-depth interviews with 15 purposively sampled MSME actors, and the data were examined through thematic analysis.
Results: Digital transformation had a positive and significant effect on all dimensions of the socio-economic welfare of MSMEs.
Conclusions: This study concludes that digital transformation has a positive impact on the socioeconomic welfare of MSMEs in Metro City by increasing income, access to resources, quality of life, and business sustainability.
Limitations: This study focused on certain variables related to digitalization, whereas many other external factors that may have influenced the results were not explored in depth.
Contribution: This research provides practical contributions to MSMEs and policymakers by demonstrating the positive impact of digital transformation on business prosperity. Academically, this study enriches the fields of digital management and economics through a holistic approach in the local MSME context.

Keywords: *Digitalization, MSMEs, Socio-Economic Welfare, Structural Equation Modeling (SEM)*

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1. Introduction

Micro, Small, and Medium Enterprises (MSMEs) are the cornerstones of the Indonesian economy, particularly in Metro City, Lampung Province. This sector contributes 60% to the Regional Gross Domestic Product (RGDP) and employs nearly 70% of the local workforce (BPS, 2025). MSMEs are vital for job creation, stimulating local economic growth, and improving community welfare. However, MSMEs in Metro City face significant challenges in adapting to technological advancements, particularly digital transformation. In the context of Industry 4.0, adopting digital technology is key to enhancing MSME competitiveness (Vidyanata, Rane, & Hanika, 2023). Digital transformation drives both operational efficiency and new growth opportunities, facilitating market expansion, product innovation, and revenue maximization.

Despite the recognized potential of digitalization to enhance productivity and efficiency, a significant digital divide persists in Metro City. Currently, only approximately 30% of MSMEs utilize digital

platforms for marketing and transactions (Amalia, Aini, Paradita, & BR, 2025). This limited adoption stems primarily from constraints in digital infrastructure and low levels of digital literacy among business operators, which hinders their ability to access digital markets and optimize technological benefits (Omowole, Olufemi-Philips, Ofadile, Eyo-Udo, & Ewim, 2024). Therefore, this study pursues two primary goals: first, it assesses the impact of digital transformation on key socioeconomic aspects, such as income growth, access to resources, quality of life, and business sustainability; second, it identifies the critical barriers that impede this transformation.

Previous research demonstrates the importance of digital technology in improving MSME efficiency and competitiveness. Studies indicate that digitization can increase MSME productivity by up to 35%, contributing to higher incomes. MSMEs that adopt digital technology can experience a turnover increase of up to 30% compared to those using conventional methods (Naibaho, Effiyaldi, Nurhadi, Suratno, & Pasaribu, 2025). Furthermore, digitalization helps MSMEs access global markets and financing, thereby increasing their competitiveness (Hasan, Abd Rahim, Ahmad, & Meliza, 2022) and enhancing their integration into global value chains (Veiga, Marnoto, Guerra-Mota, & Rexhepi, 2024). Social factors, particularly social networks and digital literacy, are critical drivers of the adoption of digital technologies (Islami, Wahyuni, & Puji, 2021). By examining the effects of digitization on both the economic and socio-psychological welfare of MSME actors, this study contributes to a more holistic understanding of the phenomenon.

This study introduces novelty through its local contextual focus and theoretical model advancement. While prior national studies Naibaho et al. (2025) have established the general economic benefits of digitization in Indonesia, they often treat socioeconomic welfare as a secondary outcome. Our research specifically investigates the unique socioeconomic landscape of Metro City, where family-run micro-enterprises predominate and digital adoption is nascent (~30%). This context allows for a granular analysis of how digital transformation uniquely influences the welfare of local entrepreneurs.

Methodologically, we advance digital welfare theory by proposing a mixed-methods Structural Equation Modeling (SEM) approach. This model uniquely integrates quantitative measures of income and sustainability with qualitative insights into the quality of life and resource access. It explicitly tests the interrelationships between these four dimensions incomes growth, access to resources, quality of life, and business sustainability as a unified socioeconomic construct affected by digital transformation. This comprehensive framework provides a more holistic understanding of how technological adoption translates into tangible and intangible welfare improvements for MSME actors in a developing regional economy.

Empirical evidence confirms that digitalization can enhance MSME productivity by up to 35% and increase turnover by approximately 30% by improving operational efficiency and expanding market reach (Naibaho et al., 2025). However, in Metro City, most MSMEs cannot harness these benefits because of persistent infrastructural limitations and low digital literacy (Omowole et al., 2024). Therefore, this study has a dual focus: to elucidate the mechanisms of income augmentation through digital transformation for local MSMEs and to pinpoint the specific barriers to its adoption. Digitalization enables MSMEs to access financing and connect with global suppliers and consumers, significantly enhancing their profitability and competitive position (Faiz, Le, & Masli, 2024; Veiga et al., 2024). This study explores the mechanisms through which digitization can broaden resource access for local MSMEs and identifies strategies to overcome prevailing infrastructural and technical barriers.

Social factors, particularly digital literacy and community networks, are critical determinants of successful technology adoption (Islami et al., 2021). By enhancing operational efficiency and fostering external business connections, digital tool integration directly contributes to the socio-psychological well-being of entrepreneurs (Sestino & Nasta, 2025). This study specifically examines how digital transformation can elevate the quality of life of MSMEs in Metro City by improving access to resources and strengthening social connectivity.

The long-term sustainability of MSMEs depends on their adaptive capacity in the face of evolving market dynamics (Kurniawan, Maulana, & Iskandar, 2023). Digital adoption is a key facilitator of this adaptability, enabling businesses to accelerate innovation and enhance their competitiveness (Hokmabadi, Rezvani, & De Matos, 2024). Focusing on the context of Metro City, this study elucidates the specific mechanisms through which digital transformation bolsters business sustainability. It further identifies the adaptation strategies that local MSMEs can employ to navigate global competitive pressures, thereby providing critical insights into the role of digitization in securing the future of these vital local enterprises.

2. Literature Review and Hypothesis Development

2.1 Literature Review

2.1.1 Micro, Small, and Medium Enterprises (MSMEs) and Digital Transformation

Micro, Small, and Medium-Sized Enterprises (MSMEs) serve as a fundamental pillar of national economies, driving economic development, generating employment, and alleviating poverty across both developed and developing countries. Their significant role extends beyond economics, as they are pivotal in fostering social inclusion and community resilience by providing livelihoods at the grassroots level. However, MSMEs consistently face a constellation of challenges, such as limited access to formal finance, inadequate managerial skills, and poor integration into broader value chains, which collectively constrain their growth potential (Ramachandran, Chandramohan, & Taibangnganbi, 2024).

In this context, digital transformation has emerged as a pivotal strategy that transcends the mere adoption of technology. It constitutes a fundamental rethinking of business models, operational processes, and customer value propositions to harness the opportunities of the digital age. This profound shift, driven by technologies such as cloud computing, big data analytics, and social media, is a strategic imperative for MSMEs, allowing them to achieve greater agility, sustained competitiveness, and enhanced responsiveness to volatile market demands (Verhoef et al., 2021). Therefore, the ability of MSMEs to adopt and leverage digital tools is now considered a key differentiator for their sustainability and a primary mechanism for improving their socioeconomic welfare (Kraus et al., 2022). This process is not solely technological but also involves significant organizational and cultural changes, requiring new digital mindsets and skillsets across the enterprise (Hanelt, Bohnsack, Marz, & Antunes Marante, 2021).

2.1.2 Socio-Economic Welfare of MSMEs: An Integrated Framework

Socioeconomic welfare is a multidimensional concept that moves beyond mere financial metrics to encompass the overall well-being of individuals and communities, integrating both economic and social dimensions (Bárcena-Martín, Medina-Claros, & Pérez-Moreno, 2021). Its fundamental concern lies with enhancing human capabilities and expanding the freedoms that individuals value (Ranis, Stewart, & Samman, 2006). Within the MSME context, this welfare is conceptualized through four interconnected pillars, as illustrated in the conceptual framework below (Figure 1).

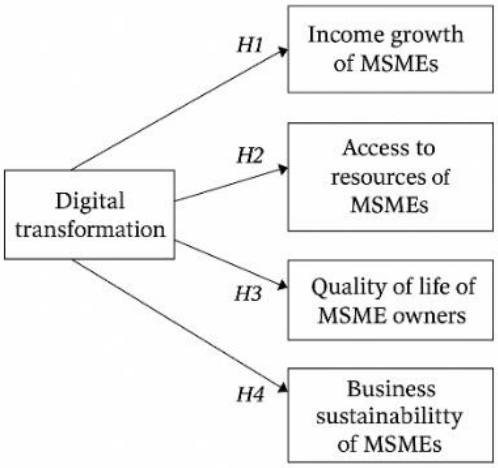

Figure 1. Structural model test results

1. Income Growth and Access to Resources. These two dimensions are fundamentally intertwined. Income growth is a critical indicator of business success and a primary driver for improving livelihoods (Graña-Alvarez, Lopez-Valeiras, Gonzalez-Loureiro, & Coronado, 2024). A common pathway for this growth involves leveraging digital platforms for market expansion and customer acquisition. Such market expansion, however, is predicated on improved access to resources, which extends beyond financial capital to include digital tools, market information, and human capital (Brush, Edelman, Manolova, & Welter, 2019). The synergy between financial literacy and fintech, for instance, not only expands access to capital but also enhances the ability of MSMEs to manage their finances, thereby supporting business performance improvement through better financial inclusion (Munasib & Fitriyah, 2025). In the Indonesian context, recent studies confirm that digital platforms have been instrumental in helping MSMEs overcome traditional resource barriers and forge new income streams post-pandemic (Oktaria, Raras, Alam, Barusman, & Habiburrahman, 2024).

2. Quality of Life. As a multifaceted concept, this dimension captures the holistic well-being of an individual, integrating physical, psychological, and social facets. For MSME owners, improvements are linked to factors such as work-life balance, perceived autonomy, and reduced economic stress, which are often downstream effects of greater business stability and efficiency gained through digitalization (Binder & Coad, 2013; Stephan, Rauch, & Hatak, 2023).

3. Business Sustainability. This dimension encapsulates the long-term viability of an enterprise. It is defined as an organization's capacity to sustain operations and pursue growth while effectively managing its economic, environmental, and social resources (Muñoz & Cohen, 2018). In the contemporary landscape, and particularly within the framework of Industry 5.0, sustainability involves not only economic resilience but also the integration of green economy principles that emphasize environmentally friendly practices (Manan, Nursari, Sejati, Yoesseri, & Mareta, 2024). A sustainable MSME contributes not only to its own longevity but also to the broader socioeconomic and environmental health of its community (Silvestre & Ţîrcă, 2019).

2.2 Hypothesis Development

The literature synthesis gives rise to the following hypotheses, which assess the effect of digital transformation on core aspects of MSMEs' socioeconomic welfare in Metro City. A summary of these hypotheses is presented in Table 1.

Table 1: Research hypothesis

Hypothesis	Statement
H_1	Digital transformation has a positive and significant impact on the income growth of MSMEs in Metro.
H_2	Digital transformation has a positive and significant impact on MSMEs' access to resources in Metro City.
H_3	Digital transformation has a positive and significant impact on the quality of life of MSME owners in Metro.
H_4	Digital transformation has a positive and significant impact on the business sustainability of MSMEs in Metro.

The theoretical justifications for these hypotheses are as follows:

The integration of e-commerce, digital payments, and social media marketing directly creates new revenue streams and expands market reach beyond geographical limitations (Verhoef et al., 2021). Furthermore, digital tools drive operational efficiency and profitability by automating processes and reducing costs, whereas data analytics enables more effective, data-driven business strategies (Elia, Margherita, & Passiante, 2020; Kraus et al., 2022)

H_1: Digital transformation has a positive and significant impact on the income growth of MSMEs in Metro City.

Digital platforms and cloud-based services provide MSMEs with affordable access to sophisticated software, market intelligence, and global supply chains, resources that were previously inaccessible (Brush et al., 2019; Elia et al., 2020). This democratization of resources through digital means is a critical determinant of competitiveness in a fast-paced urban environment such as Metro City.

H_2: Digital transformation has a positive and significant impact on MSMEs' access to resources in Metro City.

Digital tools, such as accounting software and inventory management apps, reduce the mental burden and time spent on administrative tasks, freeing up personal time and reducing burnout (Binder & Coad, 2013). The flexibility afforded by digital platforms also contributes to a better work-life balance and strengthens social capital, mitigating the isolation often experienced by entrepreneurs (Ribeiro, da Silva, & Vieira, 2024; Zhao, Barratt-Pugh, Standen, Redmond, & Suseno, 2022).

H_3: Digital transformation has a positive and significant impact on the quality of life of MSME owners in Metro City.

Digital transformation builds organizational resilience, allowing MSMEs to pivot their operations and customer engagement strategies in response to market disruptions (Kraus et al., 2020). The adoption of e-commerce and digital marketing insulates businesses from localized downturns and provides tools for continuous innovation and adaptation, which are key to long-term market presence (Hanelt et al., 2021; Verhoef et al., 2021).

H_4: Digital transformation has a positive and significant impact on the business sustainability of MSMEs in Metro City.

3. Research Methodology

This study employed an explanatory sequential mixed methods design to holistically examine the impact of digital transformation on the socioeconomic welfare of MSMEs in Metro City. The quantitative phase was conducted from July to August 2025, employing a structured questionnaire with 5-point Likert-scale items measuring four welfare dimensions: income growth, resource accessibility, quality of life, and business sustainability. This questionnaire was distributed to 100 MSME owners selected through convenience sampling from a population of 23,854 registered enterprises (BPS-Lampung, 2023).

Data were analyzed using Structural Equation Modeling (SEM) with path analysis to test the hypothesized relationships. In the subsequent qualitative phase, semi-structured interviews guided by a predefined protocol were conducted with 15 purposively selected participants to garner nuanced insights. To ensure methodological rigor, findings from both phases were triangulated; the qualitative data provided contextual explanations for the significant statistical pathways identified quantitatively. The research adhered to stringent ethical standards, securing informed consent from all participants prior to data collection and guaranteeing strict confidentiality and anonymity throughout the research process. Figure 1 presents the survey items utilized in this study.

Statement
I use digital media (such as WhatsApp, Instagram, Shopee, or Tokopedia) to market my business products/services.
I feel that the use of digital technology makes it easier for me to manage the day-to-day operations of my business.
I have a digital account (e-wallet or mobile banking) for business transactions.
I utilize digital platforms to communicate with my customers.
I actively seek business information through the internet or digital platforms.

Figure 1. Questionnaire items (Variable *X*)

Statement
I have experienced an increase in income after utilizing digital technology in my business.
I can reach more customers thanks to digital marketing.
I am able to consistently increase sales since implementing digital strategies.
I feel that my business profits have increased compared to before using digital platforms.
I feel that the use of digital technology directly contributes to the growth of my business income.
I acquire new customers from outside the area through digital marketing.

Figure 2. Questionnaire items (Variable Y_1)

Statement
I find it easier to obtain information regarding raw materials, vendors, or suppliers through the internet.
I use digital financial services to support my business financing.
I find it easier to access training, seminars, or business information online.
I can join digital communities that support the growth of my business.
I have broader access to collaboration opportunities or partnerships thanks to digital technology.
I feel digital technology has opened up more avenues for me to grow my business.

Figure 3. Questionnaire items (Variable Y_2)

Statement
I feel more satisfied with my business conditions since using digital technology.
I have more flexible hours because part of my work can be done digitally.
I find it easier to balance work and personal life.
I have experienced a reduction in stress because my work has become more structured thanks to digitalization.
I feel more confident in managing my business thanks to my digital capabilities.
I feel my personal financial condition has improved after implementing digitization in my business.

Figure 4. Questionnaire items (Variable Y_3)

Statement
I feel my business has become more stable since leveraging digital technology.
I have long-term development plans that are supported by digitization.
I see significant opportunities for my business to grow through collaboration and digital innovation.
I can withstand competition because of leveraging digital technology.
I believe digital technology is the key to my business's sustainability.
I actively innovate by utilizing digital technology to ensure my business remains sustainable in the future.

Figure 5. Questionnaire items (Variable Y_4)

No.	Questions
1.	Can you briefly outline your business profile as well as the main products or services offered?
2.	What motivated or drove you to start adopting digital technology in this business?
3.	Can you explain the chronology of digital technology adoption in your business, starting from the earliest phase to the latest? What types of digital platforms or tools have you implemented (e.g., social media, e-ecommerce, digital payments, accounting/ERP software)?
4.	How has the implementation of digital technology transformed your daily operational processes, particularly in marketing, sales, and customer service functions?
5.	Can you provide concrete examples where adopting digital technology directly led to significant changes in your business model or market reach expansion?
6.	In what ways has the digital transformation impacted your brand identity and how you engage with customers?
7.	What specific aspects of digital transformation have influenced your financial performance? (Please explain its impact on revenue structure, profitability, and operational costs.)
8.	Do you have any examples of how financial management (such as cash flow management) or record-keeping systems have gained greater funding access as a result of digital adoption?
9.	To what extent has this improved performance brought tangible benefits that enhance well-being for you and your family?
10.	Besides customers, how has digital technology facilitated connections with other sources of data and stakeholders crucial to business interests, such as suppliers, business partners, or mentors?

No.	Questions
11.	Have you shared any experiences regarding involvement in online business communities or networks? What value or benefits did you derive from that participation?
12.	With digital connectivity now, do you feel your business's level of integration into the digital ecosystem has increased?
13.	Beyond financial gains, how does adopting digital technology impact non-financial aspects, such as quality of life, work-life balance, and stress levels?
14.	How has digital technology changed your perceptions of autonomy, freedom, and the level of control and time management you have as a business owner?
15.	In your opinion, what non-financial benefits or significant values have you gained from the digital transformation process?
16.	How have the digital capabilities built prepared your business to face challenges and competition in the future?
17.	Have you utilized digital technology to innovate in your products, services, or customer experiences? (Example: augmented reality, advanced analytics, etc.)
18.	To what extent is digital technology viewed as a core component in your long-term business strategy and plann?
19.	What challenges or barriers have you found most significant during the digital transformation process? (Examples: financial aspects, skills development, HR, or technology adoption speed).
20.	Based on your experience, what support, guidance, training, or ecosystem development are most needed for MSMEs to successfully adopt technology and digitalization?
21.	Looking forward, what is your vision regarding a digital ecosystem that is ideally integrated to support business growth and sustainability?

Figure 6. Interview guide

4. Results and Discussion

4.1 Descriptive Statistics and Qualitative Analysis

This study examines the typology and digital transformation patterns of MSMEs in Metro City based on survey data from 100 enterprises. The sectoral distribution reveals that the Food and Beverage (FnB) industry is the dominant sector (62%), indicating strong consumer demand and evolving consumption patterns. Complementary sectors include fashion retail and mobile phone services (4% each), as well as automotive workshops, florists, and building material suppliers (3% each), demonstrating economic diversity across service and goods-based industries.

The analysis shows substantial digital adoption among MSMEs, with an overall digital transformation mean score of 3.43 on a 5-point scale. Key adoption indicators reveal the prevalent use of digital platforms for marketing (3.45), operational efficiency (3.46), and digital payments (3.46), particularly within the dominant food and beverage sector. These findings demonstrate that digital technology has fundamentally reconfigured business practices, facilitating both market expansion and operational optimization through the adoption of platforms such as WhatsApp, Instagram, Shopee, and Tokopedia.

The convergence of sectoral distribution and digital adoption patterns suggests that Metro City's MSME ecosystem is transitioning toward digitally-enabled operations while maintaining diverse economic activities. High adoption rates in customer-facing functions demonstrate MSMEs' strategic focus on leveraging digital tools for market reach and transaction efficiency, establishing a foundation for sustained socioeconomic development in the region.

Income growth (Y_1) demonstrated a strongly positive response to digital transformation, achieving a mean score of 3.44. Respondents reported tangible benefits from digitization, particularly enhanced cost efficiency, which enabled more competitive pricing (3.48) and provided a strategic market advantage. A directly perceived increase in income (3.47) indicates that digital platforms contribute not only to market expansion but also to higher sales volumes and improved profitability. Furthermore, significant scores for expanding customer reach and profit growth (3.43) illustrate that digitalization has effectively created new revenue generation avenues for MSMEs.

The Access to Resources variable (Y_2) attained a mean score of 3.46, signifying that digital transformation has substantially facilitated MSMEs' acquisition of essential operational resources. Access to collaboration and business development opportunities recorded the highest score (3.50), demonstrating that digital platforms effectively unlock previously inaccessible growth avenues. Furthermore, the simplified process for obtaining capital loans through digital channels (3.48) underscores technology's role in providing more adaptable financing alternatives compared to traditional banking systems. Conversely, access to information regarding raw materials and suppliers received a comparatively lower score (3.40), suggesting persistent challenges in leveraging digital tools to optimize supply chain efficiency.

The quality of life variable (Y_3) achieved a mean score of 3.49, indicating that digitalization substantially enhances the socioeconomic welfare of MSME owners. Key contributors to this outcome include facilitated access to supply chain information (3.51) and participation in digital business communities (3.50), demonstrating that digital technology extends beyond economic gains to strengthen social capital and collaborative networks. While aspects concerning digital loan applications and access to online training scored moderately lower (3.47 and 3.46, respectively), these findings nevertheless confirm digitalization's significant role in providing essential business development support.

The Business Sustainability and Development variable (Y_4) yielded a mean score of 3.47, demonstrating digitalization's significant role in enhancing MSME resilience and growth. The most substantial impact was observed in access to online training and business information (3.51), highlighting how digital platforms facilitate crucial capacity-building resources. Similarly, improved access to supply chain information (3.49) and business collaboration opportunities (3.47) further contributed to sustainable competitive advantage. Although certain dimensions, including digital lending adoption (3.46) and business development expansion (3.45), recorded comparatively lower scores, the overall results confirm that digital transformation substantially supports MSMEs' operational advancement and network expansion (Tabrizi, Lam, Girard, & Irvin, 2019).

4.2 Validity and Reliability Test Results

Validity testing was conducted by evaluating measurement instruments against established psychometric criteria. Indicator validity was assessed through factor loadings, with values exceeding 0.50 considered acceptable (Ghozali, 2014). For discriminant validity, the Average Variance Extracted (AVE) method was employed, following Cheung, Cooper-Thomas, Lau, and Wang (2024) requirement of minimum values of 0.50 for all constructs.

Table 2. Validity test results

Variable	Item	Factor Loading	AVE	Description
Digital Transformation	TD1	0.922	0.794	Valid
	TD2	0.890		Valid
	TD3	0.873		Valid
	TD4	0.871		Valid
	TD5	0.905		Valid
	TD6	0.883		Valid
Income Growth	PP1	0.890	0.771	Valid
	PP2	0.856		Valid
	PP3	0.919		Valid
	PP4	0.849		Valid

	PP5	0.893		Valid
	PP6	0.859		Valid
Access to Resources	SD1	0.904	0.810	Valid
	SD2	0.879		Valid
	SD3	0.920		Valid
	SD4	0.895		Valid
	SD5	0.902		Valid
	SD6	0.898		Valid
MSME Quality of Life	KH1	0.893	0.816	Valid
	KH2	0.918		Valid
	KH3	0.905		Valid
	KH4	0.940		Valid
	KH5	0.895		Valid
	KH6	0.867		Valid
Business Sustainability and Development	KPU1	0.891	0.779	Valid
	KPU2	0.896		Valid
	KPU3	0.868		Valid
	KPU4	0.872		Valid
	KPU5	0.899		Valid
	KPU6	0.870		Valid

Table 2 presents the results of the CFA, indicating that all measurement items demonstrated factor loadings exceeding the 0.50 threshold, thereby establishing their validity for measuring the corresponding latent constructs (Hair, Hult, Sarstedt, & Ringle, 2022). Discriminant validity was further examined using the Fornell–Larcker criterion, which compares the AVE values to the shared variances between the constructs (Cheung et al., 2024). All constructs demonstrated AVE values exceeding the 0.50 threshold, thereby confirming the discriminant validity of the measurement model and its suitability for subsequent analysis.

Table 3. Reliability Test Results

Variable	Cronbach's Alpha	Construct Reliability	Description
Digital Transformation	0.958	0.958	Reliable
Income Growth	0.953	0.953	Reliable
Access to Resources	0.962	0.962	Reliable
MSME Quality of Life	0.964	0.964	Reliable
Business Sustainability	0.955	0.955	Reliable

As presented in Table 3, the reliability analysis conducted through AMOS yielded Cronbach's alpha and construct reliability values exceeding the 0.70 threshold for all variables. These results confirm that the measurement instruments for the five constructs demonstrated adequate internal consistency, thereby establishing their reliability for subsequent statistical analysis.

4.3 Structural Model and Hypothesis Testing

The validated measurement model subsequently informed the structural model analysis. The model estimation results, derived through maximum likelihood estimation in AMOS, demonstrated a satisfactory model fit across multiple indices (p =0.163, GFI=0.961, RMSEA=0.005, CFI=0.944, TLI=0.939, NFI=0.997). With these seven distinct fit indices confirming model adequacy, the structural model demonstrated sufficient psychometric properties for hypothesis testing. The validated measurement model was subsequently used to inform the analysis of the structural model, as presented in Figure 7.

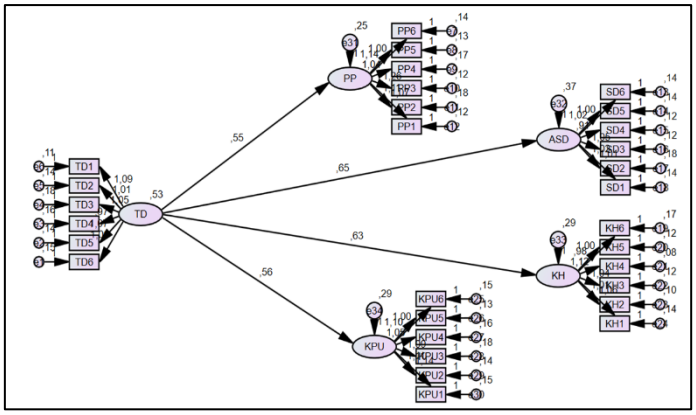

Figure 7. Structural model test results

Hypothesis testing was conducted to examine the proposed relationships, with statistical significance determined using a threshold of $p < 0.05$, and a Critical Ratio (CR) value exceeding ±1.96.

Table 4. Hypothesis Test Results

Hypothesis	Standardized Estimate (β)	Critical Ratio (CR)	P-Value	Description
H_1: Digital transformation has a positive and significant impact on the income growth of MSMEs in Metro City	0.545	6.464	0.001	Supported
H_2: Digital transformation has a positive and significant impact on the access to resources of MSMEs in Metro City	0.646	6.497	0.001	Supported
H_3: Digital transformation has a positive and significant impact on the quality of life of MSME owners in Metro City	0.627	6.779	0.001	Supported
H_4: Digital transformation has a positive and significant impact on the business sustainability of MSMEs in Metro City	0.559	6.224	0.001	Supported

The results presented in Table 4 provide robust empirical support for all four hypotheses, revealing that digital transformation exerts a positive and statistically significant impact ($p < 0.001$ for all paths) on every dimension of MSME socioeconomic welfare in Metro City.

1. *H_1* is supported, confirming that digital transformation significantly enhances income growth (β = 0.545). This finding quantitatively substantiates qualitative reports from MSMEs regarding increased sales and improved profitability through digital platforms.
2. *H_2* is supported, demonstrating the strongest effect of digital transformation on access to resources (β = 0.646). This aligns with the high descriptive scores for collaboration opportunities and digital financing, showing technology's pivotal role in overcoming traditional resource constraints.
3. *H_3* is supported, indicating a substantial positive impact on the quality of life of MSME owners (β = 0.627). This result mirrors the qualitative findings, where owners reported reduced administrative burdens and enhanced social capital through digital communities.
4. *H_4* is supported, confirming that digital transformation positively affects business sustainability (β = 0.559). This validates the descriptive data, highlighting the role of digital tools in providing access to training and information crucial for long-term resilience.

4.4 Discussion

This study provides robust empirical evidence positioning digital transformation as a significant catalyst for socio-economic welfare enhancement among MSMEs in Metro City. The confirmed relationship between digital transformation and increased income demonstrates that digital transformation is a potent tool for enhancing MSME income, aligning with recent research on Indonesian MSMEs leveraging digital payment systems and e-commerce platforms (Oktaria et al., 2024). Our findings provide a

granular understanding of this mechanism, showing that income growth manifests concretely through expanded sales on platforms such as Shopee and Tokopedia, coupled with improved profit margins from operational efficiencies gained through digital tools, supporting the proposition that digitalization simultaneously creates new revenue streams while optimizing existing ones through data-driven decision making (Kraus et al., 2022).

The most robust relationship was observed between digital transformation and access to resources, highlighting its role in democratizing opportunities for small businesses. This finding strongly corroborates recent studies on the synergy between financial literacy and fintech in promoting financial inclusion among MSMEs (Munasib & Fitriyah, 2025). The convergence of quantitative results with qualitative data reveals how this manifests in practice: MSMEs report unprecedented access to business networks through digital communities and streamlined financing through fintech applications, effectively addressing the resource constraints documented in contemporary MSME literature (Ramachandran et al., 2024).

The significant impact on quality of life confirms that digitalization benefits extend beyond economic metrics to encompass entrepreneur well-being, supporting recent findings regarding improved work-life balance through digital tool adoption (Ribeiro et al., 2024). Qualitative insights clarify that this improvement stems from reduced administrative burdens through automation and enhanced social support through digital communities, directly addressing the isolation often associated with entrepreneurship, thus fulfilling the broader definition of socioeconomic welfare advocated in recent multidimensional welfare frameworks (Baig, Ali, & Khan, 2024).

Furthermore, the relationship between digital transformation and business sustainability demonstrates its role in building long-term resilience, a finding consistent with recent research on Industry 5.0 and green economy integration in MSMEs (Manan et al., 2024). The qualitative data reveal that this sustainability is achieved through continuous learning opportunities via online training and the capacity to adapt operations using real-time market intelligence, echoing the conception of digital transformation as an organizational resilience builder in volatile market conditions (Kraus et al., 2022).

Despite these positive outcomes, qualitative insights reveal persistent challenges in digital literacy and infrastructure, particularly in suburban areas, consistent with recent findings on the digital divide in emerging economies. These findings underscore the necessity for comprehensive policy interventions that extend beyond promoting digital adoption to address underlying barriers, such as through practical training and enhanced digital connectivity, thereby aligning with calls for targeted digital inclusion strategies (Graña-Alvarez et al., 2024). The demonstrated benefits across all welfare dimensions underscore the critical role of digitalization initiatives in fostering inclusive and sustainable socioeconomic advancement through MSMEs.

5. Conclusions

5.1. Conclusion

This study demonstrates that digital transformation plays a crucial role in enhancing the welfare of urban MSMEs, significantly improving business performance and owner well-being through expanded market reach, operational efficiency, and better financial management. However, these benefits are hindered by structural barriers such as digital literacy gaps and unequal access to reliable Internet infrastructure, particularly in suburban areas and businesses with limited technical capacity. For MSME owners, integrating digital strategies into business operations is essential for success and work-life balance. For policymakers, it is crucial to focus on improving digital literacy and providing reliable, affordable Internet access across regions.

5.2. Research Limitations

This study acknowledges several limitations, including its focus on a specific set of digitalization variables, its cross-sectional design that limits causal inferences, and the use of non-probability sampling, which restricts the generalizability of the findings. Therefore, the results should be interpreted with caution, and future research should address these limitations.

5.3. Suggestions and Directions for Future Research

Future studies should focus on key areas, including the use of longitudinal or panel designs to explore causal relationships between digital adoption and MSME welfare. Additionally, research should expand variables to include psychological factors such as digital self-efficacy and objective infrastructure data. Sector-specific studies are recommended to explore the challenges and opportunities of digital adoption in different MSME industries. Comparative studies in regions with varying levels of digital maturity can provide insights into effective policies. Lastly, exploring the impact of emerging technologies like artificial intelligence and blockchain on MSME growth will be crucial for future digital transformation strategies. These research directions will enhance the understanding of digital transformation and provide valuable insights for policymakers to foster inclusive and sustainable digital growth for MSMEs.

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Author Contributions

EYS Conceptualization, study design, data collection, manuscript drafting, and final approval. TR Data analysis, manuscript drafting, revision, and final approval. MYPS Study design, data collection, and manuscript drafting.

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