

Leveraging Agricultural Supply Chain Resilience With Digital Transformation in “A Company+Farmers” Mode: From the Perspective of Dynamic Capability Theory

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ABSTRACT

This study presents a lightweight solution for digital transformation in the “A Company+Farmers” mode, integrating an agricultural production enterprise and farmer suppliers into an inter-organizational alliance. A Chinese nationwide agricultural enterprise was investigated as a case study; its digital transformation, combining enterprise social networks and artificial intelligence (AI), proved to be a low-cost solution for supply chain collaboration. A survey was conducted by employing partial least squares structural equation modeling to verify positive impacts on dynamic capabilities in an alliance environment. The findings indicated that enterprise social networks facilitate information sharing while AI facilitates knowledge sharing, building sensing capabilities. Information sharing is more conducive to high-quality collaborative decision making, whereas knowledge sharing is more conducive to making high-quality adaptive decisions. AI has potential values in sharing knowledge across organizational boundaries, helping members know how to seize opportunities, reconfigure resources, and consequently enhance overall resilience.

KEYWORDS

Digital Transformation, Enterprise Social Network, Artificial Intelligence, Agricultural Supply Chain Resilience, “A Company+Farmers” Mode, Dynamic Capability Theory

INTRODUCTION

Agricultural supply chain resilience (ASCR) is vulnerable to natural, operational, and market uncertainty, as well as social and political instability. When facing risks and uncertainties, enterprises

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often adopt redundancy strategies, i.e., increasing redundant inventory and suppliers in advance to improve supply chain resilience (Ivanov, 2022). An alternative strategy is to enhance enterprises' dynamic capabilities. Dynamic capability theory (DCT) is a critical framework for explaining how enterprises gain competitive advantages and resilience in uncertain environments (Chowdhury & Quaddus, 2017; Teece et al. 1997). From a dynamic capability perspective, the enterprise manages external risks and uncertainties by developing dynamic capabilities, a process that includes sensing risks, seizing opportunities, and reconfiguring resources (Belhadi et al., 2022).

In accordance with specific Chinese national conditions, most traditional agricultural planting is still carried out by self-employed individual farmers or smallholder farmers (Sun et al., 2024). This situation is particularly prevalent in southern China. The loose organization of this system limits the ability to establish dynamic capabilities. The "A Company + Farmers" mode is a feasible solution for dealing with loose farmer groups (Fu et al., 2017). A company is located at the center and integrates individual farmers with a temporarily inter-organizational alliance.

Most existing literature on DCT focuses on the intra-organizational level, examining how a single enterprise uses its internal resources to develop its own dynamic capabilities (Eltantawy, 2016; Yuan et al., 2024). However, there is little research in the extant literature applying the DCT framework to an inter-organizational alliance. The present study aims to extend the DCT theory in the loose "A Company + Farmers" mode to facilitate agricultural supply chains (ASCs) and enhance resilience.

Amid the rapid development of digital technologies and artificial intelligence (AI) technologies, the digital transformation of agriculture has been a crucial driver of enhanced ASCR (Luo et al., 2025; Sargani et al., 2025). The Chinese government initiated the "Digital China" strategy a decade ago, of which agricultural digital transformation was a vital component (Zheng et al., 2025). In the latest national agricultural planning initiative (2024–2035), the government proposed implementing smart agriculture, promoting the digital upgrading of ASCs, and cultivating smart agricultural clusters with complete, collaborative chains (Xinhua News Agency, 2025a). According to the latest government work report of 2025, more than half of China's agricultural enterprises and farmers have failed to effectively share and standardize agricultural data, leading to "data silos" and "information barriers" (Xinhua News Agency, 2025b). With the disruptive innovation of large language models (LLMs) and generative AI (GenAI) technologies, AI-empowered digitalization has been reshaping the business models of agricultural digital transformation and smart transformation (Lu, Xu, & Sun, 2025; Tang et al., 2025).

Recently, Li et al.'s empirical study (2024) indicated that the use of GenAI can potentially enhance supply chain resilience. Phuengrod et al. (2025) explained that these benefits are associated with the intelligent collaboration induced by LLM AI technologies. Hence, we pose the first research question:

RQ1: How does digital transformation enhance the dynamic capabilities of a large-scale agricultural alliance to cope with the uncertainties and risks associated with natural disasters, pests and diseases, and market fluctuations, improving ASCR?

The digital transformation of modern agriculture is based mainly on the widespread deployment of the Internet of Things (IoT) and other ubiquitous sensing devices (De Silva et al., 2022; Hrustek, 2020). Agriculture 4.0 aims to achieve autonomous farming and a trustworthy food supply through the comprehensive application of advanced information technologies, e.g., cloud computing, big data analytics, AI, and blockchain (Dayioglu & Turker, 2021; Liu et al., 2021). However, it is neither feasible nor beneficial to deploy ubiquitous sensing devices in such a small-scale, decentralized planting scenario. On the other hand, individual farmers are also unwilling to increase their investment in hardware equipment. An alternative solution is to establish online communities using an enterprise social network (ESN), connect with farmers, exchange data, and improve supply chain transparency.

Zhejiang ZhongYan Industrial Co., Ltd. (hereafter referred to as Company Z) is a Chinese nationwide company engaged in the processing of agricultural products. Company Z has adopted the "A

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