

Original Research

Digital transformation challenges and opportunities for micro, small and medium herbal enterprises: A case study of east java, Indonesia

Idha Kusumawati , Hanni Prihastuti Puspitasari , Pratiwi Soesilawati , Ilham Sentosa , Cordelia Masson , Subhan Rullyansyah , Firmansyah Ardian Ramadhani , Yusuf Alif Pratama 

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Abstract

Background: Micro-, small-, and medium-sized herbal enterprises (MSMHEs) play a crucial role in Indonesia's economy, particularly in East Java. As digital technologies reshape market dynamics, enterprises face pressure to adopt digital marketing strategies. However, the unique challenges and opportunities encountered in this digital transformation process remain understudied. **Objective:** This study aimed to explore the challenges and opportunities in implementing digital marketing strategies among MSMHEs in East Java, focusing on the perspectives of owners and managers across different enterprise scales. **Methods:** A qualitative approach was employed involving in-depth interviews with 17 participants from MSMHEs across seven cities in East Java. Participants included owners, technical managers, and those with dual roles. The data were analyzed using thematic analysis to identify the key themes and subcategories. **Results:** The study revealed varying levels of digital marketing adoption across enterprise scales. Key challenges include limited digital literacy, lack of financial resources, and inadequate infrastructure. Opportunities were identified in the form of a strong desire for training and a curiosity about digital marketing strategies. The perceived necessity of digital transformation varied among the participants and was associated with age, education level, and personal exposure to digital technologies. **Conclusion:** The findings highlight the need for tailored support mechanisms to address the diverse challenges faced by MSMHEs during their digital transformation journey. This study provides a foundation for developing targeted interventions and policies to support the digital growth of the herbal MSMHE sector in East Java, thereby contributing to the broader economic development of the region.

Keywords: Digital transformation, MSMHEs, herbal enterprises, East Java, digital marketing strategies, MSME development

Idha Kusumawati*. Department of Pharmaceutical Sciences, Faculty of Pharmacy, Universitas Airlangga, Nani Building, Campus C UNAIR Mulyorejo, Surabaya, East Java 60115, Indonesia. idha-k@ff.unair.ac.id

Hanni Prihastuti Puspitasari. Department of Pharmacy Practice, Faculty of Pharmacy, Universitas Airlangga, Nani Building, Campus C UNAIR Mulyorejo, Surabaya, East Java 60115, Indonesia. hanni-p-p@ff.unair.ac.id

Pratiwi Soesilawati. Department of Oral Biology, Faculty of Dental Medicine, Universitas Airlangga, Surabaya East Java 60132, Indonesia. pratiwi-s@fkg.unair.ac.id

Ilham Sentosa. Universiti Kuala Lumpur Business School, Universiti Kuala Lumpur, Kuala Lumpur 54000, Malaysia. ilham@unikl.edu.my

Cordelia Masson. Universiti Kuala Lumpur Business School, Universiti Kuala Lumpur, Kuala Lumpur 54000, Malaysia. cordelia@unikl.edu.my

Subhan Rullyansyah. Doctoral Program of Pharmaceutical Sciences, Faculty of Pharmacy, Universitas Airlangga, Campus C UNAIR Mulyorejo, Surabaya, East Java 60115, Indonesia. subhanrullyansyah.unair@gmail.com

Firmansyah Ardian Ramadhani. Department of Pharmaceutical Sciences, Faculty of Pharmacy, Universitas Airlangga, Nani Building, Campus C UNAIR Mulyorejo, Surabaya, East Java 60115, Indonesia. ardian.ramadhani@ff.unair.ac.id

Yusuf Alif Pratama. Doctoral Program of Pharmaceutical Sciences, Faculty of Pharmacy, Universitas Airlangga, Campus C UNAIR Mulyorejo, Surabaya, East Java 60115, Indonesia. yusuf.alif@ff.unair.ac.id

INTRODUCTION

Digital transformation has become a critical factor for the survival, growth, and development of MSMHEs, including those in the traditional Indonesian herbal industry. The COVID-19 pandemic accelerated the need for adaptation, with the demand for herbal products surging initially but declining sharply post-pandemic. This situation shows that digital transformation is essential for MSMEs to survive the digitalization era^{1,2}. For MSMHEs, digital transformation also requires changes in business processes, strategic thinking, and organizational culture^{3,4}. Digital technology can improve operational efficiency, expand access to markets, and improve the ability to analyze large and fast data to accelerate decision making. However, the application of digital technology has raised many concerns and issues for MSMHEs owing to their low adoption capabilities, including infrastructure, resource capabilities, and skills^{5,6}.

In Indonesia, many MSMHEs with traditional business processes have difficulty adapting to a rapidly evolving digital world. This gap creates barriers that require appropriate strategies. This case study aimed to identify and analyze the difficulties faced by MSMHEs during transformation, explore opportunities for implementing digital technology to improve competitiveness, and provide recommendations for policymakers and stakeholders⁷. These findings are crucial for addressing the digital transformation gap in traditional industries, especially in the herbal sector.



Structure of the Herbal Industry in Indonesia

Industrial herbs in Indonesia have diverse characteristics. Based on the scale of operations and regulatory classification, the herbal industry can be categorized as micro-enterprises, small herbal industries, medium herbal industries, and large companies⁸. Micro Enterprises (*Industri Rumah Tangga [IRT]* or Home Industry) are small-scale operations, often family businesses or start-ups, that produce limited quantities of traditional herbal products. This industry typically uses residences as production sites to serve the local community. These products included simple herbal teas and basic herbal preparations. The Small Herbal Industry (*Usaha Mikro Obat Tradisional [UMOT]*) is slightly larger than the micro-industry but still on a small scale that can produce all forms of simple traditional medicine preparations. Medium Herbal Industry (*Usaha Kecil Obat Tradisional [UKOT]*) is categorized as a medium-sized company with a more formalized production process that already has a CPOTB certificate (*Cara Pembuatan Obat Tradisional yang Baik*, or Good Manufacturing Practices for Traditional Medicine). Industries can produce all forms of traditional medicine at this level. Meanwhile, Large Companies (*Industri Obat Tradisional [IOT]*) are the largest scale CPOTB-certified herbal industries, with facilities ranging from extract manufacturing to finished products. It can produce a wide range of herbal products, including tablets and effervescent forms, and has significant facilities and resources for research and development, marketing, and distribution.

The classification of the herbal industry in Indonesia reflects the traditional cultural characteristics of the industry. This classification tries combining the heritage of traditional knowledge and practices as well as modern manufacturing technology at every level of its scale of operation. Each category faces unique challenges and opportunities in terms of regulation, market access, and digital transformation⁹. Another important aspect of the herbal medicine industry in Indonesia is the implementation of CPOTB to improve the quality of traditional medicine products and increase their competitiveness in the market.

Different levels of industrial structure would affect resilience and adaptability to existing conditions and the implementation of the digital transformation process. Micro and small companies would use digital transformation on digital marketing and e-commerce platforms to reach a wider market. Meanwhile, medium and large companies focus on utilizing more comprehensive digital solutions, such as supply chain management, quality control, and customer relationship management⁶.

Challenges in Digital Transformation in MSMEs

Digital transformation is a comprehensive change in business processes encompassing strategy, organization, supply chain, and marketing^{3,10}. It requires the integration of digital technologies, capabilities, and strategies, including cloud computing, AI, big data analytics, and IoT. This transformation demands significant organizational culture shifts, fostering innovation and continuous learning^{7,11}.

Large and comprehensive changes require strong leadership and a clear vision to develop new business models that are more responsive to rapidly changing market needs. For MSMHEs, digital transformation enhances operational efficiency, expands the market reach, and competes more effectively with larger companies¹². MSMHEs also need to effectively utilize digital platform capabilities, network capabilities, and ambidexterity to compete successfully in the digital age⁷. The COVID-19 pandemic has accelerated the need for digital transformation in all sectors. However, MSMHEs face unique obstacles, including limited financial constraints, lack of technical expertise, and a traditional business mindsets^{6,13}. This impact varies significantly due to factors such as company size, industry type, and technological capabilities¹⁴.

To overcome digital transformation challenges, MSMHEs should develop comprehensive strategies that align with their business goals, foster innovation, implement strong cybersecurity, seek external expertise, and explore alternative funding models. Policymakers and support organizations play a crucial role in helping MSMHEs navigate these challenges. By addressing these barriers, MSMHEs can enhance their competitiveness and sustainability within the digital business landscape¹³.

The Herbal Medicine Market in Social Media, Marketplaces, and E-commerce

Digitalization has revolutionized the marketing of herbal products across all sectors. Platforms such as social media, marketplaces, and e-commerce have become crucial for businesses and provide broader, faster, easier, and timeless facilities for marketing, brand building, and interaction with consumers, ultimately leading to increased sales¹⁵⁻¹⁷.

Platforms such as Instagram, WhatsApp, Facebook, Tiktok, Shopee, and Tokopedia provide a visual-centric space to showcase products that increases the recognition rate of products through photos and videos containing product information and promotions¹⁶. Digital marketing allows businesses to create attractive product displays, share high-quality images, and post short tutorial videos to build trust and familiarity with potential customers¹⁵. This platform also facilitates two-way communication and fosters consumer trust and loyalty¹⁶. Features such as product listings and customer reviews aid buying decisions, whereas big data insights help marketers understand consumer preferences and trends in product development and marketing strategies. However, digitalization increases competition, necessitating the development of strategies to address these challenges¹⁵.

METHODS

Research design and sample selection

A qualitative case study approach was applied to explore the challenges and opportunities for digital transformation among MSMHEs in the East Java Province. East Java is notable as the second province in Indonesia with the highest number of MSMHEs, providing a rich context for this study. Initially, a workshop on "Empowerment of Herbal Medicine (Jamu)



Micro, Small, and Medium-Enterprises using Digital Marketing Strategy” was held in January 2024. Owners and/or technical managers of MSMEs in the East Java Province were invited to participate in the workshop. Such different roles allow for perspectives from strategic decision-makers and technical managers responsible for day-to-day operations. A list of participants was used to purposively select at least 15 informants for the case study, with five representing each group. The selection criteria were as follows: the business has operated for a minimum of three years and is located in different regions of the East Java Province to ensure geographical diversity.

Data Collection Methods

Once the workshop participants agreed to participate in the case study, an information sheet was handed directly, followed by an explanation of the study that involved face-to-face, semi-structured interviews at each participant’s business site. The date and time of the interviews were arranged at their convenience, and a consent form was obtained. Semi-structured interviews were designed to collect their experiences with digital transformation, the challenges faced, and the strategies employed. There were two purposes for conducting site visits. First, it enables the direct observation of the current level of digital technology adoption and integration into business processes. Second, company documents should be reviewed, including digital strategy plans, marketing materials, and financial reports (where available). In addition to the interviews and site visits, an online presence analysis

was conducted to examine companies’ websites, social media profiles, and e-commerce listings.

Data Analysis

All the interviews were audio-recorded and transcribed *verbatim*. Coding was conducted using thematic analysis, followed by verification of the themes among the researchers. This study received ethical Approval (no. 01/LE/2023) was obtained prior to the data collection.

RESULTS

Participant Demographics

The study consisted of 17 participants selected from 67 workshop attendees representing (MSMHs) in seven cities in East Java Province, Indonesia. The participants’ ages ranged from 23 to 68 years (average age of 48 years), with 13 females and 4 males. The roles within MSMHs include owners (7), technical managers (7), and dual roles (3). Work experience in the herbal industry averaged 11 years (range: 3-34 years). This diverse sample provides a comprehensive perspective on digital transformation challenges and opportunities, from both strategic and operational viewpoints. The inclusion of participants from multiple cities ensured a broad spectrum of views considering potential regional variations. This participant description aligns with qualitative research reporting guidelines¹⁸, providing context for the study’s findings within East Java’s herbal MSMHs landscape (Table 1).

Table 1. Demographic data of the participants

		IRT (n; (%))	UMOT (n; (%))	UKOT (n; (%))	Total (n; (%))
Gender	Male	0 (0.0)	3 (75.0)	1 (25.0)	4 (100.0)
	Female	6 (46.2)	2 (15.3)	5 (38.5)	12 (100.0)
Age (years old)	≥ 20 - ≤ 30	0 (0.0)	1 (50.0)	1 (50.0)	2 (100.0)
	> 30 - ≤ 40	0 (0.0)	1 (50.0)	1 (50.0)	2 (100.0)
	> 40 - ≤ 50	4 (50.0)	2 (25.0)	2 (25.0)	8 (100.0)
	> 50	2 (50.0)	1 (25.0)	1 (25.0)	4 (100.0)
Educational Background	Senior High School	2 (66.7)	1 (33.3)	0 (0.0)	3 (100.0)
	Bachelor	3 (25.0)	4 (33.3)	5 (41.7)	12 (100.0)
	Master or Doctor	1 (50.0)	0 (0.0)	1 (50.0)	2 (100.0)
Working Experience (years)	≥ 3 - ≤ 5	2 (50.0)	2 (50.0)	0 (0.0)	6 (100.0)
	> 5 - ≤ 10	3 (37.5)	1 (12.5)	4 (50.0)	8 (100.0)
	> 10	1 (20.0)	2 (40.0)	4 (40.0)	7 (100.0)
Product	Herbal drink	6 (60.0)	3 (30.0)	1 (10.0)	10 (100.0)
	Instant powder	1 (25.0)	1 (25.0)	2 (50.0)	4 (100.0)
	Herbal tea	0 (0.0)	1 (33.3)	2 (66.7)	3 (100.0)
	Topical	0 (0.0)	3 (60.0)	0 (40.0)	3 (100.0)
	Capsul	0 (0.0)	2 (50.0)	2 (50.0)	4 (100.0)
Status	Owner	4 (57.1)	2 (28.6)	1 (14.3)	7 (100.0)
	Technical Manager	2 (28.6)	0 (0.0)	5 (71.4)	7 (100.0)
	Owner and Technical Manager	0 (0.0)	3 (100.0)	0 (0.0)	3 (100.0)



Themes and subcategories

The analysis of the interview data revealed two primary themes: challenges and opportunities in implementing digital marketing strategies for MSMHEs owners, and technical managers in East Java. The challenge was subcategorized into the current usage of digital marketing, obstacles encountered, and perceived necessity of implementation. Opportunities were subcategorized into desire for training and curiosity about learning needs. This thematic structure provides a comprehensive framework for analyzing the complex landscape of digital transformation in the herbal MSMHE sector of East Java, capturing both the hurdles faced and the potential for growth and development. The analysis aligns with the methodology, allowing systematic exploration of qualitative data and guiding the presentation and discussion of the findings.

Usage of digital marketing strategies

This study found a diverse range of marketing approaches among HEs of different scales. Strategies include production based on orders, offline store sales, and the use of digital platforms, such as social media and online marketplaces. The spreading network varied coming from families, friends, colleagues, neighbor, and others.

I sell instant herbal powder; I usually send the product to jamu shops..... During the pandemic, many people were looking for jamu, so I tried to take a picture of my products and then posted and offered them through Facebook, Instagram, and WhatsApp groups (Micro HEs-2).

I have been selling via Facebook and Instagram for a long time in open order..... Do not dare to stock products for fear of not selling well and losing money. (small HEs-3).

Currently, product sales are extremely low. Therefore, if the stock of products in the market or stores that are accustomed to selling our products is almost exhausted, we are about to start the production process again (medium HEs-3).

Notably, all micro and small HEs (MSHEs) participants reported engaging in online sales, demonstrating a significant embrace of digital marketing channels among smaller enterprises. In contrast, among the Medium HEs, only one participant reported selling online, while the others primarily operated an order-based production model. This disparity in digital adoption between smaller and medium-sized enterprises is intriguing and may reflect differences in established business models, customer bases, or perceptions of digital marketing necessity.

Interestingly, four out of six micro HEs participants and three out of five small HEs participants received digital marketing training, whereas only one out of six medium HEs participants did. This indicates that training exposure likely drove digital marketing adoption among smaller HEs, reflecting their proactive measures of needs, desires, and willingness to implement micro and small HEs. Conversely, a medium HEs participant expressed concern that the success of digital marketing might lead to capital issues and raw material

shortages owing to increased consumer demand.

I do not sell my products online. I am afraid that I will not be able to fulfill the demand because I do not have additional capital, and I am afraid that raw materials will not be available in the market (medium HEs-6).

Obstacles in Implementing Digital Strategies

The demographic data showed that micro-, small-, and medium-sized HEs were produced for an average of 6.8, 10, and 12 years, respectively. This shows that micro HEs are newer businesses that often face challenges in applying theoretical knowledge practically¹⁹. Despite training, younger businesses frequently struggle to implement learned digital strategies²⁰ because of factors such as limited resources, lack of technical expertise, and the complexities of integrating new technologies into existing business processes²¹.

I have followed everything that was taught during the training, but my product sales have not increased (micro HEs-1).

Medium HEs, being more established and encounter a different obstacles¹⁹. These older businesses often struggle to keep pace with the rapidly evolving digital technologies²⁰. Their established processes and legacy systems can create resistance to change, which makes it difficult to adapt to new digital tools²¹. The fast-paced nature of technological advancements can be overwhelming for businesses operating using traditional methods for extended periods¹⁹.

It is a hassle if I have to create content every day and create interesting photographs. If I have to hire people, this means there must be additional costs, and the price of the product will increase (medium HEs-2).

This dichotomy highlights the need for tailored approaches to digital transformation across the MSMHEs. Younger micro and small HEs require support to bridge the gap between theoretical knowledge and practical applications, while older medium HEs may benefit from strategies focusing on gradual digital integration and overcoming organizational inertia²¹. Addressing these distinct challenges is crucial for fostering comprehensive digital transformation across the MSME sector.

The perceived necessity of implementing digital marketing strategies

All participants felt the benefits and gained more understanding when attending the workshop and realized that digital marketing was one of the solutions to expand marketing reach because it could be an exhibition and introduction space that is not limited to place and time.

This was the first time I had participated in digital marketing training, and it was not as difficult as I imagined.....I think I should start now. (Small HEs-4).

This digital marketing training opened my horizons to immediately start it in my company (medium HEs-1)

All participants, regardless of enterprise size or current level of digital adoption, recognized the necessity of expanding their marketing reach through digital channels. Behind the



difficulties-faced to start, many advantageous will be derived to the business development. This shared perception stems from the rapid pace of change in the business environment and evolving consumer demands. Participants acknowledged that traditional marketing methods alone are insufficient competitiveness, and viewing digital marketing strategies is a fundamental necessity for business growth and sustainability. This collective understanding indicates a significant mindset shift among herbal MSMHEs, suggesting a readiness to embrace digital transformation despite challenges. The universal recognition of this need suggests fertile grounds for initiatives that support and accelerate these HEs digital marketing capabilities of HEs.

Desire for training

Of the participants, eight participated in the digital marketing training. They expressed an interest in more specialized, product-specific training, recognizing the challenge of applying general digital marketing principles to herbal products. While valuing their foundational knowledge, they saw a need for tailored industry-specific guidance to effectively leverage digital strategies in their niche markets.

I hope this training will continue with more detailed material, and if possible, participants can bring their own products to discuss (micro HEs-6).

Today's training still lacks material. Please invite me again if there is further training (Small HEs-5).

This study revealed a strong and nuanced desire for training among participants across different levels of digital marketing experience. The enthusiasm for further learning across all participant groups suggests a positive outlook on the potential of digital marketing and willingness to invest time and effort in developing these crucial skills for their businesses.

Curiosity about what needs to be learned

The participants showed visible curiosity during both interviews with the preceding digital marketing workshop. Their questions often centered on the cost-effectiveness, reach, and measurability of digital marketing compared with classic methods, demonstrating openness to learning and adapting strategies. They also inquired about basic technical matters, such as product content creation and differences in content for social media versus the marketplace.

I usually participate in various exhibitions to introduce my products. Does that mean it becomes easier to introduce products online? (small HEs-2).

I hope that this training material is added with content creation for products from participants so that I can create content as taught. (micro HEs-4).

DISCUSSION

This study examined digitalization challenges and opportunities for MSMHEs. A purposive sample from East Java, the second highest MSMHEs in Indonesia, was used. Of the 67 workshop

attendees, 17 represented three levels of MSMHEs. The wide age range (23-68 years) and work experience (average, 11 years) provided diverse perspectives from both experienced and young entrepreneurs.

Diversity in age and experience is crucial for understanding digital transformation across generations in an industry. Younger businesses have an advantage in adapting to digital technologies and are more familiar with social media platforms, marketplaces, and e-commerce²². However, older businesses with broader and deeper industry experience are also increasingly adopting these digital technologies²³. This diversity challenges policymakers to capitalize on the strengths of both groups to improve sector-wide adaptability. Addressing gaps in digital marketing skills requires continuous learning and training programs in which seasoned professional mentors' younger colleagues provide industry insights, while younger generations share digital skills. The right approach to learning and collaboration can be very effective in bridging the gap between age groups and experience levels²⁴.

The study's 76.5% female participation reflects the herbal industry's gender distribution in East Java, although further research is needed on the gender effects in digital strategy implementation. The businesses selected as participants in this study have various roles within their companies (owners, technical managers, and those with multiple roles) to provide a comprehensive view of the digital transformation process. The different roles allow for perspectives from strategic decision makers and technical managers responsible for day-to-day operations.

Micro and small HE participants often adopted a DIY approach to digital marketing, which can accelerate adoption but may pose challenges if specialized knowledge is lacking²². Technical managers implement digitalization in daily operations, while those with dual roles can align their strategic vision with technical implementation more smoothly²⁵. This multifaceted approach is crucial in a dynamic digital environment, requiring the consideration of both strategic and operational perspectives²⁴.

Challenges in Implementing Digital Marketing Strategies

The study identified this as the main theme, with a focus on exploring the difficulties faced by MSMHEs in their digital transformation process. The "current use of the digital marketing strategies" subcategory aims to reveal the level of digital adoption among participants. Furthermore, the variability of which may be influenced by factors such as the age of the business owner, the size of the business, or access to resources.

This study identifies the challenges in implementing digital marketing among MSMHEs in East Java. Micro and small HEs show higher engagement than medium HEs, reflecting differences in business models, customer bases, and risk management approaches. Digital transformation varies according to company size, industry, and existing capabilities²².



Despite government efforts to enhance digital capabilities, many MSMHEs still struggle with adoption, particularly as they grow and face different market dynamics²⁵. These findings underscore the need for a differentiated approach to digital marketing adoption that considers the specific characteristics and needs of businesses at different scales²⁶, ultimately aiming to contribute to job creation, increased entrepreneurship, and overall economic development in the region^{27,28}.

The study revealed “implementation obstacles” in digital marketing among MSMHEs, including limited digital literacy, lack of skills and resources, capital concerns for technology investment, and inadequate infrastructure. Participants also struggled to apply training to their specific products and situations, and to find suitable training⁷. Interestingly, some expressed concerns about fulfilling the increased demand from successful online marketing due to limited capital and raw material availability, reflecting the “liability of smallness”⁷. Micro and small enterprises also lack an understanding of herbal product promotion regulations, particularly regarding efficacy claims. This adds complexity to digital transformation challenges, necessitating training not only in digital technology, but also in herbal product advertising regulations⁷.

The “perceived need” sub-category reflects awareness and urgency regarding digital transformation among MSMHEs owners and technical managers. These perceptions can be influenced by internal (age, education, and work experience) and external factors (personal exposure to digital technology and pandemic experience). One study showed that perceived need often correlates with digital literacy and previous technology experience⁷. Education level affects the understanding of digital marketing benefit²⁵. Business owners use digital tools to increase the likelihood of seeing their business potential^{22,29}. The COVID-19 pandemic has significantly increased the perceived importance of digital marketing, accelerating its adoption as a survival strategy rather than for growth²⁶.

Opportunities in Digital Marketing Strategies

The second theme showed positive opportunities for digital transformation despite the challenges. The subcategory ‘desire for training’ demonstrated participants’ positive attitudes and willingness to learn and adapt. This is crucial for growth and competitiveness in the face of fierce business competition. The interview results showed high enthusiasm for training among all the participants. Those with prior training preferred more specific and business-applicable materials. Participants found it often difficult to apply general digital marketing principles to their specific business contexts, especially given the unique characteristics and regulation of herbal product²⁹. Those new to digital marketing training sought practical outcomes and implementation strategy, in line with what Taiminen and Karjaluoto “pragmatic approach.” The varying levels of training materials suggest the need for a tiered training program, progressing from basic to advanced digital marketing strategies for skills develop²⁷.

Another positive attitude of participants is a sense of “curiosity about what needs to be learned.” This can guide the

development of tailored training programmes. The interviews revealed two main areas of concern: preparing content for social media and understanding regulations related to herbal product advertising. Therefore, training and mentoring programs should be conducted collaboratively between digital technology practitioners and the government, who can provide regulatory content²⁸.

Implications for Policy and Practice

The research findings on digital transformation in East Java’s MSMHEs sector have significant policy and practical implications. The identified challenges suggest the need for targeted support mechanisms, including tailored digital literacy programs, financial incentives, and mentoring programs. Opportunities highlight the potential growth through digital transformation. Policymakers should develop comprehensive digital marketing training programs, create knowledge-sharing platforms, and encourage partnerships between MSMHEs and technology providers. Collaborative efforts between the government, communities, and experts are crucial in providing the necessary infrastructure, mentoring, and ongoing support for effective digital marketing implementation in MSMHEs.

Limitations and Policy Implications of the Study

MSMHEs focused solely on East Java, despite being the second-largest province for non-governmental organization herbal enterprises (NGOHEs) in Indonesia and may not be able to capture the full variety of challenges and opportunities that exist in other parts of Indonesia. The data reported were obtained through interviews, which may introduce potential bias, as participants’ perceptions may not always align with the objective reality. The rapid pace of technological change means that some findings may become less relevant over time, thus necessitating ongoing research in this area.

CONCLUSION

A study on digital transformation among MSMHEs in East Java revealed complex challenges and opportunities. Smaller enterprises showed greater agility in adopting online sales, while the key obstacles included limited digital literacy, financial resources, and infrastructure. The participants demonstrated strong interest in training and digital marketing strategies. The perceived necessity of digital marketing varied and was influenced by factors such as age, education, and personal technology exposure. These findings suggest the need for targeted support mechanisms, including tailored digital literacy programs, financial incentives, and mentorship. This study provides a nuanced understanding of the digital transformation landscape in East Java’s herbal MSMHEs sector, offering a foundation for developing targeted interventions and serving as a valuable resource for policymakers, industry leaders, and researchers.

AUTHOR CONTRIBUTIONS

Conceptualization: I.K. and H.P.P.; Data Curation: I.K. and H.P.P.; Formal analysis: I.K., P.S., and I.S.; Funding acquisition: I.K.;



Investigation: S. R., F.A.R., and Y.A.P.; Methodology: H.P.P., I.S., C. M.; Project administration: I.K. and P.S.; Supervision: I.K. and C.M.; Validation: I.K., H.P.P. and C.M., Writing-original draft: I.K. and H.P.P.; Writing-review and editing: I.K., C.M., S.R., F.A.R., and Y.A.P.

CONFLICT OF INTEREST

The authors declare there is no conflict of interest

References

1. Soesilowati E, Mizar MA, Susanti E, Melati IS, Nuryana I. the Strategy of Revitalizing the Business Model of Herbal Medicine Small Enterprises in the Post-Pandemic Era. *Corp Bus Strateg Rev*. 2024;5(1 Special issue):356-370. <https://doi.org/10.22495/cbsrv5i1siart10>
2. Kusumawati I, Puspitasari HP, Soesilawati P, Ramadhani FA, Rullyansyah S. Pemberdayaan Industri Herbal Skala Mikro (UMKM) Melalui Pelatihan Digital Marketing Strategi. *CARADDE J Pengabdian Kpd Masy*. 2024;7(1):183-191.
3. Li L, Su F, Zhang W, Mao JY. Digital transformation by SME entrepreneurs: A capability perspective. *Inf Syst J*. 2018;28(6):1129-1157. <https://doi.org/10.1111/isj.12153>
4. Kurniawati E, Idris I, Handayati P, Osman S. Digital transformation of MSMEs in Indonesia during the pandemic. *Entrep Sustain Issues*. 2021;9(2):316-331. [https://doi.org/10.9770/jesi.2021.9.2\(21\)](https://doi.org/10.9770/jesi.2021.9.2(21))
5. Purnomo S, Nurmalitasari, Nurchim. Digital Transformation of Smart Village: A Systematic Literature Review. *J Manag Digit Bus*. 2024;4(2):301-312. <https://doi.org/10.1016/j.procs.2024.06.304>
6. Priyono A, Moin A, Putri VNAO. Identifying digital transformation paths in the business model of smes during the covid-19 pandemic. *J Open Innov Technol Mark Complex*. 2020;6(4):1-22. <https://doi.org/10.3390/joitmc6040104>
7. Cenamor J, Parida V, Wincent J. How entrepreneurial SMEs compete through digital platforms: The roles of digital platform capability, network capability and ambidexterity. *J Bus Res*. 2019;100(March):196-206. <https://doi.org/10.1016/j.jbusres.2019.03.035>
8. Indonesia M of HR of. *Regulation of the Minister of Health Number 26 of 2018 on Health Sector Integrated Business Licensing Services.*; 2018.
9. Torri MC. The JAMU System in Indonesia: Linking Small-Scale Enterprises, Traditional Knowledge and Social Empowerment Among Women. *J Int Womens Stud*. 2012;13(1):32. <https://vc.bridgew.edu/jiws/vol13/iss1/3>
10. Alyani I, Saptono IT, Jahroh S. Digital Transformation Drivers for Indonesian MSMEs. *Indones Interdiscip J Sharia Econ*. 2023;7(1):423-441. <https://doi.org/10.31538/ijse.v7i1.4374>
11. Verhoef PC, Broekhuizen T, Bart Y, et al. Digital transformation: A multidisciplinary reflection and research agenda. *J Bus Res*. 2021;122(September 2019):889-901. <https://doi.org/10.1016/j.jbusres.2019.09.022>
12. Hariyanti S, Kristanti D. Digital Transformation in MSMEs: an Overview of Challenges and Opportunities in Adopting Digital Technology. *J Manaj Bisnis, Akuntansi dan Keuangan*. 2024;3(1):37-46.
13. Klein VB, Todesco JL. COVID-19 crisis and SMEs responses: The role of digital transformation. *Knowl Process Manag*. 2021;28(2):117-133. <https://doi.org/10.1002/kpm.1660>
14. Teng X, Wu Z, Yang F. Research on the Relationship between Digital Transformation and Performance of SMEs. *Sustain*. 2022;14(10):1-17. <https://doi.org/10.3390/su14106012>
15. Dwivedi YK, Ismagilova E, Hughes DL, et al. Setting the future of digital and social media marketing research: Perspectives and research propositions. *Int J Inf Manage*. 2021;59(May 2020):102168. <https://doi.org/10.1016/j.ijinfomgt.2020.102168>
16. Ayu KC, Puspitojati E, Nurlaela S. Analysis of Digital Marketing Strategies for Herbal Medicine Products (Case Study at "X" Herbal Industry in Yogyakarta, Indonesia). *J Multidiscip Stud*. 2022;11(2):1-15. <https://doi.org/10.62249/jmds.2013.2428>
17. Yunarti, Munizu M, Arsyad M, Munir AR. *Digital Marketing as a Powerful Tool to Improve MSMEs Performance*. Atlantis Press International BV; 2024. https://doi.org/10.2991/978-94-6463-400-6_28
18. Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): A 32-item checklist for interviews and focus groups. *Int J Qual Heal Care*. 2007;19(6):349-357. <https://doi.org/10.1093/intqhc/mzm042>
19. Handayati R, Rozaq AS, Nur F, Dwi MZ, Ubaidillah MM. Challenges and Solutions in the Implementation of Digital Technology in MSMEs : Perspectives from Entrepreneurs and Consumers. 2024;2(2):244-251. <https://doi.org/10.61100/tacit.v2i2.211>
20. Abdurrahim D. Analysis of MSME Challenges and Opportunities in the Digital Era. *Int J Econ Lit*. 2023;1(3):285-292.
21. Hendrawan SA, Afdhal Chatra, Nurul Iman, Soemarno Hidayatullah, Degdo Suprayitno. Digital Transformation in MSMEs: Challenges and Opportunities in Technology Management. *J Inf dan Teknol*. 2024;6:141-149. <https://doi.org/10.60083/jidt.v6i2.551>
22. Ritz W, Wolf M, McQuitty S. Digital marketing adoption and success for small businesses: The application of the do-it-yourself and technology acceptance models. *J Res Interact Mark*. 2019;13(2):179-203. <https://doi.org/10.1108/JRIM-04-2018-0062>
23. Lissitsa S, Kol O. Generation X vs. Generation Y - A decade of online shopping. *J Retail Consum Serv*. 2016;31:304-312. <https://doi.org/10.1016/j.jretconser.2016.04.015>



Idha K, Hanni P P, Pratiwi S, Ilham S, Cordelia M, Subhan R, Firmansyah A R, Yusuf A P. Digital transformation challenges and opportunities for micro, small and medium herbal enterprises: A case study of east java, Indonesia. *Pharmacy Practice*. 2026 Jan-Marc;24(1): 3280.

<https://doi.org/10.18549/PharmPract.2026.1.3280>

24. Kannan PK, Li H "Alice." Digital marketing: A framework, review and research agenda. *Int J Res Mark*. 2017;34(1):22-45. <https://doi.org/10.1016/j.ijresmar.2016.11.006>
25. Hamid H, Kusniadi CP. The Influence of Digital Marketing on the Development of MSMEs in Manado City Sulawesi Utara. 2024;3(6):731-742.
26. Kristiningsih, Soebandhi S, Trimarjono A, Imron MA. Adaptive Digital Marketing Approaches for MSMEs Amidst the COVID-19 Pandemic. *Kaav Int J Econ , Commer Bus Manag*. 2023;10:39-46. <https://doi.org/10.52458/23484969.2023.v10.iss4.kp.a5>
27. Karjaluoto H, Shaikh AA, Saarijärvi H, Saraniemi S. How perceived value drives the use of mobile financial services apps. *Int J Inf Manage*. 2019;47(August):252-261. <https://doi.org/10.1016/j.ijinfomgt.2018.08.014>
28. Yatminiwati M, Setyobakti MH, Sulistyan RB, Ermawati E. Social Entrepreneurship In MSME Development. *Int J Environ Sustain Soc Sci*. 2022;2(3):239-243. <https://doi.org/10.38142/ijesss.v2i3.111>
29. Lipiäinen HSM, Karjaluoto H. The usage of digital marketing channels in SMEs. *J Small Bus Enterp Dev*. 2015;22(4).

