Analysis of digital transformation of furniture market in the context of big data application

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Abstract. The whole furniture industry customization boom creates more and more significant demand for digitalization, and the impact of the epidemic on the furniture industry has further made many furniture companies realize the importance of industry digitalization. And in order to achieve the digital transformation of furniture enterprises, the collection and application of big data is the key: through the collection and use of customer and equipment data, you can achieve optimization of the supply chain in the furniture industry to reduce the inventory of raw materials and finished products; to achieve digital design and production intelligence to improve production efficiency and material utilization; to analyze the target customer groups and improve marketing strategies to attract more customers and increase turnover. In recent years, many scholars have also provided ideas on specific approaches to digital transformation in the furniture industry. This paper uses the literature review method and summary induction method to summarize the role that big data can play in the digital transformation of the furniture industry from three aspects: furniture production supply chain, furniture design digitalization and manufacturing digitalization, and furniture marketing.

Keywords: furniture industry, big data, supply chain, smart manufacturing, marketing, digitalization.

1. Introduction

With the boom of whole-house customization, the digital needs of furniture companies are becoming increasingly significant. By now, more and more furniture companies are moving toward whole-house customization, or even whole-home customization. However, behind this trend, many furniture companies are also facing confusion in terms of technology. Although the furniture industry's whole trend is obvious, the author realizes that the whole home customization enterprise is not much. The whole home customization covers a wide range of products and services, including closet cabinets, doors, walls, floors, and other categories, which put forward higher requirements for the whole process, from the front-end stores' design, pricing, and orders, to the back-end factories' split orders, scheduling, and production. The whole concept of home customization not only transforms the way of thinking of traditional home furnishing enterprises but also promotes the home furnishing industry to accelerate the pace of digital transformation. In recent years, along with the epidemic production slowdown, labor difficulties, and other issues, the furniture industry's digital transformation has become more urgent. The large capacity, diversity, and speed of big data make the application of big data possible,

make the digitalization of design and manufacturing processes possible, and drive the change of management mode and marketing mode, which play a key role in the process of digital transformation of the furniture industry.

This paper uses the literature review method and the summary induction method to summarize the specific concept of digital transformation in the furniture market, the role of big data in the transformation process of the furniture industry, and summarize some important existing results and research. It provides a macro-summary analysis of the role that big data can play in the digital transformation of the furniture industry.

2. Overview of related concepts

2.1. The concept of digital transformation in the furniture industry

Industrial digitization refers to the process of digital upgrading, transformation, and reengineering of the entire elements of the upstream and downstream of the industrial chain with data as the key element, value release as the core, and data empowerment as the main line, supported and led by the new generation of digital technology [1]. Specifically, in the furniture market, it is to use data as a link to carry out comprehensive optimization and fundamental reform of enterprise structure and workflow; to realize data sharing between enterprises and suppliers in the raw material procurement process to ensure low inventory and high efficiency; to build an integrated platform integrating consumers, furniture designers, and merchants in the design and manufacturing process; to realize the sharing and automatic matching of consumer demand and solution libraries; and to make sure the front and back ends are connected to produce according to demand; and the data related to consumers' needs and preferences are precisely delivered in marketing to attract customers. In other words, digital technology is gradually integrated into products, services, and processes to improve manufacturing efficiency and enhance business effectiveness.

2.2. The concept of big data

Big data refers to a set of data collected from many sources in various forms, characterized by a large scale of information, diverse data types, fast processing speed, and low value density. In furniture companies, the main types of big data are customer data, sales data, and machine and equipment data.

3. The role of big data on the transformation of the furniture industry

3.1. Supply Chain Optimization

3.1.1. Problems in the traditional model. The most important problems of furniture enterprises in the traditional model are the inventory of raw materials and finished products; the failure to procure materials in a timely manner; the difficulties of material sets and flush sets; the long manufacturing cycle; and the synergy between enterprises and factories, suppliers, and customers [2-3]. The reasons for these problems are: first, the wide variety of furniture, especially the emergence of personalized custom furniture, makes it more difficult for the whole industry to manage the category standardization. Second, subject to the traditional multi-level distribution supply chain model, furniture products are often distributed level by level, causing management difficulties. Third, the relationship between suppliers and enterprises in the traditional furniture industry is simply "buy-sell" relationships, requiring only a cursory exchange of information and temporary rush orders, resulting in both sides' need to increase the amount of inventory to respond to various situations; fourth, the uncertainty of customer demand, which means enterprises have to increase the amount of inventory to ensure that the amount of inventory meets customer demand.

3.1.2. Big Data Optimization Supply Chain. Xu proposed that if furniture manufacturing enterprises want to improve inventory control effectively, managers need to realize information sharing between

enterprises and suppliers and downstream distributors, and suggested that enterprises can jointly adopt a VMI inventory management system with distributors to promote the sharing of supply chain information and synchronized operation among enterprises [4]. Li Na and Qu Fuhai pointed out that the key to building a digitally integrated supply chain system lies in the accurate positioning of user needs. For furniture enterprises, building a digital supply chain requires using digital media to understand customers' needs and preferences accurately in real time and expressing them in the form of data through a big data intelligent information system, building models, and sharing the data across the chain [5].

As for the information sharing problem, Xiong Xianqing pointed out that the fundamental reason why many enterprises do not realize information sharing is that there are many "information silos" in enterprises using ERP and MES systems, caused by poor data and information circulation, and proposed building interfaces between the two systems, often through plug-in technology and business intelligence big data analysis, to establish The key to solving the problem is to establish a shared system interface between ERP and MES within the enterprise, to achieve data synchronization, modular structure and automatic decomposition of holes, information sharing and integration [6]. It follows that the key to optimizing the supply chain is to achieve the sharing of information across the chain; linking information between factories and collaborating enterprise departments across furniture to overcome uncertainty in demand and supply; grasping and predicting user demand and quantity of products after the need to analyze data from users of the Internet platform and share the data with partners. The collection and analysis of big data is the key to solving the problem of "information silos," so the collection and analysis of big data is the key to optimizing the supply chain.

3.2. Digitizing design and manufacturing

3.2.1. Digitalization of furniture design. (1) The need for digitalization of furniture design. Traditional furniture design has three main pain points: first, the lack of independent innovation, and most of the furniture categories in the market are similar; second, the furniture product system is not perfect and standardized; third, the design and production cycle is long and delivery is not timely [7]. The application of digital design technology constructs a complete furniture product system and builds a furniture product library through parametric modeling technology and furniture product system construction technology. The designer can call on the basic modules of the furniture product library to shorten the design cycle when customizing design solutions for customers, and at the same time, can design customized modules according to customers' individual needs or analyze the current popular product elements and predict the trends based on customer data on the Internet platform to improve the success rate of design innovation and attract more customers. The customized modules can also enrich the product library to provide designers with a continuous output of inspiration and innovation for their designs and offer more choices to customers.

(2) Big Data Empowered Furniture Design Digitalization. Chen Yue and Yu Xiaohong analyzed the application of specific digital design technologies in custom furniture design by analyzing the application forms, application advantages, and limitations of technologies such as virtual reality display, furniture product system construction, parametric modeling, and application program interface, and illustrated the necessity of digital design technologies in custom furniture design [8]. Zhang Yi and Wang Mengqiong analyzed the process of furniture customization systems and proposed that the realization of furniture customization systems mainly relies on the support of digital technology, such as: it can be used to organize the furniture module resources, code furniture accessories in a reasonable classification, and other techniques to allow customers to better participate in the design process [9]. As for the data sources in the furniture module resources, Zhang Jie et al. pointed out that they can collect and analyze user reviews and sales data from e-commerce platforms through the front-end to timely and accurately analyze and predict market demand [10]. Xiong Xianqing pointed out that if digital design is to be realized in the production process of enterprises, the key technology is to establish a shared system interface among the software in the enterprise through

plug-in technology and BI big data analysis, so that processing equipment data can be docked and functions such as self-storage and self-design in the cloud can be realized [11]. It can be concluded that the realization of furniture design digitization requires the collection and analysis of customer and sales data to get timely market demand, enrich and improve the furniture module resources to shorten the design cycle while improving the success rate of design, and the use of BI big data analysis to make the processing equipment data docking meet the technical requirements of furniture design digitization.

3.2.2. Digitalization of furniture manufacturing. Wang Chengqiao and Qiao Fei pointed out that the core unit of furniture enterprises oriented to intelligent manufacturing should be an automated manufacturing system unit composed of CNC processing equipment, material transportation equipment, automatic information acquisition and processing equipment, and computer control systems, etc., and through the integration of various types of technologies in this unit to adapt to the production of multi-species and small-lot furniture products, and to make rapid adjustments according to changes in manufacturing tasks or production environments [12]. However, this integration technology is still in the primary stage of practice. Tang Tang et al. pointed out that due to the many factors and complex relationships affecting furniture manufacturing and the weak foundation of information technology and digital construction of furniture in China, the integration technology has never been able to get rid of the problems of high error rate, low efficiency, and long production cycle [13].

In order to solve these two problems, Xiong Xianqing pointed out that the key to solving the problem is to achieve kneading single production process and information flow traceability in the production process. The solution is to carry out statistics and analysis of the material and process data in the production process, and to combine all the data of the actuators and testing systems on the production line with the production requirements to form a digital processing technology to achieve kneading single production; using automatic collection technology to All data generated in the production process is managed and the data is interacted with processing equipment in real time to achieve information flow traceability of the production process [14]. It can be concluded that statistical analysis of material and process data is beneficial to improve production efficiency: Recording the database of furniture components and their production processes and analyzing the commonality of series of single parts, according to the process categorization, can meet the fully automatic online processing of various types of standardized components in series of single components and can be compatible with the common line production of series of single components with similar processes but different sizes and shapes. When the factory receives a batch of orders, the order management system will split each order into parts and automatically generate a production task order. At the same time, the system will also automatically generate production operation instructions for each part in each workshop, which can effectively improve production efficiency.

Big data visualization platform in the production process for real-time dynamic management can improve product quality: in the production process, the system generates a large amount of data and information, such as process, materials, equipment status, personnel attributes, etc. Big data will transform this dynamic data into more detailed information, which can be analyzed into historical forecasts and actual deviations, and further use intelligent optimization algorithms to adaptively adjust the quality of the product in real time to influence the The control parameters affecting product quality can be adjusted in real time by intelligent optimization algorithms to achieve adaptive control and optimization of product quality. In addition, big data can also be applied to system operation and maintenance. Through real-time monitoring of manufacturing process data and time series data such as equipment performance parameters, potential abnormalities in system operation can be proactively detected in advance and diagnosed through clustering analysis of historical abnormality data.

3.3. Shifting Marketing Strategies

iiMedia Research 2022 furniture industry data analysis shows that 63.5% of users get information through online advertising, and online short videos, microblogs and other content sharing platforms have long been the main channels for consumers to learn about brands as well as product information.

Liang Haofeng pointed out that "digital marketing" has become the marketing strategy of furniture enterprises in recent years in the face of the rapid development of the Internet and the rapid changes in the market, and its ultimate goal is to build a two-way information interaction platform to obtain the core competitiveness of enterprises [15]. Qiu Yongde and Wu Xiaomei pointed out that, compared with traditional marketing methods, digital marketing needs to attach great importance to the collection and analysis of consumer data and information, through the application of big data technology, information technology, etc., to guide the development of marketing strategies through the mining of customer data [16]. At present, large furniture enterprises have done a good job of basic information online retrieval, online store operations, and other infrastructure, but the online and offline interaction and cooperation mode and the search for traffic entrance are still in the stage of continuous exploration, and no enterprise has really realized the construction of a two-way information interaction platform between online and offline [17]. Therefore, through the analysis of customer big data to create customer accurate portraits and then build an accurate customer consumption behavior model. This is the most direct means to help enterprises understand product positioning and customer base, combining social data, transaction data, location data, and operator data of various types; and structuring customer data according to user preference weights to predict customer behavior; using association rule calculation to complete personalized product recommendations, tap potential users, stimulate customer consumption, and achieve accurate marketing as well as meet customers' personalized needs in order to achieve the effect of improving customer satisfaction.

4. Conclusion

The digital transformation of the furniture industry is bound to bring great advantages to the industry and is inevitable for the survival and development of enterprises. The role of big data collection and analysis for the digital transformation of the furniture industry is reflected in all aspects of furniture production: to achieve information sharing between enterprises and customers and various partners to optimize the supply chain; to realize the digitalization of furniture design and manufacturing, so that customers can participate in the design and realize the modularization of design parameters; to guide the development of marketing strategies to achieve accurate marketing and meet customer needs, etc. Although many experts and scholars have provided research on the realization of the digital transformation of the furniture industry, at present there are still many problems to be solved, such as: achieving the sharing of information throughout the chain; achieving the production of kneading orders and information flow traceability of the production process; and achieving the construction of a two-way information interaction platform between online and offline. Part of the key to solving these problems lies in the further use of the various types of big data generated in the production process.

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