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Leveraging Information Technology for Indonesia Agribusiness Global Market Competitiveness

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Abstract

Purpose: To systematically review existing literature on how the utilization of information technology can enhance the global market competitiveness of Indonesian agribusiness products.

Methodology/approach: This study employs a Systematic Literature Review (SLR) method, following the PRISMA protocol. Relevant articles published between 2021-2025 were identified and selected from academic databases including IEEE Xplore, ScienceDirect, and Emerald Insight, followed by a qualitative thematic synthesis of the final 30 included studies.

Results/findings: The analysis reveals that technologies such as the Internet of Things (IoT), Artificial Intelligence (AI), and digital e-commerce platforms significantly impact competitiveness. Their adoption is proven to enhance supply chain efficiency and resilience, expand market access for small-scale farmers and MSMEs, and improve overall product quality and transparency.

Conclutions: Information technology is a critical strategic enabler for transforming Indonesian agribusiness. However, its widespread adoption is still hampered by a complex network of economic, infrastructural, human resource, and institutional barriers that require integrated and holistic solutions.

Limitations: This review is limited to published and academically accessible literature. Consequently, it may not capture innovative, on-the-ground practices that have not yet been formally documented in scientific articles.

Contribution: This study provides a strategic framework that can guide Indonesian policymakers in formulating integrated policies for digital transformation, including infrastructure development and digital literacy programs. For agribusiness actors, it highlights the importance of investing in technology and upskilling human resources to strengthen their global position.

Keywords: *Agribusiness, Competitiveness, Global Market, Information Technology*

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1. Introduction

Agribusiness is a vital sector for the development of all countries, playing an important role in the economy in meeting basic human needs and ensuring food security (Silveira, Rosa, & Siluk, 2024). The global challenge of feeding a growing population, projected to reach nine billion by 2045, demands a significant increase in food production amid increasing agricultural land limitations (Brenya, Akomea-Frimpong, Ofosu, & Adeabah, 2023). Indonesia, as one of the major agrarian countries, faces these challenges head-on, exacerbated by issues such as high dependence on imports for strategic commodities such as soybeans, as well as significant sustainability challenges in key export sectors such as coconut, especially in remote rural areas with inadequate infrastructure and limited market

access (Rozi et al., 2025). Most agricultural production is carried out by small-scale farmers or MSMEs, who often lack the capacity, resources, and institutional support to be resilient and competitive, making them the most vulnerable link in the supply chain (Harsanto et al., 2025).

In response to these challenges, the agricultural sector is undergoing a fourth revolution known as Agriculture 4.0, which is characterized by integrating cyber-physical technologies from Industry 4.0 (Almadani & Mostafa, 2021; Quadras, Rigon, da Silva, & Frazzon, 2023). This transformation involves the adoption of new innovations such as the Internet of Things (IoT), artificial intelligence (AI), big data analytics, and robotics, which have the potential to significantly improve efficiency, productivity, and sustainability in agricultural production (Bertoglio & Sehnem, 2024; Konduru et al., 2023; Quadras et al., 2023). The core concept of Agriculture 4.0 is to create a seamlessly connected environment where all elements in the value chain can communicate in real time, enabling greater autonomy, data-driven decision-making, and optimized resource utilization (Ghandar et al., 2021; Yadav, Garg, & Luthra, 2021). This paradigm shift offers a promising path to modernizing the agricultural sector and addressing long-standing challenges (Konduru et al., 2023).

The application of information technology is central to efforts to increase the competitiveness of agricultural products in the global market (Silveira et al., 2024). Technologies such as IoT and sensors enable real-time monitoring and management of production and logistics variables, guaranteeing product quality and safety from upstream to downstream (Bulut & Wu, 2024). Blockchain technology offers traceability and product transparency solutions, which can overcome information asymmetry and meet the stringent demands of international markets, such as the European Union, for verifiable sustainability. In addition, advanced analytics powered by Machine Learning (ML) and Digital Twins can help manage the stochastic nature of agriculture by providing predictive insights for production planning and supply chain operations optimization (Singh, Biswas, & Banerjee, 2024). The use of digital platforms, including social media and e-commerce, also plays a crucial role in expanding market access and developing rural economies through better connectivity (Rozi et al., 2025). Even simple platforms like WhatsApp are proving effective for learning and marketing agriculture (Das & Pradip, 2021).

Despite this enormous transformative potential, the widespread adoption of advanced IT in Indonesian agribusiness is slow due to various significant barriers (Bulut & Wu, 2024). Globally, the main obstacles often cited are high implementation costs, lack of necessary digital skills, and inadequate standardization that hinders interoperability (Fahmi & Savira, 2023). In Indonesia's specific context, these challenges are amplified by inadequate internet connectivity in many rural areas, unresolved data governance issues, and generally low readiness levels among smallholder farmers to adopt complex systems such as precision agriculture.

In addition, the success of this digital transition is highly dependent on a supportive ecosystem, which includes entrepreneurial attitudes in rural communities and the critical role of government support in providing policies, incentives, and infrastructure. Although studies have examined technologies or barriers individually, a fragmented understanding of how integrated IT utilization can systematically improve the competitiveness of Indonesia's agribusiness products remains a gap. A comprehensive synthesis is needed to understand the synergy between technologies, their collective impact, and the hierarchy of challenges in the Indonesian context. Therefore, this Systematic Literature Review (SLR) was conducted to consolidate existing knowledge, identify key technology applications and their impacts, map key challenges and opportunities, and ultimately, formulate a strategic framework that can guide policymakers and industry stakeholders in accelerating a resilient and competitive digital transformation for Indonesian agribusiness.

2. Literature Review

2.1 Agricultural Paradigm 4.0

Agribusiness competitiveness in the current global market era is a multifaceted construct that can no longer be measured solely by production volume or cost advantage (Silveira et al., 2024). The academic literature consistently asserts that modern competitiveness relies heavily on the ability to meet quality

standards, food safety, and strict sustainability practices, which are the main demands of the international market (Brenya et al., 2023). Consequently, the efficiency and resilience of the Agribusiness Supply Chain (ASC) are determining factors because every disruption both in terms of production and logistics can significantly erode profitability and consumer confidence (Imbiri, Rameezdeen, Chileshe, & Statsenko, 2024; Singh et al., 2024). In this context, Indonesia faces a paradox: Despite its status as the world's leading producer of various commodities, its export competitiveness is often not optimal, characterized by challenges in meeting global standards and fierce competition from other countries (Dermoredjo et al., 2025).

Specifically, Indonesia's agribusiness competitiveness challenges are rooted in complex structural problems at the domestic level. This sector is dominated by small-scale farmers with limited access to capital, technology, and market information, ultimately limiting productivity and weakening their bargaining position (Brenya et al., 2023). Inadequate infrastructure, especially in remote rural areas, creates long, inefficient, and high-cost supply chains (Zulham, Wardono, Permana, Pramoda, & Shafitri, 2025). This condition is exacerbated by significant information asymmetry along the value chain, which is often detrimental to producers at the upstream level (Singh et al., 2024). These constraints collectively create systemic vulnerabilities and hinder the ability of Indonesian agribusiness products to compete effectively in the global market.

As a strategic response to these challenges, the Agriculture 4.0 paradigm or smart farming emerged as a transformative framework (Almadani & Mostafa, 2021). This paradigm prioritizes using Information Technology (IT) and cyber-physical systems to create intelligent, integrated, and adaptive agricultural ecosystems (Quadras et al., 2023). Through the adoption of technologies such as the Internet of Things (IoT), Big Data Analytics (BDA), Artificial Intelligence (AI), and blockchain, Agriculture 4.0 has the potential to revolutionize the way agricultural products are produced, processed and distributed (Yadav et al., 2021). Thus, this digital transformation is no longer just an option but a strategic imperative to overcome inefficiencies, increase transparency, and build a sustainable competitive advantage for Indonesian agribusiness (Silveira et al., 2024).

2.2 The Relationship between Technology, Supply Chain, and Competitiveness

To systematically understand how IT can improve competitiveness, it is necessary to build a conceptual framework that maps the causal relationships between key variables based on the literature synthesis. This framework is based on several relevant theoretical lenses, such as the Resource-Based View (RBV), which views technological capabilities as a strategic resource that can create a competitive advantage (Samputra & Alfarizi, 2025). In addition, the Dynamic Capability View (DCV) is relevant to explain how IT enables companies to dynamically adapt to market changes (Samputra & Alfarizi, 2025). This framework identifies the use of Information Technology as the primary driving variable.

In this framework, the impact of IT does not directly generate competitiveness but through a series of Mediator Variables, which are the pillars of the supply chain. Technologies such as IoT and BDA directly contribute to improving operational efficiency and supply chain resilience by enabling real-time monitoring and data-driven decision-making (Yadav et al., 2021). On the other hand, digital and e-commerce platforms serve to increase market access and shorten distribution chains, which directly connect producers with the broader market (Zulham et al., 2025). Meanwhile, blockchain technology improves product transparency and traceability, a prerequisite for building trust and meeting global food safety standards.

This relationship between IT and supply chain performance improvement is further influenced by a series of Moderator Variables, which can strengthen or hinder the effectiveness of technology implementation. Barriers include high costs, infrastructure limitations, digital skills gaps, and unsupportive regulations (Bulut & Wu, 2024). Conversely, enablers such as government policy support, incentives, and high levels of entrepreneurship can accelerate the positive impact of IT adoption (Fahmi & Savira, 2023). The outcome of this complex interaction is the Increase in Agribusiness Competitiveness in the Global Market, which is a dependent variable in this conceptual framework.

2.3 Research Gap

Understanding of its implementation in the context of Indonesian agribusiness is still fragmented. Several crucial research gaps have been successfully identified. First, the majority of existing studies tend to focus on one type of technology (e.g., the study of blockchain only or AI only) and are often limited to technical feasibility without an in-depth analysis of the economic impact and return on investment (ROI) for business actors in Indonesia (Bertoglio & Sehnem, 2024). Studies that holistically analyze the synergies and integration of various IT platforms in a single supply chain ecosystem are still minimal.

Second, there is a scarcity of systematic reviews that specifically synthesize empirical evidence from the Indonesian context to answer the question of how the comprehensive use of IT can improve global competitiveness. Many existing studies are case studies on one commodity or specific region, so the generalizations are limited and do not provide a macro picture that can be used for national policy formulation (Rozi et al., 2025). An understanding of how contextual factors unique to Indonesia, such as cultural diversity, geographical conditions, and policy dynamics, moderate IT adoption's effectiveness is still not widely explored.

3. Methodology

3.1 Design and Research Approach

This study adopts the Systematic Literature Review (SLR) design. The SLR approach was chosen because it is the most powerful method to synthesize existing research evidence comprehensively, transparently, and replicable. Given that the purpose of this study is to map the use of information technology, analyze its impact on competitiveness, and identify challenges in the context of Indonesian agribusiness, where the existing literature is extensive and fragmented, SLR is the most appropriate approach to produce solid and evidence-based conclusions (Mustapha, Sakariyau, Zubairu, & Afang, 2022).

This study strictly follows the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) protocol to ensure methodological quality and accuracy. The PRISMA protocol is a recognized international standard for systematic review reporting, which provides checklists and flowcharts to guide the process from start to finish. In addition, the Research Questions (RQs) that guide this review are formulated using the PICO framework to ensure the focus, clarity, and relevance of each article analyzed (Mustapha et al., 2022).

Based on the PICO framework and the research objectives that have been set, this study is guided by one key question how does the use of information technology effectively increase the competitiveness of Indonesian agribusiness products in the global market compared to conventional practices. The study is broken down into three more specific analytical focuses to answer these big questions systematically. First, in RQ1, this study will identify the most dominant types of information technology in the literature to support the competitiveness of Indonesian agribusiness. Furthermore, RQ2 will analyze how the impact or specific results, both positive and negative, of the use of this technology on key indicators of competitiveness. Finally, in RQ3, this study will map the main inhibiting and supporting factors that influence the success of the adoption of this technology by agribusiness actors in Indonesia (Barbosa, Leão, Costa, & Costa, 2023).

3.2 Literature Search and Selection Process

Literature searches are conducted on reputable international academic databases to ensure broad and relevant coverage. The databases used include IEEE Explore, ScienceDirect, and Emerald Insight. The search strategy is focused on the keywords you have determined, namely "information technology", "digital", "agribusiness", "agriculture", and "Indonesia". A strict set of inclusion criteria has been established to ensure that the studies selected in this systematic literature review are of high relevance, quality, and focus. The main criterion is topical relevance, where each included article must explicitly address the intersection between information technology use and agribusiness competitiveness in Indonesia's specific context.

Furthermore, this review only includes publications such as reputable journal articles and conference proceedings to maintain academic rigor. Finally, a time limit is set for publication within the last 5 years (2021–2025) to ensure that the analysis includes the latest technological developments and only studies written in English are included to ensure global literature coverage and international comparability. In contrast, studies that did not meet these criteria were systematically excluded from this review. An article is excluded if the topic is not substantially relevant. Publications such as editorials, book reviews, news reports, opinion articles, and other types of non-scientific publications. In addition, studies that are not accessible in full-text format or published in languages other than English are also excluded due to practical limitations in the data analysis and verification process.

The study selection process follows four stages in the PRISMA flowchart, as you have visualized. This process will be documented in detail in the paper, including the presentation of the PRISMA flowchart.

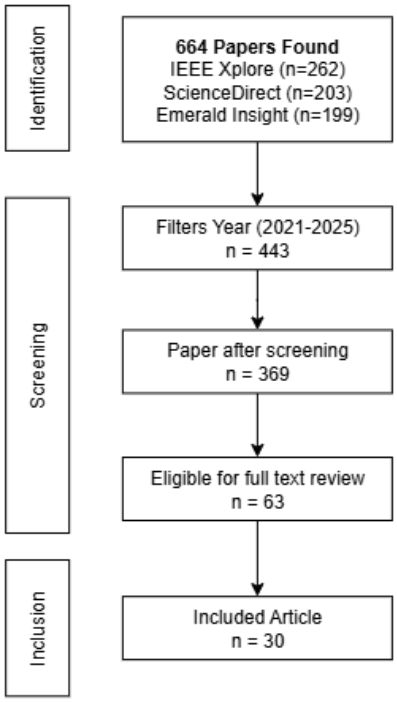

Figure 1. PRISMA Flow Diagram

At the initial identification stage, a search through an electronic database yielded 664 articles during the screening process based on the research year that only covers the last 5 years, as many as 443 articles. Furthermore, 369 articles that passed were prepared for the eligibility stage, but 303 of them could not be accessed in full text. The remaining 63 articles were then evaluated in depth through full-text reading, of which 28 articles were again excluded for not meeting specific inclusion criteria. In the end, after going through a rigorous selection process, a final set of 30 studies was obtained that were considered the most relevant and quality to be included in the qualitative synthesis analysis of this study. The entire flow of this process is visually documented in the PRISMA diagram to guarantee methodological transparency.

Data analysis in this study was carried out using a qualitative Thematic Synthesis approach. The process begins with an in-depth reading of the 30 articles that have been selected to identify and record all the information relevant to the research question (RQ). Key information such as the type of technology discussed, reported impacts, and identified barriers will be systematically extracted and compiled to facilitate comparison between studies.

3.3 Ethical Considerations

This research relies entirely on secondary data derived from scientific articles that have been published and are publicly accessible. Since there was no direct interaction with human subjects, the study did not

require approval from the ethics committee. Nevertheless, the ethical principles of academic research will be upheld, including accurate and objective representations of the findings of the reviewed studies, as well as the correct citation practice to reward the intellectual contributions of previous researchers. The entire methodological process will be reported transparently to ensure the integrity and validity of the research.

4. Results and Discussions

4.1 Classification of Information Technology in Agribusiness

Table 1. Classification of information technology in agribusiness

Technology Categories	Specific Technology Type	Role Description	Reference
Data Collection & Monitoring	Internet of Things (IoT) & Sensors	Collect real-time data from land (e.g., soil conditions, weather) and logistics (temperature, location) for monitoring and control.	(Bulut & Wu, 2024; Harsanto et al., 2025; Konduru et al., 2023; Parasuraman, Anandan, & Anbarasan, 2021)
Analytics & Decision Support	Artificial Intelligence (AI)	Provides predictive and automation capabilities, such as plant disease detection, fertilization recommendations, and risk management.	(Imbiri et al., 2024)
	Digital Twin & DSS	Create virtual models (digital replicas) of physical systems for simulation, planning, and support complex decision-making.	(Fahmi & Savira, 2023)
Connectivity & Markets	Digital & E-commerce Platforms	Connect manufacturers directly to domestic and global markets, cut out middlemen, and improve access to pricing information.	(Akudugu, Nkegbe, Wongnaa, & Millar, 2023; Ani, Darwanto, & Waluyati, 2024; Dermoredjo et al., 2025; Kayongo & Mathiassen, 2023)

The analysis in Table I shows that information technology in agribusiness can be grouped into three main functional categories that support each other: technology for data collection and monitoring, technology for analytics and decision support, and technology for connectivity and market access. At the most basic level, technologies such as the Internet of Things (IoT) and various types of sensors play a fundamental role in collecting data in real-time both from farmland, such as soil and weather conditions, and along the logistics supply chain to monitor the temperature and location of cargo. This collected data becomes a vital input for analytics technology and decision support layers (Almadani & Mostafa, 2021; Bulut & Wu, 2024; Harsanto et al., 2025; Konduru et al., 2023; Parasuraman et al., 2021; Quadras et al., 2023; Samputra & Alfarizi, 2025; Sun et al., 2021; Yadav et al., 2021).

In this layer, Artificial Intelligence (AI) is leveraged to provide predictive and automation capabilities, such as detecting plant diseases or providing precise fertilization recommendations (Adhinata, Ramadhan, Tanjung, & Fauzi, 2023; Imbiri et al., 2024). In addition, Digital Twin technology and Decision Support Systems (DSS) are used to create virtual models of physical systems that allow simulation and planning of complex scenarios for more strategic decision-making (Fahmi & Savira, 2023; Ghandar et al., 2021; Imbiri et al., 2024; Mustapha et al., 2022; Rustiadi et al., 2021; Thomas-Francois, Somogyi, & Zolfaghari, 2023).

Ultimately, digital platforms and e-commerce play a crucial role in providing connectivity and market access to connect products with consumers, allowing manufacturers to reach domestic and global markets directly while cutting out long and inefficient distribution lines. The integration of these three technology categories forms a comprehensive digital ecosystem to improve the overall competitiveness of agribusiness (Akudugu et al., 2023; Ani et al., 2024; Dermoredjo et al., 2025; Kayongo & Mathiassen, 2023; Mariyono, Santoso, Waskito, & Utomo, 2022; Musa & Basir, 2021; Permani, Sahara, Satria, Suprehatin, & Nuryartono, 2025; Rozi et al., 2025).

4.2 The Impact of Information Technology on Competitiveness Indicators

Table 2. Impact of information technology utilization on competitiveness indicators

Competitiveness Indicators	Impact Description	Reference
Improving Supply Chain Efficiency & Resilience	Optimize logistics processes, inventory management, and resource utilization through predictive data analysis.	(Akudugu et al., 2023; Dermoredjo et al., 2025; Kayongo & Mathiassen, 2023; Mariyono et al., 2022; Musa & Basir, 2021; Rozi et al., 2025; Tanuputri & Bai, 2023; Zulham et al., 2025)
	Increase the resilience or resilience of the supply chain to disruption through better visibility and coordination between stakeholders.	(Bulut & Wu, 2024; Harsanto et al., 2025; Konduru et al., 2023; Parasuraman et al., 2021; Quadras et al., 2023; Samputra & Alfarizi, 2025; Yadav et al., 2021)
Expanding Market Access & Customer Relationships	Providing access to previously unaffordable domestic and international markets for MSMEs and small-scale farmers.	(Adhinata et al., 2023; Imbiri et al., 2024; Tanuputri & Bai, 2023)
Product Quality Improvement & Transparency	Improve product quality control through precise monitoring of environmental conditions (temperature, humidity) during production and distribution.	(Fahmi & Savira, 2023)

The analysis in Table 2, confirms that the impact of IT utilization is transformative and touches various layers of competitiveness. One of the most prominent impacts is improving supply chain efficiency and resilience. The utilization of IoT for monitoring and BDA for predictive analysis significantly reduces post-harvest wastage and loss while optimizing logistics processes and inventory management. Better supply chain visibility, thanks to the smooth flow of data, also makes the system more resilient in the face of external shocks or disruptions (Akudugu et al., 2023; Ani et al., 2024; Dermoredjo et al., 2025; Kayongo & Mathiassen, 2023; Mariyono et al., 2022; Musa & Basir, 2021; Permani et al., 2025; Rozi et al., 2025; Tanuputri & Bai, 2023; Zulham et al., 2025).

In addition to internal efficiency, another crucial impact is expanding market access and economic empowerment of small-scale business actors Almadani and Mostafa (2021); (Bulut & Wu, 2024; Harsanto et al., 2025; Konduru et al., 2023; Parasuraman et al., 2021; Quadras et al., 2023; Samputra & Alfarizi, 2025; Sun et al., 2021; Yadav et al., 2021). Digital platforms have democratized access to markets by allowing farmers and MSMEs to connect directly with consumers, increasing their profit margins and strengthening their bargaining position against intermediaries (Adhinata et al., 2023; Imbiri et al., 2024; Parasuraman et al., 2021; Tanuputri & Bai, 2023). Lastly, IT fundamentally improves the quality and selling value of the product itself. Through technologies such as blockchain, traceability, and transparency can be guaranteed to consumers, a significant added value in a global market that is increasingly aware of food safety and sustainability issues. Overall, these findings show that IT serves as a tool for efficiency and a strategic enabler that transforms the way agribusiness products are created,

marketed, and validated globally (Fahmi & Savira, 2023; Ghandar et al., 2021; Imbiri et al., 2024; Mustapha et al., 2022; Rustiadi et al., 2021; Thomas-Francois et al., 2023).

4.3 Barriers to Information Technology Adoption

Table 3. Categorization of barriers to information technology adoption in agribusiness

Obstacle Category	Description of Barriers	Reference
Economics & Finance	High initial investment costs for hardware, software, and training.	(Harsanto et al., 2025)
Infrastructure & Technical	Uneven, slow, and unreliable internet connectivity, especially in rural and remote areas.	(Fahmi & Savira, 2023)
Human & Social Resources	Low levels of digital literacy and skills among farmers and agribusiness workers.	(Akudugu et al., 2023; Ani et al., 2024; Kayongo & Mathiassen, 2023)
Institutional & Regulation	Lack of comprehensive and integrated government policy support to drive digital transformation in the agribusiness sector.	(Adhinata et al., 2023; Imbiri et al., 2024; Parasuraman et al., 2021)

The analysis in Table III reveals that the adoption of information technology in Indonesian agribusiness is hampered by a complex and interrelated network of challenges, which can be categorized into several key dimensions. There are economic and financial barriers at the most fundamental layer, where the high initial investment costs for hardware and software are the main barrier for most business actors. This obstacle is exacerbated by limited access to suitable sources of financing or credit for small-scale farmers and MSMEs, as well as uncertainty regarding Return on Investment (ROI), which makes many parties reluctant to take financial risks.

These economic problems are then reinforced by infrastructure and technical barriers, especially the uneven and unreliable condition of internet connectivity in rural areas, which is a prerequisite for almost all digital solutions (Almadani & Mostafa, 2021; Bulut & Wu, 2024; Harsanto et al., 2025; Konduru et al., 2023; Parasuraman et al., 2021; Quadras et al., 2023; Samputra & Alfarizi, 2025; Sun et al., 2021). In addition, the lack of standardization and interoperability between different technology platforms creates a fragmented and complex ecosystem to integrate. At the same time, data security and privacy issues raise concerns and mistrust among users (Fahmi & Savira, 2023; Ghandar et al., 2021; Mustapha et al., 2022; Rustiadi et al., 2021; Thomas-Francois et al., 2023). On top of these technical challenges, there are layers of human and social resource barriers, where the low level of literacy and digital skills among farmers is a serious obstacle to the effective operation of technology. Low readiness and resistance to switching from traditional practices are also significant socio-cultural challenges (Akudugu et al., 2023; Dermoredjo et al., 2025; Kayongo & Mathiassen, 2023; Mariyono et al., 2022; Musa & Basir, 2021; Permani et al., 2025; Rozi et al., 2025; Tanuputri & Bai, 2023; Zulham et al., 2025).

Lastly, all of these barriers fall under the umbrella of institutional and regulatory barriers, including the lack of integrated government policy support to drive digital transformation and the absence of a clear data governance framework, creating uncertainty for stakeholders. These barriers do not stand alone but reinforce each other, thus confirming that efforts to accelerate IT adoption require holistic and systemic solutions (Adhinata et al., 2023; Parasuraman et al., 2021).

5. Conclusions

5.1. Conlusion

This research was conducted to synthesize and systematically analyze the existing literature on the use of information technology (IT) to increase the competitiveness of Indonesian agribusiness products in the global market. The results of a review of 30 relevant studies show that the technology landscape in the sector is dominated by the utilization of digital platforms and the Internet of Things (IoT) aimed at addressing pressing issues such as market access and basic quality monitoring. Meanwhile, more advanced technologies such as Artificial Intelligence (AI) and Blockchain are still emerging, with huge potential that has not yet been fully realized.

These various technologies have been proven to have a significant positive impact on competitiveness indicators, especially in increasing supply chain efficiency and resilience, expanding market access for small-scale business actors, and improving product quality and transparency through traceability. However, the overall pace of technology adoption is still hampered by a complex and interrelated network of challenges, which include economic barriers (high costs), infrastructure (internet connectivity), human resources (low digital skills), and institutions (suboptimal policies).

The findings of this study have important implications for various stakeholders. Theoretically, the study contributes by presenting a holistic synthesis of the previously fragmented literature and proposing a conceptual framework that maps the complex relationship between IT adoption, supply chain performance, and competitiveness, highlighting the crucial role of inhibitory and supporting factors. Practically, for agribusiness actors, this study underscores the importance of investing in hardware and increasing the digital capacity and skills of human resources. For policymakers, these findings serve as a basis for formulating a more integrated national strategy. Government support is not enough in the form of financial incentives. However, it must include the development of rural digital infrastructure, creating clear regulations on data governance, and developing large-scale digital literacy programs that touch down to the farmer level.

Although this research has been carried out systematically, there are several limitations that, at the same time, open up opportunities for future research. This review is limited to published and accessible literature, so there may be innovative practices in the field that have not been documented. Based on the identified research gaps, the next research direction is highly recommended to focus more on quantitative studies that can measure the economic impact and Return on Investment (ROI) of IT adoption, specifically on the export performance of Indonesia's agribusiness. In addition, an in-depth case study exploring the implementation of multi-technology integration is also needed to understand its synergies and practical challenges in the field. Longitudinal research will also be invaluable in evaluating the effectiveness of various government policy intervention models in accelerating digital transformation in the sector.

5.2. Research Limitations

This study has several limitations. First, the literature analyzed is limited to articles published between 2021 and 2025, which means that there may be new practices or innovations that have not yet been documented in scientific publications. Second, this study only involves literature that is publicly accessible, excluding field research that could provide more contextual insights into the implementation of information technology in Indonesia’s agribusiness sector. Third, the study cannot directly measure the economic impact and return on investment (ROI) from technology adoption in the field, which is highly dependent on local factors that differ across regions.

5.3. Suggestions and Directions for Future Research

Based on the findings, it is suggested that the government and agribusiness actors in Indonesia strengthen policy support that facilitates technology adoption among small farmers and MSMEs. Programs for digital literacy training and digital infrastructure in remote areas should be prioritized. Additionally, collaboration between the public and private sectors in creating technology platforms that directly connect producers to global markets should continue to be strengthened to accelerate digital transformation in the agribusiness sector. For future research, it is recommended to conduct quantitative

studies that can measure the economic impact and ROI of technology adoption in Indonesia's agribusiness sector, especially among small farmers and MSMEs. Research should also focus on the integration of multiple technologies in the agribusiness supply chain ecosystem to assess their synergies and practical challenges. Additionally, longitudinal studies examining the impact of government policies on accelerating digital transformation in agribusiness would provide a more comprehensive view of the success of policy programs in the long term.

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