

# Digital Transformation in Agribusiness: Theoretical Perspectives on Technology Adoption and Value Creation

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## Abstract

Digital transformation is increasingly reshaping agribusiness by changing the way agricultural production, information exchange, supply-chain coordination, marketing and managerial decision-making are conducted. The emergence of digital technologies has created new opportunities for improving agricultural productivity, operational efficiency, market access, traceability, information management and value creation. However, technology adoption within agribusiness is not determined by technological availability alone and is influenced by organizational capabilities, financial resources, infrastructure, knowledge, human skills, perceived usefulness and institutional conditions. This conceptual paper develops a theoretical framework for understanding digital transformation in agribusiness by integrating perspectives on technology adoption, agricultural innovation, digitalization, organizational capabilities and value creation. Drawing on an interdisciplinary review of existing literature, the paper conceptualizes digital transformation as a multidimensional process in which technological adoption interacts with organizational readiness and external institutional conditions to generate economic, operational and strategic value. The framework highlights the importance of digital technologies, organizational capabilities, stakeholder coordination, knowledge development and institutional support in transforming technology adoption into measurable agribusiness outcomes. Illustrative numerical tables are incorporated to demonstrate possible relationships between digital maturity, technology adoption and value creation. The paper contributes to theory development by integrating technology adoption and value creation perspectives within a unified agribusiness framework and provides a foundation for future empirical investigation.

**Keywords:** digital transformation, agribusiness, technology adoption, agricultural innovation, digital agriculture, value creation, organizational capabilities.

## Introduction

Digital transformation has become an increasingly important issue in contemporary agribusiness because agricultural production and food systems are undergoing substantial technological and organizational change. The growing use of information and communication technologies, digital platforms, data analytics, mobile applications, artificial intelligence, Internet-based systems, automation and other emerging technologies has altered the way agricultural organizations collect information, make decisions, coordinate activities and interact with markets. Unlike conventional agricultural modernization, which largely emphasized mechanization and physical productivity, digital transformation involves the integration of information, communication and data-driven technologies into organizational processes and business models. Consequently, digital transformation is increasingly associated with broader changes in the structure and management of agribusiness rather than simply with the introduction of individual technologies (Andreopoulou et al., 2014; Mendes et al., 2022).

Agribusiness organizations operate within a highly uncertain and interconnected environment characterized by changing consumer preferences, increasing competition, resource constraints, climate-related pressures, changing market conditions and growing requirements for supply-chain transparency. These conditions create a strong demand for timely, reliable and actionable information. Digital technologies can potentially address these requirements by enabling organizations to collect and process information more rapidly and coordinate activities across different stages of the agricultural value chain. Digital information systems can support farmers and agribusiness managers in production planning, resource allocation, marketing and decision-making, while digital communication technologies can improve interactions among producers, suppliers, processors, distributors and consumers (Andreopoulou et al., 2014; Van Alfen, 2014).

However, the existence of digital technologies does not necessarily lead to successful digital transformation. Technology adoption is a complex process influenced by economic, organizational, social, technological and institutional conditions. Agricultural producers may hesitate to adopt new technologies because of high initial costs, limited digital skills, inadequate infrastructure, uncertainty regarding expected benefits and concerns about technological complexity. Similarly, agribusiness firms may invest in digital systems without achieving significant improvements if employees lack the

capabilities required to integrate technology into organizational processes. The literature therefore suggests that technology adoption must be examined as part of a broader organizational transformation process rather than as an isolated investment decision (Babu & Joshi, 2019; Chen et al., 2022; Zhang et al., 2023).

The importance of organizational capabilities becomes particularly evident when digital transformation is considered from a value-creation perspective. Digital technologies can provide access to large volumes of information, but information becomes valuable only when organizations possess the ability to interpret it and incorporate it into decision-making. Digital transformation may therefore improve operational efficiency, reduce transaction costs, increase market access, improve supply-chain coordination and generate new business opportunities when technological resources are supported by organizational knowledge and managerial capabilities (Kraus et al., 2023; Paoloni et al., 2021). The transformation of information into organizational value consequently represents a central theoretical issue in digital agribusiness.

The agricultural sector also presents distinctive challenges for digital transformation because it includes highly heterogeneous actors. Large agribusiness corporations may possess substantial financial resources and technological infrastructure, whereas small farms and rural enterprises may operate with limited capital, skills and connectivity. This creates the possibility of a digital divide in which the benefits of technological development are distributed unevenly. Digital technologies may improve access to information and markets for smaller agricultural producers, but such benefits depend on affordability, accessibility, knowledge and institutional support (Ben Hassen et al., 2021; Mendes et al., 2022; Zhang et al., 2023). Digital transformation also has implications beyond productivity and efficiency. It can influence sustainability, transparency, traceability, resilience and stakeholder relationships. Digital information systems may improve the ability of organizations to monitor resources and production activities, while digital platforms may facilitate collaboration and information sharing. The integration of digital technologies into agribusiness supply chains can consequently generate economic as well as organizational and strategic value (Galati et al., 2021; Miranda et al., 2021; Matthew et al., 2023).

Despite increasing scholarly attention, the existing literature remains relatively fragmented. Some studies focus primarily on technology adoption, others on digital agriculture, organizational innovation, information systems or supply-chain transformation. There remains a need for a conceptual framework that integrates these perspectives and explains how technological adoption can be transformed into organizational and economic value within agribusiness. Therefore, this paper develops a theoretical framework linking digital technology characteristics, organizational readiness, technology adoption, digital capabilities and value creation. The framework aims to provide a holistic understanding of digital transformation and establish a foundation for future empirical research.

## Literature Review

Digital transformation in agribusiness has developed through the interaction of technological innovation, agricultural modernization, information management and changing organizational structures. Early research on agricultural information systems emphasized the role of information and communication technologies in improving access to agricultural information and facilitating communication among agricultural actors. Andreopoulou et al. (2014) highlighted the significance of ICT within agricultural contexts, demonstrating that information technologies can support communication, information dissemination and decision-making. This perspective established an important foundation for understanding digital agriculture because information constitutes a critical resource in agricultural production and marketing.

The importance of information has also been emphasized from a broader organizational perspective. Van Baalen et al. (2005) examined knowledge and information processes and demonstrated that information sharing can influence organizational coordination and knowledge development. In agribusiness, these issues are particularly relevant because agricultural value chains contain numerous actors with different information requirements and levels of market access. Farmers require information regarding production conditions, prices and markets, while processors and retailers require information regarding supply availability, quality and consumer demand. Digital systems can potentially reduce information asymmetry and facilitate more efficient coordination among these actors.

Agricultural technology adoption, however, cannot be explained solely through technological availability. Babu and Joshi (2019) emphasize the importance of organizational and institutional conditions in agricultural development, indicating that technology adoption is embedded within broader systems of resources, capabilities and decision-making. Eby Mathew (2010) similarly contributes to the understanding of technological and innovative change by emphasizing the role of capabilities and knowledge in technology-related development. These perspectives suggest that digital transformation requires not only technological infrastructure but also human and organizational capacity. Agricultural production is also increasingly connected with environmental and sustainability concerns. Bocchi et al. (2012) emphasized the importance of sustainable agricultural systems and the interaction between agricultural practices and environmental conditions. Within the context of digital transformation, this perspective becomes important because digital technologies can potentially improve the efficiency of resource use and support more informed agricultural decisions. Digitalization therefore has the

potential to contribute to sustainability when technologies are appropriately integrated into production and management systems.

The development of digital agriculture has accelerated the importance of technological innovation within agribusiness. Phillips et al. (2019) examined emerging agricultural technologies and their implications for agricultural transformation. Their perspective illustrates how new technologies can change agricultural practices and create new possibilities for production and management. However, technological innovation also creates new managerial challenges because organizations need to develop the capacity to evaluate, adopt and integrate technologies into existing systems. The relationship between agricultural innovation and digital transformation is further emphasized by Danse et al. (2020), whose work highlights the importance of innovation and transformation within agricultural and food systems. Digital technologies can support innovation by providing new methods of production, communication, coordination and market interaction. Innovation therefore represents a mechanism through which technological resources may be converted into organizational value.

The literature increasingly recognizes that digital transformation is not simply an operational improvement but a broader transformation of agribusiness structures. Paoloni et al. (2021) highlight the relationship between innovation, entrepreneurship and organizational transformation, suggesting that firms need to rethink their business models and capabilities when responding to technological change. This is particularly relevant to agribusiness because digital technologies can influence not only production but also marketing, logistics, financial management and customer relationships. Galati et al. (2021) similarly contribute to the understanding of innovation within agrifood systems. Their work indicates the importance of innovation in responding to changing market and technological conditions. Digital technologies can facilitate this innovation process by providing firms with new information, communication mechanisms and analytical capabilities. Digital transformation can therefore be conceptualized as an innovation process through which organizations modify existing practices and develop new forms of value creation.

The organizational dimension of digital transformation has also been highlighted by Miranda et al. (2021). Digital agriculture requires organizations to integrate technologies with existing managerial structures and operational systems. The adoption of a digital tool may generate limited benefits if it remains disconnected from other organizational activities. Effective digital transformation therefore requires integration, coordination and organizational learning. The literature also indicates that digital transformation is increasingly associated with agricultural development and rural transformation. Ben Hassen et al. (2021) examine the role of digitalization within agricultural contexts and demonstrate that technological transformation is influenced by economic and social conditions. Rural areas may experience barriers associated with connectivity, financial resources, knowledge and institutional capacity. These barriers create important questions concerning whether digital transformation can produce inclusive agricultural development or whether it may reinforce existing inequalities.

Mendes et al. (2022) provide a broader conceptual understanding of digital transformation in modern agriculture. Their work suggests that digital transformation incorporates multiple dimensions and should not be reduced to the adoption of individual technological tools. This multidimensional perspective is particularly important for the present study because it supports the argument that digital transformation involves changes in processes, capabilities, organizational structures and decision-making systems. Amoussouhoui et al. (2022) further contribute to understanding digital technologies and agricultural transformation by demonstrating the importance of technological adoption in changing agricultural practices. However, adoption decisions remain dependent on perceived benefits, technological accessibility and the ability of users to integrate new technologies into their activities.

Chen et al. (2022) emphasize the importance of factors influencing technology adoption. Their contribution is particularly relevant because it demonstrates that technology adoption is shaped by multiple conditions rather than by technological characteristics alone. The perceived usefulness of technology, compatibility with existing practices, accessibility and user capabilities can influence adoption decisions. These factors suggest that digital transformation should be conceptualized as a process involving both technological and behavioral dimensions. Das and Roy (2022) similarly emphasize the development of digital agriculture and the changing technological environment of agricultural production. Their work illustrates how digital technologies can support agricultural decision-making and productivity while also creating new requirements for technological knowledge and organizational adaptation.

Isip (2022) contributes to the discussion of agricultural digitalization by emphasizing the role of digital technologies in changing agricultural practices and information systems. Digital transformation may improve information accessibility, communication and decision-making, but successful implementation depends on the availability of appropriate infrastructure and human capabilities. Mrabet (2023) extends the discussion toward contemporary agricultural digitalization and highlights the growing relevance of digital tools within agricultural systems. The increasing integration of digital technologies suggests that future agribusiness competitiveness may depend substantially on organizations' ability to acquire, process and utilize digital information. Recent literature has also emphasized the strategic implications of digital transformation. Kraus et al. (2023) conceptualize digital transformation as a significant organizational and strategic process

rather than simply a technological upgrade. Digital transformation can alter organizational capabilities, business processes and approaches to value creation. This perspective is central to the present framework because it places digital technology within a broader strategic context.

Akudugu et al. (2023) emphasize agricultural innovation and technological transformation, demonstrating that technology adoption is closely connected with agricultural development and innovation capacity. Matthew et al. (2023) similarly contribute to understanding the relationship between digital technologies and agricultural value creation. Their perspective supports the argument that digital transformation can create value through improvements in productivity, information availability, market interaction and organizational efficiency. Pyburn et al. (2023) further highlight agricultural transformation and the importance of innovation and technology within agricultural systems. Digital technologies can facilitate new approaches to agricultural production and market participation, but their effectiveness depends upon the institutional and organizational environment in which they are implemented. Zhang et al. (2023) and Zhao et al. (2023) provide further evidence of the increasing importance of digital technologies and technology adoption within agriculture. These studies reinforce the idea that digital transformation is becoming an important component of agricultural modernization, while also indicating that adoption remains dependent on user characteristics, organizational readiness and external conditions.

The literature therefore indicates that digital transformation generates value through several interconnected mechanisms. First, digital technologies improve access to information and can reduce information asymmetry. Second, they can increase operational efficiency by supporting automation and data-driven decision-making. Third, digital platforms can improve market access and communication. Fourth, digital technologies can enhance supply-chain coordination and transparency. Fifth, digitalization can strengthen organizational innovation and support new business models. However, these benefits are contingent upon appropriate technological, organizational and institutional conditions.

**Table 1. Literature Review on Digital Transformation in Agribusiness**

| Sr. No. | Author(s) & Year           | Study Focus                 | Major Contribution                                    | Research Gap                                      |
|---------|----------------------------|-----------------------------|-------------------------------------------------------|---------------------------------------------------|
| 1       | Van Baalen et al. (2005)   | Knowledge and information   | Emphasized information and knowledge processes        | Limited agricultural digitalization perspective   |
| 2       | Eby Mathew (2010)          | Technology and innovation   | Highlighted technological and innovation capabilities | Limited focus on agribusiness value creation      |
| 3       | Bocchi et al. (2012)       | Agricultural systems        | Emphasized sustainable agricultural development       | Limited digital transformation integration        |
| 4       | Andreopoulou et al. (2014) | ICT in agriculture          | Highlighted ICT and agricultural information          | Limited organizational transformation perspective |
| 5       | Van Alfen (2014)           | Agricultural management     | Provided broader agricultural management perspective  | Limited digital value-creation framework          |
| 6       | Phillips et al. (2019)     | Agricultural technology     | Examined emerging agricultural technologies           | Adoption barriers require further integration     |
| 7       | Babu & Joshi (2019)        | Agricultural development    | Highlighted institutional and organizational factors  | Limited digital transformation framework          |
| 8       | Vilké et al. (2019)        | Agricultural technology     | Examined technology-related agricultural change       | Limited value-creation perspective                |
| 9       | Danse et al. (2020)        | Agricultural transformation | Emphasized innovation and transformation              | Need for integrated digital framework             |
| 10      | Ben Hassen et al. (2021)   | Agricultural digitalization | Highlighted digital transformation challenges         | Digital divide requires further investigation     |
| 11      | Galati et al. (2021)       | Agrifood innovation         | Connected innovation with agrifood development        | Limited technology-value integration              |
| 12      | Miranda et al. (2021)      | Digital agriculture         | Examined digital agricultural transformation          | Limited organizational capability perspective     |

|    |                            |                             |                                                      |                                                |
|----|----------------------------|-----------------------------|------------------------------------------------------|------------------------------------------------|
| 13 | Paoloni et al. (2021)      | Innovation and agribusiness | Highlighted organizational transformation            | Need for comprehensive adoption model          |
| 14 | Amoussouhoui et al. (2022) | Digital technologies        | Examined technology adoption in agriculture          | Limited value-creation integration             |
| 15 | Chen et al. (2022)         | Technology adoption         | Identified adoption determinants                     | Need for agribusiness-specific framework       |
| 16 | Das & Roy (2022)           | Digital agriculture         | Examined technology-enabled agricultural development | Limited strategic perspective                  |
| 17 | Mendes et al. (2022)       | Digital transformation      | Conceptualized multiple dimensions of transformation | Need to link transformation with value         |
| 18 | Isip (2022)                | Agricultural digitalization | Highlighted digital transformation processes         | Limited organizational integration             |
| 19 | Mrabet (2023)              | Agricultural digitalization | Examined contemporary digital transformation         | Need for comprehensive theoretical integration |
| 20 | Akudugu et al. (2023)      | Agricultural innovation     | Connected technology and innovation                  | Limited value-creation mechanisms              |
| 21 | Kraus et al. (2023)        | Digital transformation      | Emphasized strategic transformation                  | Limited agricultural-specific framework        |
| 22 | Matthew et al. (2023)      | Digital agriculture         | Examined technology-enabled agricultural value       | Need for integrated adoption perspective       |
| 23 | Pyburn et al. (2023)       | Agricultural transformation | Highlighted innovation and transformation            | Need for organizational capability integration |
| 24 | Zhang et al. (2023)        | Technology adoption         | Examined digital adoption conditions                 | Need for broader value-creation framework      |
| 25 | Zhao et al. (2023)         | Digital agriculture         | Examined digital transformation and adoption         | Need for integrated agribusiness model         |

The literature synthesis demonstrates that existing research has made substantial progress in understanding agricultural digitalization, technology adoption and innovation, but the theoretical relationship between technology adoption and value creation remains insufficiently integrated. Existing studies frequently examine technologies, adoption conditions, organizational capabilities and agricultural outcomes separately. This fragmentation creates a theoretical gap because adoption does not necessarily result in value creation. The present paper therefore proposes that organizational readiness, digital capability and institutional support act as mechanisms through which technological adoption can be transformed into measurable agribusiness value.

### Methodology

This study adopts a conceptual and integrative research methodology to develop a theoretical framework explaining digital transformation, technology adoption and value creation in agribusiness. Consistent with the conceptual orientation of the study, the methodology does not involve primary data collection, surveys or statistical testing. Instead, it synthesizes existing literature addressing agricultural technology, digital transformation, innovation, organizational capabilities, information systems and agribusiness development. The conceptual approach is appropriate because the objective is to integrate fragmented theoretical perspectives and identify relationships among major constructs.

The literature was organized thematically around technology characteristics, technology adoption, organizational readiness, digital capabilities, institutional conditions and value creation. Studies addressing agricultural ICT and information systems were used to establish the foundation for understanding the role of digital information in agriculture (Andreopoulou et al., 2014; Van Baalen et al., 2005). Research on agricultural innovation and digitalization was examined to identify the changing technological environment of agribusiness (Danse et al., 2020; Galati et al., 2021; Mendes et al., 2022). Literature on technology adoption was then considered to identify the conditions that influence the decision and ability of agricultural actors to adopt digital technologies (Babu & Joshi, 2019; Chen et al., 2022; Zhang et al., 2023).

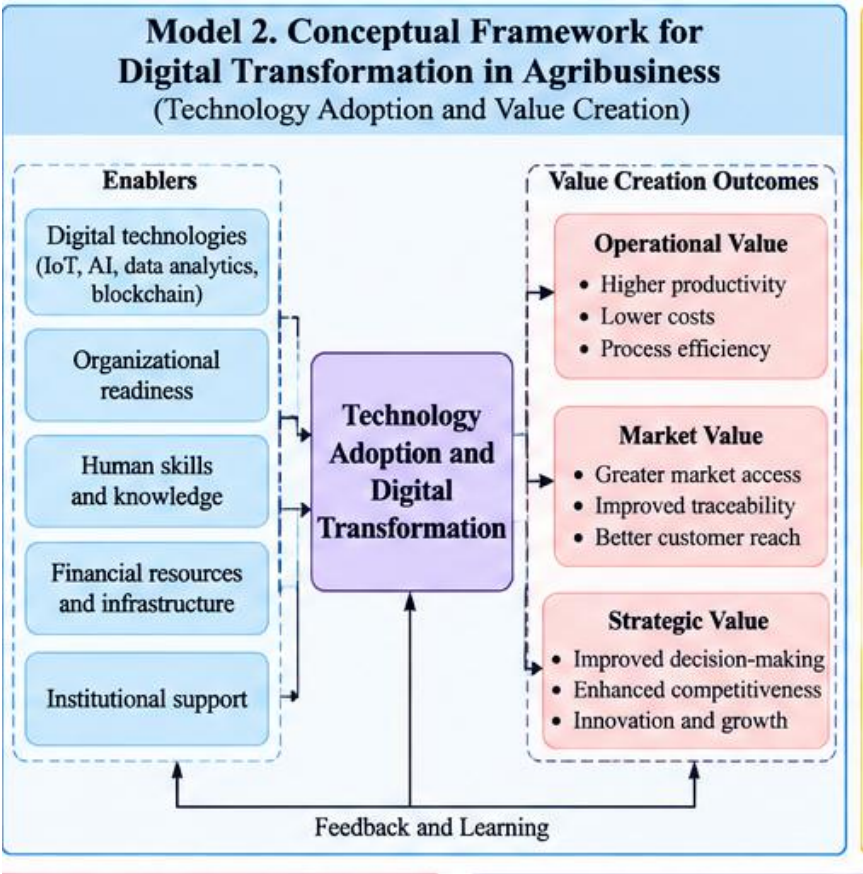


Figure 1: Conceptual Model

A thematic synthesis was subsequently undertaken to connect technology adoption with organizational capabilities and value creation. The resulting framework assumes that technological characteristics influence adoption, while organizational readiness and institutional conditions influence the effectiveness of adoption. Digital capabilities then provide the mechanism through which technology can generate operational, strategic and economic value. This theoretical logic allows the study to move beyond a simple technology-adoption perspective toward a broader conceptualization of digital transformation. The numerical tables presented in the Discussion section are illustrative conceptual calculations designed to demonstrate how digital maturity, technology adoption and value creation could potentially be measured. They are not empirical observations and should not be interpreted as results from an actual sample.

Discussion

The discussion of this study integrates insights from the literature to develop a comprehensive theoretical understanding of digital transformation in agribusiness. The analysis indicates that digital transformation should be understood as a dynamic and multidimensional process rather than as the simple acquisition of digital technologies. Technology creates possibilities, but organizational capabilities determine whether those possibilities are converted into actual value. This distinction is important because agribusiness organizations differ significantly in their resources, skills, infrastructure and institutional environments. The effectiveness of digital transformation therefore depends on the interaction between technological opportunities and organizational readiness (Mendes et al., 2022; Kraus et al., 2023). The proposed conceptual framework begins with the technological environment. Technologies such as digital information systems, mobile applications, data analytics, automation and other emerging agricultural technologies provide organizations with new opportunities for improving information management and decision-making. However, the adoption of a technology is influenced by how users perceive its usefulness, complexity, compatibility and expected benefits. Research on agricultural technology adoption emphasizes that technology adoption involves multiple economic, organizational and behavioral factors (Babu & Joshi, 2019; Chen et al., 2022). Therefore, technology availability represents only the starting point of the transformation process.

The framework proposes that organizational readiness represents an important mechanism between technology availability and successful digital transformation. An organization may have access to sophisticated technology but may be unable to generate value if employees lack the skills required to use it effectively. Similarly, insufficient financial resources may

prevent organizations from maintaining digital infrastructure, while weak managerial support may result in limited integration of technology into existing business processes. This suggests that digital transformation requires simultaneous development of technological and organizational capabilities.

**Table 2. Illustrative Digital Transformation Maturity Index**

| Digital Transformation Stage | Description                                                    | Illustrative Score |
|------------------------------|----------------------------------------------------------------|--------------------|
| Traditional                  | Predominantly manual processes and limited digital information | 20                 |
| Basic Digitalization         | Digital records and basic communication systems                | 35                 |
| Connected                    | Integration of selected digital systems                        | 55                 |
| Data-Driven                  | Regular use of analytics for managerial decisions              | 75                 |
| Advanced Transformation      | Integrated digital ecosystem and intelligent decision-making   | 90                 |

*Note: Scores are illustrative conceptual values and do not represent empirical observations.*

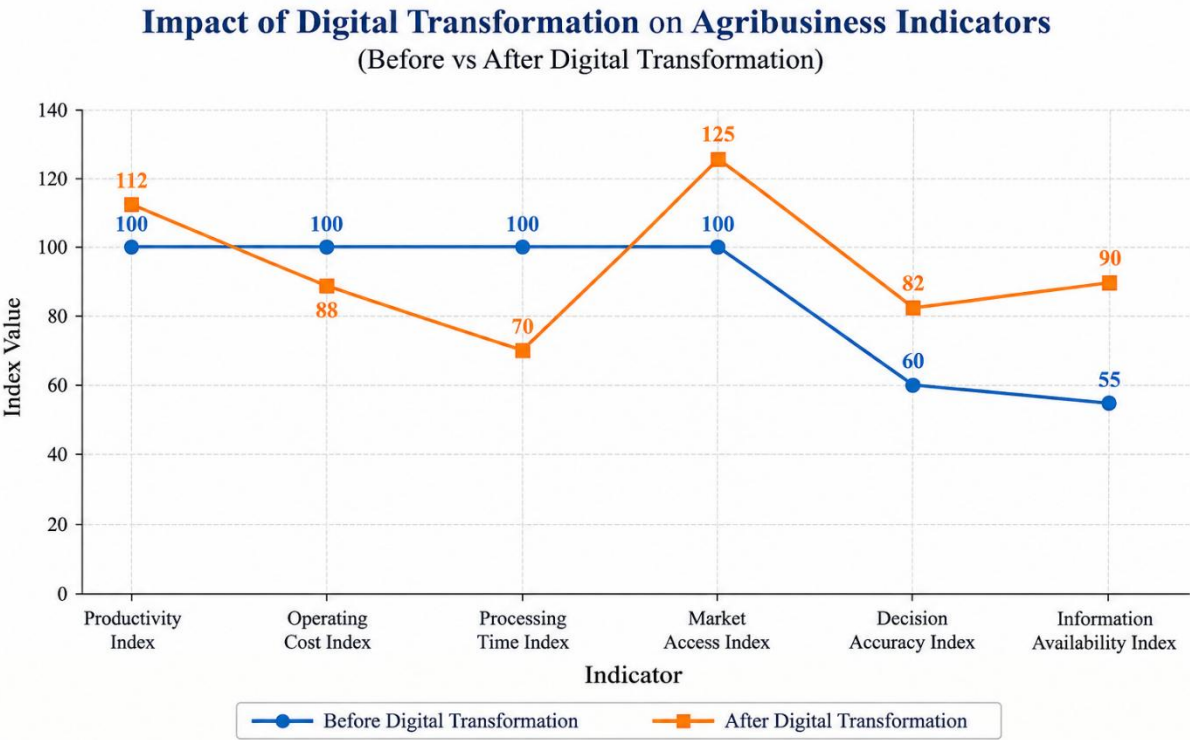
The table demonstrates the conceptual argument that digital transformation occurs progressively. An organization at the traditional stage may use limited digital tools, whereas a highly transformed organization integrates digital systems into decision-making and business processes. The movement from 20 to 90 represents increasing digital maturity rather than a specific empirical measurement. The implication is that organizations should evaluate digital transformation according to the extent to which technology has changed organizational processes rather than merely counting the number of technologies adopted. Digital transformation can generate economic value through improved productivity, lower transaction costs, improved resource utilization and better market coordination. Digital information systems can reduce the time required to collect and process information, while data-driven decision-making can support more accurate planning. Agricultural firms may therefore obtain economic benefits when digital technologies improve the efficiency of existing processes. The literature on agricultural innovation and digitalization supports the argument that technological change can contribute to improvements in agricultural production and management (Galati et al., 2021; Matthew et al., 2023).

**Table 3. Illustrative Economic Value Creation from Digital Transformation**

| Indicator                      | Before Digital Transformation | After Digital Transformation | Illustrative Change |
|--------------------------------|-------------------------------|------------------------------|---------------------|
| Productivity Index             | 100                           | 112                          | +12%                |
| Operating Cost Index           | 100                           | 88                           | -12%                |
| Processing Time Index          | 100                           | 70                           | -30%                |
| Market Access Index            | 100                           | 125                          | +25%                |
| Decision Accuracy Index        | 60                            | 82                           | +22 points          |
| Information Availability Index | 55                            | 90                           | +35 points          |

*Note: Figures are illustrative and are included only to demonstrate possible measurement of conceptual relationships.*

The numerical illustration suggests that digital transformation can potentially influence several dimensions of organizational performance simultaneously. The reduction in the operating-cost index from 100 to 88 represents an illustrative 12% improvement, while the processing-time index declines from 100 to 70, representing a hypothetical 30% improvement in process speed. The increase in market access from 100 to 125 demonstrates how digital systems could potentially connect agricultural organizations with additional customers and markets. These values should not be interpreted as actual findings but demonstrate how future empirical studies could operationalize value creation. The role of information is particularly important because agriculture involves substantial information asymmetries. Farmers may have limited access to market prices, consumer preferences, weather information and technological knowledge, while buyers may have limited information regarding production conditions and product quality. Digital platforms can potentially reduce these information gaps by increasing the speed and availability of information. Andreopoulou et al. (2014) and Van Baalen et al. (2005) provide an important theoretical foundation for understanding information and communication as resources that can influence coordination and decision-making.



Digital transformation can also influence supply-chain value. Agricultural supply chains involve multiple actors whose activities need to be coordinated. Digital systems can improve communication between producers, processors, distributors and retailers, thereby reducing delays and improving visibility. The development of digital agricultural systems can therefore shift agribusiness from fragmented decision-making toward more integrated information-based coordination (Miranda et al., 2021; Mendes et al., 2022). Another important mechanism is innovation. Digital technologies can create opportunities for agribusiness organizations to develop new products, services and business models. Paoloni et al. (2021) emphasize the importance of innovation and organizational transformation, while Kraus et al. (2023) highlight the strategic significance of digital transformation. The implication is that digital technologies should not merely automate existing activities. They can also enable organizations to redesign processes and create new forms of value.

**Table 4. Illustrative Digital Value-Creation Index**

| Value Dimension        | Score | Weight | Weighted Contribution |
|------------------------|-------|--------|-----------------------|
| Operational efficiency | 82    | 25%    | 20.50                 |
| Productivity           | 80    | 20%    | 16.00                 |
| Market access          | 78    | 20%    | 15.60                 |
| Information quality    | 88    | 15%    | 13.20                 |
| Innovation capability  | 76    | 20%    | 15.20                 |
| Overall Index          |       | 100%   | 80.50                 |

*Note: Illustrative conceptual values only.*

The illustrative Digital Value-Creation Index reaches 80.50 out of 100. Operational efficiency contributes 20.50 points because of its 25% weight, while information quality contributes 13.20 points. The purpose of this framework is to demonstrate that digital transformation should be evaluated through multiple value dimensions rather than through technology adoption alone. An organization may possess sophisticated digital infrastructure but still create limited value if technology does not improve efficiency, market access, information quality or innovation. The literature further indicates that organizational capability represents an important mediating factor. Digital technologies generate data and information, but data itself does not automatically create organizational value. Managers and employees need analytical skills, digital literacy and the ability to interpret information. The organizational capability perspective therefore provides an explanation for why similar technologies can produce different outcomes across agribusiness organizations. An organization with

stronger managerial capabilities may integrate technology more effectively than an organization with weak organizational readiness (Eby Mathew, 2010; Kraus et al., 2023).

The digital divide represents another significant issue. Large agribusiness organizations may have greater access to finance, infrastructure and technical expertise, whereas small agricultural enterprises may face greater barriers to adoption. Ben Hassen et al. (2021), Mendes et al. (2022) and Zhang et al. (2023) highlight the importance of considering the broader conditions surrounding agricultural digitalization. Technology adoption can therefore create both opportunities and inequalities depending on the distribution of technological resources.

**Table 5. Illustrative Technology Adoption Readiness**

| Adoption Factor                | Low Readiness | Medium Readiness | High Readiness |
|--------------------------------|---------------|------------------|----------------|
| Digital skills                 | 30            | 60               | 85             |
| Financial capacity             | 35            | 62               | 88             |
| Digital infrastructure         | 25            | 65               | 90             |
| Management support             | 40            | 70               | 92             |
| Institutional support          | 30            | 60               | 80             |
| <b>Average readiness score</b> | <b>32.0</b>   | <b>63.4</b>      | <b>87.0</b>    |

*Note: Illustrative conceptual scores, not empirical estimates.*

The table demonstrates the multidimensional nature of technology adoption. High adoption readiness is unlikely to be achieved through infrastructure alone. The illustrative high-readiness situation requires simultaneous improvement in digital skills, financial capacity, infrastructure, management support and institutional conditions. This reinforces the theoretical proposition that successful digital transformation depends on the interaction of technological and organizational factors. Digital transformation also has implications for agricultural sustainability. Digital systems can potentially support more efficient resource use by improving information about production conditions and enabling better monitoring. Bocchi et al. (2012) emphasize the importance of sustainable agricultural systems, while digital transformation literature suggests that technology can support more informed agricultural decision-making. Therefore, digitalization may create indirect environmental value when information is used to improve resource allocation and reduce inefficiency.

At the same time, digital transformation should not automatically be assumed to be sustainable. Digital technologies require investment, infrastructure and skills, and unequal access may reinforce existing social and economic differences. This means that the relationship between digitalization and sustainability depends on how technology is implemented and who has access to its benefits. The sustainability implications of digital agriculture must therefore be evaluated within the broader institutional and organizational context (Bocchi et al., 2012; Ben Hassen et al., 2021).

The framework also highlights the importance of institutional support. Government policies, agricultural extension systems, financial institutions and rural development organizations can influence technology adoption by providing infrastructure, training, financing and knowledge. Agricultural digital transformation therefore cannot be considered exclusively an organizational responsibility. It represents a broader ecosystem process involving farmers, agribusiness firms, technology providers, governments and other stakeholders. Recent contributions from Akudugu et al. (2023), Pyburn et al. (2023), Zhang et al. (2023) and Zhao et al. (2023) indicate the increasing importance of digital technologies and innovation within agricultural transformation. However, these developments also reinforce the need for theoretical integration. Digital technologies are increasingly available, but the central managerial question is how organizations can convert technological resources into sustainable and measurable value.

## Conclusion

Digital transformation is fundamentally changing the structure, processes and management of contemporary agribusiness. The increasing availability of digital technologies has created new opportunities for improving agricultural productivity, information management, market access, supply-chain coordination, innovation and organizational performance. However, the analysis presented in this paper demonstrates that digital transformation cannot be understood simply as the adoption of technological tools. Technology adoption represents only one component of a broader transformation process involving organizational capabilities, human skills, financial resources, infrastructure, institutional support and managerial adaptation.

The conceptual framework developed in this study integrates technology adoption and value creation within a unified agribusiness perspective. The framework proposes that technological characteristics influence the willingness and ability of agricultural organizations to adopt digital technologies, while organizational readiness and institutional conditions

determine the effectiveness of implementation. Digital capabilities then transform technological resources into improved organizational processes and ultimately into economic, operational and strategic value. This perspective extends the literature by connecting agricultural digitalization with organizational transformation and value creation rather than treating technology adoption as an isolated outcome (Mendes et al., 2022; Kraus et al., 2023).

One of the central conclusions is that information represents an important source of value in digital agribusiness. Agricultural organizations operate in environments characterized by uncertainty, information asymmetry and complex relationships among producers, suppliers, processors, distributors and consumers. Digital technologies can improve information availability and facilitate communication, thereby supporting more effective coordination and decision-making (Andreopoulou et al., 2014; Van Baalen et al., 2005). However, information generates value only when organizations possess the skills and capabilities required to interpret and use it. The study also emphasizes the importance of organizational readiness. Financial resources, infrastructure, management support, employee skills and institutional conditions influence whether technology adoption produces meaningful outcomes. Consequently, investment in digital technology should be accompanied by investment in human capital, training, organizational learning and managerial capabilities. This is particularly important for smaller agricultural organizations that may face greater financial and infrastructural constraints than large agribusiness firms (Babu & Joshi, 2019; Ben Hassen et al., 2021; Zhang et al., 2023).

The illustrative numerical tables further demonstrate how digital maturity, adoption readiness and value creation could be evaluated in future empirical research. The tables show that digital transformation can potentially be assessed through multiple dimensions rather than a single technology-adoption indicator. Operational efficiency, productivity, market access, information quality, innovation and organizational readiness can collectively provide a more comprehensive understanding of digital transformation outcomes. The study also recognizes that digital transformation can generate both opportunities and challenges. Digitalization may improve agricultural efficiency and sustainability, but unequal access to technology may create new forms of exclusion. Therefore, digital transformation should be accompanied by policies and organizational practices that improve access to infrastructure, skills, finance and knowledge. The benefits of digital agriculture will depend not only on technological progress but also on the ability of agricultural systems to distribute those benefits effectively.

Overall, the paper contributes a theoretical perspective in which digital transformation is conceptualized as a process of converting technological resources into organizational capabilities and value creation. Future empirical research can test the proposed framework using surveys, case studies, structural equation modelling and comparative studies across different types of agribusiness organizations. Particular attention should be given to the role of organizational readiness, digital skills, institutional support and technology integration. The central conclusion is that successful digital transformation in agribusiness depends not simply on adopting more technology, but on developing the organizational and institutional capabilities required to transform technology into meaningful and sustainable value.

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