Jian'an Logistics Company : A Guideline of Smart Logistics Development Using 5M Model

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Abstract

This study employed a qualitative research method, conducting semi-structured interviews with employees of Jian'an Agricultural and Animal Husbandry Logistics Company, to explore and analyze the current status and challenges of intelligent logistics within agricultural and animal husbandry logistics enterprises. The key information providers included 15 people from Jian'an Logistics Company, and each interview lasted approximately 45 minutes to 1 hour.The analysis, based on the 5M theoretical model, indicated that the company possessed a solid foundation for developing an intelligent logistics system, but still faced numerous practical challenges in talent development, system implementation, process collaboration, material dispatch, and enterprise management. The study found that a talent shortage was a key bottleneck restricting the development of intelligent logistics, while financial pressures hampered the progress of intelligent upgrades. Furthermore, a comprehensive collaborative mechanism within the agricultural and animal husbandry supply chain was lacking. To address these challenges, this study proposed specific recommendations, including strengthening talent development, expanding financing channels, and building a comprehensive supply chain system, to promote the efficient and sustainable development of the company's intelligent logistics system. This study has both theoretical and practical significance for promoting the transformation and upgrading of intelligent logistics in the agricultural and animal husbandry sectors, and improving logistics efficiency and industry competitiveness.

Keywords : Intelligent logistics, Agricultural and animal husbandry logistics, 5M Theoretical Model

Introduction

Smart logistics is a new business model that utilizes technologies such as the Internet of Things and artificial intelligence to enable logistics systems to make intelligent decisions and optimize their processes (Zhong et al., 2020). Agricultural and livestock logistics connects production and consumption, and its intelligentization is crucial for agricultural modernization

(World Bank, 2023). However, traditional agricultural and livestock logistics faces bottlenecks such as low efficiency, high costs, and information silos (China Animal Husbandry Association, 2024).

The 5M theory (Man, Machine, Material, Method, Environment) provides a systematic framework for analyzing such problem (Warm & Jones, 1990). Technological applications are enabling the upgrading of key elements: Technologies such as the Internet of Things (IoT), AI, and blockchain are reshaping agricultural and livestock logistics (Kshetri, 2022). IoT sensors monitor the transportation environment, ensuring the quality of "materials" (Li, 2024); AI algorithms optimize routes, improving the efficiency of "methods" (VIP Journal, 2025); and blockchain enables end-to-end traceability, strengthening the reliability of "laws" (Wang, 2025). These technologies are essentially intelligent empowerments for the 5M elements (materials, machinery, and communication) (Zhao et al., 2023). Model optimization emphasizes the synergy of key elements: Building an integrated supply chain is the core direction, and the key lies in achieving synergy among the 5M elements (Chopra & Meindl, 2022). For example, by integrating resources through a platform and unifying standardized processes, efficient linkage of "man, machine, material, method, and environment" can be promoted (Warm & Jones, 1990). The challenges are manifested in the shortcomings of the elements: The development bottleneck can be attributed to the lack of the 5M elements: a shortage of professional "human" talents, weak intelligent "machine" infrastructure, standard "methods" that are difficult to adapt to diverse "environments", and the lack of coordination mechanisms among the elements (VIP Chinese Science and Technology Journal, 2025). Conclusion: The development of smart agricultural and livestock logistics needs to be driven by technology, based on the 5M theory as a systematic analysis framework, and targeted at the shortcomings of each element with precise measures and enhanced coordination in order to achieve overall efficiency improvement (Christopher, 2022).

Existing research largely focuses on macro-level talent supply and demand or leading enterprise standards, lacking structural definitions and evaluation standards for the composite skills (such as traditional practical skills and basic operation of intelligent systems) required by small and medium-sized logistics enterprises (Deloitte, 2023). It also lacks research on the adaptability of talent to specific scenarios (such as the correlation between environmental parameters and intelligent equipment settings in livestock logistics) (Gibbs, 2018).

Research objectives

1. To explore the current status of Jian'an Logistics Company in terms of smart logistics talents, including employee skills, training systems, and adaptability to smart logistics technologies.

2. To analyze the relevant equipment and technologies of smart logistics at Jian'an Logistics Company and to put forward suggestions for the company's subsequent intelligent logistics development.

Literature Review

Smart Logistics Management

Intelligent logistics is a new model that utilizes technologies such as the Internet of Things (IoT) and artificial intelligence (AI) to achieve intelligent system decision-making and process optimization (Lee, 2021). Agricultural and livestock logistics connects production and consumption, and its intelligentization is crucial for agricultural modernization (FAO, 2022). However, traditional models face bottlenecks such as low efficiency, high costs, and information silos (China Animal Husbandry Association, 2024). The 5M theory (Man, Machine, Material, Method, Environment) provides a framework for system analysis (Warm & Jones, 1990).

Technological applications drive factor upgrades: IoT, AI, and blockchain technologies are reshaping agricultural and livestock logistics (Kshetri, 2022). For example, IoT sensors monitor the transportation environment (materials) (Li, 2024), AI algorithms optimize routes (method) (VIP Journal, 2025), and blockchain enables traceability (method) (Wang, 2025), essentially providing intelligent empowerment of the 5M elements (Zhao et al., 2023).

Model optimization emphasizes factor synergy: The key to building an integrated supply chain lies in achieving synergy among the 5M elements (Chopra & Meindl, 2022), such as integrating resources through platforms, unifying standardized processes, and promoting efficient linkage between "Man, Machine, Material, Method, and Environment" (Warm & Jones, 1990).

Development challenges reflect factor deficiencies: Bottlenecks can be attributed to a lack of 5M elements-a shortage of professional "Man" talent, a weak foundation in intelligent "Machinery," standards that are difficult to adapt to diverse "Environments," and a lack of inter-factor synergy mechanisms (VIP Chinese Science and Technology Journal, 2025).

Literature research shows that 5M/5M1E analysis has been widely applied to scenarios such as logistics operation optimization (e.g., improving the efficiency of transfer centers), service quality improvement, intelligent scheduling and transportation management, and smart warehouse safety management, providing an effective tool for system bottleneck identification and strategy formulation (Teng et al., 2017; Chen et al., 2020).

Definition of Intelligent Logistics Management

Intelligent logistics management refers to the deep integration of modern logistics and advanced information technology, which leverages tools like the Internet of Things, artificial intelligence, big data analysis and automated equipment to realize intelligent, automated and data-driven optimization of logistics activities, with the aim of streamlining logistics processes and enhancing overall supply chain efficiency.

Liu et al. (2018) defined it in Journal of Cleaner Production as the automation and intelligent decision-making of logistics processes via the IoT, big data and artificial intelligence, highlighting its role in cost reduction and efficiency improvement. Wang et al. (2019) further elaborated in Computers & Industrial Engineering that it is the integration of advanced information and communication technologies to upgrade the intelligence level of logistics systems and ensure efficient, reliable operations.

Wen & Ru (2002) noted that its design and application cover system architecture, core technologies and application scenarios, involving both technical implementation and the optimization of system planning and operation strategies. Dimitra et al. (2022) emphasized technology and capabilities as core elements of logistics innovation, arguing that intelligent logistics management requires the integration of technology application and knowledge management to build an innovation-driven dynamic system. Cui et al. (2020) added that it needs to balance technological and organizational innovation to strengthen logistics enterprises' competitiveness through innovation networks.

Methodology

This study employed a qualitative research methodology, primarily using semi-structured interviews to collect data (Creswell & Poth, 2018). Interviews were conducted with key personnel directly involved in intelligent logistics operations within the Jian'an Logistics Company, including human resources managers, frontline operators, project team members, and heads of the technology/information departments (Bryman, 2016). Priority was given to employees with over two years of relevant experience to ensure in-depth understanding of technology applications (Guest et al., 2006).

The interview outline featured open-ended questions based on the 5M elements of intelligent logistics (People, Machine, Material, Method, Environment), covering dimensions such as job responsibilities, equipment operation, material management, process standardization, and management culture (Patton, 2015). Interviews were limited to one hour (Kvale & Brinkmann, 2009). This study interviewed 15 individuals (Saunders et al., 2019). After interviewing and coding 10 - 12 core personnel, the core issues of intelligent logistics operations were extracted, achieving initial information saturation (Fusch & Ness, 2015). The remaining 3 - 5 individuals served as a saturation validation sample; no new viewpoints or questions will emerge, only existing information was repeated or supplemented, thus confirming information saturation (Saunders et al., 2019). This sample design covered the core information dimensions and enhances the reliability of the conclusions through the validation sample (Yin, 2018).

Interviewee Information Table

Name (code)	age	department	position	Years of working experience
A01	45	Transportation Dispatch Department	Transportation supervisor	10Year
A02	32	Customer Service Department	Customer service specialist	4Year
A03	29	driving convoy	Dedicated line driver	6Year
A04	38	Information Technology Department	Platform Operation	8Year
A05	45	Safety decontamination center	Decontamination administrator	7Year
A06	27	Human Resources Department	Recruiting Specialist	2Year
A07	35	Transportation Dispatch Department	Data Analyst	5Year
A08	30	Finance Department	Cost accountant	3Year
A09	48	Fleet Management Department	Team leader	12Year
A10	36	Project Operations Department	Regional coordinator	6Year
A11	26	driving convoy	Cold chain driver	2Year
A12	40	Customer Service Department	Complaints handler	9Year
A13	33	Information Technology Department	System maintainer	5Year
A14	28	Marketing Planning Department	Content editing	3Year
A15	50	General Manager’s Office	Strategic Consultant	15Year

Findings

Based on the 5M theory, the company has initially established an operational system adapted to the development of intelligent agricultural and livestock logistics, possessing a certain industry foundation and development advantages: clear division of labor and responsibilities; equipped with basic intelligent equipment and systems; sufficient reserves of core materials; relatively standardized core processes; a relatively sound management system; and a certain corporate culture atmosphere (Patton, 2015). However, the company still faces several prominent challenges in its intelligent agricultural and livestock logistics operations: Personnel: Insufficient targeted training, weak skill matching, shortage of multi-skilled personnel, and an imperfect incentive mechanism (Liu et al., 2020); Equipment and Technology: Frequent equipment failures, insufficient technical support, inadequate system upgrade training, and a need to improve stability (Kuang & Kuang, 2019); Materials: Shortages of some materials, high storage and transportation losses, unreasonable procurement plans, and insufficient management refinement (Chopra & Meindl, 2022); Work Processes and Methods: Some processes are not standardized, connections between links are not smooth, data processing is not standardized, and optimization is lagging (Hammer & Champy, 1993); Management Systems and Culture: Unfair and opaque performance evaluation mechanisms, a single incentive method, insufficient refinement of safety and service management, and a need to deepen cultural development (Schein, 2010). Based on their own experience, interviewees offered improvement suggestions covering five key elements, providing important evidence for the company to optimize operations and enhance competitiveness (Yin, 2018).

Discussion and conclusion

5M	Core optimization direction	Implementation path
Man	Building a "three-dimensional skills matrix" to enhance technology adaptability	1. Dual-track training: Basic technical courses + scenario-based practical courses. 2. Mentorship system: Senior employees mentor new employees, passing on technical skills and experience.
Machine	Build a "scenario-based technology matching system" to balance advanced technology with practicality.	1. Phased Upgrade: Prioritize replacing high-failure-rate equipment before implementing AI-based predictive maintenance. 2. Equipment-Scenario Binding Testing: Conduct two weeks of testing in typical scenarios before deploying new equipment, collecting optimization suggestions.
Material	Establish an "intelligent traceability + loss early warning" system	1. Material classification management: Classified by "vulnerability level" and matched with different monitoring intensities. 2. Loss early warning mechanism: Automatically triggers driver-side early warning and dispatch intervention when abnormalities are detected.
Method	Optimize the "human-machine collaboration process" while retaining flexibility for adjustment.	1. Digital Process Mapping: Transforming disinfection, transportation, and other processes into quantifiable digital nodes. 2. Dynamic Iteration: Optimizing intelligent algorithms quarterly based on employee feedback to achieve mutual learning between the system and people.
Management	Establish a "Technology-Business Integration Assessment System"	1. Dual-dimensional incentives: Technology application award + Scenario contribution award. 2. Cross-departmental collaboration: Monthly coordination meetings between the Technology Department and the Operations Department.

This study draws the following core conclusions: 1. Talent shortage is a key bottleneck restricting the development of smart logistics (Arlbjørn & Halldórsson, 2002). There is a severe shortage of multi-skilled logistics personnel, especially "three-dimensional skilled" personnel who possess both technical capabilities and knowledge of the agricultural and livestock industries (Liu et al., 2020). The company's existing training system is incomplete, and career advancement channels are unclear, resulting in low employee acceptance of new technologies and low utilization of intelligent equipment (Liu et al., 2020). 2. Financial Pressure Limits the Progress of Intelligent Upgrades (Kuang & Kuang, 2019). Intelligent transformation requires substantial capital investment, including equipment procurement, system development, and maintenance (Kuang & Kuang, 2019). As a small and medium-sized enterprise, Jian'an Logistics faces the dual pressures of tight cash flow and limited external financing channels, resulting in slow progress on some projects (Kuang & Kuang, 2019). 3. Lack of Collaboration Mechanisms Constrains Overall Supply Chain Efficiency (Wang, 2020). The company's existing logistics infrastructure is aging and incompatible with intelligent systems (Wang, 2020). As "mobile media," transport vehicles pose significant risks during disease transmission, highlighting the insufficient coordination between biosafety management and equipment upgrades (Wang, 2020)

Recommendation

Key Recommendation is that Jianan Logistics should adopt a two-pronged approach of "cooperation" and "local training" to build a "three-dimensional skills matrix" (traditional operations, intelligent technology and industry knowledge) adapted to the development of smart agricultural and livestock logistics. Attracting Financing to Promote Intelligent Upgrades: Core Recommendation: Jian'an Logistics should alleviate its financial pressure through diversified financing channels (equity, debt, and technology cooperation) to support the upgrade of intelligent equipment and systems. Collaborative Construction of a Complete Agricultural and Livestock Supply Chain: Core Recommendation: Jian'an Logistics should promote collaboration between upstream and downstream of the supply chain, especially strengthening the practices of "biosafety control" and "green logistics" in the transportation.

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