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Research on the Reform of the Curriculum System of Logistics Management Major under the Background of Smart Logistics

Luxin Chen, Yunna Liu*

Tianjin University of Technology, Tianjin, China
* **Corresponding author:** liuyunna@tjut.edu.cn

Abstract: With the rapid development of technologies such as the Internet of Things, big data and artificial intelligence, smart logistics has become the core driving force for the transformation and upgrading of the logistics industry, which puts forward new requirements for the knowledge structure and ability quality of logistics talents. This paper first dissects the connotation of smart logistics and its core technical features, and clarifies the technical basis and development direction of the industry transformation. Then, the current development status and challenges of smart logistics are analyzed, and on this basis, an in-depth analysis of the new types of talents needed for smart logistics is conducted, pointing out that the current market urgently needs compound and innovative talents who understand both traditional logistics business and master information technology. Furthermore, through an overview and analysis of the current curriculum system of the logistics management major, it focuses on dissecting its existing problems, such as lagging curriculum content and misplacement of talent cultivation, weak practical teaching links and low degree of intelligence, which lead to the urgent need for reform of the curriculum system of the logistics management major in the context of smart logistics. Finally, this paper proposes a targeted reform plan for the curriculum system of logistics management, aiming to build a new curriculum system that integrates cutting-edge technologies, reshaps the curriculum content based on industrial demands, closely aligns with industrial demands, and at the same time strengthens practical teaching and creates a teacher ecosystem of dual-teacher mobility and project incubation. To provide paths and strategies for the reform of the logistics management curriculum system in the context of smart logistics.

Keywords: Smart Logistics, Logistics Management, Curriculum Reform, Talent Demand Analysis.

1. Introduction

The world economy is moving towards the smart era, influencing all industries, and the logistics industry is beginning to shift towards intelligence and digitalization. Smart logistics, relying on logistics Internet and logistics big data, collaborates and shares innovative models and advanced artificial intelligence technologies, deeply integrates cutting-edge technologies (Internet of Things, artificial intelligence, blockchain) with logistics to drive the rapid leap of smart logistics: intelligent warehousing, unmanned delivery, real-time data optimization comprehensively reshape the operation model, significantly improve efficiency and reduce costs, and optimize the consumer experience. At the same time, it reshapes industrial division of labor and reconstructs the industrial structure, thereby transforming the way the industry develops. Smart logistics breaks down industry barriers, deeply collaborates with manufacturing, agriculture, retail and other industries, builds a seamless supply chain ecosystem, drives upstream and downstream progress, and gives rise to cross-border cooperation and new market space.

In the context of digital-intelligence-driven development, the direction of logistics talent cultivation should shift towards compound talents, and logistics management professional courses should shift towards cultivating multi-disciplinary cross-integration digital intelligence thinking [1], emphasizing the application ability of data analysis technology and decision-making ability [2]. The traditional faculty is mostly composed of academic PHDS, with a relatively single disciplinary background, making it difficult to achieve collaborative innovation education in multiple disciplines, and the mastery of digital core modules such as the Internet of Things, blockchain, operations research optimization, and data science is fragmented; When faced with "5G+AI+ logistics" integrated courses (such as intelligent scheduling algorithms, in-warehouse AMR path planning, logistics big data analysis), only "patchwork" teaching is available, unable to break through the data-business-algorithm closed loop. At this point, the teaching of logistics management in colleges and universities must keep pace with The Times, constantly update teaching content and methods to meet the industry's demand for high-quality, specialized talents [3].

2. Intelligent Logistics Development Status and Talent Demand Analysis

2.1. The Connotation and Core Technical Characteristics of Smart Logistics

Smart logistics is an advanced form of logistics in the context of the digital economy, supported by new-generation information technologies such as the Internet of Things, big data, artificial intelligence, cloud computing, and blockchain, with intelligent equipment as the carrier, data-driven as the core, and collaborative sharing as the concept, to achieve visualization, predictability, controllability, and adaptive optimization of the entire logistics process. It is not just an upgrade of technical means, but a profound transformation of management models, business models and organizational forms, with the ultimate goal of achieving the precise flow of goods from supply to consumption at lower cost, higher efficiency and better experience. It digitizes all elements of

logistics, using RFID, sensors, GPS, video recognition and other means to convert logistics elements into computable data in real time, and at the same time visualizes and makes transparent these data and the entire logistics process through digital twin and visualization platforms, and finally through open API, logistics middle platform and industrial Internet platform, Break down the information silos between enterprises, departments and regions, share resources such as capacity, warehousing, finance and customs affairs online, form a socialized and collaborative logistics ecosystem, and improve the overall logistics efficiency of society.

2.2. Current Status and Challenges of Smart Logistics Development

2.2.1. Current Development Status

In the past decade, the scale of smart logistics systems in China has been expanding rapidly. The market has expanded at an average annual rate of more than 20 percent, and the overall scale exceeded 1.09 trillion yuan in 2023. Among them, the scale of the intelligent warehousing sub-segment jumped from 72.8 billion yuan in 2017 to 159.3 billion yuan in 2023, with a compound annual growth rate of about 14 percent. Technologies such as the Internet of Things, big data, cloud computing, artificial intelligence, 5G and visual recognition have been developed on a large scale in terms of technology application; In physical manufacturing scenarios such as e-commerce and express delivery, equipment like AGV/AMRs, unmanned delivery vehicles and drones have entered the stage of mass use. Automated sorting and intelligent management systems in smart logistics have effectively improved operational accuracy and space utilization in the warehousing process; The logistics cloud is capable of matching capacity and optimizing routes, which significantly reduces empty mileage in the transportation process. It can be seen that the rapidly developing smart logistics is profoundly changing the landscape of the logistics industry and putting forward new requirements for the quality and ability of logistics management professionals. In the face of this transformation, the logistics management profession must actively explore and innovate educational models to cultivate high-quality, compound talents that meet the demands of the smart logistics era [4].

2.2.2. Major Challenges

Smart logistics, as a new business model that combines the Internet with traditional logistics, involves not only the Internet and logistics fields, but also other fields such as transportation, information technology and business [5]. Therefore, there are many challenges in the development of smart logistics. In terms of infrastructure, despite the accelerated popularization of technologies such as 5G and the Internet of Things, the coverage rate of sensing devices at key nodes such as highways, ports, and parks is less than 40%, and a large number of warehousing and transportation equipment still lack the ability to collect real-time data, resulting in prominent "data chain breaks". At the same time, there is a structural shortage of high-end compound talents. Smart logistics requires practitioners to be proficient in both business processes and tools such as AI and big data, while the current curriculum of higher vocational and undergraduate colleges is still dominated by traditional warehousing and transportation, and the mismatch between the skills of graduates and job demands is as high as more than 60%.

The development of smart logistics also faces the challenge of the pressure of green and low-carbon transformation. Under the constraints of the "dual carbon" goals, energy consumption and emission monitoring in the logistics industry have become rigid requirements, but currently the proportion of parks that have achieved real-time online monitoring of carbon emissions is seriously insufficient. The use and promotion of new energy are constrained by the insufficiency of charging and battery swapping infrastructure, which seriously hinders the large-scale implementation of green and smart logistics. Coupled with the frequent occurrence of extreme weather and public health events, the resilience of the logistics network is difficult to guarantee. Currently, smart logistics systems generally lack cross-regional and cross-mode emergency coordination mechanisms. Once key nodes are disrupted, the average recovery time will exceed 72 hours, far higher than the international advanced target of 24 hours.

2.2.3. Intelligent Logistics Talent Demand Analysis

In August 2021, the Ministry of Commerce, the National Development and Reform Commission and other departments jointly issued the "Special Action Plan for High-Quality Development of Trade and Logistics (2021-2025)", providing construction ideas for the development of modern logistics, including promoting the application of modern information technology, promoting the integrated application of digital technology and logistics in all scenarios, and improving the green logistics system. Committed to stimulating the internal driving force and development vitality of logistics enterprises, unblocking the national economic circulation and building a modern circulation system [6]. The demand for talents in smart logistics has shifted from "physical labor" to a "brainpower + technology + management" compound type. There is an urgent need for innovative and compound talents with Python/AI, digital twin, green and low-carbon thinking, and the ability to collaborate across departments, covering the entire process of grassroots operation, skill integration and R&D design in the smart logistics industry. As shown specifically in Figure 1.

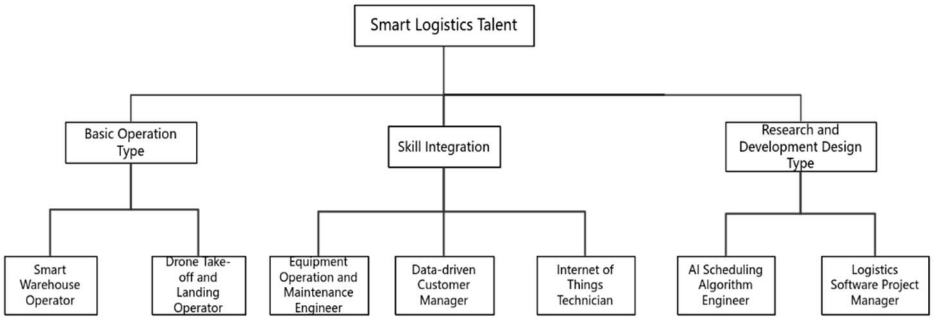

Figure 1. Analysis of the Demand for Smart Logistics Talents

3. Analysis of the Current Situation and Problems of the Curriculum System of Logistics Management Specialty

3.1. Overview of the Curriculum System for Logistics Management

Currently, domestic institutions generally position logistics management as a high ground for cultivating high-quality technical and skilled talents for the front lines of production, circulation, and services. The curriculum system is mostly based on a five-loop progressive framework of "public basic courses - professional basic courses - professional core courses - practical teaching links - elective courses". The professional core courses are centered around traditional logistics industry models such as warehouse management, supply chain management, and logistics information technology, lacking interaction with new technologies and new business forms, and have long been in a "embellishment" state.

3.2. Issues in Logistics Curriculum Management Specialization

3.2.1. Curriculum Obsolescence and Talent Cultivation Misalignment

The current course content can still mainly focus on the traditional logistics industry and lacks integration with new technological elements. Big data analysis, AI algorithm scheduling, Internet of Things practice, and blockchain traceability are only briefly touched upon in many courses, with insufficient class hours and mostly conceptual introduction, lacking code-level and equipment-level practical processes. At the same time, the existing courses are outdated. The textbooks used in the courses have not been updated in a timely manner, and the cases remain at the level of barcodes, RFID, GPS tracking, lacking the latest practical teaching such as digital twins, cloud TMS, API interface calls, and data middle platform construction. In the reform of teaching materials, teachers and administrators should incorporate the institutional concept of "smart logistics" into them and reasonably improve the compilation of teaching materials [7].

In terms of talent development, there is a mismatch between ability development and job requirements. The current logistics education is more theoretical than compound. The curriculum still mainly focuses on explaining traditional concepts and does not incorporate more core abilities such as data analysis, systems thinking, problem-solving, and innovative design. Second, fragmentation is obvious. Each course is taught independently, lacking an integrated and systematic teaching of "demand forecasting - inventory strategy - path optimization - performance analysis", making it difficult for students to form a closed-loop thinking. Third, green and innovation are weak. The proportion of class hours for new energy vehicles, carbon emissions accounting, circular packaging, green supply chain, etc. is insufficient, making it difficult to train students' innovative thinking to meet the demands of the "dual carbon" strategy and industry innovation.

3.2.2. Insufficient Practice Teaching Linkage and Intelligent Level

The educational equipment for traditional logistics management is outdated. The practical teaching link is of great significance in the construction of undergraduate logistics programs. Currently, the practical teaching link of logistics programs in colleges and universities is relatively weak, and students lack practical operation experience [8]. A very small proportion of colleges and universities have AGV, intelligent sorting lines, automated vertical warehouses and Internet of Things experimental platforms, which also leads to the practical training content being biased towards tradition. The training is still mainly based on manual form filling, manual forklifts, paper inventory taking and Excel ledgers, which is out of step with the "data-driven" concept of smart logistics. At the same time, most institutions have insufficient depth of cooperation with enterprises, the rate of introducing real projects from enterprises is not high, and students' internship positions do not match the courses they are learning.

3.2.3. The Knowledge Structure and Capabilities of the Teaching Staff Urgently Need to be Updated

In the education of logistics management, teachers play a crucial role. But in the context of smart logistics, there are technical blind spots for teachers today. Many logistics teachers have not systematically studied data analysis tools such as Python, SQL, and Tableau, and have limited knowledge of digital twins, reinforcement learning algorithms, and edge computing architectures, making it difficult to ensure the integration of traditional logistics with intelligent means in teaching. At the same time, there is a lack of enterprise experience among college teachers, and the proportion of "dual-qualified" teachers with practical experience in smart logistics projects is seriously insufficient.

4. Reform Plan for the Curriculum System of Logistics Management in the Context of Smart Logistics

4.1. Reshape the Curriculum with Industrial Demand as the Anchor

The "job map" should be embedded in the syllabus, which is oriented towards industrial demands and enhances innovation awareness. Professional teachers and enterprise operation directors should jointly sort out the real-time job vacancies in regional leading enterprises in warehousing, transportation, distribution, etc., and reverse map the job vacancies in the context of the latest smart logistics such as "intelligent warehouse supervisor" and "data dispatcher" to the course objectives. Warehouse management is no longer just about location coding, but directly introduces inventory heat maps in the enterprise WMS background, strengthens the cultivation of students' compound ability, focuses on cultivating students' intelligent thinking, and enables students to use Python to call apis to capture data and then use Tableau to generate decision boards; Transportation courses need to bring TMS real-time paths, oil price fluctuations, and weather data into the classroom to cultivate students' practical ability to generate dynamic path optimization scripts, with enterprise engineers providing online comments and real operational feedback to achieve "position-task-project" three-level mapping and ensure zero time lag between teaching content

and industry demand.

4.2. Promote the Construction of Virtual and Real Integrated Practice Platforms by Schools and Enterprises

The school-enterprise co-built practice platform plays a crucial role in reforming the curriculum system of the logistics management major, bringing enterprise-level scenarios to the campus and classrooms to the logistics park. The traditional training rooms have outdated equipment and a single project. The "1+N" school-enterprise base matrix can be adopted: 1 on-campus smart logistics center integrating AGV, high-rise warehouse, digital twin tower and Internet of Things sensor network; N off-campus enterprise scenarios cover cold chain warehouses, trunk line distribution, and unmanned delivery test fields. The on-campus center is jointly built by the enterprise, the school, and the government. The property rights of the equipment belong to the enterprise, the school has the right to use it, and the enterprise needs to update the equipment firmware and algorithms once every quarter. The off-campus base implements an alternating teaching system of "classroom on Monday and enterprise on Wednesday". Students learn real job practice operations in the park in the morning and return to the campus in the afternoon to review the data. At the same time, an online experimental platform of "cloud warehouse simulation" is developed. Students can log in remotely to complete complex tasks such as AGV scheduling and inventory optimization, and the system automatically provides error comparison with real enterprise data. Advanced training can be carried out without hardware equipment.

4.3. Create an Ecosystem of Teachers for Dual-teacher Mobility and Project Incubation

In view of the issue of updating the knowledge structure and capabilities of the existing teaching staff, on the one hand, the school needs to conduct regular teaching and training on the digital capabilities of teachers every year. At the same time, professional teachers can be sent to enterprises for more than four weeks of secondment, allowing professional teachers to deeply participate in projects such as smart warehouse transformation, algorithm iteration or process optimization of smart logistics in the context of digitalization, To enhance teachers' ability to align with the development of smart logistics in the teaching process; On the other hand, companies can send 8 to 10 technical experts to schools each year to teach a certain number of hours of practical courses, ensuring that the latest scenarios and technologies, fault cases, etc. can be directly brought into the classroom, forming a new type of educational teacher ecosystem of "dual-teacher mobility". To solidify achievements, schools and enterprises jointly build "smart logistics project incubation bases", where teachers and enterprise engineers jointly apply for horizontal projects, and students participate as project assistants. Outstanding achievements can be given priority to apply for patents or be transformed into teaching cases. Through the two-way flow of teachers, the technical line of teachers is always in sync with the demand curve of enterprises.

4.4. Build a Dynamically Updated Multi-evaluation System

In traditional logistics management education, the evaluation was mostly based on the results of the final written test. However, in today's digital age, the cultivation of logistics talents is required to shift towards innovative and compound talents. This form can no longer measure students' compound abilities such as data analysis and system optimization. Therefore, a multi-dimensional evaluation model can be adopted. The evaluation dimensions are no longer limited to the examination of professional knowledge. Instead, multiple evaluation and examination methods are established around equipment proficiency, data interpretation ability, solution innovation ability, teamwork ability, etc. Through data-driven continuous iteration, the curriculum evaluation system always stays "half a step ahead of the industry", truly achieving sustainable upgrading of smart logistics talent cultivation.

5. Conclusion and Prospects

To sum up, with the rapid development of the digital age and smart logistics, the reform of logistics management education has become an inevitable trend, and the demand for logistics compound and innovative talents has greatly increased, which requires the logistics management curriculum system to focus on cultivating logistics talents with interdisciplinary and integrated thinking. At the same time, it is necessary to deeply recognize the problems in the curriculum system of logistics management, such as lagging content and misplacement of talent cultivation, weak practical teaching links and low intelligence level, and the urgent need to update the knowledge structure and ability of the teaching staff, and carry out profound reforms in many aspects, reshape the curriculum connotation with industrial demand as the anchor point, and achieve true integration of industry and education. Promote the construction of a virtual and real integrated practice platform by schools and enterprises, and the school-enterprise integrated platform seamlessly connects real warehouses, cloud simulations and online classrooms. Create a teacher ecosystem for dual-teacher mobility and project incubation, with regular two-way mobility between teachers and enterprise engineers. Build dynamically updated multi-evaluation, data-driven dynamic evaluation fine-tuning content in real time to ensure that what is learned is put to use. To achieve precise talent supply, efficient resource sharing, and make the logistics management curriculum system education resonate with the industry from now on, contributing to the steady development of smart logistics.

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