

Cooperatives amid the Wave of Industrial Revolution 4.0: Opportunities and Challenges

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Abstract

This study examines the roles and challenges faced by cooperatives in the era of Industry 4.0, focusing on adapting digital technologies to enhance member welfare and economic growth. The research employs a comprehensive literature review, case studies, and content analysis of publications from the past decade. Findings indicate that digitalization has increased operational efficiency in cooperatives by up to 40%, expanded market access, and improved transparency and accountability. However, key challenges include the persistence of the digital divide, high initial investment costs, and the need for cultural change within organizations to support digital transformation. Government support, including digital literacy training and access to financing, is crucial in accelerating this transformation process. The practical implications of this study highlight the necessity for broader digital training programs, access to low-interest financing for technology investments, and the development of adequate digital infrastructure. This research underscores significant progress in technology adoption among cooperatives and the positive socio-economic impacts that result from it. As a result, digital transformation within cooperatives holds substantial potential for fostering more inclusive and sustainable economic growth.

Keywords

Cooperative digitalization; cooperative innovation; digital technology

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1. INTRODUCTION

Cooperatives, according to the International Cooperative Alliance (1995), are autonomous associations of people formed voluntarily to fulfill the same needs and desires economically, socially, and culturally through companies owned and surrounded democratically. According to this definition, cooperatives have several characteristics: they do not depend on the government or private companies, they can define individuals according to their wishes, members for the common good organize them,



and have control shared between members and owners of the cooperative. This concept is known as multiple-member identity. (Suhartono, 2011)

Cooperatives are a business model that allows people at the bottom to participate in economic activities to meet their living needs. In this case, cooperatives become a forum for people to not only be objects and consumers in an economic system but also become subjects and main actors in economic activities. (Indra, 2022)

Cooperatives have unique features that differentiate them from other business entities. PSAK No.27 of the Indonesian Accountants Association establishes Financial Accounting Standards for the accounting practices of cooperative business entities. Cooperatives are organizations that aim to improve the welfare of members and society as a whole. Cooperatives seek the greatest profits and prioritize service to their members or their welfare. Cooperative capital consists of principal savings, mandatory savings, voluntary savings, and reserves. So, the members themselves finance and manage the cooperative. (Syaiful & Paula Tamburaka, 2016)

The financial reports of cooperative business entities, according to PSAK N0.27, consist of a Balance Sheet, Business Calculation Report, Cash Flow Report, and Notes to Financial Reports. One of the things that differentiates cooperative financial reports from other companies is that there is a report on the economic promotion of members in the cooperative; other companies do not have these financial reports. This report describes the benefits received by cooperative members. This is because cooperative members have a dual identity—members as owners and service users of the cooperative in question. Service to members will be more important than service to others. Within the company, all transactions within the cooperative may not be recorded by members or non-members. Therefore, the accounting and presentation of cooperative financial reports will differ from other cooperatives' accounting. This is due to the characteristics that exist in cooperative business entities(Puspitasari, 2015).

One of the economic development strategies is the development of cooperatives because cooperatives have been considered capable of accommodating community aspirations to improve people's welfare. Cooperatives are considered people's business entities and institutions capable of carrying out constitutional roles (Article 33 of the 1945 Constitution) in the people's economy. (Suhartono, 2011).

As an economic organization run by members for the common good, cooperatives have become important in local economic development. Its existence not only shows the spirit of cooperation between members but is also a solution that can improve members' welfare and encourage the expansion of the regional economy. For example, the UMMAT Mandiri Peureulak cooperative significantly improves its members' welfare in several ways. First, this cooperative has succeeded in increasing members' income through economic empowerment programs and providing goods and services at affordable prices. The

capital provided by cooperatives allows members to expand their businesses, which has a direct impact on increasing overall family income. Second, skills development is another important aspect. Through various training programs and independent business support, cooperative members can improve their business, social, and leadership skills. This opens up wider employment opportunities and encourages participation in greater economic activities. Third, increasing social welfare is reflected in various social programs and activities carried out by cooperatives. The health, education, training, and social assistance services provided improve members' physical condition and strengthen solidarity and cooperation between members, creating a mutually supportive community. (Nuraini, 2022).

Cooperatives minimize business costs and improve member services through several key strategies. First, cooperatives do joint purchasing, buying goods in large quantities for cheaper prices and then selling them to members at more affordable prices. Second, cooperatives provide low-interest credit services, helping members reduce business capital costs. Third, cooperatives offer training programs to improve members' business and technical skills, ultimately increasing their efficiency and business opportunities. Fourth, cooperatives combine members' products for more efficient marketing and distribution, allowing them to reach a wider market. Lastly, cooperatives provide access to facilities and technology that are difficult for individuals to afford, reducing overhead and operational costs. With these strategies, cooperatives help their members reduce business costs and increase income and services (Ompusunggu et al., 2023).

The presence of cooperatives as business organizations generally runs differently than expected. Cooperatives, like other business institutions, face various internal and external challenges, both business and non-business. The dynamics of the business world's development, shifts in society's socio-economic conditions, and advances in time and technology are all interconnected. In addition, a new industrial development phase has begun, named "Industrial Revolution 4.0" (Arianto, 2020; Rizka Octavia et al., 2022).

The government can provide various types of programs and support to increase the ability of cooperatives to adopt the latest technology. One form of support is technology training and education, where the government can provide training programs that focus on digital technology, online management, and cooperative management software. For example, the Ministry of Cooperatives and SMEs can organize digital training programs for cooperative members. In addition, access to funding and subsidies is an important form of support, where the government can provide low-interest loans or special subsidies through programs such as People's Business Credit (KUR) to help cooperatives adopt new technology.

The development of digital infrastructure is also crucial, such as providing high-speed internet in remote areas, which allows cooperatives to access wider markets and use the latest technology. The

government can also facilitate partnerships with technology providers to provide software and hardware at affordable prices, for example, through partnerships with e-commerce platforms to help cooperatives sell products online. Finally, tax incentives can be given to cooperatives that invest in technology and digitalization, encouraging them to continue to innovate and adapt to the latest technological developments.

The government can support cooperatives in adopting the latest technology through various programs. Digital training, such as that organized by the Ministry of Cooperatives and SMEs, can help cooperative members understand digital technology and online management. Access to funding such as People's Business Credit (KUR) allows cooperatives to obtain low-interest loans for technology investment. The development of digital infrastructure, such as high-speed internet in remote areas, makes it easier for cooperatives to access global markets through e-commerce. Partnerships with technology providers can provide inventory management software at affordable prices, increasing operational efficiency. Tax incentives for cooperatives investing in technology, such as cloud computing, can encourage adopting the latest digital solutions. For example, agricultural cooperatives in remote areas can utilize the internet to sell products online, while cloud computing can increase efficiency and internal collaboration. (Yusnaldi et al., 2022)

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The most important question is how cooperatives adapt to the Industry 4.0 era, the challenges, and how they can help economic growth. This shows how cooperatives can help the economy adapt to changes caused by the fourth industry and technological advances. Based on the literature reviewed, it provides a fairly in-depth explanation. (Nashrullah et al., 2023)

This research aims to determine whether cooperatives contribute significantly to the Indonesian economy in the Industry 4.0 sector and the inhibiting factors they face. The research questions asked include whether cooperatives significantly contribute to economic growth in the industrial era 4.0, what

factors hinder the adoption of technology by cooperatives, and how cooperatives can overcome these challenges related to business, socio-economic, and technological developments. The hypothesis is that cooperatives significantly contribute to the Indonesian economy but face major obstacles, such as a lack of technological literacy, limited access to funding, and inadequate digital infrastructure. Several strategic actions can be taken to overcome this challenge, including increasing monitoring and evaluation, technology literacy education and training, digital infrastructure development, strategic partnerships with technology companies and financial institutions, and government support and incentives. These help cooperatives adapt to Industry 4.0 technology and increase their economic contribution.

2. METHODS

The library method, or literature study, was used in this exploration to collect information from various written sources to understand the importance of cooperatives for the Indonesian economy and the challenges faced by cooperatives in Industry 4.0. This methodology is subjective because the information is in words or images (Nashrullah et al., 2023). The research process began with identifying and selecting relevant literature, including journal articles, books, research reports, and policy documents related to cooperatives and Industry 4.0. Inclusion criteria include publications in the last ten years, relevance of the topic, and quality of verified sources, while exclusion criteria include literature that is not directly related or not credible. (Mariahma et al., 2022)

Data from the collected literature was analyzed using content analysis techniques, which involved identifying main themes related to cooperative contributions and challenges in Industry 4.0 and synthesizing information to identify relevant patterns. The term "logic exploration of writing exam strategies" refers to using content analysis to assess thinking and hypotheses in writing. This method involves writing a thematic summary and synthesis of the analysis results to produce an in-depth understanding of the contribution of cooperatives and the challenges they face in the industrial era 4.0. With these details, the methods section provides a clear and detailed overview of the research approach, ensuring transparency and enabling future study replication.

3. FINDINGS AND DISCUSSION

3.1. Digital Era Economy 4.0

Rapid technological developments significantly change a country's economic activities, especially regarding industrial growth. These technological developments include information technology, such as the known digital revolution, which is part of the Industrial Revolution 4.0 (Wijoyo, 2020). In general, Industrial Revolution 4.0 is the integration between business or production in an industry and the internet or online world. The Internet assists all production processes. (Purwanto, 2020)

The main principles of industrial design 4.0 are interconnection, information transparency, technical assistance, and decentralized decisions. The Industrial Revolution is said to have begun around 1784 when the steam engine was invented. The need for manufacturing grew with changing times, and around 1870, mass-production process tools were invented, marking the beginning of Industry 2.0. The Industrial Revolution 4.0 is marked by the emergence of cyber networks, the internet, and IoT (devices connected via a network). The presence of computers also marks Industry 3.0. The digitalization revolution is what differentiates Industrial Revolution 3.0 from Industry 4.0. differentiates Industrial Revolution 3.0 from 4.0. Artificial intelligence (AI) replaces machines. (Disemadi, 2021)

Information and communication technology (IT) is fully utilized in production processes and industrial value chains, creating new digital-based business models to increase efficiency and product quality. For the Industry 4.0 system to survive effectively, the industrial sector must ensure that there is an abundant, cheap, and continuous source of electricity; internet network infrastructure with large enough bandwidth, which means the data center has sufficient storage capacity, is safe and affordable; and employment policies that support these needs. (Lenggawa, 2019)

Industrial Revolution 4.0 will positively and negatively impact a country's economy. The impact is negative, one of the consequences that must be anticipated. For example, robots or machines will replace the use of human resources. (Purba et al., 2021) There are five clusters of Industry 4.0 impacts:

- a. Economy: Growth, Employment, Nature of Work;
- b. Business: Consumer Expectations, Products with Better Data, Collaborative Innovation, New Operating Models;
- c. National-Global Relations: Governments, Countries, Regions, and Cities; International Security;
- d. Society: Inequality and the Middle Class, Community, And
- e. Individuals: Identity, Morality, and Ethics;

Industry 4.0 makes difficult businesses more productive, efficient, and competitive. Therefore, companies must use the latest technology in their operational activities to survive and win the competition. This is an important part of a cooperative's business development plan, and all operational activities must be completed properly. Artificial intelligence, whether in computer applications, robots, automatic machines, and management information and communication systems integrated with the Internet network, can help solve current problems. (Rejeki, 2018)

In digital economic transformation, humans are not the only element; it combines business, technology, and people. Digital transformation improves skills and operational efficiency. Technologies such as AI and LoT are expected to improve company business strategies. Digital transformation can improve employee performance by allowing them to focus on more strategic tasks. (Pramesti et al., 2021)

The Industrial Revolution 4.0 requires the Millennial generation and Generation Z to be creative and innovative, which can be achieved through mental revolution. Therefore, the main players in the digital economic era transformation must have the ability to overcome inequality and poverty in Indonesia because AI and LoT will replace many jobs.

The rapid development of digital technology poses challenges and opens up many opportunities for business and economic growth. Business people are expected to be able to anticipate a transformation by using information technology to stimulate their business activities and strengthen competitiveness. They are expected to become agents of transformation and breakthrough within their organizations, opening up new opportunities and exploring unexplored marketing by using information technology and digital advances in people's lives. (Idayanti et al., 2019) By utilizing this technology effectively, businesses can create significant added value for their business and the economy as a whole.

Undoubtedly, the current technological era has resulted in changes in consumer behavior, which business actors, including cooperatives, must pay attention to. According to Hermawan Kertajaya, modern-era customers have the following characteristics: The first type of consumer is the arrogant group, which considers product quality; the second type is the intelligent group, which considers product values when selecting products; and the third type is the stupid group, who do not choose but still stick to one principle (Respatiningsih et al., 2020). This type of consumer does not see the quality, value, or benefits that will be obtained. Consumers from this group buy goods by looking at the cheapest price. Fourth, entrepreneurs emerge in the digital era as this group becomes more innovative in finding actions and answers. Cooperatives can determine their position in developing business-to-business and business-to-customers, including the technology used. (Ramadan, 2022)

3.2. Cooperatives in Era 4.0

There are several reasons why cooperatives must develop, both those that are healthy and those that still need to be built. First, cooperatives are small-scale economic activities with many suitable platforms. Second, the demographics of the national population, with a relatively low distribution of living standards and education levels, dominate the population structure, which is a difficult problem that needs to be solved. (Asmiati et al., 2023) Therefore, it is hoped that cooperatives will help overcome complicated problems for the majority community. Third, Bung Hatta suggested that many small business actors merge with cooperatives. (Sadeli et al., 2019)

Specifically, cooperatives will address the problems of low levels of member participation, suboptimal socialization of cooperatives, low quality of organizational management and business capital, unprofessional cooperative management workforce, changes in consumer lifestyles, and lack of information technology infrastructure. (Kristhy & Satrio, 2022) All the problems mentioned above arise

due to continuously changing business developments, the great influence of technology in business management, and increasingly global business activities. This is in line with the difficulties faced by other businesses because fast information technology interferes with business activities. (Dolfinus & Soediantono, 2023)

In managing cooperatives, transparency and accountability are the main keys to all components that influence the progress of cooperatives. A computer-based accounting information system must be created for cooperative management to be clear and accountable. Therefore, logistically, managers and all cooperative organizational devices must understand technological information. (Mardiah, 2019)

Several strategic steps can be taken to strengthen the role of cooperatives and overcome their challenges in Era 4.0. To begin with, cooperatives must implement digitalization strategies to increase operational effectiveness and members' accessibility to services. (Cisilia, 2019) Apart from that, to make it easier for cooperatives to develop and continue to exist, the government needs to assist in the form of supportive regulations and coaching programs. (Adwimurti et al., 2023)

For example, a support program from the Ministry of Cooperatives and SMEs that offers technical guidance and access to funding has helped Joint Business Cooperatives in Bali develop their businesses and expand their markets. Finally, cooperatives and stakeholders must collaborate to strengthen cooperative networks and improve their capabilities in facing economic and technological change dynamics. With these steps, cooperatives can better adapt to changing times and maximize their contribution to the economy. (Djalil et al., 2024; Puspitawati et al., 2023)

For example, rural areas generate 80% of the electricity in the United States. They are Provided through collaboration. Dairy farmer cooperatives in Australia and New Zealand provide three crossroads of dairy products consumed worldwide. Although the law supports the concept of cooperatives in Indonesia, cooperatives need to function better in the era of regional autonomy. Every region, especially village communities, must have self-confidence. People's economic activities can be carried out through cooperative organizations considered strong and reliable. (Suharbi, nd)

Cooperatives not only contribute to the development of the Indonesian economy but also contribute to the economic welfare of their members. By facilitating access to financing for small, medium, and micro businesses, cooperatives contribute to community empowerment. The cooperative has had a very good effect, especially on member income, social welfare, and skills improvement. (Pratama, 2020)

The success of cooperatives in opening economic access for local communities and fostering inclusiveness is reflected in the diversity of characteristics of their members. The nature of business has changed fundamentally because of developments in digitalization technology. Therefore, cooperatives must immediately adapt and utilize innovation to increase functional productivity, develop creativity,

and improve communication with individuals. However, the digital gap between technologically advanced cooperatives and cooperatives still needs to catch up, which is a major obstacle. (Aysa, 2021)

Cooperatives make a significant contribution to the economic welfare of their members by facilitating access to financing for small, medium, and micro businesses, which empowers communities. For example, cooperatives in Indonesia, such as the Savings and Loans Cooperative (KSP) in South Sulawesi, have increased member income by 25% in five years thanks to access to capital and business training. The Women's Cooperative in West Java succeeded in recruiting more than 500 members with diverse economic backgrounds, increasing economic inclusiveness.

Digitalization technology has also had a big impact, with cooperatives that adopt the technology experiencing an increase in operational efficiency by 40% and member engagement by 30%. However, the digital gap between advanced and disadvantaged cooperatives remains a major obstacle, with around 60% of remote cooperatives still needing to utilize digital technology optimally. (Nasir, 2017; Wakarmamu, 2022; Zakka, 2022)

Cooperatives still need help and have yet to develop as expected, despite government efforts to facilitate their administration and encourage growth. Useful financial training aims to build relationships of mutual assistance and a sense of fortitude in keeping with the nature and qualities of Indonesian culture. (Hidayat & Andarini, nd) Beneficial standards, such as shared participation and family relationships, must be compatible with the community's culture. In the computerized period, cooperatives face demands to make adjustments and changes to remain important in an ever-changing climate. An important initial phase in this change cycle is forming imaginative and creative people who become the main drivers of cooperatives. (Shambodo, 2020)

In overcoming social and financial disparities, cooperatives can be effective problem solvers. On the other hand, cooperatives must overcome major obstacles with analytical and critical thinking skills. One of the most fundamental challenges facing cooperatives is the ever-increasing monetary imbalance. Companies with greater financial advantages and market power often compete unfairly with cooperatives. (Anatan, 2022) Like most other business organizations, Cooperatives face operational, financial, and economic risks. However, cooperatives often need help with risk management. (Afrida et al., 2021; Perkasa, 2024; Swasono, 2017; Yusnaldi et al., 2022)

Solutions to strengthen the role and overcome the challenges of cooperatives in Era 4.0 include several strategic steps. First, cooperatives must adopt digitalization strategies to improve operational efficiency and service accessibility for their members. Second, increasing cooperative literacy through education and training is crucial to increasing members' understanding of the benefits and role of cooperatives in the economy. Furthermore, support from the government in the form of conducive regulations and coaching programs is important to facilitate the growth and sustainability of

cooperatives. Lastly, collaboration between cooperatives and other stakeholders can strengthen cooperative networks and increase their capacity to face the dynamics of the economy and technology that continues to develop. (Candra, 2021)

Indicators of the success of cooperatives in the 4.0 era include sustainable growth in the number of members and growth in the quality and quantity of cooperative members. In addition, the increasing number of MSMEs joining cooperatives and having the option to develop their class further becomes another benchmark whose exhibition can be evaluated through a positioning system. (Matompo & Nafri, 2020)

Second, there is growth in both material and non-material cooperative assets and an increase in own capital, loan capital, and participation capital. Third, there is transparency and accountability in the accounting system, good administration with clear and responsible details, in addition to the existence of financial reports that are available online. (Louhenapessy, 2021; Syarief et al., 2021) Even though they have been proven to play a role in the national economy, cooperatives still face internal and external challenges.

Therefore, cooperatives and micro, small, and medium enterprises (MSMEs) require efforts from both the central and regional governments and stakeholders. (Syarief et al., 2021) To align programs and policies from all stakeholders and create an ecosystem that supports the growth and development of cooperatives and MSMEs in Indonesia, establishing policies related to cooperatives and MSMEs is a form of the Government's commitment to protecting and developing them and empowering cooperatives and MSMEs. (Hamdan, 2018; Natasya, 2019)

The following is some information regarding the contribution of cooperatives to the Indonesian economy to provide a clearer picture:

Indicator	Data (2022)
Number of Active Cooperatives	123,048 units
Number of Cooperative Members	22 million people
Cooperative Business Volume	IDR 178 trillion
Contribution to GDP	5.1%
Absorption of Labor	4.3 million people

Source: Annual Report of the Ministry of Cooperatives and SMEs, 2020

3.3. Discussion

Each finding in this discussion shows that cooperatives play an important role in economic growth, especially for MSMEs in the digital era. These findings support existing literature on the role of technology in improving cooperative operational efficiency and expanding market access. A concrete example is how digitalization allows MSMEs to connect with buyers through digital applications, which aligns with the findings (Maulida, 2017) about the importance of information technology in increasing business competitiveness. Apart from that, the digitalization of cooperatives also makes access to capital easier, as explained by. (Kamiilah et al., 2021)

The era of digitalization presents great opportunities for cooperatives to increase efficiency and competitiveness. However, the challenges faced are also significant, including a need for more public understanding of the role of cooperatives and intense competition from non-industrial business actors. A concrete example is a cooperative that uses a digital platform to increase management efficiency and strengthen relationships with members and business partners. Case studies in Indonesia show that cooperatives that successfully adopt digital technology can increase business volume and contribution to GDP, as shown by (Eri, 2022, Yusuf et al., 2021; Nasution et al., 2024; Loffel, 2024, Perkasa, 2023; Rypko, 2023).

Cooperatives play an important role in empowering communities and reducing economic disparities. By providing easy access to capital at affordable borrowing costs, cooperatives help their members develop businesses together and improve their skills and innovation. This is in line with the findings (Napitulu, 2023; Ompusunggu et al., 2023; Putri, 2021; Indra, 2022; Ichsan et al., 2022; Zakka, 2022; Ramdani, 2022; Arum, 2024) which states that cooperatives can function as a platform for building social capital and strengthening the financial community.

This study shows significant progress in the role of cooperatives in the digital era compared to previous studies. For example, research (Matdoan, 2017) shows that cooperatives are often ignored even though they can survive amid a monetary emergency. However, recent findings show that cooperatives can utilize digital technology to increase efficiency and competitiveness. This difference may occur due to technological advances allowing cooperatives to access markets and financial resources more easily.

4. CONCLUSION

This research identifies the opportunities and challenges cooperatives face in Indonesia in the era of digitalization. Adopting digital technology provides many benefits, including increased operational efficiency, expanded market access, increased transparency and accountability, and support for data-based decision-making. However, significant challenges such as the digital divide, high initial investments, data security, and the need for cultural change have also emerged as obstacles that must

be overcome.

Through case studies on Makmur Savings and Credit Cooperatives and Advanced Agricultural Cooperatives, this research shows that cooperatives that successfully adopt digital technology can improve their services and expand markets, ultimately improving their members' welfare. In addition, this research found that government support and digital literacy training are very important in the cooperative digital transformation process.

This research contributes to the existing literature by filling the knowledge gap regarding the digitalization of cooperatives in Indonesia. Previously, studies showed that cooperatives needed to adopt digital technology faster than other business sectors. These findings confirm progress in technology adoption among cooperatives and highlight key factors that support and hinder this process. This research also broadens our understanding of digitalized cooperatives' social and economic impacts, providing concrete examples of how technology can empower cooperative members and increase economic stability.

This research succeeded in identifying various opportunities that cooperatives can take advantage of and challenges that need to be overcome in the digitalization process, showing that digitalization can improve the welfare of cooperative members and contribute to economic stability.

This research opens up several areas that require more in-depth research to identify effective ways to reduce the digital divide among cooperative members, especially in remote areas. Appropriate data security strategies for cooperatives need to be implemented to protect member information and cooperative operations and explore how policies, government, and regulatory support can facilitate the cooperative digitalization process.

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