

Exploring the Integration Model of Social and Digital Transformation for the Sustainability of Circular Economy-Based Creative MSMEs in Greater Malang

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ABSTRACT

This study aims to identify, map, and explore an integrative model linking social and digital dimensions to strengthen the competitiveness and sustainability of local creative MSMEs. The study uses a mixed-methods exploratory sequential design, starting with a qualitative stage through in-depth interviews, participant observation, and thematic analysis, then continuing with a quantitative stage by distributing questionnaires to test the relationships among the resulting model variables. This approach allows for a comprehensive understanding of both social meaning and measurable empirical data. Quantitative analysis uses SEM-PLS. The results of the analysis show that digital transformation influences the integration of the circular economy. Social transformation influences the integration of the circular economy. Digital transformation influences the sustainability of creative MSMEs. Social transformation influences the sustainability of creative MSMEs. Circular economic integration influences the sustainability of creative MSMEs. Digital transformation influences the sustainability of creative MSMEs through circular economic integration. Social transformation influences the sustainability of creative MSMEs through circular economic integration.

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Introduction

The acceleration of digitalization and the demands of sustainability have become two driving forces that are reshaping the business practices of creative MSMEs in Indonesia [1]-[3]. The government reports that tens of millions of MSMEs have entered the digital ecosystem. Official data shows that around 27 million MSMEs have adopted digital technology [4]-[7], with the target of further expansion as part of a national program to strengthen the competitiveness of micro-enterprises (Digital on Boarding and Level Up programs) [8]-[10]. This situation presents significant opportunities for market expansion and production efficiency, but also reveals the gap in technology adoption [11]-[14] and the limited social readiness of the business community [15]-[18]. In parallel, the creative economy remains a strategic sector: its contribution to national GDP remains substantial despite post-pandemic fluctuations, illustrating the importance of strengthening the competitiveness of creative actors at the local level [19]-[21]. In Greater Malang, the center of creative activity and micro-industry in East Java, the number of registered MSMEs continues to grow, a strong indicator that the region has a large creative production base and is vulnerable to the pressures of linear production models and market disruptions [22]-[24]. The simultaneous phenomenon of rapid digital penetration, pressure on resource sustainability, and a large creative MSME base demonstrates the urgency of formulating a transformation framework that integrates social, technological, and circularity aspects as a strategic response to local and national challenges [25]-[29]. Although previous studies have generated important insights into digital transformation, social transformation, and circular economy practices, these research streams have predominantly been examined separately or through partially integrated perspectives. Studies on digital transformation among MSMEs tend to emphasize technology adoption, digital capabilities, innovation, productivity, and market access [30], [31], while circular economy studies commonly focus on resource efficiency, waste reduction, circular business models, and environmental sustainability [32], [33]. Meanwhile, the social dimension has received comparatively less attention as a transformative mechanism connecting technological adoption with changes in organizational practices, stakeholder relationships, community participation, and circular value creation. Consequently, there remains a theoretical and empirical gap concerning how digital and social transformation interact and jointly enable circular economy practices in creative MSMEs [34], [35].

This gap is particularly important in the context of creative MSMEs, because their sustainability is shaped not only by technological capabilities and resource efficiency but also by creativity, social networks, local knowledge, community engagement, and cultural values. Existing studies have provided valuable evidence on SME digitalization and circular economy adoption, but limited research has developed an integrated model specifically explaining the

interaction among digital transformation, social transformation, and circular economy within creative MSMEs in an emerging local ecosystem such as Greater Malang. Thus, the existing literature provides insufficient explanation of the mechanisms through which technological and social changes can be translated into sustained circular practices at the local MSME level.

The novelty of this study lies in integrating digital transformation, social transformation, and circular economy into a single analytical framework for understanding the sustainability of creative MSMEs. Rather than conceptualizing digital transformation merely as a technological adoption process, this study positions it as a transformation process that interacts with social capabilities, stakeholder relationships, collaborative practices, and circular value creation. This integrated perspective extends existing MSME sustainability research, which has largely treated technological, social, and environmental dimensions as separate or loosely connected factors, by proposing a socio-digital-circular transformation perspective.

Theoretically, this study contributes by connecting the literature on technology diffusion and digital transformation with social transformation and circular economy perspectives, thereby providing a more holistic explanation of how creative MSMEs can transition toward sustainable business practices. The proposed framework emphasizes that circular transformation is not solely a technological or environmental process but also a social process involving changes in capabilities, relationships, behavior, and collective practices.

Practically, the study provides a context-sensitive framework that can assist creative MSME owners, incubators, local governments, and other stakeholders in designing transformation strategies that simultaneously strengthen digital capabilities, social readiness, stakeholder collaboration, and circular practices. The Greater Malang setting further enables the study to identify how local institutional conditions, community networks, and entrepreneurial ecosystems shape the implementation of circular economy practices.

Based on this, this study formulates the problem: what is the form and mechanism of an effective integration model of social and digital transformation that can facilitate the implementation of circular economy practices and enhance the sustainability of creative MSMEs in Greater Malang? The research objectives are to (1) explore the social and digital transformation mechanisms underlying circular economy practices among creative MSMEs; (2) develop an integrated conceptual model linking social transformation, digital transformation, and circular economy practices to MSME sustainability; (3) examine the initial empirical relevance of the proposed relationships; and (4) formulate applicable policy recommendations and incubation program designs [35], [36]. To achieve this objective, a mixed methods approach was used with an exploratory sequential design: an initial qualitative stage (in-depth interviews, participant observation, focus groups with MSME actors,

incubation facilitators, and policy makers) to explore social mechanisms and local practices [37]-[39]. Qualitative results were then operationalized into quantitative instruments for testing the inter-variable relationships and initial modeling [40], [41]. Model validation was conducted through Expert Judgment and local stakeholder workshops to ensure practical relevance [41]. This methodology allows for the synthesis of contextual depth and empirical generalization required at the Parallel Distributed Processing stage [42]. The research's contributions are theoretical, empirical, and policy-making. Theoretically, the research develops an integrated socio-digital-circular transformation framework that connects social transformation, digital transformation, and circular economy perspectives in the context of creative MSMEs. This contributes to the literature by explaining their interrelationships rather than examining each transformation independently [43]. Empirically, it provides a map of practices, obstacles, and adaptation strategies of Malang Raya MSMEs which can be the basis for incubation design interventions [44]. From a policy perspective, the study provides evidence-based recommendations for local policy makers and incubators, including the development of locally relevant circular performance indicators and transformation programs that address both technological and social readiness [45].

Materials and Methods

The research employed an exploratory sequential mixed-methods design [46]. The design consisted of two connected phases: (1) a qualitative exploration to identify locally relevant themes, mechanisms, practices, barriers, and enabling conditions related to social transformation, digital transformation, circular economy practices, and MSME sustainability; and (2) a quantitative phase to operationalize the qualitative findings into measurable constructs and test the relationships among the resulting variables. The qualitative phase therefore served not only as an exploratory component but also as the empirical basis for developing and contextualizing the quantitative measurement instrument and the initial structural model.

The overall research procedure comprised six sequential steps: (1) qualitative sampling and instrument preparation; (2) semi-structured interviews, and field observations; (3) thematic coding and identification of key constructs and relationships; (4) transformation of qualitative themes into questionnaire dimensions and measurement items; (5) quantitative survey and SEM analysis; and (6) integration of qualitative and quantitative findings through joint interpretation and model refinement. This sequence ensured that the quantitative phase was directly informed by the contextual evidence generated during the qualitative phase.

The research location is centered in the Greater Malang region, which includes Malang City, Malang Regency, and Batu City. These three regions were selected because they have experienced rapid growth in the creative economy sector and are representative of the

dynamics of MSMEs in urban, semi-urban, and tourism areas. The research subjects were creative MSMEs operating in the culinary, craft, and design sectors who had been in business for at least two years. The minimum two-year operating period was used as an inclusion criterion because MSMEs with sufficient operating experience were expected to have experienced and reflected on changes in their business practices, digital adoption, social relationships, and sustainability practices.

For the qualitative phase, participants were purposively selected based on their direct knowledge and experience of MSME operations, digital transformation, social/community engagement, circular economy practices, or MSME support and policy implementation. The qualitative participants included MSME owners/managers, MSME community administrators, business-support and incubation institutions, and local government officials involved in the creative economy and/or digital transformation. Participants were selected to provide variation in sector, institutional role, and local context across Greater Malang. For the quantitative phase, eligible respondents were creative MSME owners or managers who met the following criteria: (1) operated a business in Malang City, Malang Regency, or Batu City; (2) operated in the culinary, craft, or design sector; (3) had been operating for at least two years; and (4) had sufficient knowledge of the business's digital practices, social relationships, resource-use practices, and sustainability activities to complete the questionnaire.

The study population included all creative MSMEs in Greater Malang registered with the Malang Raya Cooperative and MSME Service. Sampling was conducted using purposive sampling for qualitative data and proportionate stratified random sampling for quantitative data [47] From a population of approximately 3,000 creative MSMEs, a sample of 246 respondents was selected for the quantitative survey and approximately 20 key informants for in-depth interviews and focus group discussions (FGDs). The quantitative sample was proportionally distributed across the three geographical areas and selected MSME sectors to reflect the composition of the target population. The qualitative sample size was determined by the information generated during data collection, with interviews and FGDs continuing until the research team obtained sufficient thematic coverage and no substantially new themes relevant to the research objectives were emerging.

Qualitative data was collected through in-depth interviews, focus group discussions (FGDs), and field observations, documented in narrative transcripts. Quantitative data was obtained through a survey using a Likert-scale questionnaire. Secondary data was also collected from government reports, academic publications, and research results from national institutions such as the Statistics Indonesia (BPS) and the Creative Economy Agency (BEKRAF). The validity of the qualitative data was tested through triangulation of sources and methods, while the reliability of the quantitative data was assessed using Cronbach's Alpha.

Qualitative data analysis was conducted using Thematic Content Analysis [48]. To identify themes and relationships between concepts in the context of social, digital, and circular economic transformation. The results will be used as the basis for developing a conceptual model. Quantitative analysis was conducted using a Structural Equation Modeling (SEM) approach [49]. To test the causal relationships between variables and their level of influence on MSME sustainability. The integration of qualitative and quantitative results was carried out at the final interpretation stage to ensure the findings had ecological and empirical validity.

Results and Discussions

A. The research model analysis

The PLS analysis process in this study was carried out through three main stages, namely Outer Model analysis to test the validity and reliability of the indicators forming the construct, Inner Model analysis to assess the relationship between latent constructs, and hypothesis testing to determine the significance of the relationship between research variables [50]. The research model analyzed includes four main constructs, namely Social Transformation (X1), Digital Transformation (X2), Circular Economy Integration (Z1), and Sustainable Creative MSMEs (Y1). The relationship between constructs in this study is visualized in a structural model to determine the direct and indirect influence of Social Transformation and Digital Transformation on the Sustainability of Creative MSMEs through Circular Economy Integration as an intervening variable.

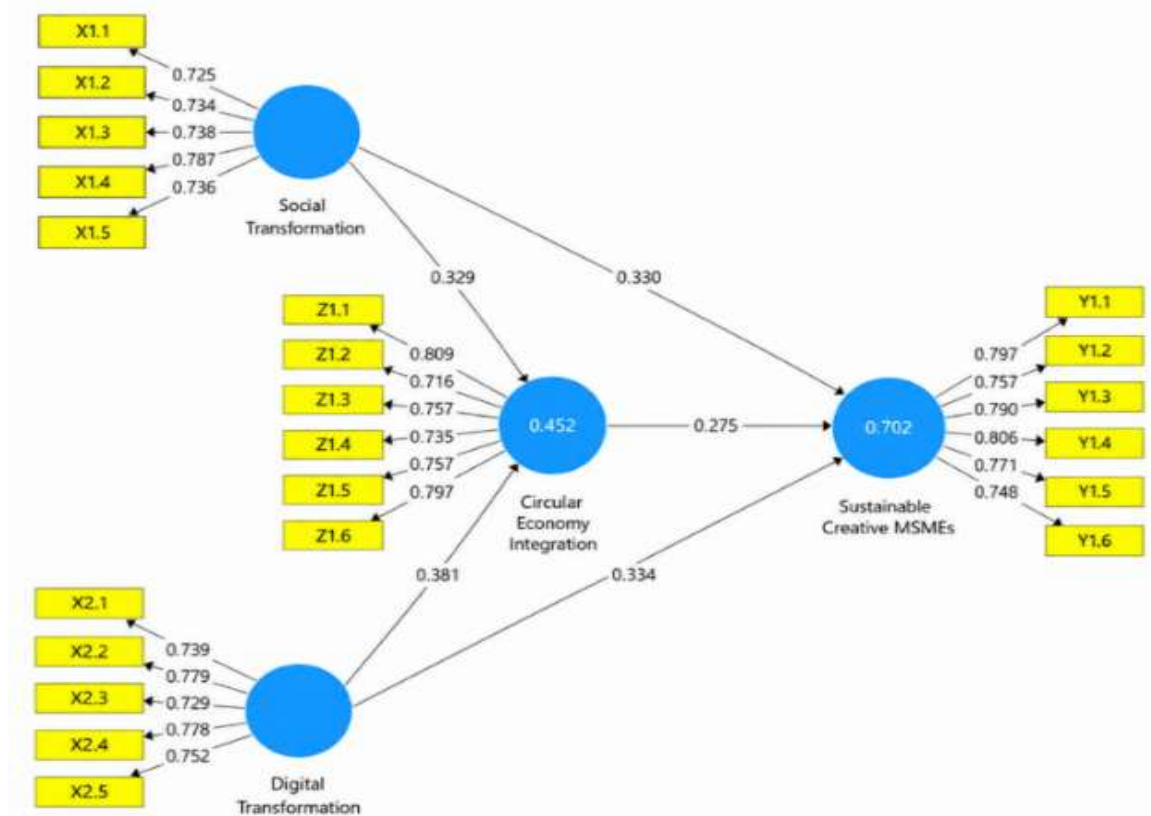


Fig. 1. Valid Outer Loading Values of Research Items

B. Validity and Reliability

Before testing the structural model (inner model), this study first evaluated the measurement model (outer model) to ensure that each construct met validity and reliability requirements. The outer model evaluation was conducted through convergent validity testing using outer loading values and Average Variance Extracted (AVE), as well as reliability testing using Cronbach's Alpha and Composite Reliability (CR). Referring to Hair et al. (2022) [51], an indicator is declared to meet convergent validity if it has an outer loading value above 0.70 and an AVE value greater than 0.50. Meanwhile, a construct is declared reliable if it has a Cronbach's Alpha and Composite Reliability value greater than 0.70. The results of validity and reliability testing for all research constructs are presented in the following table.

Table 1. Results of the Validity and Reliability Test of the Construct (Outer Model)

Variable, Item	Outer Loading	AVE	Cronbach's Alpha	Composite Reliability	Results
Social Transformation		0.554	0.798	0.861	Reliable
X1.1	0.725				Valid
X1.2	0.734				Valid
X1.3	0.738				Valid
X1.4	0.787				Valid
X1.5	0.736				Valid
Digital Transformation		0.571	0.813	0.869	Reliable
X2.1	0.739				Valid
X2.2	0.779				Valid
X2.3	0.729				Valid
X2.4	0.778				Valid
X2.5	0.752				Valid
Circular Economy Integration		0.582	0.857	0.893	Reliable
Z1.1	0.809				Valid
Z1.2	0.716				Valid
Z1.3	0.757				Valid
Z1.4	0.735				Valid
Z1.5	0.757				Valid
Z1.6	0.797				Valid
Sustainability of Creative MSMEs		0.606	0.870	0.902	Reliable
Y1.1	0.797				Valid
Y1.2	0.757				Valid
Y1.3	0.790				Valid
Y1.4	0.806				Valid
Y1.5	0.771				Valid
Y1.6	0.748				Valid

Source: Processed primary data, 2026.

Based on Table 1, all indicators in each construct have outer loading values ranging from 0.716 to 0.809, thus all indicators meet the convergent validity criteria because they are above the minimum limit of 0.70. This indicates that each indicator is able to adequately represent the latent construct being measured. All constructs in this study meet the requirements for convergent validity and reliability as recommended by Hair [51], because all outer loading values > 0.70, AVE > 0.50, Cronbach's Alpha > 0.70, and Composite Reliability > 0.70. Thus, the

research instrument is declared valid and reliable, so it is suitable for use for further analysis at the stage of testing the structural model (inner model) to test the relationship between variables in the integration model of social transformation, digital transformation, circular economy, and the sustainability of creative MSMEs in Malang Raya.

C. Hypothesis Testing

Hypothesis testing was conducted to determine the influence of Social Transformation and Digital Transformation variables on the Sustainability of Creative MSMEs, both directly and indirectly through the mediating variable of Circular Economy Integration. In this study, hypothesis testing was conducted by observing the path coefficient, t-statistics, and p-values in the bootstrapping results. The hypothesis is declared accepted if the t-statistics value is greater than 1.96 and the p-value is less than 0.05 at a significance level of 5%. The results of testing the direct and indirect effects on each research hypothesis are presented as follows.

Table 2. Hypothesis Testing

Hypothesis	Variables	Path coefficients	t- static tics	p-values	Information
H1	Social Transformation → Circular Economy Integration	0.329	3,266	0.001*	H1 accepted
H2	Digital Transformation → Circular Economy Integration	0.381	3,719	0.000*	H2 accepted
H3	Social Transformation → Sustainability of Creative MSMEs	0.330	4,659	0.000*	H3 accepted
H4	Social Transformation → Sustainability of Creative MSMEs	0.334	3,733	0.000*	H4 accepted
H5	Circular Economy Integration → Sustainability of Creative MSMEs	0.275	4,920	0.000*	H5 accepted
H6	Social Transformation → Circular Economy Integration → Sustainability of Creative MSMEs	0.091	2,691	0.007*	H6 accepted
H7	Digital Transformation → Circular Economy Integration → Sustainability of Creative MSMEs	0.105	3,093	0.002*	H7 accepted

* significant at $\alpha=5\%$

Source: Processed primary data, 2026.

Discussion

A. The Influence of Social Transformation on Circular Economy Integration

Social transformation significantly influences circular economy integration, meaning that the better the social transformation among creative MSMEs, the higher the adoption of the circular economy in their business activities. The results of this study indicate that changes in social interaction patterns, strengthening collaboration, community involvement, and social adaptability are important factors in supporting the implementation of the circular economy among creative MSMEs in Greater Malang. Social transformation encourages collective

awareness of the importance of resource efficiency, waste reduction, and the reuse of production materials in business activities.

In the context of creative MSMEs, social transformation is reflected in increased collaboration between business actors, involvement in business communities, participation in training, and a business orientation that focuses not only on economic profit but also on social and environmental impact. This condition supports the creation of circular economy practices such as reuse, recycle, and reduce in the production process. This research finding aligns with the opinion of Geissdoerfer et al. [52] which states that a circular economy requires not only technological innovation, but also social and behavioral changes in business actors in managing resources sustainably.

Creative MSMEs in Greater Malang are characterized by businesses heavily influenced by social networks and local communities. Many businesses leverage collaboration between MSMEs to share knowledge, raw materials, and waste management strategies. For example, several craft and fashion MSMEs have begun utilizing waste fabric, plastic, and other used materials to create products with economic value. This demonstrates that social transformation can strengthen circular economy practices through increased awareness and collaboration among businesses.

Furthermore, the existence of creative communities and mentoring programs from the local government and universities in Greater Malang have accelerated the integration of the circular economy into MSMEs. Training on waste management, the use of environmentally friendly materials, and the development of innovative recycled-based products has helped entrepreneurs understand the importance of environmentally sustainable businesses. Changes in organizational culture and increased social awareness are crucial factors in the successful implementation of the circular economy in the small and medium enterprise sector [53].

Social transformation is also driving a shift in the mindset of MSMEs, moving from a linear economic system to a more sustainable one. Previously, some businesses tended to focus solely on production and sales without considering the environmental impact of their activities. However, through social interaction, education, and community influence, MSMEs are beginning to understand that waste reduction and resource efficiency can provide economic benefits while improving a business's image in the eyes of consumers. This aligns with research. Korhonen et al. (2018) [54] which states that the implementation of a circular economy is greatly influenced by changes in social behavior and environmental awareness of business actors.

On the other hand, challenges in integrating the circular economy remain for some MSMEs, particularly related to limited knowledge and conventional production practices. Some

business owners still consider waste management and the use of environmentally friendly materials to be significantly expensive. Therefore, social transformation through education and mentoring is crucial to increase MSMEs' understanding of the long-term benefits of the circular economy for business sustainability.

Supportive social and environmental factors also play a crucial role in strengthening the implementation of a circular economy. Support from communities, consumers, governments, and educational institutions creates a business ecosystem that is more concerned with environmental sustainability. Consumers are also increasingly paying attention to products that are environmentally friendly and have social value, encouraging MSMEs to implement circular economy practices in their business processes. The success of a circular economy depends heavily on the involvement of various parties in creating sustainable production and consumption systems [55].

Thus, the results of this study indicate that social transformation significantly contributes to the integration of the circular economy into creative MSMEs in Greater Malang. The stronger the social collaboration, community involvement, adaptability, and social awareness of business actors, the better the implementation of circular economy principles in MSME activities. These findings support various previous studies that suggest that social change is a crucial foundation for the successful implementation of the circular economy and business sustainability in the MSME sector.

B. The Transformational Impact of Digital on Circular Economy Integration

Digital transformation has a significant effect on circular economy integration, indicating that higher levels of digital transformation among creative MSMEs are associated with stronger implementation of circular economy practices. The findings indicate that digital technologies can support resource optimization, waste reduction, operational efficiency, and sustainability-oriented product innovation. More importantly, the findings suggest that digital transformation functions not merely as an operational tool but as an enabling mechanism through which MSMEs can reorganize production, information flows, and value creation in ways that support circularity. This finding is in line with Jamwal et al. (2024) [56] that digital transformation can facilitate the adoption of a circular economy by increasing efficiency, innovation, and connectivity among SMEs. Digital technology can support the circular economy transition by increasing resource efficiency, innovation, coordination, and sustainable business practices [57], [58].

The use of digital technology enables MSMEs to quickly obtain information on market needs, trends in environmentally friendly products, and more efficient resource management strategies. Furthermore, digital technology also makes it easier for businesses to monitor production and distribution processes, thereby reducing waste of raw materials and energy.

Integrating digital technology with a circular economy can create a more efficient and sustainability-oriented production system [52].

In Greater Malang, the rapid development of the digital ecosystem has also supported the implementation of a circular economy in the creative MSME sector. Many businesses have begun utilizing digital platforms to market recycled and environmentally friendly products. Furthermore, the use of digital applications for inventory management and production recording helps MSMEs control raw material usage more efficiently. This demonstrates that digital transformation impacts not only marketing but also business sustainability practices.

Digital transformation is also driving the emergence of circular economy-based product innovation. Through access to information and technology, MSMEs can develop creative products from waste or used materials that have higher economic value. Several MSMEs in Greater Malang have begun utilizing waste fabric, plastic, and organic materials to create crafts and eco-friendly products that have their own market appeal. This aligns with research. Natrajan et al. [59] which states that digital technology can strengthen the implementation of a circular economy through the development of innovation and production efficiency in MSMEs.

Furthermore, digital transformation facilitates collaboration between businesses and expands access to information on sustainable business practices. Through digital media, MSMEs can share knowledge, build business networks, and participate in training on waste management and resource efficiency. This accelerates the adoption of a circular economy in daily business activities. Successful implementation of a circular economy requires support from innovation, technology, and collaboration between businesses and stakeholders [53].

However, implementing digital transformation in MSMEs still faces several challenges, such as limited technological capabilities, a lack of digital literacy, and limited infrastructure for some business owners. Some MSMEs still use conventional methods for business management, thus hindering the optimal implementation of the circular economy. Therefore, digital training and mentoring are needed to enable MSMEs to maximize their use of technology to support business sustainability.

Support from the government and supporting institutions is also crucial in accelerating the digital transformation of MSMEs in Greater Malang. MSME digitalization programs, digital marketing training, and education on the circular economy help improve business preparedness for increasingly technology- and sustainability-driven business changes. The success of circular economy integration in MSMEs is heavily influenced by technological support, human resource capacity, and policies that support business sustainability [60].

Thus, the results of this study indicate that digital transformation has a significant impact on circular economy integration among creative MSMEs in Greater Malang. The greater the

utilization of digital technology in business activities, the better the implementation of circular economy principles by MSMEs. These results support previous research that suggests digital transformation is a strategic factor in driving efficiency, innovation, and sustainability of circular economy-based businesses in the MSME sector.

C. The Influence of Social Transformation on the Sustainability of Creative MSMEs

Social transformation significantly influences the sustainability of creative MSMEs, meaning that the better the social transformation that occurs in creative MSMEs, the higher the level of sustainability of their businesses. The results of this study indicate that social change in the form of strengthening collaboration, increasing community participation, social adaptability, and orientation towards social impact can support the sustainability of creative MSMEs in Greater Malang.

Social transformation in this study is reflected in the ability of MSMEs to build collaborations with other business actors, involvement in business communities, participation in training and business capacity development, and concern for the social impact on the surrounding community. These conditions provide a significant contribution to business sustainability because MSMEs are not only oriented towards economic profit but also consider social and environmental aspects in running their businesses. This is in line with research that business sustainability is strongly influenced by social change and the ability of organizations to build collaborative relationships that support business innovation and adaptation [52].

In Greater Malang, creative MSMEs thrive in a dynamic social environment supported by creative communities, universities, and local government business mentoring programs. Strong social interactions among MSMEs foster business networks that strengthen their resilience, particularly in the face of market changes and competition. MSMEs active in the community tend to have easier access to information, market opportunities, and business development support than those operating independently.

Social transformation also encourages increased adaptability of MSMEs to changing consumer needs and developments in the business environment. Creative MSMEs with strong social adaptability tend to be more innovative in developing products and marketing strategies. Furthermore, involvement in training and business capacity development helps MSMEs improve their competency, creativity, and managerial skills, which support long-term business sustainability. Business sustainability is influenced not only by economic factors but also by the organization's social capacity to adapt and build sustainable relationships with its environment [54].

The sustainability of creative MSMEs is also influenced by the social orientation of business actors. Many MSMEs in Greater Malang have begun developing businesses that not only generate economic profits but also provide social benefits to the surrounding community, such

as creating jobs, empowering local communities, and supporting products based on local culture. This approach creates a better relationship between MSMEs and the community, thereby increasing consumer loyalty and business sustainability. The social dimension is an important part of the sustainability concept because it relates to the creation of shared value between business actors and the community [53].

Furthermore, social transformation helps MSMEs build business resilience in the face of economic changes and business crises. Collaboration between business actors allows MSMEs to support each other in marketing, product distribution, and sharing business resources. This is one factor that strengthens the sustainability of creative MSMEs amidst increasingly fierce business competition.

However, several challenges remain in the social transformation process of MSMEs, such as low participation of some entrepreneurs in the business community, limited access to training, and a lack of awareness of the importance of social collaboration in business development. Therefore, ongoing support from the government, educational institutions, and the business community is needed to improve the social capacity of creative MSMEs in Greater Malang.

A strong social ecosystem is a crucial factor in strengthening the sustainability of creative MSMEs. MSME empowerment programs, entrepreneurship training, strengthening creative communities, and collaboration between the government, academia, and the private sector can help create a more adaptive and sustainable business environment. Business sustainability will be more easily achieved when supported by strong social collaboration among stakeholders [55].

Thus, the results of this study indicate that social transformation has a significant influence on the sustainability of creative MSMEs in Greater Malang. The better MSMEs' ability to build collaboration, adapt socially, engage with the business community, and create positive social impacts, the higher the level of sustainability of their businesses. This finding reinforces previous research that suggests that social aspects are a crucial factor in supporting the sustainability and resilience of MSMEs in the face of changes in the business environment.

D. The Impact of Digital Technology Adoption on the Financial Performance of MSMEs

Digital transformation significantly impacts the sustainability of creative MSMEs, meaning that the higher the level of digital transformation in creative MSMEs, the better their business sustainability. The results of this study indicate that the use of digital technology can help MSMEs improve operational efficiency, expand market access, strengthen relationships with consumers, and enhance business innovation capabilities, thus supporting long-term business sustainability.

The digital transformation in this study is reflected in the use of social media and marketplaces as marketing tools, the implementation of digital systems for financial recording, the use of digital technology in business operations, the use of data for decision-making, and the ability of business actors to utilize digital technology. This digitalization has a positive impact on business sustainability because MSMEs become more adaptive to changes in the business environment and evolving consumer needs. These findings align with research. Verhoef et al. [61] which states that digital transformation is able to increase the competitiveness and sustainability of organizations through business process innovation and increased operational efficiency.

In Greater Malang, the development of digital technology presents significant opportunities for creative MSMEs to expand their markets and enhance their business presence. Many MSMEs are starting to utilize social media platforms like Instagram, TikTok, and Facebook, as well as marketplace platforms, to reach a wider audience without being limited by geographic location. This helps MSMEs maintain sales stability and improve business sustainability amidst increasingly competitive markets.

Furthermore, digital transformation helps MSMEs improve business management efficiency through the use of digital applications for financial record-keeping, inventory management, and sales monitoring. The use of digital systems enables business actors to obtain real-time data, enabling them to make faster and more accurate business decisions. Vial [62], digital transformation enables organizations to create new value through the integration of technology into business activities that can increase business resilience and sustainability.

Digital transformation also encourages creative MSMEs to continuously innovate products and services. Through access to digital information, businesses can understand market trends, consumer needs, and develop more effective marketing strategies. This innovation is crucial for maintaining business sustainability because MSMEs are able to adapt to changing consumer preferences and market developments. Digitalization provides organizations with the flexibility to develop new business models that are more adaptive to changes in the business environment [61].

On the other hand, digital transformation helps MSMEs improve customer relationships through faster and more interactive communication. Digital media enables businesses to build customer loyalty through responsive service, more effective promotions, and direct interaction with customers. A strong customer relationship is a crucial factor in maintaining long-term business sustainability.

However, implementing digital transformation in creative MSMEs still faces several challenges, such as limited technological capabilities, low digital literacy among some business owners, and limited access to digital infrastructure. Some MSMEs are still unable to utilize

technology optimally due to a lack of understanding of how digital applications are used in business activities. Therefore, ongoing training and mentoring are needed to help MSMEs improve their digital capabilities.

Support from the government, universities, and supporting institutions is also a crucial factor in accelerating the digital transformation of MSMEs in Greater Malang. Various MSME digitalization programs, digital marketing training, and mentoring on the use of business technology help improve business readiness for the digital economy era. The success of MSME digital transformation is heavily influenced by the support of the digital ecosystem, human resource capacity, and policies that support innovation and business sustainability [63].

Thus, the results of this study indicate that digital transformation has a significant impact on the sustainability of creative MSMEs in Greater Malang. The higher the level of digital technology utilization in business activities, the better the sustainability of creative MSMEs, as demonstrated by business growth, resilience, innovation, and social and environmental contributions. These findings reinforce previous research that suggests digital transformation is a strategic factor in increasing the competitiveness and sustainability of MSMEs in the digital economy era.

E. The Impact of Circular Economy Integration on the Sustainability of Creative MSMEs

Circular Economy Integration has a significant impact on the Sustainability of Creative MSMEs, meaning that the better the implementation of circular economy principles in creative MSMEs, the higher the level of business sustainability they have. The results of this study indicate that circular economy practices such as waste reduction, reuse of production materials, recycling, resource efficiency, and waste-based product innovation are able to support the sustainability of creative MSMEs in Malang Raya economically, socially, and environmentally.

The implementation of a circular economy in this study is reflected in MSMEs' efforts to reduce waste in production processes, reuse usable materials, implement recycling processes, optimize resource use, and develop waste-based product innovations. These practices help MSMEs create more efficient and environmentally friendly production systems, thereby increasing long-term business resilience. These findings align with research. Geissdoerfer et al. [52] which states that the circular economy is a sustainable business approach that is able to create economic value while reducing negative impacts on the environment.

In Greater Malang, some creative MSMEs have begun implementing the circular economy concept by transforming waste into products with economic value. For example, MSMEs in the crafts and fashion sectors are utilizing waste fabric, plastic, and other used materials to create creative products with higher sales value. Besides helping reduce production waste, this

innovation also serves as a product differentiation strategy that can increase business competitiveness in the market.

Circular economic integration also helps MSMEs save production costs through more efficient resource use. Reusing production materials and reducing waste allows businesses to reduce operational costs, thereby improving financial stability. A circular economy is not only oriented towards environmental sustainability but also improves economic efficiency and business resilience in the face of resource constraints [54].

Beyond the economic aspect, implementing a circular economy has a positive impact on business image and consumer loyalty. Consumers are increasingly paying attention to environmentally friendly and sustainable products. MSMEs that implement circular economy principles tend to receive positive public perception due to their perceived social and environmental responsibility. This is a factor supporting long-term business sustainability.

Circular economy integration also encourages creative MSMEs to continuously innovate products and production processes. The use of recycled materials and the development of waste-based products create new, more creative and value-added business opportunities. Innovation is a key element in implementing a circular economy because it enables organizations to create more efficient and sustainable production systems [53].

However, the implementation of a circular economy among MSMEs still faces several obstacles, such as limited knowledge about waste management, lack of access to supporting technology, and limited capital to develop sustainability-based innovations. Some MSMEs are also still oriented towards conventional production systems, resulting in suboptimal implementation of the circular economy. Therefore, education, training, and policy support are needed to improve MSMEs' understanding of the importance of a circular economy.

Support from the government, the business community, and educational institutions is crucial in strengthening the implementation of a circular economy among creative MSMEs in Greater Malang. Waste management training programs, mentoring on environmentally friendly product innovation, and business sustainability campaigns can help increase MSME readiness to implement circular economy principles more broadly. The success of a circular economy requires collaboration between various parties in creating a business ecosystem that supports sustainability [55].

Thus, the results of this study indicate that circular economy integration has a significant impact on the sustainability of creative MSMEs in Greater Malang. The better the implementation of circular economy principles in business activities, the higher the level of sustainability of creative MSMEs, as demonstrated by business efficiency, product innovation, environmental awareness, and long-term resilience. These findings reinforce previous

research that suggests the circular economy is a crucial strategy for supporting the sustainability and competitiveness of MSMEs in the era of sustainable business.

F. The Influence of Social Transformation on the Sustainability of Creative MSMEs through Circular Economy Integration

Social transformation significantly influences the sustainability of creative MSMEs through circular economy integration. The results of this study indicate that circular economy integration can mediate the relationship between social transformation and the sustainability of creative MSMEs. This means that the better the social transformation among creative MSMEs, the more it will encourage the implementation of a circular economy, which ultimately improves business sustainability.

The social transformation in this study is reflected in the ability of MSMEs to build collaboration, engage in business communities, adapt to social and market changes, participate in training, and prioritize the social impact of their businesses. These conditions foster a collective awareness of the importance of business management that is not solely focused on economic profit but also considers environmental and sustainability aspects. This social awareness is then realized through the application of circular economy principles in daily business activities.

In Greater Malang, the existence of creative communities and MSME networks provides a space for businesses to share information and experiences related to sustainable business practices. Strong social interactions among businesses help accelerate the adoption of circular economy practices such as waste reduction, reuse of production materials, and recycling-based product innovation. This situation demonstrates that social transformation is a crucial factor driving circular economy integration in supporting the sustainability of creative MSMEs.

Circular economic integration acts as a mechanism linking social transformation with business sustainability. When MSMEs have a strong social awareness and are supported by a collaborative community environment, they are more likely to implement environmentally friendly and resource-efficient business practices. These practices help MSMEs improve operational efficiency, reduce production costs, create product innovation, and strengthen their business image in the eyes of consumers. The circular economy is a strategic approach to creating business sustainability through the integration of economic, social, and environmental aspects [52].

Furthermore, social transformation also strengthens MSMEs' ability to adapt to changing market trends that increasingly prioritize sustainable and environmentally friendly products. Modern consumers tend to be more attracted to products with social and environmental value, so MSMEs that implement a circular economy have a greater opportunity to maintain consumer loyalty and increase business competitiveness. A circular economy can create added

value for organizations through resource efficiency and increased long-term sustainability [54].

On the other hand, the implementation of a circular economy in creative MSMEs is also influenced by community support and mentoring programs that help entrepreneurs understand the importance of business sustainability. Training on waste management, environmentally friendly product innovation, and production efficiency helps increase the capacity of MSMEs to more optimally implement circular economy principles. The success of a circular economy is greatly influenced by changes in organizational culture, social collaboration, and increased awareness of sustainability among entrepreneurs [53].

However, several challenges remain in the process of integrating the circular economy, such as limited technical knowledge, conventional production practices, and limited access to technology and financing. Therefore, social transformation needs to be continuously strengthened through increased education, strengthening the business community, and government policy support to ensure broader and more sustainable implementation of the circular economy.

Strong social ecosystem support is a crucial factor in strengthening the relationship between social transformation, the circular economy, and the sustainability of creative MSMEs. Collaboration between the government, universities, the business community, and the private sector can help create a business environment that is more adaptive to sustainability principles. The success of a circular economy requires the involvement of various parties in building sustainable production and consumption systems [55].

Thus, the results of this study indicate that Circular Economy Integration can mediate the influence of Social Transformation on the Sustainability of Creative MSMEs in Greater Malang. The better the social transformation that occurs among MSMEs, the higher the implementation of the circular economy, which ultimately improves business sustainability. This finding supports previous research that suggests that social change and circular economy practices are crucial factors in creating competitive and sustainable MSMEs.

G. The Impact of Digital Transformation on the Sustainability of Creative MSMEs through Circular Economy Integration

Digital Transformation has a significant impact on the Sustainability of Creative MSMEs through Circular Economy Integration. The results of this study indicate that Circular Economy Integration can mediate the relationship between Digital Transformation and the Sustainability of Creative MSMEs. This means that the higher the level of digital transformation implemented by creative MSMEs, the better the implementation of the circular economy, which ultimately improves business sustainability.

Digital transformation in this study is reflected in the use of social media and marketplaces for marketing, the implementation of digital systems for financial record-keeping, the use of digital technology in business operations, the use of data in decision-making, and the ability of business actors to utilize digital technology. This digitalization not only helps MSMEs improve business efficiency but also encourages the implementation of more effective and sustainable circular economy practices.

In the context of creative MSMEs in Greater Malang, digital transformation makes it easier for businesses to manage resources more efficiently, reduce waste of production materials, and monitor operational processes in a more structured manner. The use of digital technology enables MSMEs to more optimally control raw material stocks, record production waste, and develop recycling-based product innovations. This situation demonstrates that digital transformation is a crucial factor in strengthening the integration of the circular economy in supporting business sustainability.

Circular economy integration serves as a mechanism connecting digital transformation with the sustainability of creative MSMEs. Through the application of digital technology, business actors find it easier to implement the principles of reduce, reuse, and recycle in their business activities. Digital technology also helps MSMEs obtain information on trends in environmentally friendly products, resource efficiency strategies, and sustainability-based innovations. Integrating digital technology with the circular economy can create a more efficient, innovative, and sustainability-oriented business system [52].

Furthermore, digital transformation enables creative MSMEs to expand market access to circular economy-based products. Through digital platforms and social media, businesses can market environmentally friendly products to a wider consumer base. Consumers are increasingly paying attention to sustainability and environmental values when choosing products, making the implementation of a circular economy a competitive advantage for creative MSMEs. This supports increased business sustainability, as MSMEs are able to maintain consumer loyalty and expand market opportunities.

Digital transformation also supports circular economy-based product innovation. With broader access to information and technology, MSMEs can develop creative products from waste or used materials into products with high economic value. This innovation not only reduces environmental impact but also creates new, more sustainable business opportunities. Digital transformation is a key driver of circular economy implementation because it can increase efficiency, innovation, and connectivity in MSME business activities [56].

On the other hand, implementing a circular economy through digital transformation also helps MSMEs improve operational cost efficiency. The use of technology in production and distribution management helps reduce resource waste and increase business productivity. A

circular economy provides economic benefits through efficient resource use and reduced production waste, which can strengthen long-term business sustainability [54].

However, several challenges remain in implementing digital transformation and the circular economy in creative MSMEs, such as limited digital literacy, lack of access to technology, and limited capital to develop sustainability-based innovations. Some businesses also still use conventional production methods, preventing optimal implementation of the circular economy. Therefore, training, mentoring, and policies that support sustainability-based MSME digitalization are needed.

Support from the government, universities, the business community, and technology providers is crucial in strengthening the integration of digital transformation and the circular economy among creative MSMEs in Greater Malang. MSME digitalization programs, training in environmentally friendly product innovation, and strengthening human resource capacity can help businesses improve their preparedness for the sustainability-oriented digital economy era. The successful implementation of a circular economy among MSMEs is heavily influenced by technological support, innovation, and collaboration among stakeholders.[60].

Thus, the results of this study indicate that Circular Economy Integration can mediate the influence of Digital Transformation on the Sustainability of Creative MSMEs in Greater Malang. The higher the level of digital transformation implemented by MSMEs, the better the implementation of the circular economy, which ultimately improves business sustainability. This finding supports previous research that states that digital transformation and the circular economy are important strategies in creating innovative, competitive, and sustainable creative MSMEs.

Conclusion

This study demonstrates that social and digital transformation contribute to the sustainability of creative MSMEs in Greater Malang, both directly and through circular economy integration. Theoretically, this study contributes an integrated socio-digital-circular perspective by positioning circular economy integration as a mechanism through which social and digital transformation can be translated into sustainable MSME practices.

For managers, the findings highlight the need to combine digital capabilities, social collaboration, and circular business practices. MSMEs should use digital technologies not only for marketing and administration but also for resource management, product innovation, and market development for sustainable products. Strengthening business networks and knowledge sharing is equally important for supporting long-term adaptation and resilience.

For policymakers, MSME development programs should integrate digitalization and circular economy initiatives rather than treating them as separate agendas. Training,

mentoring, access to technology, circular product development, and inter-MSME collaboration should be incorporated into local support programs to accelerate sustainable transformation.

Future research should test the proposed model across different regions and MSME sectors and examine additional factors such as digital literacy, entrepreneurial orientation, innovation capacity, and government support. Overall, this study provides a practical and theoretical basis for advancing the sustainability of creative MSMEs through an integrated social, digital, and circular transformation approach.

Conflict of Interest

The authors declare no conflict of interest.

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