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THE ROLE OF MSMES (MICRO, SMALL, AND MEDIUM ENTERPRISES) IN IMPROVING PUBLIC WELFARE IN THE ERA OF THE FOURTH INDUSTRIAL REVOLUTION (INDUSTRY 4.0) THROUGH DIGITALIZATION (E-COMMERCE)

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ABSTRACT

This article examines how digitalization through e-commerce can strengthen the contribution of Micro, Small, and Medium Enterprises (MSMEs) to public welfare in the era of Industry 4.0. It specifically analyzes the links among digital literacy, e-commerce adoption, MSME business performance, and the multidimensional dimensions of welfare. The study applies a qualitative descriptive approach using library research. Secondary data were collected from scholarly journal articles, books, institutional publications, and relevant Indonesian laws and regulations, and were analyzed descriptively and thematically. The literature synthesis indicates that digital literacy enables MSME owners to identify market information, create digital content, communicate with customers, manage online transactions, and use platform features more effectively. E-commerce can then reduce geographical barriers, broaden market access, strengthen customer awareness, and support improvements in sales, turnover, and business performance. Business expansion may create additional demand for workers and support household income. These economic pathways can contribute most directly to the income dimension of welfare and may indirectly improve households' ability to meet needs related to housing, education, and health. Nevertheless, such outcomes are not automatic: they depend on digital capabilities, business management, product quality, infrastructure, logistics, access to finance, platform costs, and institutional support. The article argues that e-commerce should therefore be understood as an enabling instrument rather than a stand-alone solution to public welfare challenges. As a literature-based conceptual study, it explains plausible pathways and enabling conditions and does not claim to establish causal effects for all MSMEs or households.
Keywords: *MSMEs, Public Welfare, Industry 4.0, Digitalization, E-commerce*

A. INTRODUCTION

Everyone aspires to a prosperous life one where all basic needs for clothing, food, and shelter can be met. There are many ways to achieve this, one of which is by establishing Micro, Small, and Medium Enterprises (MSMEs). MSMEs play a vital role in enhancing and fostering economic growth within a community. They demonstrate a remarkable ability to endure various challenges, contributing significantly to the well-being of society. The resilience of MSMEs was clearly evidenced during the 1998 monetary crisis; while many large-scale businesses collapsed, MSMEs not only survived but even grew in number. By absorbing labor, the MSME sector bolsters economic growth and assists the government in reducing unemployment and poverty rates. The development of MSMEs must be structured, planned, and sustainable, with a focus on increasing productivity and competitiveness. This approach also fosters the emergence of new, more resilient entrepreneurs, ultimately improving the welfare of the community (Srijani & Kadeni, 2020).

In this era of globalization and the Fourth Industrial Revolution (Industry 4.0), all business owners including those running MSMEs must adapt to technological advancements, which often influence profit margins. MSMEs need to stay attuned to their surroundings and implement effective marketing communication strategies to reach potential customers. Leveraging technology and the internet for

marketing activities serves as a compelling way to attract buyer interest. Life in the era of the Fourth Industrial Revolution demands practicality and speed, making online systems increasingly essential and popular for both sellers and buyers. As this era intensifies business competition, the government has placed a strong emphasis on developing the MSME sector, ensuring that these enterprises remain relevant and are not sidelined or neglected in the global marketplace.

Micro, Small, And Medium Enterprises (MSMEs)

A micro-enterprise is a productive business owned by an individual and/or an individual business entity that meets the criteria for micro-enterprises as stipulated in the Law (Undang-Undang Nomor 8 Tahun 2008, Tentang UMKM, 2008). A small enterprise is an independent, productive economic venture operated by an individual or a business entity that is neither a subsidiary nor a branch of, nor owned, controlled, or otherwise affiliated (directly or indirectly) with, a medium or large enterprise, and which meets the criteria for small enterprises as defined by the Law. According to Statistics Indonesia (BPS), a micro-enterprise is a business unit with up to 4 permanent employees; a small enterprise has between 5 and 19 permanent employees; and a medium enterprise has between 20 and 99 permanent employees. Companies with more than 99 employees fall into the category of large enterprises. MSMEs are capable of absorbing a significant workforce and engaging in the export of specific goods, thereby generating substantial foreign exchange and contributing to the Gross Domestic Product (GDP). In general, the objective is to foster resilient and independent MSMEs that possess high competitiveness and play a primary role in the production and distribution of essential goods and raw materials, as well as in capital provision, to navigate the challenges of a free-market environment.

From a business perspective, MSMEs (Micro, Small, and Medium Enterprises) can be classified as follows: a) Livelihood Activities: Micro, small, and medium-scale enterprises that provide employment opportunities for generating income often referred to as the informal sector such as street vendors, b) Micro Enterprise: Micro, small, and medium-scale enterprises that exhibit the characteristics of craftspeople or artisans but have not yet developed entrepreneurial traits, c) Small Dynamic Enterprise: Micro, small, and medium-scale enterprises that possess an entrepreneurial spirit and are capable of undertaking subcontracted work and engaging in exports and d) Fast-Moving Enterprise: Micro, small, and medium-scale enterprises that possess an entrepreneurial spirit, where the business owners actively pursue development or transformation into large-scale enterprises (LSEs). MSMEs (Micro, Small, and Medium Enterprises) share several common characteristics, namely The types of commodities traded tend to be unstable and may change at any time, The business location can change at any time, Administrative practices are not yet implemented; often, there is no clear distinction between personal finances and business finances, The human resources involved lack a strong entrepreneurial spirit, The educational level of the human resources is typically low, MSME operators generally lack connections to the banking sector, though some may have relationships with non-bank financial institution dan Small business operators often lack formal legal documentation or business licenses, such as a Taxpayer Identification Number (NPWP).

The characteristics of Micro, Small, and Medium Enterprises (MSMEs) represent a fundamental aspect that reflects the actual condition of a business entity, encompassing both its operational activities and the behavioral traits of its owners in conducting business. These characteristics can be identified through several indicators, such as business scale, number of employees, business capital, net worth, and annual sales revenue. The World Bank classifies MSMEs based on the number of employees: micro-enterprises have a maximum of 10 employees, small enterprises have a maximum of 30 employees, and medium enterprises have a maximum of 300 employees. This classification demonstrates that the number of employees serves as an indicator for describing the operational scale and capacity of a business.

In Indonesia, the criteria for Micro, Small, and Medium Enterprises are historically governed based on their net worth and annual sales revenue (Undang-Undang Nomor 8 Tahun 2008, Tentang UMKM, 2008). Under these provisions, a micro-enterprise is defined as a business with a net worth of up to IDR 50,000,000.00 (excluding land and the buildings used for business operations) or an annual sales revenue of up to IDR 300,000,000.00. A small enterprise is defined as a business with a net worth exceeding IDR 50,000,000.00 up to a maximum of IDR 500,000,000.00 (excluding land and the buildings used for business operations), or an annual sales revenue exceeding IDR 300,000,000.00 up to a maximum of IDR 2,500,000,000.00. Meanwhile, a medium-sized enterprise has a net worth of

more than IDR 500,000,000.00 up to a maximum of IDR 10,000,000,000.00 excluding land and buildings used for business operations or an annual sales revenue of more than IDR 2,500,000,000.00 up to a maximum of IDR 50,000,000,000.00 (Republic of Indonesia, 2008).

In line with economic development and the need to strengthen the national MSME (Micro, Small, and Medium Enterprises) ecosystem, the government has enacted Government Regulation Number 7 of 2021 concerning the Facilitation, Protection, and Empowerment of Cooperatives and Micro, Small, and Medium Enterprises, serving as an updated regulatory framework. The classification of MSMEs is based on criteria related to business capital or annual sales revenue. The business capital criterion is used for the purposes of establishing or registering business activities, while the annual sales revenue criterion is applied in the provision of facilitation, protection, and empowerment for MSMEs (Peraturan Pemerintah Republik Indonesia Nomor 7 Tahun 2021 Tentang Kemudahan, Pelindungan, Dan Pemberdayaan Koperasi Dan Usaha Mikro, Kecil, Dan Menengah, 2021).

Pursuant to Article 35, paragraph (3), the business capital criterion is divided into three categories. First, a micro-enterprise has business capital of up to a maximum of IDR 1,000,000,000.00 (one billion rupiah), excluding land and buildings used for business operations. Second, a small enterprise has business capital exceeding IDR 1,000,000,000.00 up to a maximum of IDR 5,000,000,000.00 (five billion rupiah), excluding land and buildings used for business operations. Third, a medium enterprise has business capital exceeding IDR 5,000,000,000.00 up to a maximum of IDR 10,000,000,000.00 (ten billion rupiah), excluding land and buildings used for business operations. Furthermore, pursuant to Article 35, paragraph (5), the criteria based on annual sales revenue stipulate that a micro-enterprise has an annual sales revenue of up to IDR 2,000,000,000.00 (two billion rupiah); a small enterprise has an annual sales revenue of more than IDR 2,000,000,000.00 up to a maximum of IDR 15,000,000,000.00 (fifteen billion rupiah); and a medium enterprise has an annual sales revenue of more than IDR 15,000,000,000.00 up to a maximum of IDR 50,000,000,000.00 (fifty billion rupiah) (Peraturan Pemerintah Republik Indonesia Nomor 7 Tahun 2021 Tentang Kemudahan, Pelindungan, Dan Pemberdayaan Koperasi Dan Usaha Mikro, Kecil, Dan Menengah, 2021).

Consequently, the classification of MSMEs (Micro, Small, and Medium Enterprises) in Indonesia has evolved: the previous approach which focused on net worth and annual sales revenue, as stipulated in Law Number 20 of 2008 has shifted to an approach that considers business capital and annual sales revenue, as set forth in Government Regulation (PP) Number 7 of 2021. This change provides a more relevant classification framework for identifying the scale and economic capacity of MSMEs. In the context of research, the characteristics of MSMEs are a crucial aspect to consider, as differences in business scale may relate to resource capacity, management capabilities, access to financing, the utilization of technology, and the ability to navigate market competition dynamics. Therefore, an understanding of MSME characteristics is not only necessary for determining business categories but also serves as a foundation for analyzing business behavior, development strategies, and performance.

MSMEs (Micro, Small, and Medium Enterprises) can serve as the largest contributors to the domestic product by increasing the volume of goods produced within the country. These products can reach both national and international markets. Furthermore, MSMEs expand employment opportunities, indirectly helping individuals secure jobs and supporting government initiatives to reduce unemployment rates. MSMEs offer a viable solution for the middle-income segment, as many government institutions provide full support to the sector most notably through the provision of small-scale credit and capital. Another advantage of MSMEs lies in their operational flexibility; they typically feature lean leadership structures, with clearly defined roles and responsibilities for each leader. This allows MSME-sector businesses to be more responsive to emerging trends and evolving consumer preferences. Micro, Small, and Medium Enterprises (MSMEs) possess a number of strengths that make them a crucial sector in supporting economic growth and national development. One of MSMEs' primary strengths lies in their ability to develop specific market segments through unique product characteristics and the implementation of relatively simple and flexible business management systems. This flexibility enables MSMEs to be more adaptive in responding to changing consumer needs, market dynamics, and business competition. Furthermore, MSMEs make a strategic contribution to job creation due to their labor-intensive nature, which allows them to absorb labor, including those with limited access to the formal sector. MSMEs also play a role in encouraging entrepreneurial growth by creating new entrepreneurs with the potential to foster productive economic activity in the community. Another

strength is their relatively open potential for business development, whether through product innovation, market expansion, or increased production capacity. Furthermore, MSMEs have the ability to optimize the use of local resources, including raw materials and waste or by-products from large-scale and other industries, thereby creating added economic value while supporting efficient resource utilization.

Despite their various strengths, MSMEs also face a number of weaknesses and obstacles that can impact the sustainability and development of their businesses. In general, these obstacles can be grouped into two categories: internal and external factors. Internal factors encompass various problems stemming from the internal conditions and capacities of MSMEs themselves. One frequently encountered issue is the limited quality and competence of human resources, both in managerial aspects, financial management, technological mastery, and business strategy development. These limitations can impact MSMEs' ability to manage their businesses professionally and increase competitiveness. Furthermore, limited access to and reach of marketing are also significant obstacles. Some MSMEs tend to be more production-oriented than marketing-focused, resulting in relatively limited access to market information, building distribution networks, understanding consumer behavior, and optimally utilizing marketing channels. This condition often results in MSME products having a narrow market reach and less than optimal market penetration. Another issue relates to the level of consumer trust in product quality, particularly when MSMEs lack adequate product standardization, certification, or consistent quality. From a financial perspective, limited capital is also a significant internal constraint. Most MSMEs still rely on relatively limited personal capital, resulting in less than optimal capacity to increase production capacity, innovate, develop technology, and expand markets.

Meanwhile, external factors represent various obstacles stemming from the environment beyond the direct control of MSMEs, including government policies, fostering institutions, supporting institutions, and business conditions. External obstacles can arise when MSME development and development programs implemented by the government or related institutions do not fully align with the needs and specific challenges faced by MSMEs. Furthermore, weak inter-agency coordination, inadequate monitoring and evaluation of empowerment programs, and overlapping policies or mentoring programs can reduce the effectiveness of support provided to MSMEs. These conditions demonstrate that the success of MSME development is not solely determined by the internal capacity of MSMEs but is also influenced by the quality of the business ecosystem, institutional support, access to resources, and the effectiveness of empowerment policies implemented by various stakeholders.

Based on this description, it can be understood that MSMEs have dualistic characteristics, namely having advantages in business flexibility, job creation, entrepreneurship development, and utilization of local resources, but at the same time facing limitations in aspects of human resources, marketing, consumer trust, capital, and institutional support. Therefore, the development of MSMEs requires a comprehensive approach through strengthening internal capacity and improving the external environment. These efforts are important to increase competitiveness, expand market access, and fostering innovation and ensuring the sustainability of MSMEs as they navigate an increasingly dynamic business environment.

E-Commerce

E-commerce is defined as the use of IT to conduct business activities between two or more organizations, or between an organization and one or more end-customers, via one or more computer networks (Jogianto, 2005:286). E-commerce more commonly known as "online shopping" encompasses commercial operations such as the sale, purchase, ordering, payment, and promotion of products (goods and/or services) conducted through the use of computers and digital electronic communication tools or data telecommunications. E-commerce refers to commercial transactions involving services in an electronic format (Transatlantic Business Dialogue Electronic Commerce White Paper).

Electronic commerce refers, in a general sense, to all forms of transactions related to commercial activities whether by organizations or individuals that are based on the processing and transmission of digitized data, including text, sound, and images (OECD, 2021; Simarta, 2006:326). E-commerce encompasses a wide range of activities, including the electronic trade of goods or services, the online delivery of digital content, electronic fund transfers, electronic share trading, electronic bills of lading, commercial auctions, collaborative design and engineering, online sourcing, public

procurement, direct-to-consumer marketing, and after-sales services (Helmalia & Afrinawati, 2018). It also includes products (such as consumer goods or medical equipment) or services (such as information, financial, and legal services), as well as both traditional activities (in sectors like healthcare and education) and new types of activities (such as virtual malls) (European Commission).

B. RESEARCH METHOD

This study uses a qualitative descriptive approach with a library research design. This approach was selected because the article aims to examine and synthesize existing concepts, regulations, and scholarly discussions concerning the role of Micro, Small, and Medium Enterprises (MSMEs) in improving public welfare through digitalization, particularly the use of e-commerce in the Industry 4.0 era. The study does not collect primary data from respondents or measure the statistical effect of e-commerce adoption on household welfare; instead, it develops a conceptual analysis based on relevant published sources.

The data used in this study are secondary data obtained through documentation and literature review. The sources include books on economic development and welfare, scholarly journal articles discussing MSMEs, entrepreneurship, digital literacy, and e-commerce, as well as relevant Indonesian laws and regulations. The regulatory sources include Law Number 20 of 2008 concerning Micro, Small, and Medium Enterprises, Government Regulation Number 7 of 2021 concerning the Facilitation, Protection, and Empowerment of Cooperatives and Micro, Small, and Medium Enterprises, and Law Number 11 of 2009 concerning Social Welfare. The literature was selected based on its relevance to the article's main themes, namely MSME characteristics and development, e-commerce and digital literacy, and the dimensions of public welfare.

The collected materials were analyzed using descriptive and thematic analysis. First, the relevant information was identified and grouped into themes covering the role and characteristics of MSMEs, their strengths and internal and external constraints, the concept and indicators of public welfare, and the use of e-commerce in business activities. Second, the themes were compared and interpreted to identify the ways in which MSME activities and e-commerce adoption may support employment, household income, market access, and the fulfillment of basic social needs. Finally, the findings were synthesized to formulate a conceptual explanation of the opportunities and conditions required for digitalization to strengthen the contribution of MSMEs to public welfare. The analysis is interpretive and literature-based; therefore, the conclusions are presented as conceptual insights and are not intended as statistical or causal generalizations.

C. RESEARCH & DISCUSSION RESULTS

Public Welfare

Social welfare refers to a condition in which the needs of individuals or groups whether material, spiritual, or social are met. According to Law Number 11 of 2009 concerning Social Welfare, social welfare is defined as the fulfillment of a citizen's material, spiritual, and social needs, enabling them to live a decent life, develop themselves, and effectively carry out their social functions. This definition indicates that welfare is not merely about an individual's ability to meet economic needs; it also encompasses quality of life, social conditions, and opportunities to develop one's potential. Thus, a person who is "well-off" or living in a state of welfare is not only free from poverty and various life-threatening risks but is also capable of meeting their basic needs decently, enjoying a sense of security, and fulfilling their social roles within the community. The concept of welfare is multidimensional, as it cannot be measured solely by material aspects or levels of consumption. Welfare cannot be defined exclusively through material or hedonistic terms; rather, it must also account for humanistic and spiritual dimensions (Sugandi & Suhaeni, 2019). Consequently, the level of welfare can be understood as a condition that reflects the capacity of an individual or group to satisfy both material and spiritual needs, while simultaneously gaining opportunities to enhance their quality of life.

Todaro & Stephen C. Smith (2004) explain that efforts to achieve social welfare in material, worldly, and spiritual terms must address three fundamental aspects. First, the provision of basic needs: enhancing individual capabilities and ensuring an equitable distribution of essentials, such as food, clothing, shelter, healthcare, and protection. Second, the improvement of the quality of life (standard of living), reflected in higher incomes, better access to education, and an overall enhancement in the community's well-being. Third, the expansion of economic and social choices for individuals and

society specifically through the creation of better employment opportunities thereby allowing people to increase their productivity and improve the welfare of their families. This third aspect emphasizes that the development of well-being is not solely focused on increasing income, but also on expanding access, opportunities, and the capacity of individuals to achieve a higher quality of life.

Measuring the level of societal well-being requires a set of indicators that can objectively represent the living conditions of individuals and households. Sukirno (2010) explains that well-being is not merely related to consumption patterns and the ability to meet material needs; it also encompasses the development of human potential and capabilities, which serve as vital capital for achieving a better life. Consequently, well-being should be viewed through a multidimensional approach that considers economic and social aspects, as well as the quality of human resources. Such measurement can be conducted using both physical and non-physical indicators, including per capita consumption levels, employment conditions, economic status, crime rates, and access to information and mass media. One approach to measuring societal well-being is the Human Development Index (HDI), which captures the quality of human development across three primary dimensions: a long and healthy life (represented by life expectancy), knowledge (measured through educational indicators), and a decent standard of living (represented by adjusted real per capita expenditure). Furthermore, Sukirno (2010) outlines several methods for comparing levels of well-being: comparing well-being across countries by refining national income calculations; using non-monetary indicators to assess living conditions; and adjusting income figures to account for price level differences between nations. These various approaches demonstrate that measuring well-being requires considering purchasing power and actual living conditions, rather than relying solely on nominal income figures.

In the context of measuring household well-being in Indonesia, Statistics Indonesia (BPS) employs a range of socio-economic indicators to describe the living conditions of the population. Based on the dimensions utilized in this study, societal well-being can be analyzed through four key indicators: income, housing and household organization, education, and health. Income is an important indicator that reflects the capability of an individual or a household. Income can be defined as the total receipts obtained by an individual or a household over a specific period whether derived from labor, returns on asset ownership (such as rent, interest, and dividends), or government transfers and allowances. An adequate level of income provides households with the economic capacity to meet basic needs, increase consumption, and gain access to various facilities that enhance their quality of life. Furthermore, housing and human settlements serve as indicators of the quality of one’s living space and environment. A home functions not merely as a shelter but as a fundamental necessity that plays a strategic role in supporting family life. Decent, healthy, and comfortable housing can bolster the physical and psychological well-being of its occupants, while also creating an environment conducive to the education and development of family members. Consequently, the quality of residential structures, the availability of basic amenities, sanitation, and the condition of the surrounding settlement are critical aspects in assessing a household's level of well-being.

In addition, education is a fundamental dimension in improving societal well-being, as it fosters the development of knowledge, skills, and human resource capacity. Education is a basic right for every citizen, offering the opportunity to develop one’s potential regardless of social or economic background, ethnicity, religion, or geographical location. A higher level of education enhances an individual's prospects for securing decent employment, boosts productivity, and expands opportunities for social and economic mobility. Thus, access to quality education not only benefits the individual but also contributes to the well-being of the family and the sustainable development of society. Meanwhile, health serves as a vital indicator of quality of life and is a prerequisite for individuals to engage productively in social and economic activities. Good health enables people to work, pursue an education, and participate in various development-related endeavors. Conversely, limited access to healthcare services and a high risk of illness can diminish productivity and increase the financial burden on households. Therefore, the availability of healthcare facilities, access to medical services, individual health conditions, and the community's ability to obtain adequate healthcare are crucial aspects in measuring well-being.

Based on this, public well-being is a multidimensional concept that cannot be sufficiently represented solely by income levels or consumption capacity; it is also reflected in the quality of housing, access to education, and the health status of the population. These indicators are interconnected in shaping the quality of life for individuals and households. In the context of economic development,

productive economic activities including the presence and growth of Micro, Small, and Medium Enterprises (MSMEs) have the potential to contribute to improved well-being by creating jobs, increasing household income, and expanding the community's ability to access basic necessities, education, healthcare, and decent housing. Consequently, an analysis of public well-being must consider the relationship between economic capacity and the fulfillment of basic social needs to provide a more comprehensive picture of the quality of life and the level of well-being within a society.

The Role OF MSMEs in Societal Well-Being Through E-Commerce

Digital Literacy as an Enabling Capability for E-Commerce Adoption

Digital literacy is a foundational capability that enables MSME owners to move from merely having access to digital devices toward using digital technologies productively in business activities. UNESCO Institute for Statistics (2018) conceptualizes digital literacy as the ability to access, manage, understand, integrate, communicate, evaluate, and create information safely and appropriately through digital technologies. Applied to MSMEs, these competencies include searching for market and competitor information, assessing the credibility of online information, preparing product descriptions and visual content, communicating with customers, managing digital identities, processing orders, and protecting transaction and customer data. Digital literacy therefore should not be equated with the simple ability to open a marketplace account or upload a product. It also involves the capacity to select suitable platforms, interpret customer responses, maintain service quality, and use transaction information to support business decisions.

The relationship between digital literacy and e-commerce adoption is consequently complementary. Digital literacy provides the knowledge and skills required to adopt and operate e-commerce, while repeated use of digital tools can create opportunities for MSME owners to improve their business and financial-management capabilities. Evidence from a study of 5,035 ultra-micro, micro, and small enterprises across 17 provinces in Indonesia indicates a positive and significant relationship between digital adoption and business performance; the study also finds evidence that digital adoption can improve owners' financial literacy (Affandi et al., 2024) . This finding suggests that digitalization is not only a channel for selling products but may also support organizational learning and more informed business decisions. However, the relationship should not be interpreted as automatic: the benefits depend on the intensity and quality of use, the owner's capabilities, business characteristics, and the availability of supporting infrastructure. This relationship is also supported by Suryani et al., (2022), whose study of small and medium enterprises in Indonesia found that digital literacy and market orientation were positively related to e-commerce adoption and business performance, with online-to-offline business adoption playing a moderating role.

E-Commerce, Market Accessibility, and Business Performance

E-commerce can contribute to MSME development by reducing some of the geographical and informational barriers associated with conventional marketing. Through online marketplaces, social-commerce channels, and business websites, MSMEs can present products to consumers beyond their immediate neighbourhood without having to establish a physical outlet in every target market. Digital channels also allow businesses to display product information, communicate with prospective buyers, receive orders, and maintain customer relationships across a wider geographic area. This broader visibility can increase the probability of customer discovery and provide smaller firms with opportunities to compete for market segments that would otherwise be difficult or costly to reach. Yacob et al., (2021), in a study of 150 MSME entrepreneurs in Jambi Province, found that e-commerce adoption significantly affected the sustainability of MSME business performance, while entrepreneurial orientation moderated this relationship. The result indicates that technology adoption works together with the entrepreneur's willingness to innovate, take calculated risks, and respond proactively to market opportunities.

Market accessibility, however, should be distinguished from actual market success. Having an online storefront does not guarantee that products will be noticed, purchased, or delivered profitably. Sales conversion also depends on product differentiation, price competitiveness, quality consistency, attractive and accurate product information, customer reviews, responsiveness, payment options, and delivery reliability. E-commerce may increase the number of potential customers, but MSMEs still need to develop capabilities to convert digital visibility into repeat purchases and customer loyalty. In this

respect, Wirdiyanti et al., (2023), using survey data from 338 Indonesian MSMEs adopting e-commerce across ten provinces, report that improvements in brand recognition and customer awareness are associated with better business performance. Their findings also indicate that improved business performance can encourage greater inclusion in the financial system through access to and use of more diverse financial products and services. Thus, market access can create value not only through sales opportunities but also through stronger business visibility and potential access to formal financial services.

The Income and Employment Pathways to Public Welfare

One of the most direct pathways connecting e-commerce adoption to public welfare is through MSME business performance and household income. When online channels enable a business to reach additional customers, increase order frequency, or serve existing customers more efficiently, the enterprise may experience higher turnover. If the additional revenue exceeds the associated costs of platform commissions, advertising, packaging, delivery, returns, and digital operations, the business may also generate higher profits. Evidence from 1,084 micro and small industries in Karanganyar Regency shows that e-commerce use has a positive relationship with financial performance, measured through turnover, profit, and return on assets. The study also reports that firm size moderates this relationship, with smaller firms experiencing a stronger performance improvement in the observed setting (Martini et al., 2023). This finding is important because it indicates that the benefits of e-commerce may differ according to business scale and should not be assumed to be uniform across all MSMEs.

An improvement in business revenue can contribute to household welfare when it is translated into more stable earnings for business owners and workers. Higher and more predictable income can strengthen a household's capacity to purchase food and clothing, meet housing costs, maintain adequate living conditions, and finance education and healthcare. Nevertheless, an increase in sales should not be treated as equivalent to an increase in household welfare. Revenue must first be distinguished from profit and disposable household income, since operating costs, platform charges, debt obligations, and reinvestment needs may absorb part of the additional receipts. The welfare effect therefore depends on whether digitalization improves net business returns and whether those returns are sustained over time. This distinction is essential to avoid overstating the relationship between e-commerce adoption and improvements in living standards.

E-commerce may also affect welfare through employment creation. As online demand expands, some MSMEs may need additional workers or external service providers for production, packaging, inventory management, customer service, digital content creation, delivery coordination, and administration. These activities can generate employment opportunities directly within the enterprise and indirectly along its supply and distribution networks. Evidence from Indonesia supports this potential pathway: Shalih & Hartono (2026) , using data from the 2022 Statistics Indonesia Survey of Micro and Small Industries and a propensity score matching approach, report a positive association between e-commerce adoption and the number of workers employed by adopting micro and small manufacturing enterprises. The study also emphasizes the relevance of digital training, business formalization, and business-specific conditions in strengthening employment outcomes. However, the employment effect may vary across sectors and firms; automation, outsourcing, changes in retail practices, or the replacement of certain conventional tasks may offset some new job opportunities. Accordingly, the net employment contribution depends on whether business expansion generates more labour demand than the tasks displaced or reorganized by digitalization.

Connecting Digitalization with the Multidimensional Dimensions of Welfare

The relationship between digitalization and public welfare can be understood through the multidimensional conception of welfare discussed earlier in this article. First, the income dimension is the most immediate economic channel: broader market access and improved business performance may increase business owners' net earnings and create wage opportunities for workers. Second, the housing dimension may be affected indirectly when more stable household income enables families to improve housing conditions, access basic utilities, and maintain a healthier living environment. Third, the education dimension may benefit when households have greater financial capacity to pay education-related expenses and when digital business activities encourage the development of practical skills, including communication, information management, and technology use. Fourth, the health dimension

may improve when households are better able to finance healthcare, nutrition, and preventive services. These relationships are indirect pathways rather than guaranteed outcomes of e-commerce adoption.

The distinction between direct and indirect effects is important. Digital platforms do not themselves provide adequate housing, quality education, or accessible healthcare. Instead, digitalization may strengthen the economic resources and capabilities through which households can access these services. Whether additional income leads to better housing, education, or health also depends on household priorities, the stability of earnings, the availability and quality of public services, local infrastructure, and the distribution of resources within the household. This interpretation is consistent with a multidimensional understanding of welfare: economic improvement is an important foundation, but it is not sufficient on its own to establish that all dimensions of quality of life have improved. Therefore, the contribution of e-commerce to public welfare should be assessed not only by online sales or business growth, but also by the extent to which economic gains are sustained and translated into improved household living conditions and opportunities.

Critical Conditions, Risks, and the Role of Institutional Support

Despite its potential, e-commerce adoption does not produce the same benefits for every MSME. OECD (2021) notes that smaller firms generally face greater constraints in digital transformation because they have fewer financial, managerial, and human resources and may initially adopt only basic digital tools. In the MSME context, limited digital literacy, unreliable internet connectivity, inadequate devices, weak bookkeeping, insufficient working capital, product-standardization problems, and limited logistics capacity can restrict the benefits of online selling. In addition, platform commissions, paid advertising, intense price competition, customer complaints, fraud, data-security risks, and dependence on platform rules may increase business costs or uncertainty. These constraints can result in a situation in which digital visibility increases but profitability and business resilience do not improve proportionately.

A critical implication is that digital inclusion should not be measured solely by the number of MSMEs registered on e-commerce platforms. More meaningful assessment should consider the quality and continuity of use, the ability to manage transactions and customer data, the capacity to interpret sales information, the development of repeat customers, and the effect on net business performance. MSMEs also need to compare the costs and benefits of different channels, including marketplaces, social commerce, and direct-to-consumer platforms, rather than relying uncritically on a single platform. A combination of digital channels and conventional relationships with customers, suppliers, and local communities may be more appropriate for businesses whose products require direct inspection, customized service, or local distribution.

Institutional support is therefore necessary to convert digital opportunities into more inclusive welfare outcomes. Government agencies, universities, financial institutions, platform providers, and business associations can strengthen MSMEs through practical digital-literacy training, assistance with product photography and descriptions, digital bookkeeping, financial management, cybersecurity awareness, business formalization, access to affordable financing, and improvements in logistics and internet infrastructure. Training should be continuous and adapted to the business sector and level of digital capability, rather than limited to one-time platform registration. This approach is consistent with the evidence that firm characteristics, infrastructure, and the business environment are associated with differences in digital adoption (Affandi et al., 2024) , and with the finding that targeted training and formalization are relevant to employment outcomes in micro and small industries (Shalih & Hartono, 2026).

Taken together, the literature supports a conditional rather than deterministic relationship between digitalization and public welfare. Digital literacy enables meaningful e-commerce adoption; e-commerce can broaden market access and strengthen customer engagement; improved business performance may increase net income and stimulate labour demand; and these economic gains can expand household capacity to meet material and social needs. The strength of each link, however, depends on entrepreneurial capability, firm size, infrastructure, financial and managerial resources, market conditions, and institutional support. The central argument of this article is therefore that e-commerce is an enabling mechanism through which MSMEs may contribute to public welfare, not an independent or sufficient solution to poverty and social inequality. Its contribution becomes more likely when digital adoption is accompanied by improvements in business capabilities and when increased economic returns are translated into sustained improvements in household living conditions.

D. CONCLUSION

This article has examined how MSMEs can contribute to public welfare in the Industry 4.0 era through digitalization, particularly e-commerce. The literature synthesis indicates that digital literacy is an enabling capability for meaningful e-commerce adoption because it allows MSME owners to access and evaluate information, create digital content, communicate with customers, manage online transactions, and use digital tools for business decisions. E-commerce can reduce geographical barriers and broaden market accessibility; when these opportunities are converted into higher net sales and sustainable business performance, they may increase household income and create additional demand for labour. These economic improvements can strengthen households' capacity to meet basic needs and may indirectly support better housing, education, and health outcomes. However, the relationship is conditional rather than automatic. Digital skills, business management, product quality, infrastructure, logistics, financing, platform costs, and institutional support influence whether online activity produces sustainable benefits. Therefore, policies to strengthen MSMEs should combine accessible digital infrastructure with continuous digital-literacy development, financial and managerial assistance, market access, and business formalization. Since this article is based on library research, its conclusions represent a conceptual synthesis of existing literature and should not be interpreted as a direct empirical estimate of the causal effect of e-commerce on public welfare. Future empirical studies may examine these pathways using household- and firm-level data, including net income, employment, and access to education, health, and adequate housing.

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