Digital Transformation And Omnichannel Strategies In Indonesian Agricultural Retail: A Technology Organization Environment Perspective.

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Abstract. Digitalisation is reshaping how agricultural products and farm inputs move along value chains, yet the role of agricultural retailers in this process remains underexplored. This study investigates digital transformation and omnichannel strategies in Indonesian agricultural retail, focusing on agro input shops and agrifood outlets that combine physical stores with digital channels such as social media, marketplaces, and websites. Guided by the Technology Organization Environment framework, it analyses how technological, organisational, and environmental factors influence omnichannel adoption, identifies key barriers, and examines perceived effects on business performance. A mixed method design is employed: in the qualitative phase, semi structured interviews with owners and managers explore current digital practices, drivers, and obstacles and inform the development of a structured questionnaire; in the quantitative phase, survey data from agricultural retailers in several Indonesian regions are analysed using partial least squares structural equation modelling. The results indicate that all three Technology Organization Environment dimensions have positive and significant relationships with the degree of omnichannel adoption. The study also finds important barriers, including limited rural digital and logistics infrastructure, seasonal demand patterns, perceived high costs of integrated systems, gaps in digital skills and confidence, and difficulties in integrating data and processes across platforms. Higher levels of omnichannel adoption are associated with improved perceived sales, customer relationships, and operational efficiency. Overall, the findings suggest that well designed omnichannel strategies can strengthen the intermediary role of agricultural retailers and support more efficient and inclusive agricultural marketing systems in Indonesia.

Keywords: Digital transformation; Omnichannel retail; Agricultural retail; Agrifood sector; Technology Organization Environment (TOE)
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INTRODUCTION

Rapid advances in digital technology have transformed retail industries worldwide, reshaping how firms design customer journeys, manage operations, and create value across channels[1], [2]. In many countries, digital transformation in retail is no longer limited to front end marketing but increasingly involves the integration of data, processes, and platforms throughout the value chain, from sourcing to last mile delivery. In the agrifood sector, digital technologies play a growing role in coordinating agricultural product supply chains, improving information flows between farmers, intermediaries, retailers, and consumers, and enabling new business models that connect farms and markets more efficiently. Recent work shows that digital transformation in agricultural product supply chains is driven by external pressures such as changing diets and food waste, as well as internal needs for industrial upgrading and competitiveness in agri food systems[3], [4].

Alongside this broader transformation, omnichannel retailing has emerged as a dominant strategic approach. Omnichannel refers to the integration of physical and digital channels to deliver a seamless, consistent customer experience across touchpoints, going beyond simple presence in multiple channels[5], [6]. Research shows that effective omnichannel strategies can improve customer experience, extend market reach, and stimulate sales growth by synchronising inventory, pricing, and promotions across online and offline environments [7].

Systematic reviews confirm that scholarly interest in omnichannel retailing has grown steadily, but most examples concern general retail sectors such as fashion, electronics, and modern grocery in developed markets, rather than agriculture oriented retailers[8].

In agriculture and food, digitalisation and omnichannel strategies are beginning to reshape how products and services reach farmers and consumers[9], [10]. Case evidence from an internationalised agri food small and medium sized enterprise shows that digitalisation can support a staged transition from traditional export channels to more integrated omnichannel configurations, combining online platforms and physical distributors to serve foreign markets [11]. Other studies highlight specific omnichannel formats such as buy online and pick up in store for agricultural and fresh products, which allow consumers to order online while collecting from physical outlets, thus combining convenience with product quality and trust [12]. At the same time, the rapid diffusion of social media and digital analytics provides agribusinesses with new tools to understand and influence consumer behaviour and to communicate with farmers in real time [13].

Indonesia provides a particularly dynamic context for studying digital transformation and omnichannel retail in agriculture. The country has one of the fastest growing digital economies in Southeast Asia, with strong uptake of e commerce platforms among firms and consumers[14], [15]. Previous research shows that e commerce adoption among Indonesian micro, small, and medium enterprises can improve performance and financial inclusion, although disparities in digital capabilities between large and small retailers remain significant [16]. More recently, studies on agricultural and fresh product markets in Indonesia illustrate how digital platforms are changing marketing practices. Research on an Indonesian agricultural e commerce platform shows that technology acceptance factors, social influence, and facilitating conditions shape usage behaviour for fresh product e commerce [17]. Other work on online purchases of agricultural products in Jakarta finds that consumer behaviour, subjective norms, and time savings are key drivers of intention to buy agricultural products via e commerce [18]. Evidence from digital vegetable farmers indicates that participation in e commerce can increase sales and alter the role of intermediaries in fresh produce value chains [19].

However, most of these studies focus on farmers, platforms, or general micro, small, and medium enterprises rather than on agricultural retailers as a specific category of actor. Agricultural retailers such as agro input shops and agrifood outlets play a strategic intermediary role in the agricultural system[20], [21]. They link farmers with input supply, technical advice, and downstream markets. Yet, empirical studies that examine how these retailers adopt omnichannel strategies, what drives or hinders their digital transformation, and how omnichannel practices affect their performance are still limited[22]. Existing omnichannel research mainly addresses non agricultural retail sectors and tends to treat retailers as generic firms, without considering the specific conditions of agricultural value chains, such as seasonality, rural infrastructure gaps, biological risks, and strong trust based relationships with farmers [1], [2], [6].

There is therefore a clear research gap at the intersection of digital transformation, omnichannel retailing, and agricultural systems. While agri food studies document how e commerce and digital platforms affect farmers and consumers, they typically analyse single online channels rather than integrated omnichannel strategies that combine physical stores, online marketplaces, social commerce, and direct delivery [11], [12], [17], [18].

Likewise, research on digital agriculture often emphasises production technologies or macro policy issues rather than the managerial challenges that agricultural retailers face when synchronising online and offline operations. As a result, little is known about how technological, organisational, and environmental factors jointly influence omnichannel adoption among agricultural retailers, and how omnichannel strategies contribute to the performance of agricultural retail businesses that serve both farmers and end consumers.

To address this gap, the present study applies the Technology Organization Environment framework to the context of omnichannel adoption in Indonesian agricultural retail [23]. The study focuses on agricultural retailers and agrifood outlets that combine physical stores with digital channels such as marketplaces, social media, and proprietary applications. It contributes to the literature in three main ways. First, it extends omnichannel research by analysing agricultural retailers as key intermediaries in the agricultural value chain, rather than treating them as generic retailers. Second, it shows how typical characteristics of agricultural systems, including seasonality, dependence on rural infrastructure, and trust based relationships with farmers, shape the way Technology Organization Environment factors influence omnichannel adoption. Third, it examines how omnichannel strategies relate to business performance outcomes such as sales, customer loyalty, and operational efficiency in the specific context of Indonesian agricultural retail.

Accordingly, the study addresses three research questions. The first concerns which technological, organisational, and environmental factors determine the adoption of omnichannel strategies by agricultural retailers in Indonesia. The second concerns what barriers these retailers encounter when implementing digital transformation for omnichannel services. The third concerns how the degree of omnichannel adoption relates to business performance outcomes in terms of sales, customer loyalty, and operational efficiency in Indonesian agricultural retail.
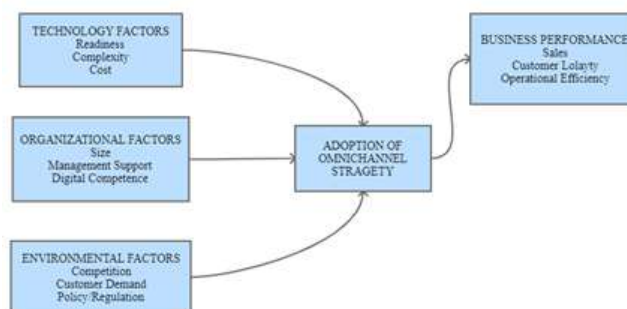

Figure 1. Conceptual Frameworks

Figure 1 presents the conceptual framework of this study, which links technology, organization, and environment factors to omnichannel adoption and business performance in Indonesian agricultural retail.

MATERIALS AND METHODS

Research design

This study uses a mixed method approach that combines qualitative and quantitative techniques. The qualitative stage has an exploratory character and is designed to obtain an in depth understanding of the determinants and barriers of digital transformation for omnichannel strategies in Indonesian agricultural retail. Insights from this stage

are used to refine the conceptual model and to develop the survey questionnaire. The quantitative stage has a confirmatory character and tests the conceptual model based on the Technology Organization Environment framework, by examining the relationships between the main constructs using advanced statistical techniques.

The mixed method approach is chosen because the topic of digital transformation and omnichannel strategies in agricultural retail is complex and involves both technological and organizational change as well as external pressures. A purely qualitative design would not be sufficient for empirical testing of the conceptual model, while a purely quantitative design would not provide enough depth about practical challenges faced by agricultural retailers. The overall research design is therefore both descriptive and verificative. The descriptive element portrays the current state of digital transformation and omnichannel adoption in Indonesian agricultural and agrifood retail. The verificative element tests the influence of Technology Organization Environment factors on the adoption of omnichannel strategies and the impact of these strategies on business performance.

Study setting and units of analysis

The study is conducted in several regions in Indonesia, focusing on agricultural and agrifood retailers that combine physical outlets with digital channels. These include modern agrifood retailers such as supermarkets that sell fresh produce, specialized agro input shops that distribute seeds, fertilizers, pesticides, and small farm equipment, as well as agricultural small and medium enterprises and farmer cooperatives that market agricultural products through online platforms while maintaining physical points of sale. The empirical work is concentrated in urban and semi urban areas, such as Manado and Surabaya, which serve as hubs that connect rural production areas with urban markets.

The unit of analysis is the agricultural retail organization. Each organization is represented in the study by one key informant who has sufficient knowledge about digital strategies and operations, typically the owner, a senior manager, or a manager responsible for digital or information technology functions.

Population and sampling

The population consists of agricultural and agrifood retailers in Indonesia that have implemented or plan to implement omnichannel strategies. This includes businesses that already integrate online and offline channels, as well as those that are in the process of developing such integration.

In the qualitative exploratory stage, between ten and twenty informants are selected using purposive sampling. The informants are drawn from owners or managers of agricultural retailers, practitioners responsible for information technology or digital marketing in agribusiness firms, and coordinators of agricultural small and medium enterprises or farmer cooperatives that are engaged in digitalization and online sales. The main criterion for inclusion is direct involvement in planning or implementing digital and omnichannel strategies in agricultural retail.

In the quantitative confirmatory stage, the target respondents are owner managers or senior managers of agricultural and agrifood retail businesses. The planned sample size ranges from two hundred to four hundred respondents, which is adequate for structural equation modeling with several latent variables. Purposive sampling is again used, with the criteria that the retailer operates at least one physical outlet, uses or plans to use online channels such as social media, marketplaces, or proprietary websites and applications, and is willing to participate in the survey.

Data collection procedures

Primary qualitative data are collected through semi structured interviews. An interview guide is used that covers the current digital strategy of the business, perceived drivers of adopting online channels, major barriers in implementing digital transformation and omnichannel strategies, and the perceived outcomes of these efforts. Interviews are conducted either face to face or via online communication tools, depending on the location and availability of the informants. Each interview is recorded with the consent of the participant and transcribed for analysis.

Primary quantitative data are collected through a structured questionnaire that uses a five point Likert scale, from strongly disagree to strongly agree. The questionnaire is distributed both online and in person to accommodate differences in internet access and digital familiarity among agricultural retailers. Online distribution uses email, messaging applications, and survey links shared through agribusiness and cooperative networks. Offline distribution uses paper questionnaires administered during visits to agricultural retail outlets or meetings with farmer groups and cooperatives.

Secondary data are obtained from industry reports on Indonesian agricultural and agrifood retail, official statistics on e commerce and digitalization from Statistics Indonesia, and policy documents from government programs that promote digitalization of micro, small, and medium enterprises, including those in the agricultural sector. These sources are used to enrich the description of the research context and to support the interpretation of findings.

Research instruments

The qualitative instrument is a semi structured interview guide. The guide contains open questions that invite informants to describe their digital and omnichannel strategies, to identify internal and external factors that drive or inhibit digital transformation, and to evaluate the results of implementing omnichannel practices in their agricultural retail business. Probing questions are used to clarify and deepen the information obtained, especially regarding technology infrastructure, organizational readiness, and environmental pressures experienced by agricultural retailers.

The quantitative instrument is the survey questionnaire. It is designed to measure five main constructs, namely technology readiness, organizational readiness, environmental pressure, adoption of omnichannel strategies, and business performance. Each construct is operationalized through several statements that respondents rate on the five point Likert scale. For example, technology readiness includes items on the extent to which the information technology system supports integration between online and offline channels, the affordability of omnichannel technology implementation, the ease of use of digital tools for employees, the quality of internet infrastructure at the business location, and access to technology providers that support omnichannel systems. Organizational readiness includes items on digital competence of staff, management support for digital transformation, openness of organizational culture to technological change, the presence of personnel dedicated to online channels, and the extent to which organizational structure supports coordination between online and offline activities. Environmental pressure includes items on competitive pressure, customer demand for online services, government support for digitalization, support from suppliers and partners for managing online channels, and perceived pressure to provide fast and convenient online services in the business environment. Adoption of omnichannel strategies includes items on the existence of an integrated online offline

strategy, consistent product stock information across channels, the ability of customers to order online and pick up in physical outlets, the availability of systems for cross channel returns, and consistency of promotions and prices across channels. Business performance includes items on perceived increases in total sales, customer loyalty, operational efficiency, service quality, and competitive advantage as a

result of implementing omnichannel strategies. Exemplary items are summarized in the variables and indicators table, while the full list of questions appears in the appendix.

Table 1 summarises the constructs used in this study, their roles in the model, operational definitions, and example questionnaire items.

Table 1. Variables, operational definitions, and example items.

Construct	Role in model	Operational definition	Example item (5-point Likert)
Technology readiness	Independent	Availability and quality of IT and internet that support online–offline use.	Our IT system supports integration between online and offline channels.
Organisational readiness	Independent	Culture, skills, and management support for digital and omnichannel change.	Management supports digital and omnichannel initiatives.
Environmental pressure	Independent	External pressures from competitors, customers, partners, and regulation.	Our competitors increasingly use digital channels to serve customers.
Omnichannel strategy adoption	Mediating	Level of integration between physical stores and digital channels.	We manage online and offline channels in an integrated way.
Business performance	Dependent	Perceived improvements in sales, customers, and efficiency from omnichannel use.	Omnichannel strategies have improved the sales performance of this business.

Variables and operational definitions

The study includes three sets of independent variables, one mediating variable, and one dependent variable. The independent variables are technology factors, organization factors, and environmental factors. Technology factors capture perceptions of technology readiness, investment and implementation cost, system complexity, and the suitability of digital solutions for agricultural retail. Organization factors capture company size, human resource competence, and the degree of management support for digital transformation in agricultural retail organizations. Environmental factors capture competitive intensity in agricultural and agrifood markets, customer demand for digital services, and the broader regulatory and infrastructural environment in which agricultural retailers operate.

The mediating variable is the adoption of omnichannel strategies by agricultural retailers. It reflects the extent to which the business integrates online and offline

channels in a coherent way, rather than merely using multiple channels in parallel. This includes strategic, technological, and process integration between physical outlets, online platforms, and supporting logistics. The dependent variable is business performance, defined in terms of perceived improvements in sales, customer loyalty, and operational efficiency that are attributable to omnichannel strategies. These dimensions are measured from the perspective of the retailer, consistent with the focus of the study on the provider side rather than the exclusive perspective of consumers.

Data analysis

Qualitative data analysis begins with transcription of the interviews. The transcripts are then coded and analyzed using thematic analysis. The aim is to identify recurring themes related to drivers and barriers of digital transformation and omnichannel strategy in agricultural retail, as well as patterns of successful and less

successful practices. Themes emerging from this analysis are used to refine the quantitative instrument and to enrich the discussion of quantitative findings. Dedicated qualitative data analysis software such as NVivo or ATLAS.ti can be used to support this process.

Quantitative data analysis starts with data cleaning and descriptive statistics, followed by tests of validity and reliability of the measurement scales. Construct reliability is assessed using Cronbach's alpha and composite reliability measures, and construct validity is evaluated using confirmatory factor analysis. After satisfactory measurement properties are established, structural equation modeling using partial least squares is employed to test the relationships between the Technology Organization Environment factors, omnichannel strategy adoption, and business performance. This technique is chosen because it is suitable for models with multiple latent variables and mediating relationships, and it can handle moderate sample sizes, which is relevant for a survey of agricultural retailers. Software such as SmartPLS, AMOS, or SPSS is used to perform the quantitative analysis.

RESULTS AND DISCUSSION

This section presents the empirical findings on digital transformation and omnichannel strategies in Indonesian agricultural retail and discusses them in relation to previous research on omnichannel retailing, e commerce, and agricultural markets. The results are organised around the profile of agricultural retailers and their current omnichannel practices, the influence of Technology Organization Environment factors on omnichannel adoption, the main barriers to digital transformation, and the effects of omnichannel strategies on business performance.

The survey shows that most participating firms are micro, small, and medium sized agricultural retailers. They include agro input shops that sell seeds, fertilisers, pesticides, and simple machinery to farmers, as well as agrifood outlets that market fresh and processed agricultural products to end consumers. Many of these businesses are family owned and have operated for many years in peri urban and rural areas, acting as important contact points for farmers. They not only supply inputs but also provide informal advice on production decisions, recommended products, and market conditions. This intermediary role distinguishes agricultural retailers from many other retail sectors and underlines their strategic position in the agricultural value chain, linking upstream farmers with downstream markets.

In terms of channel configuration, virtually all respondents operate at least one physical outlet and use at least one digital channel. The most common digital tools are social media and messaging applications, which are used to display product catalogues, share agronomic information, receive and confirm orders, and maintain communication with farmers and consumers. A smaller group of retailers has developed online stores on marketplace platforms or created their own websites and applications. However, only a minority of businesses can be described as fully omnichannel in a strict sense, where information, processes, and customer experiences are integrated across offline and online channels. In many cases, online activities remain loosely connected to offline operations, with separate stock records, limited integration of customer data, and occasional differences in prices or promotions between channels. This pattern is consistent with the idea that omnichannel retailing represents a more advanced stage of digital transformation beyond simple multichannel presence [5], [6], [7].

The qualitative interviews confirm that digital transformation in agricultural retail is gradual and shaped by the specific

realities of agricultural business. Many retailers describe how younger family members or digitally literate staff initiate the use of social media, marketplaces, and online advertising, while more senior owners contribute deep knowledge of agricultural products, suppliers, and local farming networks. Some agro input shops, for example, use messaging groups to coordinate input orders with farmer groups, announce the availability of seeds and fertilisers before planting seasons, or organise promotions for particular products during critical periods. These practices illustrate how digital tools are embedded in existing patterns of interaction between retailers and farmers. They also show that digital transformation in agricultural retail is not simply a matter of adopting generic retail technologies, but involves adapting those technologies to seasonal cycles, production risks, and the information needs of farmers [1], [2].

The structural equation modelling results based on the Technology Organization Environment framework indicate that technological, organisational, and environmental factors all have positive and significant influences on the degree of omnichannel adoption among agricultural retailers. Technological readiness emerges as a strong driver. Retailers with more reliable information systems and internet connectivity and better access to technology providers show higher levels of integration between channels. They are more likely to synchronise stock information for inputs and outputs across physical stores and digital platforms, to offer services such as order online and pick up in store or collection at a nearby agro input shop, and to align promotions and prices across channels. In the agricultural context, this integration is particularly important because it helps farmers obtain timely and accurate information on the availability and price of seeds, fertilisers, pesticides, and other inputs, and helps agrifood retailers manage perishable products more effectively [5], [6].

Organisational readiness also has a clear and significant effect on omnichannel adoption. Agricultural retailers that have staff with adequate digital skills, management that actively supports digital initiatives, and internal structures that facilitate coordination between online and offline activities exhibit more advanced omnichannel practices. Interviewed retailers emphasise the importance of training staff to handle both in store customers and digital inquiries from farmers and consumers, of assigning clear responsibilities for managing digital channels, and of developing new routines that combine physical and digital tasks. These findings highlight that for agricultural retailers, digital transformation involves changes in how employees interact with farmers, how advice is provided, and how information is recorded and used. They support the argument that organisational culture, leadership, and human resource capabilities are central to digital transformation and omnichannel strategy implementation (Begum & Ul Oman, 2025; Fauzzia et al., 2025; Mishra & Varshney, 2024).

Environmental factors are also important determinants of omnichannel adoption. Agricultural retailers that perceive stronger competition from modern supermarket chains, agrifood platforms, and other digitally active retailers are more motivated to invest in omnichannel solutions. They feel pressured to match competitors in terms of convenience, transparency, and service quality, for example by offering home delivery for fresh products or allowing farmers to reserve inputs online during busy planting periods. At the same time, retailers observe that farmers and consumers increasingly expect information to be available online and prefer flexible ordering and delivery options. These pressures are consistent with

evidence that e commerce adoption among Indonesian micro, small, and medium enterprises is driven by market competition and customer expectations, and that digital channels can improve performance and financial inclusion when firms are able to respond effectively (Wirdiyanti et al., 2023).

Despite these positive drivers, the study identifies several barriers that make digital transformation and omnichannel integration in agricultural retail particularly challenging. Infrastructure limitations remain a major problem, especially for retailers operating near rural production areas. Respondents report unstable internet connections and limited logistics services, which make it difficult to maintain real time inventory systems, update online information on product availability, and deliver online orders reliably. For fresh products, inadequate cold chain and storage facilities add to the risk of spoilage, which reduces the feasibility of promising tight delivery windows. These conditions weaken the potential benefits of omnichannel strategies and show that improvements in rural infrastructure are essential for digital transformation in agriculture.

The perceived cost of implementing integrated omnichannel systems is another barrier. Many smaller agro input shops and agrifood outlets see investments in hardware, software, and staff training as risky, especially when demand is seasonal and margins are thin. Some retailers prefer to rely on simple social media and messaging solutions instead of more integrated systems, even though they recognise that manual methods create additional work. Gaps in digital skills and confidence further slow down transformation. Owners and long serving employees are sometimes reluctant to use new tools or to rely on digital records, and they worry about making mistakes or losing important information. These issues indicate that building digital literacy and confidence among agricultural retailers is just as important as providing technological solutions [13], [23].

Technical and managerial challenges in integrating data and processes across platforms constitute a fourth barrier. Many agricultural retailers still manage separate records for physical and online sales, leading to discrepancies in stock levels and confusion about which customers have ordered what, especially during busy agricultural seasons. Some retailers are unable to combine data from social media, marketplaces, and in store transactions into a single customer view, which limits their ability to provide consistent prices, personalised advice, or targeted promotions. This fragmentation makes it difficult to fully realise the potential of omnichannel strategies and confirms that unified customer and inventory data are essential for seamless cross channel experiences [5], [6], [13].

The analysis shows that higher levels of omnichannel adoption are associated with better perceived business performance among agricultural retailers. Retailers with more integrated omnichannel practices report improvements in sales, customer relationships, and operational efficiency. They describe how digital channels help them reach new customer segments, including urban consumers who seek traceable fresh products and farmer groups that prefer pre ordering inputs online. They also report that maintaining continuous communication with farmers and consumers through digital channels helps to strengthen trust and increase repeat purchases. From an operational perspective, integrated channels and data help retailers forecast demand more accurately across seasons, plan purchases from farmers and suppliers, and reduce stockouts or overstocks for both inputs and outputs. These patterns are consistent with evidence that digital transformation and omnichannel

integration can enhance both external and internal performance [1], [2], [16], [23].

However, the findings also show that the benefits of omnichannel strategies are not automatic. When agricultural retailers add online channels without aligning technology, people, and processes, they often experience increased workload and confusion rather than efficiency gains. For example, handling orders manually through messaging applications while keeping separate stock records can lead to double work, errors, and customer dissatisfaction during critical planting or harvest periods. These experiences underline that successful digital transformation in agricultural retail requires alignment between technological, organisational, and environmental elements, as emphasised in the Technology Organization Environment framework and omnichannel literature [1], [6], [23].

Taken together, the results support the relevance of the Technology Organization Environment framework for explaining omnichannel adoption in Indonesian agricultural retail and show how its components operate in a sector that is shaped by seasonality, rural infrastructure constraints, biological risks, and close relationships between retailers and farmers. The study extends omnichannel research by positioning agricultural retailers as key intermediaries in the agricultural value chain and shows that omnichannel strategies, when properly implemented, can contribute to more efficient and inclusive agricultural marketing systems in Indonesia.

CONCLUSIONS

This study examines digital transformation and omnichannel strategies in Indonesian agricultural retail, focusing on agro input shops and agrifood outlets that combine physical stores with digital channels. The findings show that most agricultural retailers are in a transition phase, moving from purely offline operations towards multichannel activity, while only a smaller group has reached integrated omnichannel practices where information, processes, and customer experiences are coordinated across channels. Using the Technology Organization Environment perspective, the study finds that technological readiness, organisational readiness, and environmental pressure are all important drivers of omnichannel adoption. Better systems, stronger management support, staff with digital skills, and increasing competition and customer expectations encourage agricultural retailers to integrate channels and rethink how they serve both farmers and end consumers.

At the same time, the study reveals several barriers that make digital transformation and omnichannel integration in agricultural retail particularly challenging. Limited rural digital and logistics infrastructure, seasonal demand patterns, perceived high investment and maintenance costs, gaps in digital confidence, and difficulties in integrating data and processes across platforms all slow down progress. The results indicate that higher levels of omnichannel adoption are associated with better perceived sales performance, stronger customer relationships, and greater operational efficiency, but also show that simply adding online channels without adjusting technology, people, and processes can create extra workload instead of benefits. Overall, the study suggests that omnichannel strategies have the potential to strengthen the intermediary role of agricultural retailers and to support more efficient and inclusive agricultural marketing systems in Indonesia, provided that they are supported by long term investment in technology, human resources, process redesign, and improvements in rural connectivity.

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