

Transforming Logistics with Innovative Interaction Design and Digital UX Solutions

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Abstract: This article investigates how to alleviate logistical pain points and alter logistics systems by reconstructing the system's digital user interface/user experience (UI/UX) and demonstrating current logistics systems' operation modes and use scenarios. By analyzing the user experience and system design in the mainstream management system (WMS) and label and scanning system (LNS) used in warehouses, it reveals how to improve warehouse staff operating efficiency, reduce operational errors in logistics circulation, and improve the overall system user experience by optimizing the UI/UX. In addition, the essay anticipates the development patterns and directions of integrating artificial intelligence, the Internet of Things, and big data in logistics.

Keywords: Logistics innovation, Digital UX Solutions, Warehouse Management System (WMS), Label and Scanning System (LNS), interaction Design, User interface Design, Operational Efficiency, Supply Chain Optimization, Digital Transformation in Logistics, Smart Logistics Systems.

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1 THE DIFFICULTIES AND PROSPECTS OF CONTEMPORARY LOGISTICS

The logistics sector of today is at a turning point in its history and is undergoing significant change. The current society's high standards for cargo circulation speed are becoming more and more unmet by the inefficient old logistics system, and handling commodities is prone to mistakes and delays. Simultaneously, the openness of freight monitoring data has shown the limitations of conventional logistics, particularly its poor emergency response capability [1].

Driven by globalization and digitalization, the logistics industry must swiftly modernize and digitize. This necessitates not only the development of multiple digital logistics platforms with a variety of functions, but also increased transparency in overall logistics transportation, information collection and intelligent management, and consideration of information connectivity between different systems. This is a massive problem, because of the complexity of supply chain management, the need for real-time data, and the many coordinating of cross-border transportation. These obstacles enhance the difficulty of the change, but it is unavoidable [2].

Because many transformation issues have not been properly resolved in the logistics industry, they have been repeatedly magnified during the COVID-19 pandemic from 2019 to 2021. This has forced the public to truly appreciate the importance of the logistics system on a global scale [3]. From the shortage of daily necessities and medicines in low-income countries to the panic buying, hoarding and purchase restrictions in high-income countries, all of these highlight the critical role of logistics and transportation. Just as the human body relies on blood to transport oxygen, modern society also relies on logistics systems to ensure the smooth and efficient operation of the global supply chain. However, the current operating model of the logistics industry is stretched when responding to emergencies and extreme demands, exposing many shortcomings [4]. This series of events reminds us that whether it is the transportation of vaccines in emergency periods or the distribution of basic commodities in daily life, the logistics system is the foundation for the stable operation of society. The logistics system is not only responsible for the efficient flow of materials but also must ensure that this flow can proceed smoothly in various emergencies.

Therefore, the digital transformation of the logistics industry is imminent. This is a challenge and an opportunity at this stage. It is this transformation that can significantly improve operational efficiency, reduce the burden on front-line employees, reduce operating costs, create more opportunities for small and medium-sized enterprises to enter the international market, improve customer satisfaction, and

provide consumers around the world with more convenient channels to obtain goods [5]. In this regard, the logistics sector must not only rely on cutting-edge technology like automation platforms and artificial intelligence to improve system responsiveness but also optimize and innovate each link in the supply chain as a whole. This approach entails a thorough integration with contemporary technology in addition to a re-examination and redesign of the logistics platforms' and systems' operational mechanisms. An important part of this approach is interactive design research and optimization. The simplicity of use and user experience of the system can be greatly enhanced by creating intuitive, more amiable, and efficient user interfaces. This will increase staff productivity and lower the cost of acquiring items for each potential client [6]. This paper aims to examine the challenges and opportunities associated with interactive design in facilitating the digital transformation of the logistics industry. It will also demonstrate the practical effects of its application through case studies, to offer guidance and support for the future development of the logistics industry.

2 THE ROLE OF UI/UX IN LOGISTICS

User experience (UI/UX) design is turning into a critical component of the answer as the modern logistics sector confronts its complicated problems. This is so because UI/UX design runs through the whole end-to-end process and significantly affects all links of logistics as these organizations undergo their digital transformation [7].

Modern logistics mostly depends on data management, collecting and forwarding in systems, so the system starts to process and record pertinent data from the minute a logistics company gets an order. First getting a paper goods list, the operator then fills out and logs in on scanner equipment in the warehouse in daily flow. They then scan the barcode on the outside packaging of the box delivered to the warehouse together with the list of items using the LNS system's scanning capability. Staff members must enter and document data into the system as soon as items leave the warehouse. Should users submit orders through the corporate platform, the front-end website must guarantee seamless connection with later systems in addition to offering understandable and easy-to-use access [8]. Every link depends critically on UI/UX design whether it is order generation, choosing logistics transportation options and additional services, or pricing calculations. Planning transportation routes and scheduling helps to ensure consistency. Particularly following the arrival of the items at the destination warehouse, the usability of the system interface design will directly influence the effectiveness of goods distribution and reception.

In these procedures, system user research and system interface design not only help to raise user satisfaction but also are fundamental tools for maximizing the operational efficiency of the logistics system. Logistically systems

becoming more and more complicated as social needs progressively rise. Operators and consumers must spend a lot of time engaging with several systems and handling a lot of real-time data and varied needs [9]. Right now, the friendliness of the system architecture and the interface simplification are especially crucial. Apart from helping users grasp and get started with the operation process for the first time, this type of interface may help users acquire logistics trends and price information in real time, so lowering learning costs and error rates in operations. Apart from improving customer confidence in the logistics brand and organization, a well-designed system can also help to minimize poor communication between personnel and customers. Every day these technologies and platforms wow clients and grow to be indispensable instruments for their regular employment. Good UI/UX design can simplify complicated operations and processes, make the system more efficient and reliable when handling daily duties and responding to crises, increase the efficiency of every stage in the logistics process, and timely handle possible faults and gaps in the system. On the other hand, bad UI/UX design could make user operation difficult, result in regular mistakes, and even lead to client turnover and company loss. Complex and unintuitive systems not only load operators but also could cause data entry mistakes and order processing delays, therefore influencing the operational efficiency of the whole supply chain and the market competitiveness of the company [10]. Consequently, in contemporary logistics systems, user experience design should first concentrate on its functionality and usability and give operators and users with an efficient, succinct, and understandable interface to the greatest extent. Simultaneously, consideration should be given to the UI's aesthetics and fit to satisfy the needs of various users and operators. By use of scientific interface design concepts and in-depth user requirements analysis, UI/UX design can considerably raise the accuracy and efficiency of logistics operations. UI/UX design may help the system rapidly respond to the operator's commands, lower the probability of misoperation, and maximize the data flow transfer smoothing out the whole logistics process. Encourage the effective growth of the whole logistics sector as well as improve the market competitiveness of logistics businesses.

Thus, in contemporary logistics systems, user experience design should first concentrate on functionality and usability and mostly give operators and users an efficient, simple, and understandable interface. Simultaneously, compatibility and consistency of the interface must be given top priority to satisfy various operators and consumers. Using thorough user demand analysis and scientific interface design principles, UI/UX design can enable the system to rapidly respond to operator instructions, enhance the accuracy and efficiency of logistics operations, smooth out the whole logistics process, and so support the efficiency of the whole logistics industry. development of.

3 APPLICATION AND CASE STUDY OF USER DESIGN (UI/UX) IN SYSTEMS OF LOGISTICS

There are several dozen systems with various purposes in the process of logistics flow. Two of the most often used and typical systems—the warehouse management system (WMS) and the labelling and scanning system (LNS)—will be discussed in this part together, together with the particular application of user design (UI/UX) in these logistics systems. We derive efficient design strategies and lessons learned by analyzing how the interaction design in these systems enhances user experience and operational efficiency and by combining successful and failed cases. We also show how UI/UX design might help logistics firms bring higher operations. efficiency, so encouraging the growth of the whole sector toward increased intelligence and digitalization.

Although the operating equipment and user groups are different and the warehouse management system (WMS) and the labelling and scanning system (LNS) each have different duties in the logistics process, the data between them usually has to be smoothly linked and both are intimately related to the logistics warehouse. Optimizing the interaction design of these systems helps to significantly lower operational mistakes, increase general job efficiency, and raise system usability and user happiness.

*All survey data and system comparison charts are only kept for research purposes before the company authorizes them to be made public, and are not displayed in this paragraph.

Warehouse Management System (WMS)

Warehouse Management System (WMS) is a scalable enterprise-level platform operating system, which is a software application designed to manage and optimize warehouse operations [11]. The main users include front-line warehouse staff, warehouse managers, internal staff of logistics companies and training managers. Users usually use desktop computers or laptops to access and operate. It supports various processes within a warehouse, including receiving, put-away, picking, packing, shipping, inventory management and labour management. Among them, some staff are responsible for checking the logistics process of goods in different states, and timely proofreading data such as cycle counting, receiving, putaway and picking, ensuring the sharing of accurate real-time information, and making adjustments and feedback according to actual conditions [12]. Therefore, after these users log in, the dashboard page and table page are the areas where they stay the longest, occupying most of the user's operation time. Here, the core task of system user research and design is to improve the work efficiency and operation accuracy of operators. Provide an intuitive interface as much as possible, and retain a certain degree of functional extensibility. This enables operators to quickly locate and perform the required tasks, reducing the

occurrence of operational errors. The other part of users are mostly managers and other internal liaison personnel. These users use the WMS system to control and manage the performance of staff, including WMS training and performance indicator management [13]. Therefore, the main operation interfaces of these users after logging in include the warehouse inventory management page, user training and permission page, and performance indicator page. These users need to check the overall performance of employees, view the records of employees' execution according to standards, manage operational matters, and arrange the functions and permissions of different accounts. Therefore, the functions and focuses of WMS for different user accounts after logging in are different.

Label and Scanning System (LNS)

The label and scanning system (LNS) plays a vital role in warehouse operations and is a basic tool designed by logistics companies to optimize overall warehousing and logistics operations. LNS has a wide range of uses and is usually installed on mobile devices with Android operating systems. It supports login operations with mobile devices of different brands and handheld scanners [14]. Its main functions include labelling, scanning statistics uploading, and recording damaged goods in the warehouse environment. These functions aim to achieve accurate inventory management and traceability of goods. When customers send goods to the warehouse, the LNS system can record the specific information of the goods, including the quantity, category, and storage location of the goods, by scanning the labels on the goods. This function can not only improve the accuracy of inventory management but also provide real-time updated information when the goods are sent to the destination, thereby reducing the processing time of the destination distribution centre (DC) [15]. In this system, the most important operation steps are to select the client from the goods form of the PO/SO, perform the scanning operation task, record the damaged goods and upload them to the cloud in time. Therefore, the goods list processing page and the scanning page are the key points. Sometimes a carton does not necessarily correspond to a single category of goods, so on the scanning page, it is necessary not only to check the carton ID scanned by the user in real-time, but also to add the recording function of the mixed carton so that users can switch freely through the shortcut key function on the mobile device to avoid terminal operation. The system design here not only needs to consider how to display as much user data as possible on a smaller screen as simply as possible, but also needs to link the shortcut keyboard of the scanner and reasonably design the interactive operation on the hardware [16]. An LNS system with good user experience and system design can significantly improve the accuracy and speed of cargo processing in the entire warehouse, help operators perform operations in a simple and clear scanning interface, and reduce the possibility of scanning errors and interrupted operations. In addition, the design of the LNS system should also take into account the complexity of the operating

environment, because warehouses often have complex actual operating environments such as insufficient light or signal interference. Therefore, when designing the system, for systems such as LNS systems, actual user usage scenarios should be considered, field visits and user research should be conducted, and standards for multi-faceted designs should be formulated.

Successful Cases

In actual applications, some logistics companies have greatly improved their operational efficiency by improving interface design, interactive design, and overall user experience, and have maintained most of their customers in a highly competitive modern environment. For example, after the user logs in, the optimized WMS system interface design can automatically connect to the corresponding API data interface according to the user's permissions and warehouse data, collect data from different warehouses, and intuitively display the real-time carton quantity of the warehouse through charts, allowing users to select a customized timeline to review historical cargo data and automatically generate a receipt/shipping plan for some time in the future. This system can also download and export files in different formats for transmission through online functions, greatly reducing the time cost required for users to perform complex operations in the system. With these improvements, warehouse managers and operators can complete more tasks in a shorter time, and customer satisfaction has been significantly improved.

Lessons from Failed Cases

The LNS system is often the first step for goods to arrive and leave the warehouse, and front-line operators rely on the system for up to 4-8 hours a day. However, the overly complex LNS system has too many functions. Although it seems comprehensive, in actual operation, the complex interface makes it difficult for users to quickly find the required information, which affects work efficiency and delays operation time. Due to the small screen of the scanning mobile device, many operators' thumbs cannot accurately click on the various functions on the screen, and there is no way to set keyboard shortcuts for overly complicated functions so that users can easily record and operate them, which increases the burden on employees. In addition, in some failed LNS system designs, due to excessive emphasis on the visual design of the system interface, the functions and design are not concise enough, and the use in actual scenarios is ignored, which makes it easy for users to be interrupted when scanning for a long time, thus obtaining negative feedback. Because the number of received/shipped goods is closely related to the operator's own performance and income statistics, such defects will lead to customer complaints and distrust of the company's system, forcing warehouse managers to abandon the system and choose other platforms, which ultimately leads to large-scale system reconstruction. This case reminds us that UI/UX design should always be user-centric, conduct in-depth research on actual usage scenarios, and balance functional richness with operational

simplicity.

4 EXTENDED TECHNOLOGIES AND FUTURE DIRECTIONS OF INTERACTIVE DESIGN

Together with the application and case study in the above-mentioned logistics system, the development direction and functional focus of various logistics systems differ, which implies distinct development directions of different systems. Therefore, when implementing new technologies—especially artificial intelligence (AI)—applications must create customized iteration plans depending on the purposes of several systems and user groups.

In WMS systems, for instance, future development possibilities and design derivative directions will mostly concentrate on optimizing the overall interface design, distinguishing functional sections for various users, and changing the logical structure between pages. More intelligent warehousing automation—that is, real-time inventory data updating and automatically detecting and prioritizing significant orders can be attained using artificial intelligence technology. This lowers human error in addition to helping operators accomplish chores more quickly.

By routinely evaluating real-time warehouse data for managers to export and download, artificial intelligence may also automatically provide employee performance and warehouse management reports. This will drastically save training time, ease management load, and guarantee every warehouse runs effectively. Online support and help portals can be included at the system design level to offer timely support, particularly for user accounts with unsatisfactory performance or unusual actions, hence further lowering management and communication expenses.

Additionally very important for the WMS system will be the integration of big data and the Internet of Things (IoT). The Internet of Things can accomplish real-time tracking of all warehouse products by combining with interactive design, thus enhancing the accuracy of inventory control [17]. Big data can offer comprehensive data analysis, strong support for system optimization and user experience enhancement, so encouraging the ongoing development of the intelligence degree of the logistics system.

5 CONCLUSION

Using a thorough investigation of the interface design and UI/UX applications of conventional systems such as WMS and LNS in logistics systems, we can grasp the major influence of tailored optimization targets and expansion directions in enhancing operational efficiency and user experience. It should be underlined that the design should be reduced from becoming disconnected from the total by providing tailored optimization goals and expansion directions to various systems, so ensuring the coherence and

consistency between each system in the optimization stages. In the same work cycle, users may move between numerous distinct systems to carry out tasks. It should be avoided in the future stage of system optimization that the interaction design of one system differs too much from the iteration of the interface of another system to guarantee that users may operate in every system. Log in and operate once using a simple and user-friendly interface that leaves the same brand memory and further achieves a more intelligent user experience. This will boost the efficiency and effectiveness of the worldwide supply chain and assist in supporting the general digital transformation of the logistics sector.

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