

A Systematic Review of the Literature on Barriers to Digital Transformation and Strategic Management Aimed at Enhancing the Competitiveness of Agribusinesses

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Abstract

The digital transformation and strategic management of businesses are essential components of competitiveness, but research studies show that there are still barriers that prevent the implementation of these practices in agriculture. Therefore, the purpose of this study is to identify the barriers mentioned in scientific literature that constrain the processes of digital transformation and strategic management for agribusiness competitiveness. Methodologically, this paper uses systematic literature review as a methodological framework of analysis, following the PRISMA protocol principles. The analysis of scientific indexed publications during the 2019-2023 period was carried out. The barriers have been identified as: limitations in technological infrastructure, limitations in financing, limitations in digital literacy, resistance to changes in organizations, strategic management weaknesses, lack of institutional coordination, and limitations in public policies aimed at fostering innovations. It can be concluded that the overcoming of these barriers necessitates an integrated approach involving digital transformation, strategic management, and collaboration of all parties involved in the sector.

Keywords: Agribusiness, Barriers, Strategic Management, Digital Transformation.

Introduction

The competitiveness of agribusinesses is among the key problems confronting modern agri-food systems as there is an imperative to enhance productivity, satisfy market demands, and adopt sustainable modes of production. In this scenario, digital transformation has acquired its significance by making it possible for the adoption of technologies like artificial intelligence, IoT, data analytics, cloud computing, and precision agriculture, which contribute to decision-making and effective management of production units. In this connection, Abbasi et al. (2022) emphasize that the process of digitization transforms the management of agricultural systems as it allows for a better utilization of resources and enhances productivity, whereas Jakku et al. (2021) state that digital technologies are among the key motivators for innovations in order to achieve competitiveness and sustainability of agriculture.

However, utilizing such technologies involves more than using digital instruments and entails organizational procedures that allow for strategic management of them. In this regard, strategic management becomes a vital element in the process of turning the technological potential into a competitive advantage. According to Luo et al. (2022), digital transformation can produce substantial effects only through its interaction with the processes of planning, organizational leadership, and knowledge management. Meanwhile, Ureña-Españat et al. (2022) emphasize that the competitiveness of agribusinesses today becomes conditional upon the capability of organizations to integrate technological

innovations with managerial approaches to changes in the production environment.

In recent times, there has been an increase in the number of studies carried out regarding the topic of digital transformation as applied to agriculture. Different authors have investigated the adoption of digital technologies, Agriculture 4.0, smart manufacturing, automation, and application of digital technologies in order to make processes more sustainable and competitive. In this respect, Abbasi et al. (2022) argue that many articles have discussed emerging technologies and their possible advantages, whereas Jakku et al. (2021) state that the increase in the number of reviews has helped to understand what fosters and hinders the adoption of technologies in production.

In spite of such advancements, the current empirical evidence indicates the existence of important conceptual and methodological discrepancies concerning the identification of the obstacles that hinder digital transformation as an aspect of strategic management and competitiveness of agribusinesses. Such research tends to study technological, economic, or social barriers separately without considering the ways in which these barriers interact with each other and create obstacles for the competitive performance of agribusinesses. The same can be said about sectoral, regional, and technological limitations as the majority of studies tend to concentrate on particular aspects only.

Thus, the problem driving the need for the review in question is that, despite the emerging amount of studies dedicated to the digitization process in agriculture, there is still no synthesis of these findings enabling one to

reveal the barriers standing in the way of the digitization and strategic management processes that can enhance competitiveness of agribusiness. It prevents us from understanding a complex issue where a variety of elements such as technological, financial, organizational, institutional, and capacity building play their role.

The absence of an overall vision is one of the reasons why there are no adequate approaches for creating strategies that will facilitate innovations in agriculture. Therefore, the following issues should be taken into consideration: What are the major obstacles to digitalization and strategic management in the agribusiness mentioned in the scientific literature? What are the repeated factors in various countries? And what are the tendencies that can help improve the competitiveness of the sector strategically?

The rationale for performing the systematic review lies in our ability to consolidate the scientific knowledge that has been produced in recent years and obtain an organized perspective on the barriers to digital transformation in agribusiness. Moreover, by consolidating the existing evidence, we could lay the groundwork for further research in order to strengthen strategic management practices in agriculture and formulate public policy to promote innovation and competitiveness in the sector.

From the point of view of science, the research is useful for putting together findings that were fragmented earlier and discovering trends identified by researchers working in various geographic environments. Such an approach will allow us to determine analytical categories for major impediments to digital transformation and strategic management, thus creating a conceptual foundation for developing strategies that help make businesses more competitive and sustainable.

Consequently, the purpose of this research is to find out, using a systematic review of literature following the PRISMA approach, the main barriers that have been found out by the scientific community to be hampering digital transformation and strategic management in order to make agribusinesses more competitive in the years from 2019 to 2023.

Theoretical Framework

Contemporary agribusinesses' competitiveness is determined by the integration of technological processes and managerial choices which transcend the boundaries of classic agricultural activities. Explaining this integration implies conducting a simultaneous study of three dimensions which have been examined in the scientific literature increasingly frequently: digitalization as an operational driver, strategic management as a decision-making tool, and competitiveness as a result of both of them. This section will analyze these conceptual dimensions through a logical sequence, which will enable the reader to see how each one of these dimensions has provided important theoretical background for the analysis of barriers to implementing them.

The theoretical framework consists of four interrelated parts. The first one starts with the discussion of the definition, history, and technologies of digital transformation in agriculture. Next, the theory of strategic management as an instrument of competitive advantage is examined, followed by an analysis of the multifaceted notion of competitiveness combining such aspects as innovation, sustainability, and resilience. Lastly, the integrative approach explaining the necessity for collaboration between digital transformation and strategic management to ensure the competitive development of agribusinesses is formulated.

Digital Transformation in Agribusiness

Digital transformation in agribusiness can be described as a process whereby digital technology gets incorporated into agriculture activities in order to change the traditional business models. According to Bongomin et al. (2020), digital transformation in agribusiness occurs due to the convergence between the fourth industrial revolution and agri-food system, leading to the emergence of what is referred to as Agriculture 4.0. The digital transformation in agribusiness according to Yang et al. (2022) is a process that does not happen all at once but a process that evolves through different stages from computerization of activities to the incorporation of intelligent systems that add value to the entire production chain.

The importance of digital transformation stems from the opportunities to enhance production efficiency, lower operating costs, and improve data-driven decision making. According to Birner et al. (2021), digitization of agriculture is led by big companies and start-ups working on the creation of sensors, data analytics, and application of artificial intelligence in agriculture. Ibrahim and Truby (2023) emphasize that technologies like artificial intelligence, robotics, IoT, and machine learning allow for predicting the patterns of production and optimizing the usage of resources. Thus, new competitive advantages are formed.

Agriculture 4.0 is the highest form of this concept in which smart machines, big data and communication technologies are used to increase the accuracy of agriculture. As stated by Bongomin et al. (2020), this concept comes after other concepts related to mechanization and automation and considers digitalization as the framework structure of the current production system. According to Fielke et al. (2022), agri-food digitization does not only involve the use of technologies but changes the relationship between producers, institutions, and markets, therefore necessitating an approach that considers the social aspect of agribusiness along with the technological aspect.

Strategic Management: The Cornerstone of Competitiveness

Strategic management can be considered the process of decision-making through which organizations formulate, implement, and evaluate the decisions that lead to

achieving their long-term goals. According to Fuertes et al. (2020), the idea of strategy emerged from its military origins to the description of organizational goals, resource allocation, and the formulation of actions based on changes in the competitive environment. In this regard, strategic management can be defined not as a one-time event but rather as a continuous process of formulation, implementation, and evaluation in order to adapt to the internal and external conditions of an organization's operations.

The attainment of competitive advantage in strategic management is dependent on how an organization can position itself in relation to its competitors and continue maintaining such a position in the long run. According to Fuertes et al. (2020), the strategic management allows organizations to create value, enhance their competitiveness, and steer managerial decisions in a manner that helps realize organizational goals. Moon (2022) observes that in industries in which competition dynamics are absent in the same way they are missing in most of agricultural production activities the lack of a deliberate strategic approach leads to inefficiency. Strategic management is vital for agricultural companies because these enterprises have to operate in conditions of climatic uncertainty, market volatility, and a lack of differentiation of basic goods. Lukyanova et al. (2020) suggest scenario planning as the strategic approach which can be used for the development of agro-industrial complex since it provides for the consideration of different scenarios and facilitates decision-making in the long run for rural territories. According to Qiu et al. (2023), strategic management knowledge is a fundamental skill for agricultural specialists since it is used as the basis for family farms and cooperatives' management on efficiency and competitiveness principles.

Agribusiness Competitiveness

Agribusiness competitiveness transcends its economic facet and embraces the innovative potential of production enterprises. Asem Hiablie et al. (2023) posit that technological competition involving innovations is the decisive variable for the sustainable development of agricultural systems in cases when there remain structural weaknesses which restrict development of this industry. According to Ureña Espaillat et al. (2022), the management of knowledge and innovation stimulates creativity and competitiveness of agricultural businesses which makes them more responsive to challenges of the changing world market and environment.

Agricultural resilience and sustainability are two interconnected aspects of modern agricultural competitiveness. Asem Hiablie et al. (2023) point out that the development of resilience, agility, and adaptability is a necessary aspect of solving various challenges that affect agriculture including those in areas where there are risks of experiencing both climatic and health crisis. According to Ureña Espaillat et al. (2022), the responsible innovation focused on environmental

sustainability can help agribusinesses change the structure of their production while preserving their economic sustainability.

The concept of value creation complements the definition of competitiveness in agribusiness through the relationship between productivity, society, and institutions within agri-food chains. As Malhotra et al. (2023) state, the objective of interventions within agricultural value chains is to enhance the market power of producers by ensuring their access to improved market conditions and sources of income. In other words, this means that competitiveness in agribusiness is not just about being productive, but rather about innovation, sustainability, resilience, and value creation – all integrated into a unified process of development.

Factors of Digital Transformation and Strategic Management in the Competitive Development of Agribusinesses

Digital transformation and strategic management are not parallel concepts; they are complementary aspects of the process of development of competitive capability. Ge et al. (2022) maintain that the adoption of digital technologies requires developing dynamic capabilities which will allow organizations to align themselves structurally, procedurally, and through their business models to new technological trends, and thus the role of strategy will be the guiding concept which helps understand technology adoption. Otherwise, technology adoption becomes the means for its own sake.

The combination of the two aspects gains particular significance in situations of uncertainty when the responsiveness of an organization determines its survival. As is proven by Browder et al. (2023), having developed technologies beforehand, organizations become capable of adjusting their activities and developing organizational resilience; thus, using technologies strategically allows transforming technological developments into a source of competitive advantage for firms. It is obvious from the above discussion that resilience is not a consequence of technologies' presence, but of the capability of their strategic application.

En el ámbito agroalimentario, esta integración se traduce en la capacidad de convertir los datos generados a lo largo de la cadena de suministro en decisiones estratégicas que fortalecen la competitividad del sector. Neto et al. (2023) demuestran que el aprovechamiento de la analítica de datos constituye una fuente de ventaja competitiva para las agroempresas, aunque su efectividad depende de que estas cuenten con las capacidades organizacionales necesarias para interpretar la información y traducirla en decisiones. Este planteamiento confirma que la transformación digital y la gestión estratégica constituyen factores interdependientes cuyo desarrollo conjunto resulta indispensable para consolidar el desarrollo competitivo de los agronegocios.

Methodology

The study is conducted in the form of a systematic literature review, and its purpose is to analyze and summarize the current scientific data on the barriers that hinder the digital transformation and strategic management of increasing the competitiveness of agribusinesses. In order to guarantee the quality of the methodological process, the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) protocol guidelines were used, which consist of the list of 27 items acting as a methodological and structural framework for conducting systematic reviews (Page et al., 2021). This was because of the relevancy of the protocol not only in the scientific field but also in the fields of agribusiness and strategic management.

The process was based on the research question used in finding and selecting the sources used: what are the technological, organizational and strategic barriers that hinder digital transformation and strategic management in order to improve agribusiness competitiveness? According to the research question used, the following criteria of inclusion are set: full-text articles written between 2019 and 2023, written in English or Spanish, peer-reviewed and addressing one of the following variables: barriers to digital transformation in the agricultural sector, strategic management in agricultural firms, agribusiness competitiveness, or digital technology adoption in the agricultural sector. On the other hand, the exclusion criteria used are the following: gray literature, duplicate articles, full text articles, articles addressing industrial sectors other than the agricultural sector, and articles mentioning digital transformation or strategic management without mentioning barriers and agribusiness competitiveness.

The literature review was done in high impact journals which had comprehensive coverage in agricultural sciences, management, and technology like Scopus, Web of Science, ScienceDirect, and Wiley Online Library. The search was augmented by another Google Scholar search in order to find recent literature that is not indexed in the above databases. Boolean operators such as AND

and OR were utilized in constructing the search strings, and therefore enabling to either increase or reduce the results found. The search strings used were "digital transformation AND agribusiness," "barriers AND digital transformation AND agriculture," "strategic management AND agribusiness competitiveness," "transformación digital AND agronegocios," "barreras AND gestión estratégica AND competitividad agropecuaria," and "digitalization OR strategic management OR agricultural competitiveness." Hence, a total of 95 articles were identified.

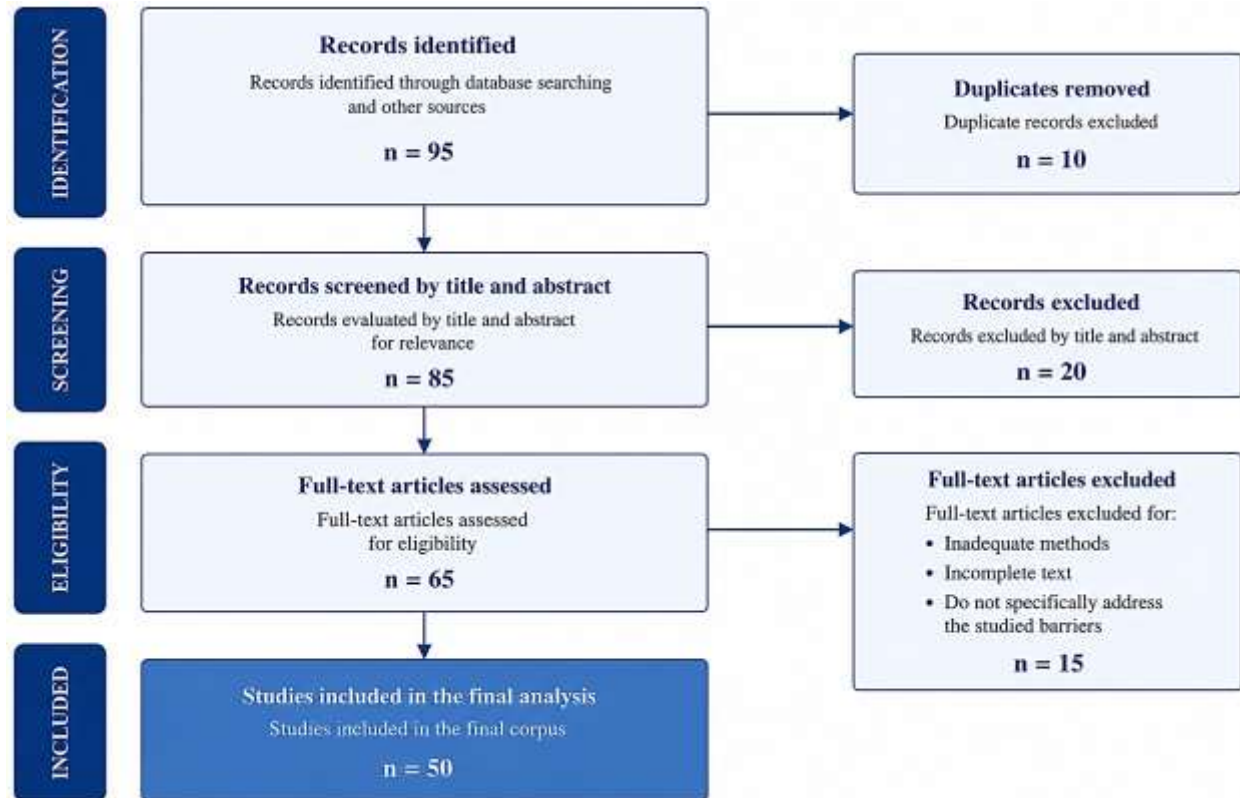
Results

The results conform to the research questions and can be categorized in two distinct analytical phases. The first one concerns the identification and structuring of the bibliographic corpus, during which the selection, inclusion, and exclusion criteria of the consulted documentary corpus were developed. The second one pertains to the critical analysis of this corpus, where the theoretical convergences and tensions of the literature being analyzed were identified.

First Phase Results: Searches for Bibliographic Resources

The selection process was carried out through the four phases of PRISMA 2020 guidelines. During the first phase, 95 bibliographic resources were identified in the Scopus, Web of Science, ScienceDirect, and Wiley Online Library databases as well as in Google Scholar, where duplicates in the sources examined were excluded. During the second phase, titles and abstracts of the documents were screened against the inclusion and exclusion criteria, with those failing to correspond to the research goal being excluded. At the third phase of eligibility, the selected documents were read in full to establish their validity and relevance. Finally, at the fourth phase of inclusion, the corpus was completed and comprised of 50 documents for the review.

Figure 1 PRISMA flowchart of the literature source selection process



Note: The figure depicts the four stages of the process of identification, screening, eligibility assessment, and inclusion of the selected articles for the review, as per the criteria set forth by Page et al. (2021).

From among all the 95 documents identified, 10 of them were discarded because they were duplications in the various databases utilized. Of the 20 documents that underwent title and abstract review, they were excluded from the literature review since they did not pertain to digital transformation or strategic management within the agribusiness industry or they failed to mention the variables of competitiveness. From the 65 remaining documents which were subjected to full review, 15 were then discarded either because they lacked proper methodologies, incomplete texts, or they did not explicitly deal with the barriers in question. This led to the identification of 50 documents.

The selected works were structured in a theoretical framework of systematization according to criteria that included the year of publication, geographic location, methodology applied, type of barrier, and the key factor that was considered in the discussion the technological, organizational, and strategic barriers. This process of systematization helped structure analytical categories that would connect the results with the formulated objectives.

Results from Phase Two: Literature Review

Technological barriers

Based on the analysis of the available literature, it may be stated that inadequate availability of technological infrastructure and weak connectivity constitute the main

technological challenge concerning the study of the problem of digital transformation in agriculture. In this connection, according to Mhlanga & Ndhlovu (2023), inadequate power supply and poor connectivity interfere with the effective implementation of technologies such as precision agriculture and the Internet of Things (IoT). At the same time, Birner et al. (2021) point out the importance of communication, data storage, and cloud computing for sustainable digitization of agriculture.

As per the authors cited above, inequality in the development of infrastructure leads to greater inequality in the access to technology among different regions. In the same way, Xiumei and Xianghui (2022) observe that the difference in broadband and digital service provision in rural and urban settings prevents the equal use of innovations in agriculture, while Taneja et al. (2019) prove that reliance solely on cloud-based technology in regions with low internet access and adverse weather conditions is impossible. Comparison of the above-stated findings implies that technologies applied in agriculture need resilient architectures.

Other issues brought out by the two articles include interoperability and technological access being a condition that goes beyond having technology itself. As pointed out by Neto, Brewer, and Gray (2023), the disparities in the ability to generate, manage, and manipulate data within the various nodes of the agri-food chain inhibit the use of information, whereas, according

to Adereti et al. (2023), the unintuitive user interface and the inability to adapt intelligent decision support systems to local circumstances reduce the likelihood of sustained use. In this regard, the two articles concur on the point that user-friendliness is not only a technical aspect but a condition for equal access to technology.

Differences in the degree of mechanization and integration capabilities are also pointed out in the review. In this context, according to Lowenberg-DeBoer and Erickson (2019), the adoption of satellite navigation technologies is faster on mechanized farms whereas such technologies are hardly implemented by small and medium-size farms in developing countries. As for Brugler et al. (2023), they observe that sensor integration with cloud computing and remote imagery into one operational system is complicated due to the technical complexity and the need for specialized resources. This difference is crucial since it demonstrates that not only is there a territory-based technology gap but there is also a production-scale-related one.

It is clear from the literature analysis that interoperability and connectivity need to be viewed as the process of coordinating different stakeholders rather than just a technical element. Indeed, Moretti et al. (2021) argue that coordination problems between developers, suppliers, and farmers lead to the ineffectiveness of innovative solutions. On the other hand, according to Barbier (2022), there are digital poverty traps, which prevent small farmers from using innovations for enhancing their effectiveness. This means that the problem of overcoming technological barriers in agriculture is not only related to the creation of necessary infrastructure but also to the establishment of a digital ecosystem of coordinated solutions.

Financial Constraints

According to an analysis of the literature on this issue, credit availability is the most significant factor that constrains the modernization of farming operations. In their study, Regassa et al. (2023) establish that the lack of liquidity and transaction costs prevent small producers from making investments in fertilizers and advanced technologies. Also, Ölkens and Mußhoff (2023) argue that the high interest rate and stringent collateral requirements in Mali cause high financing costs, hence limiting investments in equipment and inputs.

However, it is important to stress that the expected economic benefit also affects the readiness to invest in innovations within agriculture. According to Ozdemir (2023), the higher availability of financing positively impacts production and value-added within the industry but credit constraints reduce the competitiveness of small farmers. From the other side, Ma et al. (2023) state that low adoption of digital technologies leads to lower financing possibilities and negatively impacts the availability of credit facilities which has more pronounced effects on less developed areas.

The results clearly reveal that both the approach of collective financing and the use of mobile financial

innovations lead to an increase in investment options for small producers. According to Kotu et al. (2023), collective investment distributes the cost of mechanization between several people, while individual investments demand certain amounts of resources from people who are not able to afford such expenses due to their lower net value. In agreement with this statement, Abdul Rahaman and Abdulai (2021) state that mobile money decreases transaction costs and increases liquidity of small producers, leading to higher investments.

In contrast, however, the application of technology calls for the need to examine carefully the link between investment and anticipated profit from this investment. According to Delay et al. (2021), the application of precision agriculture is advancing slowly due to risk-averse nature, financing constraints, and uncertainties associated with the profitability of integrated technology systems. In addition to this, the argument is supported by the observation of Delay et al. (2023), who claim that the lack of well-defined property rights in agricultural data leads to increased transaction costs and thus hinders the development of digital economy.

Thus, the findings obtained from the review indicate that financial obstacles within the agricultural industry go beyond credit availability and include its cost, its intended use, as well as the economic value of the investment made. The literature indicates that it is necessary to improve the financing instruments, lower the transaction cost and increase the access to digital financial services to achieve the financial viability of farms. However, there are some areas that require further research, particularly related to the long-term impact assessment of these instruments and their specific application depending on the producer's size and capacity.

Human Capital Related Barriers

The majority of reviewed studies point out the importance of digital skills in the context of barriers related to human capital. In particular, Degieter et al. (2023) note that technical training and perceived ease of use encourage the use of robots and UAVs, while poor technological skills reduce the probability of adoption. At the same time, Michels et al. (2020) find out that young farmers, who are more experienced in digital technologies, have higher willingness to use mobile internet, while advanced age correlates with low skills and negative attitude toward digital technologies.

It should be acknowledged that the level of education and access to specialized knowledge also play roles in technology adoption. According to Akzar et al. (2022), farmers who have low educational levels and inadequate capabilities for understanding production-related information adopt technologies at lower rates, preventing their movement from knowledge acquisition to using technologies. On the other hand, Erickson and Fausti (2021) state that successful implementation of precision agriculture technology is based on farmers' capacity for interpreting data and making decisions, and this problem

appears to be especially critical for small-scale producers with limited access to specialized technical expertise.

Apart from this, training and institutional support are key elements in overcoming resistance to change. According to Baffoe-Bonnie et al. (2021), during the COVID-19 lockdown, the inadequate digital know-how and training of the extension service staff prevented its relocation to virtual spaces. In a similar vein, Shako et al. (2021) reveal that the inadequacy in training the extension officers and lack of coordination among institutions impede the transfer of knowledge because the weaknesses of the extension system are not only in producers but also in humans.

It should be noted that the issue of leadership becomes an across-the-board factor that unites both productive and organizational areas. Nguyen et al. (2023) prove that the presence of female leadership together with sufficient training fosters the usage of the Internet and improves the functioning of agricultural cooperatives due to the high age of managers, which creates a generation gap in terms of digitalization. At the same time, Wrede et al. (2020) maintain that leadership on the part of senior management becomes essential in leading organizational changes since uncertainty and fear of losing a job increase resistance to digitalization.

A synthesis of the studies examined reveals that the factors affecting human capital do not hinge upon the mere presence of IT competencies, but upon the presence of a combination of training, institutional leadership, and change management. These three aspects are recognized as being key by the authors of the studies examined, as a greater focus on them can diminish producer and management opposition and increase the sustainability of the process of technology adoption. There is, however, room for further research concerning the adjustment of training procedures to each context's particularities.

Barriers to Organizational and Strategic Management

It should be highlighted that knowledge management is one of the pillars often mentioned as an organizational barrier in agriculture. According to Ureña Espallat et al. (2022), the lack of proper processes of knowledge acquisition, distribution, and utilization results in the inability to innovate in agribusiness companies, while the learning-oriented culture promotes the development of sustainable competitive advantages. Likewise, according to Zhang (2022), the absence of properly defined digital strategies and information management systems hinders adaptation to the competitive environment and long-term planning process in agricultural enterprises.

At the same time, the importance of strategic planning increases significantly when the situation is characterized by high uncertainty. Thus, Young et al. (2023) show that multi-year stochastic programming can be used to model climate variability and its cumulative impact, thus resulting in more realistic decision-making about land-use and allocation of resources compared to the annual model limitations. In a similar vein of thought, Su et al.

(2020) state that the success of rural cooperatives relies on an organizational culture of fairness, trust, and participation.

On the contrary, the field of collaborative governance becomes a subject that is highly vulnerable to organizational constraints. Candemir et al. (2021) state that the diversity of the members and their size, goals, and risks make it problematic to reach an agreement on the principle of "one member, one vote," thus hindering strategic thinking in the long term. In line with the above-mentioned information, Hernández Espallardo et al. (2021) point out that monitoring, socialization, and member selection ensure the prevention of opportunistic actions but can be counterproductive in case of excessive control.

Nevertheless, it is necessary to stress that the process of digitization creates additional issues for strategic management of agricultural data. As Rotz et al. (2019) note, excessive concentration of power within corporations and interoperability of platforms negatively influence planning and create barriers in access to information which could be helpful in making decisions, thus decreasing the independence of farmers. Following this logic, Ibrahim and Truby (2023) state that the absence of governance models and regulatory fragmentation create difficulties in creation of effective digital environment.

In other words, the reviewed evidence leads to a conclusion that the organizational and strategic management barriers in agriculture are united by the necessity to build a collaborative culture, evidence-based planning, and knowledge governance. According to the literature review, it is important to develop all the components listed above in order to enhance decision-making process and sustainable development of the organizations in question (business or cooperative). At the same time, there is still some gap related to control versus autonomy and governance adaptation to new digital realities.

Institutional and Environmental Obstacles

A further finding in the review is that poor institutional coordination affects the adoption of technology within the agri-food industry. Van Campenhout (2022) demonstrates that initiatives aimed at only making price information available will fail to deliver the desired results without institutional coordination and institutional arrangements that link producers, traders, and institutions. Similarly, Waldenström (2022) finds that the weakening of institutions in rural areas through reduction in extension and financing services reduces the institutions for agricultural learning and innovation, particularly in areas where there are difficulties in agriculture.

In the same manner, the management of partnerships and advisory services also acts as an important determinant in the institutional development of the sector. As pointed out by Vellema et al. (2019), the partnerships between the public sector, private sector, and communities do not

necessarily result in transformative change since rigid institutions and unequal power dynamics inhibit them from being able to contribute towards sustainable change. This means that one needs to be aware of the fact that according to Townsend and Noble (2022), the commercialization of extension services makes commercial organizations the leaders.

At another level, the review reveals that the institutional setup of the value chain and public policies is a key factor in the sustainable innovations. According to Jraisat et al. (2022), poor governance mechanisms and the lack of common policies prevent coordination among organizations and make it impossible to develop strategic alliances aimed at sustainability. This evidence is also supported by Späti et al. (2022), who point out that insufficient uptake of precision tools can be attributed not to technical and economic factors but to inadequate policy instruments.

Hence, government incentive schemes are essential in ensuring sustainable innovation processes. According to Liu et al. (2020), using an evolutionary game theory approach, the adoption of low-carbon technologies is based on coherent government incentive schemes and the institutional ability to reconcile subsidies and support. Additionally, according to Wu and Ma (2020), government intervention through subsidies and supervision is imperative at the early stages of adopting the Internet of Things technology, even though government interventions may eventually reduce as stakeholders cooperate in creating a competitive yet cooperative environment.

In summary, the literature reviewed confirms the perception that the barriers posed by institutions and the environment result from the fragmented nature of public policies, poor governance, and lack of cooperation among the actors in the agri-food system. It is evident from the literature review that the need for inter-institutional coordination, incentive structures relevant to specific production conditions, and constant platforms for cooperation is necessary to ensure the sustainability of innovation process. However, there is a need for further research on the transition from government-based models to cooperation and competitive models.

Sustainable Competitiveness Barriers

Based on the analysis of the literature, the use of digital technologies can be considered the key to sustainable competitiveness enhancement of the agri-food industry. Siaw et al. (2022) state that the application of the Internet of Things increases productivity and encourages innovations; however, high implementation expenses and constraints in research and development hinder the development of sustainable competitive advantages. The same idea is expressed by Asem Hiablie et al. (2023), who indicate that the lack of technological resources and insufficient utilization of digital tools among African farmers hinder the effectiveness of the production process.

From yet another viewpoint, competitiveness in sustainability implies that the digital innovations should satisfy the criteria of responsibility and organization management. According to Espig et al., (2022), scientific organizations should strike a balance between productivity, social inclusion, multi-stakeholder engagement, and the environmental impact assessment to make sure that benefits brought about by technology remain sustainable. At the same time, another equally interesting finding presented by Yang and Cui (2022) is that the productivity effect of digital innovations is rather small at the initial stage in the agricultural enterprises in China but gradually becomes stronger.

In this regard, innovation in technology works as a cross-cutting factor driving competitiveness along the whole value chain. According to Hailu (2023), the technological advancement helps to increase output with the same amount of inputs, which ensures food security and environmental sustainability; however, challenges with regards to financing, education, and institutional factors continue to exist and hamper the adoption of innovation. In turn, Mariyono (2019) proves that the move from subsistence farming to commercial farming is determined by the elimination of restrictions concerning financing, information, and human capital.

On the other hand, the stability of value chains under conditions of crisis and digitalization raises further problems of sustainable competitiveness. As it is demonstrated by Manda and Miti (2023), the inclusion of small-scale producers in formalized value chains guaranteed the continuity of production during the pandemic period, but the growth in the cost of imported raw materials has exposed the vulnerability of such chains to shocks. At the same time, in their study Kruk et al. (2023) indicate that the digitalization of sustainability practices makes processes more efficient but demands better technological skills.

In broad terms, the available research evidence suggests that sustainability of competitive advantage within agriculture requires the combination of technological innovations, productivity, resilience, and inclusive value chains. It can be concluded that the available research evidence confirms that overcoming certain obstacles, which relate to cost factors, infrastructure, financing, and technology aspects, are key prerequisites to establishing agri-food systems that are more effective and resilient to environmental changes. At the same time, there is still a lack of clarity concerning the equal distribution of technological advantages among agricultural producers of various scales.

Discussion

The results indicate that barriers to digitalization of agribusinesses are not individual problems, but rather symptoms of a unified problem: the challenge of transforming technological assets into organizational capacities. Poorly developed infrastructure, finance, digital literacy, and institutional coordination support each other and finally limit the strategic capability of

rural organizations. The analysis of barriers is more than the understanding of digitization as technology implementation, since Luo et al. (2022) emphasize that the impact of digitization is associated with planning, leadership, and knowledge management. Therefore, the process of digital transformation should be considered an organizational one.

This means that infrastructure and connectivity are an enabler, but cannot on their own suffice to promote competitiveness. According to Mhlanga and Ndhlovu (2023) and Birner et al. (2021), limitations to electricity, Internet access, storage, and digital services diminish the capacity to exploit advanced technologies. The findings are however further complicated because of the territorial and productive distinctions raised by Xiumei and Xianghui (2022) and Lowenberg-DeBoer and Erickson (2019). Expanding the coverage without paying attention to interoperability, scale of production, and adaptability would simply reinforce existing disparities. As observed by Moretti et al. (2021) and Barbier (2022), digital ecosystems are required that are tailored for producers, and not simply for producers, and are able to deal with existing realities on the ground.

This is an issue that is worsened by the financial element due to the fact that it decides who would be able to join in the process. According to Regassa et al. (2023) and Ölkens & Mußhoff (2023), inadequate amounts of finance, its costs, and the demand for collateral make investments harder, while Ozdemir (2023) relates greater availability of funds to growth in production and added value. Nevertheless, it is not just about having enough money to use, since DeLay et al. (2021, 2023) prove that uncertainties about profitability and data management also discourage adoption. This means that competitiveness should be ensured through affordable lending combined with risk management, crowdfunding, and digital finance services, according to Kotu et al. (2023) and Abdul Rahaman & Abdulai (2021).

Even with the presence of technology and funding, any transformation will be difficult to implement without people having the necessary skills to transform innovations into something meaningful. In accordance with Degieter et al. (2023), Akzar et al. (2022), and Erickson and Fausti (2021), digital competency, education, and interpretation skills are important for innovation implementation. The problem becomes even more strategic since, as proved by Wrede et al. (2020) and Nguyen et al. (2023), leadership plays a significant role in change readiness. Hence, training must include not only technological training of tools but the development of skills to analyze information and decision making. Consequently, continuing education, technical assistance, and management of change become competitive investments.

From this point of view, organizational barriers show that the real problem is not using technologies but transforming the processes of managing knowledge and making decisions. Ureña Espallat et al. (2022) associate knowledge management with innovation and competitive

advantages, whereas Zhang (2022) states that without digital strategy and information systems, organizations are unable to adapt. These problems are accompanied by the difficulties associated with planning described by Young et al. (2023) and the problems with trust and participation mentioned by Su et al. (2020). This means that agribusinesses have to switch from a reactive mode of decision-making to models of information-based, learning, and anticipatory management. The approach suggested by Lukyanova et al. (2020) could be considered appropriate in case of such uncertainty.

The institutional limitations also make it evident that digital competitiveness will not be possible solely via efforts of individual companies or farmers. As noted by Van Campenhout (2022) and Waldenström (2022), the lack of adequate extension, financing and coordinating capacities hinder the transfer of knowledge, while Vellema et al. (2019) warn about partnerships being unable to remain transformational in case there are imbalances of power present. This becomes particularly relevant in consideration of the regulatory fragmentation and problems with data governance highlighted by Ibrahim & Truby (2023) and Rotz et al. (2019). Therefore, differentiated policies, data governance, incentives based on production conditions, and consistent frameworks for public-private-community cooperation become necessary. The public policy has to shift from subsidizing technologies to capacity building and ecosystems.

One of the key implications of this literature review is the realization that the sustainability of competitiveness of agribusiness is in the interplay of innovation, strategic management, resilience and inclusiveness. As shown by Siaw et al. (2022) and Hailu (2023), technology could increase productivity and spur innovation. Nevertheless, its success will depend upon finance, education and institutions. Moreover, the role of inclusion in supply chain management during a crisis is highlighted by Manda and Miti (2023), while the risks associated with exclusion in the process of digital transformation are pointed out by Kruk et al. (2023). Therefore, the barriers identified can only be addressed through the move from adoption to development of digital capabilities.

Conclusions

As per the results gathered from the review, the conclusion is that the processes of digital transformation and strategic management are interlinked in a manner that will make agribusinesses more competitive. This process is not determined by technology alone, but it is determined by the environment that makes technology sustainable. In this regard, competitiveness is viewed from the perspective of technological, financial, human, organizational, and institutional capabilities. If there are deficiencies in any of these capabilities, the potential of innovation and adaptation will be constrained.

However, to be able to deal with these issues, one will need to take an integrated approach that entails much more than just the steps of infrastructure or technology.

The agribusiness must adopt an integrated approach that includes connectivity, financing, training of labor, training of management, and lastly, proper information management. Through this, the digitalization of the process becomes a question of transformation rather than just technology adoption. This will enable investments to improve efficiency and adaptability to competitive environments.

Strategic management becomes particularly relevant due to its role in providing guidance and consistency in digital transformation efforts. The process of technology implementation should include having clear goals, planning, controlling, and capability to forecast situations, manage resources, and make decisions based on changes in the market environment. Hence, to improve agribusiness, it is necessary to create organizations that would be able to learn, manage knowledge and make decisions based on the available information. In this case, this means shifting from reactive management systems to more flexible and proactive ones, based on information and integration of technologies based on real demands of each production unit.

In addition, fostering competitiveness calls for more cooperation between producers, businesses, banks, universities, technology providers, and government agencies. Digital transformation is unlikely to occur when the stakeholders act in isolation or when the policy measures, funding schemes, and technology that is used do not consider the peculiarities of the particular regions and smaller-scale producers. Ecosystems of cooperation are required to enable financing, technology transfer, knowledge transfer, data management, and access to the benefits of digitalization. Such an approach could ensure that the gaps are filled and that technological advances do not contribute to increasing inequality.

Therefore, it should be said that the development of the competitive advantages of the agribusiness implies the gaining of the digital transformation and strategic management as the permanent competences rather than the temporary actions. The key point is the creation of the conditions under which it is possible to implement the technology using the business approach, inclusiveness, and sustainability. Moreover, the literature review proves the need for the further research about the interaction of the mentioned capabilities and their influence on the efficiency and involvement into the value chain. Such an approach will help to develop more context-specific models of transformation.

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