Etikonomi
Volume 25(2), 2026: 519 - 536
P-ISSN: 1412-8969; E-ISSN: 2461-0771
https://doi.org/10.15408/etk.v25i2.50439

Human–Technology Symbiosis Linking Digitalization and Marketing 5.0 for Responsible MSME Transformation

Syaifuddin[1*], Taufiq Ramdani[2]
[1]Universitas Sebelas April, Indonesia
[2]Universitas Mataram, Indonesia
Email: [1]syaifuddin.feb@unsap.ac.id; [2]taufiq.ramdani@unram.ac.id
[*)]**Corresponding Author**

JEL Classification:
M31
O33
L26

Received: 10 March 2026

Revised: 08 May 2026

Accepted: 15 May 2026

Available online: September 2026

Abstract

Research Originality: This study examines how digitalization and Marketing 5.0 influence responsible business transformation in MSMEs. The novelty of this study lies in positioning human–technology symbiosis as the main mechanism linking digitalization and responsible transformation.

Research Objectives: This study aims to examine how digitalization and Marketing 5.0 influence responsible business transformation through human-centric orientation and human–technology symbiosis in MSMEs.

Research Method: A quantitative explanatory approach was employed using survey data collected from 200 MSME owners and managers in Indonesia and analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM).

Empirical Results: The findings reveal that digitalization and Marketing 5.0 significantly strengthen human-centric orientation and human–technology symbiosis. However, human-centric orientation does not significantly affect responsible business transformation. In contrast, human–technology symbiosis has a strong positive effect and significantly mediates the relationship between digitalization, Marketing 5.0, and responsible transformation. These findings indicate that responsible transformation depends more on effectively integrating technology with human judgment than on value orientation alone.

Implications: This study implies that MSMEs and policymakers should strengthen human–technology collaboration, digital capability, and responsible data governance to support ethical, accountable, and sustainable business transformation.

Keywords:
socio-technical integration; ethical digital governance; responsible innovation; customer-centric technology; sustainable MSME strategy.

How to Cite:

Syaifuddin., & Ramdani, T. (2026). Human–Technology Symbiosis Linking Digitalization and Marketing 5.0 for Responsible MSME Transformation. *Etikonomi, 25*(2), 519 – 536. https://doi.org/10.15408/etk.v25i2.50439.

Copyright © 2026 by Authors.
This is an open-access article under CC BY-SA license (https://creativecommons.org/licences/by-sa/4.0)

INTRODUCTION

Digitalization has fundamentally transformed contemporary business activities by reshaping how firms create value, interact with customers, manage operations, and sustain competitiveness in increasingly dynamic markets. The rapid adoption of artificial intelligence, big data analytics, automation, digital platforms, and data-driven marketing systems has accelerated organizational transformation across industries (Verhoef et al., 2021; Vial, 2019). In this context, digital transformation is no longer viewed merely as technological adoption or the conversion of manual processes into digital systems, but rather as a strategic organizational transformation affecting business models, managerial capabilities, customer relationships, and long-term sustainability. Consequently, digitalization has become a central theme in contemporary management and marketing research.

However, academic debates regarding digital transformation remain highly fragmented and inconclusive. On one side, many scholars argue that digitalization improves organizational efficiency, innovation capability, market expansion, customer engagement, and business performance (Kraus et al., 2022; Guandalini, 2022). Digital technologies enable firms to collect and process customer data more effectively, optimize decision-making processes, and create personalized customer experiences through advanced marketing systems. From this perspective, digital transformation is often associated with organizational agility and competitive advantage. On the other hand, recent studies warn that digital transformation may also generate ethical and managerial risks, including data privacy violations, algorithmic bias, digital inequality, excessive automation, reduced human control, and irresponsible use of customer data (Lobschat et al., 2021; Müller, 2022; Zimmer et al., 2023). These contrasting perspectives indicate that digital transformation does not automatically produce positive organizational outcomes. Instead, the effectiveness of digitalization depends on how technology is governed, interpreted, and integrated into organizational decision-making processes.

This debate makes the topic increasingly important and academically relevant, particularly because discussions about digital transformation have shifted from technological adoption toward responsible and sustainable transformation. Recent literature increasingly emphasizes responsible digitalization, ethical governance, and human-centered technological development (Dwivedi et al., 2023; Kraus et al., 2023). Nevertheless, previous studies still predominantly focus on performance-oriented outcomes such as efficiency, innovation, profitability, and competitiveness, while giving limited attention to how digitalization contributes to responsible business transformation. As a result, an important academic question remains unresolved: why do some digitally transformed firms become more ethical, transparent, and sustainable, while others experience governance problems and social risks despite adopting similar technologies? This unresolved issue shows that responsible transformation cannot be explained solely through technological capability; it must also consider socio-technical and human-oriented mechanisms.

The issue becomes more critical in the context of micro, small, and medium enterprises (MSMEs). MSMEs are increasingly encouraged to adopt digital platforms,

https://journal.uinjkt.ac.id/index.php/etikonomi
DOI: https://doi.org/10.15408/etk.v25i2.50439

digital payments, social media marketing, and data-based customer interaction systems in order to survive in competitive digital markets. In Indonesia, MSMEs play a strategic role in economic growth and job creation, making their digital transformation crucial for sustainable economic development. However, MSMEs frequently face structural limitations such as weak digital literacy, limited financial resources, informal governance systems, inadequate technological infrastructure, and insufficient managerial capability (Dörr et al., 2023; Kraus et al., 2022). Consequently, many MSMEs adopt digital technologies pragmatically to expand sales and improve operational efficiency without integrating ethical governance and responsible decision-making into their transformation processes. This condition creates an important paradox in MSME digitalization: technology adoption continues to increase, but responsible transformation does not necessarily follow.

At the same time, Marketing 5.0 has emerged as a relevant conceptual approach for understanding responsible transformation in the digital era. Marketing 5.0 emphasizes integrating advanced technologies such as artificial intelligence, predictive analytics, automation, and big data with human-centered value creation and customer engagement (Paschen et al., 2020; Bakator et al., 2024). Unlike previous marketing paradigms that focused primarily on transactional performance, Marketing 5.0 attempts to balance technological sophistication with empathy, customer well-being, and social value creation. This perspective is particularly relevant because firms increasingly rely on algorithmic systems and automated customer interaction. Nevertheless, implementing Marketing 5.0 in MSMEs remains challenging because many MSMEs still lack data capability, technological readiness, and formal governance mechanisms. Therefore, Marketing 5.0 should not be understood merely as a technology-enabled marketing strategy, but as a socio-technical framework that integrates technology, ethical awareness, and human judgment to support responsible business outcomes.

Conceptually, this study integrates five constructs: digitalization, Marketing 5.0, human-centric orientation, human–technology symbiosis, and responsible business transformation. Digitalization refers to the adoption and utilization of digital technologies in business activities. Marketing 5.0 reflects technology-enabled marketing practices that combine data-driven insights with human-centered customer value. Human-centric orientation refers to the extent to which MSMEs prioritize empathy, customer well-being, ethical awareness, and human value creation. Human–technology symbiosis refers to the collaborative relationship between human actors and digital technologies in organizational processes, where technology supports rather than replaces human judgment (Jarrahi, 2018). Responsible business transformation refers to organizational transformation toward ethical, accountable, transparent, and sustainable business practices. This framework is based on the argument that responsible transformation requires not only technological capability, but also operational mechanisms that effectively integrate technology with human judgment and ethical governance.

Despite the growing literature on digital transformation and Marketing 5.0, several important research gaps remain unresolved. First, previous studies on MSME

digitalization predominantly focus on technology adoption, innovation, competitiveness, and organizational performance, while limited studies examine responsible business transformation as the primary outcome. Second, studies on corporate digital responsibility mainly discuss ethical principles and governance frameworks conceptually, but empirical explanations regarding how responsible transformation occurs operationally in MSMEs remain limited (Lobschat et al., 2021; Zimmer et al., 2023). Third, prior studies on Marketing 5.0 mainly explain customer engagement, predictive marketing, and technological applications, but insufficiently explain how Marketing 5.0 contributes to ethical and responsible transformation through socio-technical mechanisms. Fourth, many previous studies assume that human-centric values automatically generate responsible outcomes, although empirical evidence on how these values translate into organizational practices remains inconsistent. Therefore, understanding of the mechanisms connecting digitalization, Marketing 5.0, and responsible business transformation in MSMEs remains limited.

Accordingly, this study's novelty lies in developing and empirically testing a socio-technical framework that positions human–technology symbiosis as the primary mechanism linking digitalization and Marketing 5.0 to responsible business transformation. Unlike prior studies that mainly position digital transformation as a driver of organizational performance, this study positions responsible business transformation as the central outcome. In addition, this study distinguishes between value-based orientation and operational transformation mechanisms. Human-centric orientation represents the normative value-based dimension, whereas human–technology symbiosis represents the operational socio-technical mechanism that translates technological capability into responsible organizational practices. This distinction offers a new explanation for why digital transformation may fail to produce responsible outcomes despite strong human-centered values. Thus, this study contributes theoretically by extending the literature on digital transformation, Marketing 5.0, and responsible business through a socio-technical perspective in the MSME context.

Based on these arguments, this study aims to analyze the influence of digitalization and Marketing 5.0 on responsible business transformation in MSMEs through human-centric orientation and human–technology symbiosis. Specifically, this study examines whether digitalization and Marketing 5.0 strengthen human-centric orientation and human–technology symbiosis, whether these mediating variables influence responsible business transformation, and whether they mediate the relationship between digitalization, Marketing 5.0, and responsible transformation. Practically, this study provides insights for MSME actors and policymakers in designing digital transformation strategies that are not only performance-oriented, but also ethical, accountable, and sustainable.

METHODS

This study uses a quantitative approach and an explanatory research design to analyze the relationships among digitalization, Marketing 5.0, human-centric orientation, human–

https://journal.uinjkt.ac.id/index.php/etikonomi
DOI: https://doi.org/10.15408/etk.v25i2.50439

technology symbiosis, and responsible business transformation in MSMEs. The analysis uses Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4 software. PLS-SEM is considered appropriate because this study focuses on prediction-oriented analysis involving multiple latent constructs and mediation relationships (Hair et al., 2021; Sarstedt et al., 2022).

The unit of analysis is MSME owners and managers in Indonesia who are actively involved in business operations, digitalization, and marketing decision-making. Data were collected through a cross-sectional survey conducted between October and December 2025 using an online questionnaire distributed through MSME communities, entrepreneurial networks, and digital business platforms. This study uses purposive sampling because a comprehensive sampling frame for digitally active MSMEs in Indonesia is unavailable. Respondents were selected based on three criteria: (1) having operated a business for at least one year, (2) having adopted digital technology in business activities, and (3) being directly involved in marketing and customer-related decision-making. These criteria ensured that respondents had sufficient experience and understanding of digitalization and marketing practices in MSMEs.

A total of 200 valid responses were obtained and analyzed. The sample size is considered adequate for PLS-SEM because the model includes multiple constructs and mediation effects with medium complexity. According to Kock and Hadaya (2018) and Hair et al. (2021), a sample size between 100 and 200 respondents is sufficient to detect significant structural relationships and achieve adequate statistical power in predictive SEM analysis. Therefore, the sample fulfills the recommended minimum requirement for PLS-SEM estimation. All constructs were measured using reflective indicators on a five-point Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree"). The selection of variables was based on recent literature on digital transformation, Marketing 5.0, and responsible business practices, which emphasizes the importance of socio-technical integration and human-oriented organizational mechanisms (Hanelt et al., 2021; Paschen et al., 2020).

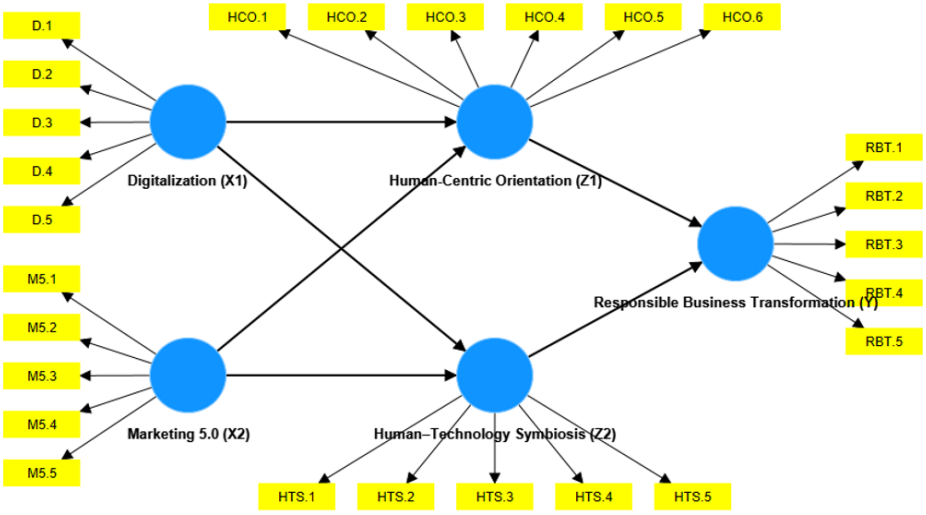
Table 1. Research Variables

Variable	Definition	Role
Digitalisation	Adoption and utilization of digital technologies in business activities	Exogenous
Marketing 5.0	Technology-enabled marketing practices integrating data-driven insights with human-centered value creation	Exogenous
Human-Centric Orientation	Organizational orientation prioritizing empathy, customer well-being, and ethical value creation	Mediating
Human–Technology Symbiosis	Collaborative integration between human judgment and digital technologies in organizational processes	Mediating
Responsible Business Transformation	Transformation toward ethical, accountable, transparent, and sustainable business practices	Endogenous

Source: Developed by the authors (2026).

The research framework proposes that digitalization and Marketing 5.0 influence responsible business transformation both directly and indirectly through human-centric orientation and human–technology symbiosis. Human-centric orientation represents the value-based mechanism, while human–technology symbiosis represents the socio-technical operational mechanism connecting technological capability with responsible organizational practices. The research framework illustrates the relationships among digitalization, Marketing 5.0, human-centric orientation, human–technology symbiosis, and responsible business transformation in MSMEs. Digitalization and Marketing 5.0 are positioned as exogenous variables that influence responsible business transformation both directly and indirectly through two mediating variables: human-centric orientation and human–technology symbiosis. Human-centric orientation represents the value-based mechanism, while human–technology symbiosis represents the socio-technical operational mechanism that integrates human judgment with technological capability in organizational processes.

Figure 1. Research Framework



Data analysis was conducted in two stages. First, the measurement model was evaluated through validity and reliability assessment. Second, the structural model was analyzed to examine the significance of direct and indirect relationships among variables using bootstrapping procedures. In addition, a full collinearity assessment using the variance inflation factor (VIF) was applied to minimize potential common method bias (Kock, 2020).

RESULTS AND DISCUSSION

The findings indicate that digitalization and Marketing 5.0 indirectly influence responsible business transformation in MSMEs. Human–technology symbiosis is the key driver, while human-centric orientation has no significant direct effect. This indicates that

https://journal.uinjkt.ac.id/index.php/etikonomi
DOI: https://doi.org/10.15408/etk.v25i2.50439

transformation depends more on effectively integrating technology with human judgment than on value orientation alone. To provide context for the sample, Table 1 presents the demographic and business characteristics of the respondents, including gender, age, education level, business location, sector, duration, workforce size, and digital usage patterns.

Table 2. Respondent Characteristics

Characteristics	Category	Frequency (n)	Percentage
Gender	Male	92	46
	Female	108	54
Age	17 to 25 years old	38	19.0
	26 to 35 years old	74	37
	36 to 45 years old	56	28
	46 to 55 years old	24	12
	Over 55 years old	8	4
Highest level of education	Junior high school equivalent	14	7.0
	High school equivalent	78	39
	Diploma	26	13
	Bachelor	70	35
	Postgraduate	12	6
Business location	Sumatra	42	21
	Java	102	51.0
	Kalimantan	18	9.0
	Sulawesi	20	10
	Bali and Nusa Tenggara	12	6
	Maluku and Papua	6	3
Business sector	Culinary	58	29
	Fashion	34	17
	Beauty and care	18	9.0
	Crafts	22	11.0
	Services	52	26.0
	Others	16	8
Business duration	Less than 1 year	24	12
	1 to 3 years	78	39
	4 to 7 years	60	30
	Over 7 years	38	19
Workforce size	1 to 4 people	146	73
	5 to 19 people	44	22
	20 to 99 people	9	4.5
	100 people or more	1	0.5
Primary digital channel	Social media	86	43
	Marketplace	54	27
	Instant messaging for sales	32	16
	Digital payments	24	12
	Own website or application	4	2
Intensity of digital usage	Low	46	23.0
	Moderate	106	53.0
	High	48	24

Source: Processed primary data (2025).

The results indicate that MSMEs are predominantly managed by individuals in productive age groups with moderate educational backgrounds. Most businesses operate at a micro scale and are concentrated in Java, particularly in culinary and service sectors. The dominance of social media as the primary digital channel suggests that digitalization in MSMEs remains practical and efficiency-driven rather than strategic. This context explains why human-centric orientation does not directly lead to responsible business transformation, as value-based approaches are not yet fully translated into structured operational practices.

To assess the adequacy of the measurement model, this study evaluates indicator reliability, convergent validity, discriminant validity, and construct reliability. The results show that all indicator loadings exceed the recommended threshold of 0.70, indicating that each construct is well represented by its respective indicators. This confirms that the indicators have satisfactory reliability and are suitable for further analysis.

Table 3. Outer Loadings

	Digitalization (X1)	Human-Centric Orientation (Z1)	Human–Technology Symbiosis (Z2)	Marketing 5.0 (X2)	Responsible Business Transformation (Y)
D.1	0.740				
D.2	0.752				
D.3	0.727				
D.4	0.726				
D.5	0.717				
HCO.1		0.733			
HCO.2		0.741			
HCO.3		0.739			
HCO.4		0.748			
HCO.5		0.778			
HCO.6		0.710			
HTS.1			0.740		
HTS.2			0.737		
HTS.3			0.705		
HTS.4			0.732		
HTS.5			0.717		
M5.1				0.733	
M5.2				0.753	
M5.3				0.786	
M5.4				0.749	
M5.5				0.720	
RBT.1					0.728
RBT.2					0.716
RBT.3					0.724
RBT.4					0.775
RBT.5					0.731

Source: Author's calculation using SmartPLS 4 (2025).

https://journal.uinjkt.ac.id/index.php/etikonomi
DOI: https://doi.org/10.15408/etk.v25i2.50439

The discriminant validity results demonstrate that each construct is empirically distinct from the others, as indicated by the HTMT values within acceptable limits. This suggests that all variables capture different conceptual domains and do not exhibit multicollinearity issues. The reliability and validity assessment shows that all constructs meet the required criteria, with Cronbach's alpha and composite reliability values above 0.70 and AVE values exceeding 0.50. These results confirm that the measurement model is both reliable and valid, ensuring the robustness of the constructs used in this study.

Table 4. Discriminant Validity

	Digitalization (X1)	Human-Centric Orientation (Z1)	Human–Technology Symbiosis (Z2)	Marketing 5.0 (X2)	Responsible Business Transformation (Y)
Digitalization (X1)	0.732				
Human-Centric Orientation (Z1)	0.744	0.742			
Human–Technology Symbiosis (Z2)	0.925	0.761	0.726		
Marketing 5.0 (X2)	0.854	0.711	0.879	0.748	
Responsible Business Transformation (Y)	0.897	0.733	0.944	0.887	0.735

Source: Author's calculation using SmartPLS 4 (2025).

To evaluate the structural relationships among constructs, the model's explanatory power is assessed using the coefficient of determination (R-square). The results show that the model has strong explanatory power, particularly for human–technology symbiosis and responsible business transformation, as indicated by high R-square values. This suggests that digitalization and Marketing 5.0, together with the mediating variables, effectively explain the variation in responsible transformation outcomes in MSMEs. These findings indicate that the proposed framework robustly captures the key mechanisms of transformation, especially the role of socio-technical integration in driving responsible business practices.

Table 5. Reliability and Validity

Construct	Cronbach's Alpha	rho_A	Composite Reliability (CR)	AVE
Digitalisation (X1)	0.784	0.784	0.853	0.536
Human-Centric Orientation (Z1)	0.837	0.840	0.880	0.550
Human–Technology Symbiosis (Z2)	0.776	0.776	0.848	0.527
Marketing 5.0 (X2)	0.803	0.803	0.864	0.560
Responsible Business Transformation (Y)	0.787	0.788	0.855	0.540

Source: Author's calculation using SmartPLS 4 (2025).

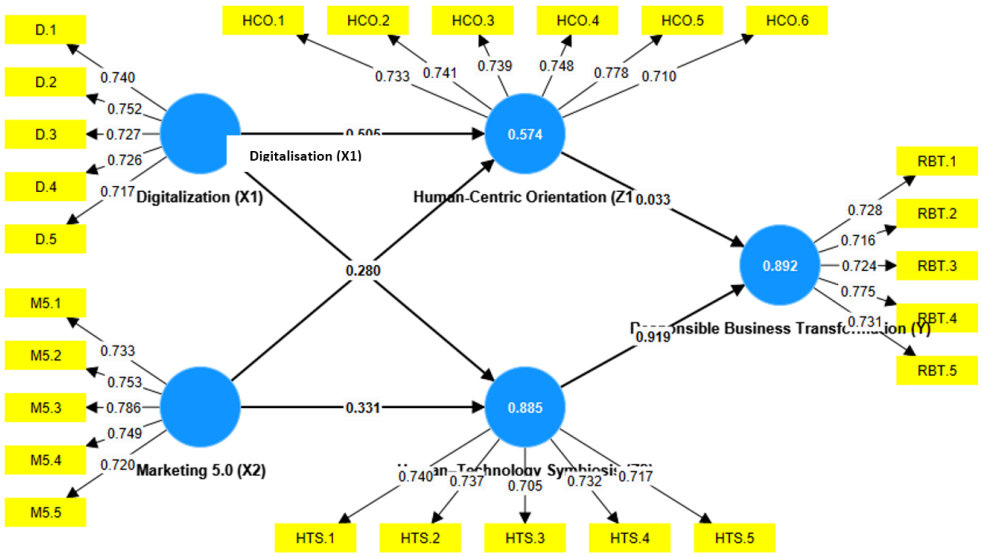
Table 6. R-Square Values

	R-square	Adjusted R-square
Human-Centric Orientation (Z1)	0.574	0.569
Human–Technology Symbiosis (Z2)	0.885	0.884
Responsible Business Transformation (Y)	0.892	0.891

Source: Author's calculation using SmartPLS 4 (2025).

To examine the direct relationships among variables, Table 7 presents path coefficients and their significance levels. The results indicate that digitalization has a significant positive effect on both human-centric orientation and human–technology symbiosis. This finding suggests that digital adoption not only improves operational efficiency but also reshapes how MSMEs perceive customer needs and integrate technology into decision-making processes. This finding supports prior research that highlights the role of digitalization in enhancing customer understanding and organizational adaptability, while also extending it by showing its influence on internal orientation.

Figure 2. Structural Model



Source: Author's calculation using SmartPLS 4 (2025).

Similarly, Marketing 5.0 significantly influences both human-centric orientation and human–technology symbiosis. This implies that technology-driven marketing strategies contribute not only to customer engagement but also to integrating human values with technological capabilities; in this context, Marketing 5.0 bridges technological advancement and relational value creation. However, human-centric orientation does not directly affect responsible business transformation. This indicates that value-based orientation alone is insufficient to drive transformation, particularly in MSMEs where organizational systems and governance mechanisms are still limited. In contrast, human–

https://journal.uinjkt.ac.id/index.php/etikonomi
DOI: https://doi.org/10.15408/etk.v25i2.50439

technology symbiosis shows a very strong and significant effect on responsible business transformation. This highlights that responsible outcomes are achieved when technology is operationalized in collaboration with human judgment. Thus, the effectiveness of digital transformation lies not only in adopting technology but in how it is integrated into decision-making processes.

Table 7. Direct Effects

Relationship	Original Sample (O)	Sample Mean (M)	STDEV	t-Statistic	P-Value	Conclusion
Digitalisation (X1) → Human-Centric Orientation (Z1)	0.505	0.508	0.074	6.815	0.000	Significant
Digitalisation (X1) → Human–Technology Symbiosis (Z2)	0.642	0.641	0.058	11.128	0.000	Significant
Human-Centric Orientation (Z1) → Responsible Business Transformation (Y)	0.033	0.034	0.034	0.983	0.325	Not Significant
Human–Technology Symbiosis (Z2) → Responsible Business Transformation (Y)	0.919	0.918	0.032	28.802	0.000	Significant
Marketing 5.0 (X2) → Human-Centric Orientation (Z1)	0.280	0.278	0.081	3.461	0.001	Significant
Marketing 5.0 (X2) → Human–Technology Symbiosis (Z2)	0.331					

Source: Author's calculation using SmartPLS 4 (2025).

Table 8. Mediation Effects

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T-statistic (|O/STDEV|)	P-values	
Digitalisation (X1) → Human-Centric Orientation (Z1) → Responsible Business Transformation (Y)	0.017	0.017	0.017	0.985	0.325	Does not mediate
Digitalisation (X1) → Human–Technology Symbiosis (Z2) → Responsible Business Transformation (Y)	0.590	0.589	0.058	10.229	0.000	Mediation
Marketing 5.0 (X2) → Human-Centric Orientation (Z1) → Responsible Business Transformation (Y)	0.009	0.010	0.011	0.847	0.397	Does Not Mediate
Marketing 5.0 (X2) → Human–Technology Symbiosis (Z2) → Responsible Business Transformation (Y)	0.304	0.305	0.053	5.723	0.000	Mediation

Source: Author's calculation using SmartPLS 4 (2025).

To examine the indirect relationships among variables, Table 8 presents the mediation effects. The results show that human–technology symbiosis significantly mediates the relationship between digitalization and responsible business transformation, as well as between Marketing 5.0 and responsible transformation. This indicates that the impact of digitalization and marketing strategies on responsible outcomes occurs primarily through integrating technology with human decision-making processes. In contrast, human-centric orientation does not exhibit a significant mediating effect. This suggests that value-based orientation alone is insufficient to drive transformation unless operational mechanisms support it. These findings highlight that responsible business transformation in MSMEs depends more on how values are translated into practice through human–technology collaboration, rather than on normative orientation alone.

To assess the relative impact of each relationship in the model, Table 9 presents effect size (f^2) values. The results indicate that human–technology symbiosis has the strongest effect on responsible business transformation, confirming its central role in the model. The substantial effect of digitalization on human–technology symbiosis further highlights that digital adoption is a key driver of effective human–technology integration. In contrast, the effect of human-centric orientation on responsible business transformation is negligible. This suggests that value-based orientation alone has limited impact unless it is translated into operational practices. These findings reinforce the argument that responsible transformation in MSMEs is primarily driven by socio-technical mechanisms rather than normative values.

Table 9. Effect Size (f^2)

	f-square
Digitalization (X1) -> Human-Centric Orientation (Z1)	0.162
Digitalization (X1) -> Human–Technology Symbiosis (Z2)	0.969
Human-Centric Orientation (Z1) -> Responsible Business Transformation (Y)	0.004
Human–Technology Symbiosis (Z2) → Responsible Business Transformation (Y)	3.285
Marketing 5.0 (X2) → Human-Centric Orientation (Z1)	0.05
Marketing 5.0 (X2) → Human–Technology Symbiosis (Z2)	0.258

Source: Author's calculation using SmartPLS 4 (2025).

The findings provide strong evidence that responsible business transformation in MSMEs is driven primarily by socio-technical integration rather than by technological adoption or human-oriented values alone. The empirical results demonstrate that digitalization and Marketing 5.0 significantly strengthen both human-centric orientation and human–technology symbiosis; however, only human–technology symbiosis has a significant direct effect on responsible business transformation. These findings indicate that responsible transformation depends not merely on the existence of technological capability or customer-oriented values, but on the extent to which technology is operationally integrated with human judgment, organizational oversight, and decision-making processes. Therefore, this study's main contribution is explaining that responsible transformation

https://journal.uinjkt.ac.id/index.php/etikonomi
DOI: https://doi.org/10.15408/etk.v25i2.50439

emerges through operational socio-technical mechanisms rather than normative orientation alone.

The positive relationship between digitalization and human-centric orientation indicates that digital technologies improve MSMEs' ability to understand customer preferences, personalize services, and respond more effectively to market demands. This finding supports previous studies arguing that digital technologies enhance customer engagement, organizational responsiveness, and market adaptability (Verhoef et al., 2021; Kraus et al., 2022). Nevertheless, this study extends prior research by showing that digitalization not only influences external business performance but also reshapes organizational orientation internally. In MSMEs, where business decisions are often centralized around owners or managers, digitalization functions as a cognitive support system that facilitates faster interpretation of market information and customer behavior. Consequently, digital transformation contributes not only to operational efficiency, but also to the development of relational and customer-oriented organizational perspectives.

More importantly, digitalization significantly strengthens human–technology symbiosis, suggesting that the effectiveness of digital transformation depends on the interaction between human capability and technological systems. The strong path coefficient between digitalization and human–technology symbiosis confirms that MSMEs increasingly rely on technology-supported decision-making processes rather than purely manual judgment. This finding aligns with socio-technical theory, which argues that organizational effectiveness emerges through alignment between technological systems and human capability (Jarrahi, 2018; Zimmer et al., 2023). Recent international studies also highlight that human–AI collaboration improves organizational adaptability and decision quality when technology complements rather than replaces human roles (Raisch & Krakowski, 2021). In the MSME context, this relationship is particularly important because limited organizational resources require flexible, adaptive decision-making supported by digital capability.

The findings also reveal that Marketing 5.0 significantly influences both human-centric orientation and human–technology symbiosis. This result indicates that Marketing 5.0 should not be interpreted merely as technological modernization in marketing activities, but as a strategic framework that integrates technological capability with human-centered value creation. Previous studies by Paschen et al. (2020) and Gooljar et al. (2024) emphasize that Marketing 5.0 enables firms to combine automation, predictive analytics, and artificial intelligence with empathy and relational customer engagement. However, this study extends the existing literature by showing that Marketing 5.0 also contributes to organizational integration processes, particularly by strengthening collaboration between human judgment and technological capability. Thus, Marketing 5.0 functions not only as a customer engagement strategy but also as an organizational transformation mechanism that supports responsible business practices.

However, one of the most important findings of this study is that human-centric orientation does not significantly influence responsible business transformation. This finding challenges the dominant assumption in previous literature that customer

orientation and human-centered values automatically generate ethical and sustainable organizational outcomes. Although prior studies frequently associate customer orientation with sustainability performance and stakeholder satisfaction, this study's results indicate that value orientation alone is insufficient to drive responsible transformation in MSMEs. This finding supports recent arguments suggesting that ethical orientation requires organizational capability and governance mechanisms to produce practical outcomes (Hanelt et al., 2021; Kraus et al., 2022). In many MSMEs, customer-oriented values often remain informal and conceptual without being translated into operational systems, data governance structures, and accountable organizational practices. Consequently, normative orientation alone cannot guarantee responsible transformation.

In contrast, human–technology symbiosis demonstrates a very strong and significant influence on responsible business transformation. The exceptionally high coefficient indicates that socio-technical integration is the primary mechanism linking digital capability to responsible organizational outcomes. This finding strongly supports the literature on responsible digital transformation, which emphasizes that ethical and sustainable outcomes depend on integrating technological systems with human oversight and governance structures (Lobschat et al., 2021; Müller, 2022). Through effective collaboration between human judgment and digital capability, MSMEs can better ensure transparency, accountability, ethical decision-making, and sustainable operational practices. In this context, technology functions not as a substitute for human capability, but as a tool that strengthens organizational control and responsible managerial judgment.

The mediation analysis further strengthens these findings by demonstrating that digitalization and Marketing 5.0 influence responsible business transformation indirectly through human–technology symbiosis. This result suggests that technological capability alone cannot directly generate responsible outcomes unless it is operationalized through organizational integration mechanisms. Similar conclusions appear in recent studies on digital sustainability and responsible innovation, which argue that the effectiveness of digital transformation depends heavily on governance structures, implementation pathways, and organizational readiness (George et al., 2021; Pappas et al., 2023). Therefore, responsible transformation in MSMEs cannot be understood simply as the consequence of adopting digital technologies, but rather as the result of integrating technology into organizational routines, managerial practices, and ethical decision-making processes.

Another important contribution of this study lies in distinguishing between value-based and mechanism-based transformation pathways. Human-centric orientation represents the normative and value-based dimension of transformation, whereas human–technology symbiosis represents the operational socio-technical mechanism through which transformation occurs. The findings reveal that operational mechanisms are substantially more influential than normative orientation in driving responsible business transformation. This distinction provides a new explanation for inconsistent findings in prior studies regarding the relationship between customer orientation, sustainability, and digital transformation outcomes. While many studies focus primarily on organizational values

https://journal.uinjkt.ac.id/index.php/etikonomi
DOI: https://doi.org/10.15408/etk.v25i2.50439

and ethical intentions, this study demonstrates that responsible transformation depends more strongly on operational implementation and socio-technical integration.

From a practical perspective, the findings imply that MSMEs should prioritize developing human–technology collaboration rather than relying solely on customer-oriented values or digital adoption. MSMEs need to integrate digital tools into organizational decision-making processes while maintaining human oversight and ethical accountability. This includes strengthening data governance practices, improving digital literacy, and ensuring that technology supports rather than replaces managerial judgment. For policymakers, the findings suggest that digitalization programs should not focus exclusively on technological infrastructure and adoption rates, but also on organizational capability development, ethical digital governance, and responsible implementation frameworks. Without these supporting mechanisms, digital transformation may improve operational efficiency while failing to produce responsible and sustainable business outcomes.

Overall, this study shows that responsible business transformation in MSMEs is achieved not simply through digitalization or marketing innovation, but through the effective integration of human capability and technological systems within organizational practices. The findings provide a stronger socio-technical explanation of responsible transformation and extend the literature on digitalization, Marketing 5.0, and responsible business in the MSME context.

CONCLUSION

This study concludes that digitalization and Marketing 5.0 influence responsible business transformation in MSMEs indirectly through human–technology symbiosis. Although digitalization and Marketing 5.0 significantly strengthen both human-centric orientation and human–technology symbiosis, only human–technology symbiosis significantly affects responsible transformation. These findings indicate that responsible business transformation is not determined solely by customer-oriented values or technological adoption, but by the effective integration of technology with human judgment and organizational decision-making processes. Therefore, the study successfully explains the socio-technical mechanism linking digitalization and Marketing 5.0 to ethical, accountable, and sustainable business practices in MSMEs.

From a practical and policy perspective, MSMEs should strengthen human–technology collaboration by integrating digital tools into organizational decision-making while maintaining ethical oversight and responsible data management. Policymakers should also design digitalization programs that focus not only on technology adoption, but also on digital capability development, data governance, and ethical digital practices for MSMEs. These efforts are important to ensure that digital transformation contributes not only to business performance, but also to sustainable and responsible organizational outcomes.

REFERENCES

Bakator, M., Ćoćkalo, D., Makitan, V., Stanisavljev, S., & Nikolić, M. (2024). The Three Pillars of Tomorrow: How Marketing 5.0 Builds on Industry 5.0 and Impacts Society 5.0? *Heliyon, 10(17)*, e36543. https://doi.org/10.1016/j.heliyon.2024.e36543.

Becker, J. M., Klein, K., & Wetzels, M. (2021). Hierarchical Latent Variable Models in PLS-SEM: Guidelines for Using Reflective-Formative Type Models. *Long Range Planning, 54(5)*, 102110. https://doi.org/10.1016/j.lrp.2020.102110.

Dwivedi, Y. K., Hughes, L., Baabdullah, A. M., Ribeiro-Navarrete, S., Giannakis, M., Al-Debei, M. M., Dennehy, D., et al. (2023). So What if ChatGPT Wrote It? Multidisciplinary Perspectives on Opportunities, Challenges and Implications of Generative AI for Research, Practice and Policy. *International Journal of Information Management, 71*, 102642. https://doi.org/10.1016/j.ijinfomgt.2023.102642.

Dörr, L., Fliege, K., Lehmann, C., Kanbach, D. K., & Kraus, S. (2023). A Taxonomy of Influencing Factors towards Digital Transformation in SMEs. *Journal of Small Business Strategy, 33(1)*, 53–69. https://doi.org/10.53703/001c.66283.

George, G., Merrill, R. K., & Schillebeeckx, S. J. D. (2021). Digital Sustainability and Entrepreneurship: How Digital Innovations are Helping Tackle Climate Change and Sustainable Development. *Entrepreneurship Theory and Practice, 45(5)*, 999–1027. https://doi.org/10.1177/1042258719899425.

Gooljar, V., Issa, T., Hardin-Ramanan, S., & Abu-Salih, B. (2024). Sentiment-Based Predictive Models for Online Purchases in the Era of Marketing 5.0: A Systematic Review. *Journal of Big Data, 11*, 107. https://doi.org/10.1186/s40537-024-00947-0.

Guandalini, I. (2022). Sustainability Through Digital Transformation: A Systematic Literature Review for Research Guidance. *Journal of Business Research, 148*, 456–471. https://doi.org/10.1016/j.jbusres.2022.05.003.

Hair, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N. P., & Ray, S. (2021). Evaluation of measurement models in PLS-SEM: Guidelines and best practices. *Structural Equation Modeling: A Multidisciplinary Journal, 28(3)*, 1–17. https://doi.org/10.1080/10705511.2021.1904387

Hair, J. F., Sarstedt, M., Ringle, C. M., & Gudergan, S. P. (2022). Advanced Issues in Partial Least Squares Structural Equation Modeling. *Journal of Marketing Theory and Practice, 30(1)*, 1–19. https://doi.org/10.1080/10696679.2021.1954737.

Hanelt, A., Bohnsack, R., Marz, D., & Marante, C. A. (2021). A Systematic Review of the Literature on Digital Transformation. *Journal of Management Studies, 58(5)*, 1159–1197. https://doi.org/10.1111/joms.12639.

Henseler, J. (2021). Measurement Invariance in Composite-Based Structural Equation Modeling. *Journal of Marketing Analytics, 9(2)*, 1–12. https://doi.org/10.1057/s41270-020-00087-2.

Jarrahi, M. H. (2018). Artificial Intelligence and the Future of Work: Human–AI

https://journal.uinjkt.ac.id/index.php/etikonomi
DOI: https://doi.org/10.15408/etk.v25i2.50439

Symbiosis in Organizational Decision Making. *Business Horizons, 61(4)*, 577–586. https://doi.org/10.1016/j.bushor.2018.03.007.

Kock, N. (2020). Common Method Bias in PLS-SEM: A Full Collinearity Assessment Approach. *International Journal of e-Collaboration, 16(2)*, 1–10. https://doi.org/10.4018/IJeC.2020040101.

Kock, N., & Hadaya, P. (2018). Minimum Sample Size Estimation in PLS-SEM: The Inverse Square Root and Gamma-Exponential Methods. *Information Systems Journal, 28(1)*, 227–261. https://doi.org/10.1111/isj.12131.

Kraus, S., Durst, S., Ferreira, J. J., Veiga, P., & Kailer, N. (2022). Digital Transformation in SMEs: A Systematic Literature Review. *Journal of Small Business Management, 60(2)*, 305–334. https://doi.org/10.1080/00472778.2021.1898375.

Kraus, S., Schiavone, F., Pluzhnikova, A., & Invernizzi, A. C. (2023). Digital Transformation in Business and Management Research: An Overview of the Current Status Quo. *International Journal of Information Management, 70*, 102625. https://doi.org/10.1016/j.ijinfomgt.2023.102625.

Lobschat, L., Mueller, B., Eggers, F., Brandimarte, L., Diefenbach, S., Kroschke, M., & Wirtz, J. (2021). Corporate Digital Responsibility. *Journal of Business Research, 122*, 875–888. https://doi.org/10.1016/j.jbusres.2019.10.006.

Matthews, L., Sarstedt, M., Hair, J. F., & Ringle, C. M. (2021). Identifying and Treating Unobserved Heterogeneity with FIMIX-PLS: Part I—Method. *European Business Review, 33(1)*, 59–90. https://doi.org/10.1108/EBR-10-2019-0223.

Müller, B. (2022). Corporate Digital Responsibility. *Business & Information Systems Engineering, 64(5)*, 689–700. https://doi.org/10.1007/s12599-022-00760-0.

Pappas, I. O., Mikalef, P., Giannakos, M. N., & Pavlou, P. A. (2023). Digital Transformation and Organizational Change: The Role of Data and Artificial Intelligence. *Information Systems Frontiers, 25*, 1–15. https://doi.org/10.1007/s10796-021-10201-7.

Paschen, J., Kietzmann, J., & Kietzmann, T. C. (2020). Artificial Intelligence and Marketing. *Journal of Business & Industrial Marketing, 35(9)*, 1351–1362. https://doi.org/10.1108/JBIM-10-2019-0445.

Raisch, S., & Krakowski, S. (2021). Artificial Intelligence and Management: The Automation–Augmentation Paradox. *Academy of Management Review, 46(1)*, 192–210. https://doi.org/10.5465/amr.2018.0072.

Rigdon, E. E., Sarstedt, M., & Ringle, C. M. (2020). On Comparing Results from CB-SEM and PLS-SEM: Five Perspectives and Five Recommendations. *Marketing ZFP, 42(3)*, 4–16. https://doi.org/10.15358/0344-1369-2020-3-4.

Ringle, C. M., Sarstedt, M., Mitchell, R., & Gudergan, S. P. (2020). Partial Least Squares Structural Equation Modeling in HRM Research. *The International Journal of Human Resource Management, 31(12)*, 1617–1643. https://doi.org/10.1080/09585192.2017.1416655.

Sarstedt, M., Hair, J. F., Cheah, J. H., Becker, J. M., & Ringle, C. M. (2022). How to

Specify, Estimate, and Validate Higher-Order Constructs in PLS-SEM. *Australasian Marketing Journal, 30(3)*, 197–211. https://doi.org/10.1177/18393349211040430.

Sarstedt, M., Ringle, C. M., & Hair, J. F. (2021). Partial Least Squares Structural Equation Modeling. In. Homburg, C., Klarmann, M., & Vomberg, A. (Eds.). *Handbook of Market Research,* 1–47. Cham: Springer.

Shmueli, G., Sarstedt, M., Hair, J. F., Cheah, J. H., Ting, H., Vaithilingam, S., & Ringle, C. M. (2019). Predictive Model Assessment in PLS-SEM. *European Journal of Marketing, 53(11)*, 2322–2347. https://doi.org/10.1108/EJM-02-2019-0189

Verhoef, P. C., Broekhuizen, T., Bart, Y., Bhattacharya, A., Dong, J. Q., Fabian, N., & Haenlein, M. (2021). Digital Transformation: A Multidisciplinary Reflection and Research Agenda. *Journal of Business Research, 122*, 889–901. https://doi.org/10.1016/j.jbusres.2019.09.022.

Vial, G. (2019). Understanding Digital Transformation: A Review and a Research Agenda. *Journal of Strategic Information Systems, 28(2)*, 118–144. https://doi.org/10.1016/j.jsis.2019.01.003.

Zimmer, M. P., Järveläinen, J., Stahl, B. C., & Müller, B. (2023). Responsibility of/in Digital Transformation. *Journal of Responsible Technology, 16*, 100068. https://doi.org/10.1016/j.jrt.2023.100068.

https://journal.uinjkt.ac.id/index.php/etikonomi
DOI: https://doi.org/10.15408/etk.v25i2.50439