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The Impact of the PENA Program on the Digitalization of Women-Led MSMEs in Semarang

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Abstract

This study explores the impact of the PENA Program on the digitalization of women-led MSMEs in Semarang and its implications for empowerment and business sustainability. Using a qualitative approach, in-depth interviews were conducted with eleven female micro-entrepreneurs who are program beneficiaries. Thematic analysis was used to examine shifts in business practices, digital adaptation strategies, and how digital tools support women's empowerment. The results show that the PENA Program has facilitated digital access through financial literacy training and mentorship. Digitalization has improved marketing, operational efficiency, and self-confidence among participants, contributing to greater empowerment and sustainable economic inclusion. However, challenges remain, including limited time, dual domestic and business roles, and inadequate infrastructure. Digital adaptation varied across participants depending on digital literacy and social support levels. The study concludes that enhancing digital literacy and adaptive mentoring is key to accelerating digital transformation among women entrepreneurs. This research highlights the critical role of integrated support programs in promoting inclusive, gender-responsive digitalization at the micro-enterprise level. It offers valuable insights for policymakers and practitioners aiming to strengthen women's economic participation in the digital economy

Keywords: Women Entrepreneurs; Digital Transformation; Social Empowerment; MSMEs; PENA Program

1. Introduction

In the era of globalization and the industrial revolution 4.0, digital transformation is the main factor that affects the sustainability and competitiveness of micro, small, and medium enterprises (MSMEs). Women-managed MSMEs are a very important segment in the Indonesian economy, given their contribution to labor absorption and local economic growth (Purba,et al., 2025). Based on the latest data from (Indonesia Ministry of Communications and Information, 2023) around 64.5% of national MSMEs are led by women, which number around 37 million business units. However, although the strategic role of women MSMEs is very significant, they still face various challenges in utilizing digital technology as a tool to expand market access, increase productivity, and strengthen the sustainability of their businesses(Helmi, et al., 2025).

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The main obstacles faced by women MSMEs include low digital literacy, limited access to technological infrastructure, limited capital, and an imbalance between domestic responsibilities and business activities. These factors are serious obstacles that hinder the optimal use of digital technology by women business actors, especially in medium-sized urban areas such as Semarang City. At the global level, the gender digital gap is also an important concern because it can exacerbate social and economic inequality. According to the World Economic Forum (2023), women's empowerment through digitalization is one of the keys to achieving inclusive and sustainable economic development.

In response to these challenges, the Government of Indonesia through the Ministry of Social Affairs launched the Nusantara Economic Heroes Program (PENA). This program is a social economic empowerment initiative specifically designed to support vulnerable groups, including women, by providing entrepreneurship training, business assistance, and capital assistance. Until 2024, more than 25,360 Beneficiary Families (KPM) have been certified as independent entrepreneurs thanks to this program (Ministry of Social Affairs, 2024a). However, despite the growing emphasis on MSME digital transformation, a comprehensive evaluation of the PENA program's impact on the digitalization of women-led MSMEs remains limited. National data indicate that approximately 25.5 million MSMEs around 40% of the total MSME population in Indonesia have adopted digital platforms as of 2024, yet these statistics are not disaggregated by gender, program participation, or regional level. In particular, there is a lack of empirical evidence measuring the extent of digital adoption such as the use of e-commerce platforms, digital payments, or online marketing—among women-led MSMEs participating in the PENA program at the city level, including Semarang. This gap underscores the urgent need for an in-depth study to provide empirical evidence on the effectiveness of the PENA program in promoting business digitalization and women's economic empowerment.

Various international studies have proven that digitalization can play an important role in improving the efficiency, business scale, and competitiveness of women's MSMEs. According to (Nair, 2023), access to digital technology plays a crucial role in empowering women in business, contributing positively to their economic independence and family welfare. Access to digital technology plays a crucial role in empowering women in business, contributing positively to their economic independence and family welfare. However, most existing studies remain broad in scope and have not specifically examined the impact of government intervention programs aimed at promoting the digital transformation of women-led MSMEs. In particular, there is limited empirical evidence evaluating how targeted public programs address the digitalization challenges faced by female entrepreneurs. (Gagliardi & Novelli, 2025) demonstrate that women-led MSMEs in Indonesia experience significant income and profit disparities compared to those led by men, highlighting structural inequalities that may hinder women's ability to benefit from digital transformation. These findings underscore the need for targeted policy interventions and programmatic strategies that explicitly address digitalization barriers faced by women MSME actors.

The research gap is the basis for this research to further explore how the PENA Program contributes to encouraging the digitalization of women's MSMEs in Semarang City. This study uses a qualitative approach to understand the experiences of women MSME actors in adopting digital technology, the obstacles they face, and the form of support they receive through the PENA program. This research not only focuses on the digitalization aspect, but also examines how the digital transformation supports an inclusive and sustainable economy, in accordance with the spirit of the Sustainable Development Goals (SDGs). The main focus is directed to the three SDGs, namely goal 5 on Gender Equality, goal 8 on Decent Work and Economic Growth, and goal 9 on Innovation and Infrastructure.

The purpose of this study is to explore the impact of the PENA program in the process of digitizing women's MSMEs in Semarang and how this digitalization contributes to the creation of an inclusive and sustainable economy. The research also aims to identify the main obstacles experienced by women business actors in implementing digital technology and the extent to which assistance from the PENA program is able to overcome these obstacles. In addition, this study seeks to understand the perception of MSME actors towards the benefits of digitalization and how this affects their business performance. A qualitative approach

was chosen to provide a deeper and more comprehensive understanding of the dynamics in the field that are not easily revealed through quantitative data.

This research is expected to enrich the literature on women's economic empowerment and the digitalization of MSMEs, especially in the context of government intervention in developing countries such as Indonesia. The results of this study will complement previous studies that have focused on aspects of digital technology and entrepreneurship in general without directly linking the role of social empowerment programs such as PENA. This research also has the potential to provide a conceptual model of how government programs can effectively support the digitalization of women's MSMEs, which can then be used as a reference in the development of similar policies and programs in other regions.

The results of this study are expected to make an important contribution to policy makers and implementers of economic empowerment programs in Indonesia. The findings obtained can be the basis for improving and strategizing the PENA program to be more responsive to the digitalization needs of women's MSMEs. In addition, this research can be considered for relevant institutions in strengthening the capacity of women MSME actors, both through increasing digital literacy and providing adequate infrastructure and access to technology. Thus, future economic empowerment programs can be more targeted and have a significant impact in encouraging inclusive and sustainable economic growth.

From the perspective of sustainable development, this study also highlights how the digitalization of women's MSMEs not only strengthens their economies individually but also contributes to poverty alleviation and equitable distribution of welfare in society. In line with the principles of the SDGs, the digitalization of women's MSMEs is expected to increase women's participation in the formal economy and strengthen their position in the broader economic value chain. This is in line with the recommendations of (Morte-Nadal & Esteban-Navarro, 2025) which affirm the importance of digital inclusion to address gender inequality and promote equitable and sustainable economic development.

With this background and urgency, this research has become very relevant and strategic in the context of Indonesia's economic development which increasingly prioritizes technological innovation and the empowerment of vulnerable groups. Focusing on Semarang City as a research location also provides added value because this city is the center of economic growth in Central Java which is undergoing a fairly rapid digital transformation but still has significant challenges in empowering women MSMEs (Sugiyanto, Suharnomo, & Perdhana, 2024) Therefore, the results of this study are expected to provide a concrete picture that can be applied both at the local and national levels.

2. Literature Review

2.1 PENA Program and Economic Empowerment Strategy for Vulnerable Communities

The Nusantara Economic Heroes Program (PENA) is a strategic initiative from the Ministry of Social Affairs of the Republic of Indonesia to empower vulnerable communities, including women MSME actors. Launched in November 2022, this program aims to reduce dependence on social assistance by encouraging economic independence through social entrepreneurship. PENA provides capital assistance of up to IDR 5 million, skills training, business assistance, and access to digital marketing and financial literacy for Beneficiary Families (KPM) who previously received assistance such as PKH and BPNT (Ministry of Social Affairs of the Republic of Indonesia, 2024).

As of March 2024, PENA has successfully graduated more than 21,000 KPM who are no longer dependent on social assistance. The focus of this program lies in changing the mindset from recipients to independent entrepreneurs, as well as individual and community capacity building. This program also reaches other vulnerable groups such as people with disabilities, the elderly, and disaster victims through vocational training based on local potential (Hudang,et al., 2025) The empowerment strategy used is in line with the Bappenas' approach, namely increasing income and creating jobs through market needs-based training and business management assistance. The program also facilitates market access through digitalization,

cooperatives, and local markets.

Ongoing training is an important component of PENA, including craft training, entrepreneurship, and family financial management. The goal is to build a spirit of entrepreneurship and sustainable economic independence among poor families and vulnerable groups. Overall, PENA reflects a holistic economic empowerment strategy, supporting the SDGs, particularly poverty alleviation, women's empowerment, and inclusive and sustainable economic growth.

2.2 Women's empowerment theory

Women's empowerment theory emphasizes increasing women's individual and collective capacity to take control of lives, make strategic decisions, and access resources to achieve economic and social well-being (Nair, 2023). This theory includes the psychological, social, economic, and political dimensions to address structural gender inequality. Outlines three main dimensions of empowerment: resources (access to materials and services), agents (decision-making ability), and achievements (the outcome of the process) (Dewi, et al., 2022).

In the economic context, women's empowerment includes increased participation in productive activities and income management. (Smits, et al., 2025) shows that women's economic empowerment has a positive impact on human development in sub-Saharan Africa, through increased work participation and decision-making. In Indonesia, (Arwani, et al., 2023) emphasized the importance of entrepreneurship training, financial access, and social support in women's empowerment, although challenges such as limited capital and social norms are still obstacles.

Programs that are contextually designed, such as the PENA Program from the Ministry of Social Affairs of the Republic of Indonesia, are examples of effective interventions. This program aims to empower vulnerable groups, including women MSME actors, through capital assistance, training, and business assistance. The technological aspect is also crucial; (Alom et al., 2025) show that ICT access improves market information and women's business networks.

Women's empowerment has a wide impact on family welfare, such as increased investment in education and child health (Nair, 2023). However, barriers such as cultural norms and non-inclusive policies remain a challenge. This study uses empowerment theory to analyze the impact of the PENA Program on the digitalization of women's MSMEs in Semarang, as an effort towards an inclusive and sustainable economy.

2.3 Digitization of MSMEs: Opportunities and Challenges for Women Small Business Actors

Digitalization has become an important strategy for women Micro, Small, and Medium Enterprises (MSMEs) to increase the resilience and competitiveness of their businesses, especially in the face of crises such as the COVID-19 pandemic. Digital technology allows women to access a wider market through e-commerce, improve operational efficiency, and strengthen business networks. A study by (Helmi et al., 2025) shows that digitalization helps entrepreneurial women in Europe increase the resilience of their businesses during the crisis, with the adoption of digital platforms such as social media and online training strengthening their confidence and professionalism.

In Indonesia, the use of social media such as WhatsApp and Instagram has become an effective marketing tool for women MSMEs, especially during mobility restrictions due to the pandemic. Social media offers an affordable and easy-to-use platform to promote products and interact with customers, helping to maintain business continuity during difficult times (Widagdo, et al., 2023) (Via Amalia, et al., 2025). However, women MSME actors face challenges in digitalization, including limited digital literacy, access to technological devices, and adequate infrastructure. A study by (Alfarizi, Widiastuti, & Ngatindriatun, 2024) highlights that while Information and Communication Technology (ICT) can improve access to information and business opportunities for women, barriers such as device costs, lack of training, and limited infrastructure remain significant obstacles.

To address these challenges, comprehensive policy support is needed, including digital literacy training,

provision of technological infrastructure, and access to financing. Empowerment programs that are contextually designed and sensitive to local needs have proven to be more effective in supporting the digitalization of women's MSMEs, thereby encouraging inclusive and sustainable economic growth.

2.4 Inclusive and sustainable economy within the framework of the SDGs

The concept of inclusive and sustainable economy is the main foundation of the Sustainable Development Goals (SDGs), especially in the 8th (decent work and economic growth), 5th (gender equality), and 10th (reducing inequality). An inclusive economy emphasizes the active participation of all levels of society in the economic process, especially vulnerable groups such as women and MSME actors, so that they are not only objects of development but economically empowered (Rana & Singh, 2025)

The inclusive economic approach also intersects with the principles of sustainable economics, which combines economic growth with social justice and environmental protection. In the context of global development, a sustainable economy not only pursues the growth of Gross Domestic Product (GDP), but also pays attention to the distribution of welfare and the sustainability of resources (Destrian, 2024) This is important because inequality and environmental degradation are two of the major challenges of 21st century development.

Women's economic empowerment is a key strategy in realizing an inclusive economy. The study by (Khabbaz & Kuran, 2024) emphasizes that women's inclusion in productive activities contributes significantly to poverty reduction and community economic resilience, particularly in developing countries. Another study by (Qiu, 2022) shows that increasing women's access to capital, entrepreneurship training, and digital markets can accelerate the achievement of the SDGs, especially targets related to poverty reduction, gender equality, and inclusive economic growth.

In Indonesia, national development strategies that are in line with the SDGs have encouraged integration between MSME empowerment, inequality reduction, and economic digitalization. The government through various programs, including the PENA Program, has emphasized the importance of sustainability and justice in community economic empowerment. The digitalization of women's MSMEs is considered to be able to expand economic participation while reducing social and economic exclusion.

Thus, an inclusive and sustainable economic approach is not only a global norm within the framework of the SDGs, but also a national and local framework to build a just, equitable, and economically resilient society in the midst of global disruption.

2.5 Conceptual framework

The conceptual framework in this study is based on the linkages between empowerment programs (PENA Program), digitalization of women's MSMEs, and an inclusive and sustainable economy within the framework of the Sustainable Development Goals (SDGs). The following is an image that explains the conceptual framework of this research:

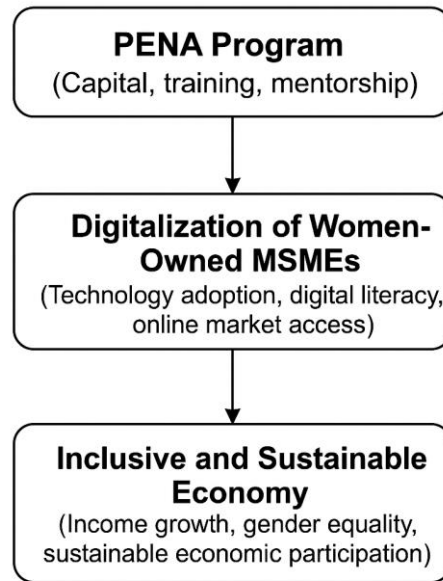


Figure 1. Conceptual Framework of the Impact of the PENA Program on the Digitalization of Women's MSMEs Towards an Inclusive and Sustainable Economy

Figure 1 illustrates a conceptual framework that explains the relationship between the main variables in the study "The Impact of the PENA Program on the Digitalization of Women's MSMEs Towards an Inclusive and Sustainable Economy." This model is designed to understand how interventions through the PENA Program affect the digitalization process of women's MSMEs and their contribution to achieving an inclusive and sustainable economy.

In the chart, the PENA Program is positioned as an independent variable that includes interventions in the form of capital assistance, skills training, business assistance, and financial and digital literacy. This program is expected to increase the economic capacity of women, especially micro business actors from vulnerable groups. The digitalization of women's MSMEs acts as a mediating variable, reflecting the extent to which women entrepreneurs can adopt digital technology in production, marketing, and transaction processes. This digitalization process allows for business efficiency, market expansion, and increased competitiveness (Palomares, et al., 2023)

The result of this interaction comes down to the Inclusive and Sustainable Economy as a dependent variable. This concept refers to an economic development model that focuses not only on growth, but also on equal opportunity and the sustainability of resources. Successful digitalization of MSMEs will encourage women entrepreneurs to contribute to job creation, income increase, and poverty reduction—in line with the Sustainable Development Goals (SDGs 1, 5, 8, and 9) (United Nations, 2022).

This framework shows that the success of empowerment programs such as PENA is measured not only by direct economic outputs, but also by how far they trigger structural transformations in women's empowerment and their integration in an inclusive and sustainable digital economy.

3. Methods

3.1 Types and Approaches to Research

This research uses a descriptive qualitative approach, which aims to deeply understand the phenomenon of

women's empowerment through the Nusantara Economic Hero Program (PENA) in the context of digitizing Micro, Small, and Medium Enterprises (MSMEs) in Semarang. This approach was chosen because it is able to explore the meaning, experience, and perspective of women entrepreneurs in a contextual and holistic (Sandelowski, 2021) Descriptive qualitative research focuses on the "what" and "how" of a phenomenon occurs, without variable manipulation or experimental interventions.

The descriptive design allows researchers to present a real picture of program implementation, challenges, and results experienced by women MSME actors. In this case, the researcher explores how the PENA Program facilitates access to capital, training, and digital literacy and its impact on women's adaptability to the digital economy. Thus, this approach is well suited to uncovering complex social dynamics and empowerment processes in real life (Bradshaw, et al., 2021)

Data collection was conducted through in-depth interviews, field observations, and documentation to build an accurate and reflective narrative of the informants' experiences. The validity of the findings is maintained by the triangulation technique of sources and methods. The results of the descriptive analysis are then arranged thematically to identify patterns, tendencies, and relationships between the main concepts in the conceptual framework that has been formulated.

3.2 Research Location and Time

This research was conducted in Semarang City, the capital of Central Java Province, which serves as one of the economic growth centers in central Indonesia. Semarang was selected due to its substantial MSME population and its designation as one of the implementation areas of the Nusantara Economic Heroes Program (PENA) administered by the Ministry of Social Affairs of the Republic of Indonesia.. According to administrative data from the PENA program, a total of 118 women-led MSMEs in Semarang are registered as program beneficiaries a total of 118 women led MSMEs in Semarang are registered as program beneficiaries representing a significant group of female entrepreneurs from vulnerable socio-economic backgrounds. In addition, Semarang exhibits considerable socio-economic diversity, making it a relevant and strategic location for examining the effectiveness of the PENA program in promoting digitalization and economic empowerment among women led MSMEs.

In addition, Semarang shows rapid development in the digitalization of MSMEs, supported by technology infrastructure and digital literacy initiatives that support local economic transformation. This provides the right context to explore the contribution of the PENA Program to women's empowerment and technological adaptation by MSME actors.

This research was carried out for four months, from March to June 2025. During this period, the researcher coordinated with the Social Service and the Coordinator and Companion of the Family Hope Program (PKH), identified informants, conducted in-depth interviews with women MSME actors, observed business activities, and collected supporting documents. This time is considered sufficient to obtain in-depth data related to the process, challenges, and results of the implementation of the PENA Program in the framework of digitizing small businesses in an inclusive and sustainable manner

3.3 Data Collection Techniques

This study uses a descriptive qualitative approach, so that data collection is carried out in a naturalistic and in-depth manner to understand complex social phenomena. The main techniques used include in-depth interviews, participatory observations, and documentation.

In-depth interviews were conducted with women MSME actors who received the PENA Program in Semarang City to explore their perceptions, experiences, and behavioral changes towards the adoption of digitalization post-intervention programs. Interviews are semi-structured so that researchers can explore topics flexibly but remain directed according to the research focus (Rubin, H. J., & Rubin, 2021)

Participatory observations were carried out during training and business activities of MSME actors to obtain direct information about the digitalization process and the use of technology by participants. This

method allows researchers to capture social interactions, practice challenges, and cultural contexts that influence women's digital empowerment (Saldaña, 2021)

In addition, documentation is also used as a secondary data source, including training modules, PENA program implementation reports, and digital promotional materials used by MSMEs. This triangulation approach aims to improve the validity and reliability of the data (Creswell, J. W., & Poth, 2022)

The combination of these three techniques allows researchers to get a complete picture of the impact of the PENA Program on the digitalization of women's MSMEs, both in terms of subjective experience and the socio-economic dynamics involved.

3.4 Data Analysis Techniques

The data obtained in this study was analyzed using thematic analysis techniques, which are a qualitative approach to identify, analyze, and report patterns or themes in the data. This analysis is carried out in stages, starting from transcription of interview results, repeated reading, data encoding, identification of key themes, to interpretation of results (Braun, V., & Clarke, 2021)

After data was collected from interviews, observations, and documentation, an open coding process was carried out to mark an important part of the narrative related to the impact of the PENA program on digital adoption by women MSMEs. Furthermore, axial coding is carried out to group codes into categories, such as changes in digital behavior, digitalization challenges, and the role of training and mentoring.

The analysis was carried out iteratively, by comparing data between informants and sources to achieve triangulation. The final result of this thematic analysis is formulated in the form of a narrative that describes the relationships between the main concepts within the conceptual framework of the research. This method is considered appropriate for exploring social experiences in the context of government program-based empowerment (Nowell, L. S. et al., 2022)

3.5 Data Validity

In qualitative research, data validity is an important aspect to ensure that the findings obtained truly reflect the social realities being studied. To ensure validity in this study, several triangulation strategies were used, including triangulation of sources, techniques, and time (Creswell, J. W., & Poth, 2021) Source triangulation was carried out by comparing information from various informants, such as PENA Program participants, PKH companions, and Semarang City PPKH Coordinators. The triangulation technique includes the use of various data collection methods such as in-depth interviews, direct observations, and documentation. Meanwhile, time triangulation is carried out by collecting data in several stages to test the consistency of information.

In addition, the credibility of the data is also strengthened through the member checking technique, which is the process of confirming provisional findings to informants so that the researcher's interpretation is in accordance with their experience (Nowell, 2022) The researcher also applies peer debriefing, which is a discussion with peers to review the analysis process and avoid the subjectivity bias of the researcher.

The trail audit technique is used to record the entire research process transparently, including field notes, interview transcripts, and the analysis process. This is done to ensure the dependability and confirmability of the data collected (Yin, 2023). With this multi-layered validation approach, it is hoped that the data obtained has a high level of validity and is able to provide an accurate picture of the impact of the PENA Program on the digitalization of women's MSMEs in Semarang.

4. Results and Discussion

4.1 Respondent Profile

This qualitative study involved eleven women MSME actors in Semarang City who were beneficiaries of the PENA Program. Participants were selected using purposive sampling from a total population of 118 women-led MSMEs registered under the PENA Program in Semarang, with the aim of capturing rich and

diverse perspectives relevant to the research objectives. The selection criteria included business sector, level of digital adoption, and length of participation in the PENA Program. The final number of respondents was determined based on data saturation, where additional interviews no longer produced new themes or substantive insights. This approach ensured an in-depth understanding of the role of the PENA Program in supporting digitalization and economic empowerment among women-led MSMEs. They come from various backgrounds of micro-businesses that are run independently with varying levels of adaptation to digitalization. The following is a brief profile of each respondent that provides an initial overview of their conditions, types of businesses, and involvement in the digitalization process through the PENA Program.

The first respondent was named Sofa Wijayanti (45 years old). Mrs. Sofa is a market snack and catering business actor with quite a long experience. His business includes making risols, arem-arem, bika ambon, to gudeg rice and rice bowl tumpeng. He is a diligent figure and relies on regular subscriptions. Through the PENA Program, he began to get to know the concept of digital promotion even though it is still limited to simple media such as WhatsApp. The enthusiasm is high, but the adaptation to technology is still gradual.

The second respondent is named Rinawati (45 years old). Mrs. Rinawati runs a sewing and make-up service business as well as sequins. As an MSME actor in the service sector, he is greatly helped by digital promotion training. He feels that the ability to display his work through photos can increase the trust of new customers. Although he does not fully understand social media, he shows motivation to learn and develop a customer network.

The third respondent is named Sudarminingsih (42 years old). Running a home laundry business, Mrs. Sudarminingsih is an example of MSME actors who have limited customer access due to their business location. The PENA program motivates him to be more open in promoting his business in the digital environment, especially through WhatsApp groups of local residents. It also began to implement digital daily order recording for efficiency.

The fourth respondent is named Retno Adwianti (47 years old). Mrs. Retno manages a grocery store that serves the basic needs of residents. At first, he was skeptical of the concept of digitalization for his small shop. However, after mentoring, he started using a simple recording application and provided QRIS payments. He now feels more modern and makes it easier for customers, especially the younger generation.

The fifth respondent is named Eko Susilowati (47 years old). As the owner of Ery Salon, Mrs. Eko has a high spirit to innovate. She quickly adapted to the use of social media to showcase haircuts and spa services. He realized that business visualization is very important to attract new customers. It is also open to the use of a simple reservation platform.

The sixth respondent is named Dewi Yuliani (44 years old). Mrs. Dewi is a peyek entrepreneur with a variety of flavors. Before participating in the PENA Program, he only marketed his products directly. Now he is starting to use local Facebook and WhatsApp for promotion, and is trying to improve the appearance of product packaging. He is interested in reaching a wider market but is still learning slowly.

The seventh respondent is named Ngatmiyati (47 years old). The owner of the soto and rawon stall showed high enthusiasm in learning digital promotion. He was accompanied to make the location of his stall registered on Google Maps, and now customers can pre-order via text message. He felt a positive change in time management and customer service.

The eighth respondent is named Siti Anisah (44 years old). Ibu Siti runs angkringan with special menus such as cat rice and fried foods. Through the PENA Program, he understands the importance of digital communication. He started receiving orders through WA and used his time more efficiently in serving customers. He is also interested in trying promotion through social media accounts in the future.

The ninth respondent named Tohiroh (46 years old) as a seller of daily necessities and kitchen materials, Mrs. Tohiroh began to learn stock recording and digital transactions. He still relies on traditional systems, but is committed to trying to use simple applications. He also began compiling a list of merchandise in the form of a digital catalog that was sent to regular customers.

The tenth respondent named Lestari (45 years old), the soto and nasi rames business run by Mrs. Lestari

has been growing since she learned digital promotion. She feels more confident in sharing photos of her daily cooking to WhatsApp groups and the surrounding environment. This increases the number of customers and expands the reach of his business.

The eleventh respondent is named Islami (42 years old). Mrs. Islami runs a culinary business of geprek chicken, rames rice, and various drinks. He is among the most active respondents in the use of social media and has started to use digital payments such as QRIS. He understands the importance of product visuals, branding consistency, and transaction convenience for millennial customers.

In general, the respondents showed a high enthusiasm to adapt to technology despite facing technical and infrastructure limitations. The PENA program has a positive impact on increasing confidence, expanding marketing networks, and facilitating digital business transactions. This is an important foundation in accelerating the digital transformation of women's MSMEs towards a more sustainable business.

4.2 The Role of the PENA Program in Opening Digital Access

The results of the study show that the PENA Program has an important role in opening digital access for women MSME actors in Semarang City. Before participating in this program, most of the respondents did not have an adequate understanding of the use of digital technology in business management and development. The lack of digital literacy, limited devices, and lack of mentoring are the main factors inhibiting digitalization in the micro business segment, especially those managed by women.

The PENA program provides practical training-based interventions and intensive assistance that are relevant to the local needs of MSME actors. Of the eleven respondents interviewed, almost all admitted that the training provided made it easier for them to understand the basic concepts of business digitalization, such as the use of WhatsApp Business, simple promotional content creation, digital recording, and the introduction of non-cash payment methods such as QRIS. For example, respondents named Sofa Wijayanti and Dewi Yuliani revealed that they learned to make digital product catalogs and promote products through social media for the first time after participating in the PENA Program.

The involvement of field assistants is an important key in the process of opening up digital access. Companions help bridge the digital literacy gap with a personal and contextual approach. Mrs. Ngatmiyati, the owner of a soto stall, said that she felt more confident in registering her business location on Google Maps after being assisted by a program assistant. This shows that the presence of facilitators who understand local socio-cultural conditions can accelerate the digital adoption process for micro business actors.

In addition to technical training, the PENA Program also fosters a new understanding of the importance of digitalization in increasing business competitiveness. Respondent Islami and Eko Susilowati, who runs a culinary and salon business, emphasized that they are now aware of the importance of product visualization and digital branding consistency. This change in perspective is an early indicator of the digital cultural transformation, where business actors not only use technology as a tool, but also begin to build business identities in the digital space.

The program also encourages the use of cashier applications and simple digital record-keeping. Most respondents admitted that they previously recorded transactions manually or even did not record them at all. However, after the training, they began implementing note-taking using Android-based applications or through Google Sheets which was guided in stages. These changes contribute to improving business financial governance and increasing transparency and operational efficiency.

These findings indicate that the PENA Program not only plays a role as a means of economic empowerment, but also as an enabler in accelerating digital transformation among women MSMEs. The opening of digital access through training, mentoring, and practical skills has proven effective in increasing the readiness of MSME actors to face the digital economy era. This change is the first step towards a more adaptive, inclusive, and sustainable micro-business.

4.3 Changes in Business Patterns and Digital Adaptation Strategies

Participation in the PENA Program encourages significant changes in the business patterns of women MSME actors, especially in terms of adaptation strategies to digital technology. Based on field findings, most of the respondents have shifted from conventional business patterns to business models that are more open to the use of technology. This transformation not only covers the marketing aspect, but also touches on the system of record, customer service, and operational management.

Before participating in the program, the majority of respondents were still running their businesses manually with word-of-mouth marketing methods and simple paper-based recordings. However, after receiving training and mentoring, they began to implement digital promotion strategies, such as sharing product photos through WhatsApp groups, using social media to reach new consumers, and listing business locations on Google Maps. Respondents such as Mrs. Islami and Mrs. Eko Susilowati have even actively used social media consistently to strengthen business branding.

On the other hand, adaptation strategies are also seen in the use of digital payment methods. Some respondents who previously only received cash payments have now started to provide QRIS payment options. In addition to making it easier for customers, this innovation also reflects the readiness of MSMEs in responding to changes in consumer preferences in the digital era.

This digital adaptation is not without challenges, such as limited devices and technical skills. However, the enthusiasm for learning and intensive mentoring from the PENA Program succeeded in creating a positive learning climate. Overall, this change in business patterns shows that an appropriate and contextual digitalization strategy can strengthen resilience and expand opportunities for sustainable growth of women MSMEs.

4.4 Changes in Self-Empowerment and Gender Roles

The PENA program not only has an impact on the technical aspects of the business, but also encourages significant changes in the self-empowerment of women MSME actors and the strengthening of gender roles in their social environment. Based on the findings of the study, most of the respondents experienced increased confidence, decision-making ability, and greater involvement in household economic management after participating in the program.

Before participating in the PENA Program, some respondents admitted that they lacked confidence to appear in public spaces or promote their businesses directly. However, the training and assistance provided, especially those based on participatory and group, have opened up space for dialogue and mutual support among fellow MSME actors. Mrs. Rinawati and Mrs. Ngatmiyati, for example, stated that they are now more courageous to express their opinions and take initiative in making business decisions, including marketing strategies and financial management.

This capacity building also has an impact on the role of women in the household. Some respondents said that their economic contribution was increasingly recognized by their spouses or families. In fact, in some cases, family members have begun to help in aspects of business digitalization such as creating content or helping with financial records. This shows that there is a new dynamic in the more equal division of gender roles.

In addition, the digital empowerment provided by the PENA Program expands women's mobility space from previously limited to the domestic sphere to community-based and digital economic actors. Women are not only seen as complementary to household income, but also as drivers of business and innovation. This transformation is an important indicator that digitalization is not only about technology, but also closely related to the social and cultural dimensions that strengthen women's position as equal and empowered economic actors.

4.5 Contribution to Business Sustainability and Economic Inclusion

The PENA program has proven to make a real contribution to the sustainability efforts of micro businesses while expanding economic inclusion for women MSME actors in Semarang City. Through an empowerment

approach based on digital training and direct mentoring, this program helps respondents build a business foundation that is more adaptive, efficient, and competitive in the digital era.

Business sustainability can be seen from the implementation of a more organized work system. Several respondents, such as Mrs. Tohiroh and Mrs. Sudarminingsih, began to implement digital financial records, organize stock of goods more regularly, and understand the importance of separating business and household finances. This small step is the starting point in building sound business management, which is very important to maintain continuity in the midst of market dynamics.

In addition, digital promotions that have begun to be adopted such as the use of social media and online product catalogs allow MSME actors to reach a wider market and are not limited geographically. This creates new opportunities to increase revenue and expand business networks. Mrs. Islami and Mrs. Eko Susilowati, for example, have succeeded in increasing the number of customers with a strategy of visualizing products and services through digital media.

The PENA program in terms of economic inclusion has also reduced the gap in women's access to technology and economic information. MSME actors who were previously limited to offline marketing can now participate in the digital economy more equally. Women are not only passive actors, but also actively take on the role of digital-based business managers. This is an important step forward in strengthening women's position in a more inclusive local economic structure.

Therefore, the PENA Program plays a strategic role in strengthening the sustainability of micro businesses and expanding digital economy inclusion, especially for vulnerable groups such as women MSME actors who have been less reached by formal economic development programs.

4.6 Discussion

This research shows that the PENA Program makes a significant contribution to the digitalization and empowerment of women MSMEs in Semarang City. The findings indicate that interventions based on digital training and intensive mentoring not only have an impact on the technical aspects of the business, but also on the social, cultural, and psychological aspects of business actors.

These findings are in line with studies that show the importance of digitalization as a means of accelerating the growth of MSMEs (Alzamel, 2024) MSMEs that have access to digital technology tend to be more resilient to economic shocks, more adaptive to market dynamics, and have greater opportunities to access a wider market. In the context of female MSME actors, digitalization is also closely related to the empowerment process, as it provides space for women to become more independent economic agents (Al-Mamary & Abubakar, 2023)

The findings of this study also confirm the importance of a contextual and participatory approach to training. As shown in a study by (Liu, Zheng, Yang, & Zhou, 2025) effective entrepreneurial intervention programs not only provide technical training, but also pay attention to aspects of mentoring, social networking, and personal motivation. This approach seems relevant to the implementation of the PENA Program in Semarang, where participants gain not only technical knowledge but also moral and social support from facilitators and fellow participants.

Furthermore, the changes in business patterns and gender roles observed in this study reflect that economic empowerment programs can trigger broader social change. Some respondents showed increased self-confidence, greater involvement in family decision-making, and the ability to build new social relationships outside the scope of the household. This phenomenon is consistent with the concept of transformative empowerment described by (Agarwala, Maity, & Sahu, 2022) where empowerment is not only about access to resources, but also about changes in power relations and individual autonomy.

However, this study also noted that there are structural obstacles that still hinder the digitalization process of women's MSMEs. These obstacles include limited access to digital devices, low technological literacy, and internet network constraints in several suburban areas. These barriers are in line with findings (Khabbaz & Kuran, 2024) which note that the digital divide is still a major challenge in efforts to drive an inclusive digital

economy, especially for women groups and microeconomic actors.

As a solution, a locally-based approach needs to be strengthened. For example, strengthening the role of women's communities or business groups as informal digital literacy centers can be an effective strategy. Mentoring can be carried out by local cadres who have experience in digitalization, with a familiar language approach and practical methods. In addition, cooperation with local governments to provide basic infrastructure such as public Wi-Fi access, regular training at village halls or sub-districts, and digital marketing facilitation through local platforms are very potential steps.

The Sustainable Development Goals (SDGs) emphasize gender equality, inclusive economic growth, and technological innovation as key drivers of sustainable development. This study is aligned with several SDGs that provide a relevant framework for analyzing the role of government programs in promoting digitalization and economic empowerment among women-led MSMEs. First, SDG 5 (Gender Equality) is addressed through the program's support for women's economic empowerment and the promotion of more equitable gender roles. Second, SDG 8 (Decent Work and Economic Growth) is reflected in efforts to enhance the productivity, sustainability, and capacity of MSMEs. Third, SDG 9 (Industry, Innovation, and Infrastructure) is supported through the encouragement of digital technology adoption in microeconomic activities. Finally, SDG 10 (Reduced Inequalities) is relevant as the program targets women from vulnerable economic groups who have historically faced limited access to formal economic opportunities.

Thus, the results of this study not only have practical implications for the development of similar programs in other regions, but also provide theoretical contributions to the study of local economic digitalization and gender-based empowerment. This research shows that the digital transformation of women's MSMEs cannot be separated from the social, cultural, and institutional dimensions that surround them. Therefore, the design of future empowerment programs needs to integrate technology, participatory approaches, and strengthening local support structures simultaneously.

In the future, further research can explore more deeply the long-term impact of programs such as PENA on business sustainability, family welfare, and gender relations in households. In addition, a quantitative evaluation of the digital maturity level of post-program women's MSMEs is also important to measure how far digital transformation has really occurred. Collaboration between academia, government, and civil society organizations is key to ensuring that initiatives like the PENA Program continue to thrive, be inclusive, and have a sustainable impact on the local economy.

5. Conclusion

The results of this study show that the PENA Program has a positive impact on the digitization process of women's MSMEs in Semarang City, although with variations influenced by social background, digital literacy level, and family support. This program has proven to be able to open access to digital devices, introduce payment technologies such as QRIS, and equip participants with basic knowledge of online marketing. However, not all MSME actors are able to take advantage of this opportunity to the fullest. Differences in technological adaptability show that the success of digitalization is not only determined by program interventions, but also by personal factors such as motivation, social environment support, and learning capacity.

Digitalization has been proven to not only improve market access and business efficiency, but also strengthen women's empowerment through increased confidence, role in decision-making, and social mobility. However, this process is highly dependent on the sustainability of digital literacy and the availability of adaptive assistance that is able to answer the contextual challenges of women entrepreneurs, such as time constraints, domestic roles, and access to technology.

In terms of policy, these results emphasize the importance of strengthening community-based digital literacy and the development of a flexible and sustainable mentoring system. Interventions involving local actors and families have proven to be more effective in driving inclusive digital transformation.

This study has limitations on the number and distribution of respondents, which are still focused on urban areas. For this reason, further research needs to be carried out in rural areas with mixed quantitative and longitudinal methods, in order to describe the long-term dynamics of the digitalization of women's MSMEs and their influence on family welfare more comprehensively).

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