Research on the Impact of Big Data and Enterprise Digitalization on the E-commerce Industry and Coping Strategies

Zelong Zhong[1,a,*]

[1]CEO Academy, Yango University, Fuzhou, Fujian, 350015, China
a. 1808010111@stu.hrbust.edu.cn
*corresponding author

Abstract: Big data, enterprise digitalization, and e-commerce all have one thing in common: they were born from the Internet. Since the onset of the 21st century, the global Internet industry has experienced rapid growth, with e-commerce emerging as a key player. Participants in e-commerce engage with both the global online marketplace and the physical market, utilizing modern communication networks and information technology to conduct business activities through e-commerce platforms or service platforms. E-commerce embodies characteristics such as market globalization, rapid transactions, virtualization, and cost-effectiveness, making it highly favored by enterprises. Presently, e-commerce relies heavily on robust databases, as well as the data collection, processing, and analysis capabilities of big data. This reliance compels traditional enterprises to undergo digital transformation. This study delves into the impact of big data and enterprise digitalization on the e-commerce industry, exploring the mechanisms underlying their influence on cross-border e-commerce. By examining these dynamics, the study aims to provide insights into the evolving landscape of e-commerce and the transformative potential of big data and digitalization in shaping its future trajectory.

Keywords: Internet, Digital Transformation, E-commerce, Big Data

1. Introduction

E-commerce is the inevitable result of the integration of information technology development and global economic integration, and it is a revolutionary new form of trade formed by the application of information technology in trade and other fields. Today's e-commerce is no longer a sales channel or consumption tool but an important economic format involving key areas such as finance, taxation, entrepreneurship, and employment. Nowadays, due to the rapid increase in internet-based technologies, e.g., digital sensors, cloud computing, etc., a massive amount of data is being generated and stored [1]. Based on the data variety, velocity, and volume, they are called Big Data [2]. Many companies take advantage of analyzing these big data to enhance their business strategy and gain benefits [3]. At the same time, digital transformation has created a new trend in the e-commerce industry.

The new digital transformation era towards e-commerce suggests a change in how products are marketed, redefining the types of offers and sourcing practices and strengthening links with target

customers and suppliers [4]. Digitalization is a key aspect of this accelerated e-commerce transformation [5–7]. Digitalization pertains to the extent of a company's management systems, facilitating data integration and processes using various technologies [8]. Companies with a high level of digitalization can gather a broader range of data on their customers, orders, production, and the market [2]. Consequently, digitalization is conducive to collecting customer and market data, which is the most effective strategy to promote enterprise development in the current era of digital transformation.

Hence, the following research questions have the following implications: What do big data and enterprise digital transformation bring to the e-commerce industry, and what is the impact mechanism of enterprise digitalization on the e-commerce industry?

This paper will also put forward strategies and analyze the digital transformation of China's e-commerce industry to provide a valuable perspective for Chinese e-commerce enterprises through big data and enterprise digital transformation.

2. Case Description

First, the current development status of enterprises in the e-commerce industry in the digital transformation is showing a positive trend. In 2021, the scale of China's cross-border export e-commerce industry accounted for 77.46% of the total transaction scale of the industry, and the scale of the cross-border import e-commerce industry accounted for 22.54% of the total transaction scale of the industry. Overall, the scale of the cross-border export e-commerce industry increased from 6.3 trillion yuan in 2017 to 11 trillion yuan in 2021, an increase of 4.7 trillion yuan in five years, with a compound annual growth rate of 11.79%. The scale of the cross-border import e-commerce industry increased by 1,440 billion yuan in five years, and the transaction scale reached 3.2 trillion yuan in 2021, with a compound annual growth rate of 12.70%. It can be seen that during the pandemic, due to the growth of contactless demand, the penetration rate of e-commerce has increased significantly.

The digital transformation of enterprises in China's e-commerce industry is also inseparable from the impact of big data. E-commerce companies have taken the benefits of analyzing big data to improve their processes, as well as maintaining and increasing their revenues [9]. Through the powerful database of big data, scholars collect and analyze customers' shopping behavior and launch targeted products and other services based on this. Secondly, the digital transformation of enterprises in China's e-commerce industry is also inseparable from the popularization of mobile Internet, which has become the mainstream of the e-commerce industry with the popularization of smartphones. Due to the convenience of the mobile Internet, many e-commerce companies have developed their own apps (such as Taobao, JD.com, and Amazon) to allow users to experience shopping more conveniently.

At the same time, China's e-commerce industry is facing some challenges in the development of the digital transformation of enterprises. To address these problems, enterprises need to continue to invest, strengthen technology research and development and innovation capabilities, optimize supply chain management and logistics efficiency, and cope with the increasingly fierce market competition.

3. Analysis of the Problem

3.1. Influence Identified of Big Data and Enterprise Digitalization on the Cross-Border E-Commerce Industry

3.1.1. Personalized Marketing

The digital transformation of enterprises has enabled the e-commerce industry to understand consumer needs better. Through accurate user portraits and personalized recommendation algorithms,

the e-commerce industry can provide personalized products and services to different consumers, thereby improving consumers' shopping experience and satisfaction and enhancing consumer loyalty and stickiness.

3.1.2. Accurate Market Analysis and Forecasting

The support of digital transformation and big data can help the e-commerce industry conduct market analysis and forecasting more accurately. Through the mining and analysis of massive data, the e-commerce industry can gain an in-depth understanding of consumer behavior, purchase preferences, consumption trends, and other information in the global market so as to grasp market demand and changes more accurately. This helps the e-commerce industry to develop more precise marketing strategies, improve product targeting and competitiveness, and then increase sales and market share.

### 3.1.3. The Performance of the Business

Enterprise digital transformation includes applying digital technology in the enterprise production process, business process, business model innovation, and decision support [10-13]. This also includes the impact on enterprise performance and the many benefits that digital transformation brings to enterprises. The market needs to provide personalized products and services, reduce operating costs, and improve business productivity and resource efficiency. The side improves the profitability and performance of the enterprise.

3.1.4. Logistics System

The logistics system of the e-commerce industry has experienced the development of traditional logistics and modern logistics. From the traditional storage and transportation of goods with few varieties, large quantities, small batches, and long cycles, it has been transformed into modern integration, networking, intelligence, systematization, and integration.

The digital transformation of enterprises has played a positive role in the modern development of the logistics system, which is reflected in the emphasis on the application of a series of electronic, mechanized, and automated tools and the supervision of the logistics process with accurate and timely logistics information, emphasizing the speed of logistics, the smoothness of logistics system information and the rationalization of the entire logistics system. With the flow process of logistics in the process of e-commerce transactions, the smooth flow of information links the corresponding business activities such as transportation, warehousing, and distribution to make them coordinated, which is a necessary way to improve the overall operational efficiency of the e-commerce logistics system.

As shown in Figure 1, it is a simple e-commerce logistics system, and the content in the box is the main structural module of the e-commerce logistics system. Compared with the traditional logistics system, there is no essential difference between the two, and the difference is that the e-commerce logistics system emphasizes the application of a series of electronic, mechanized, automated tools and accurate and timely logistics information to supervise the logistics process and also emphasizes the speed of logistics, the smoothness of logistics system information and the rationalization of the entire logistics system. With the development of enterprise digitalization, the e-commerce logistics system can use the digital information flow to link the corresponding transportation, warehousing, distribution, and other business activities faster and improve the overall operational efficiency of the e-commerce logistics system.
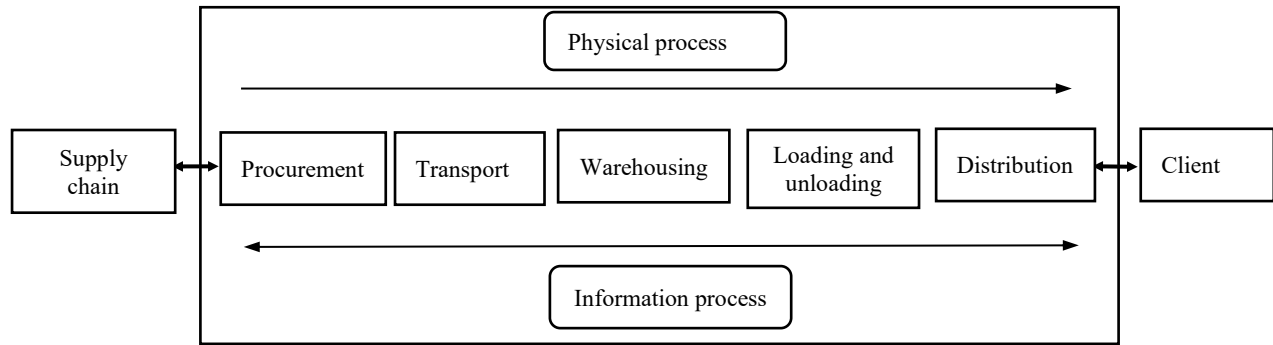
E-commerce logistics system

Figure 1: E-commerce logistics system

3.1.5. Innovative Business Models

The application trend of e-commerce will change with the development of science and technology, and enterprise digitalization has just promoted the innovation of business models in the e-commerce industry. Traditional e-commerce mainly relies on online sales, while digital technology enables e-commerce to explore more diversified business models, such as the use of wireless smart devices - such as tablets, smartphones, wearable devices, etc. to connect to the Internet, participate in business activities of mobile e-commerce, through digitization, big data database and mobile e-commerce unique GPS positioning technology, to identify consumers' location information, which allows enterprises to launch targeted services according to consumers' location information. For example, restaurants, theaters, and bookstores can push information about products and services that they are interested in as they pass by.

3.1.6. Upgrade of User Personas

User personas are based on a comprehensive description of user data and behavior, including the user's age, gender, education level, occupation, hobbies, purchase history, and other information, which marketers can use to understand users' needs and purchase behaviors better and provide more accurate products and services. The core work of building user portraits is mainly to analyze and mine a large amount of data stored in massive logs and databases stored on the server, as well as label users. With the help of big data and enterprise digitalization, e-commerce companies can now produce more accurate user portraits for customers, which can be summarized as determining the extracted user feature dimensions and the data sources that need to be used, storing the data that need to be used in Hadoop clusters through data collection tools, such as Flume or other scripts, merge the features extracted by users through various data sources and give a certain degree of credibility, and finally distribute the result data to precision marketing through big data databases, personalized recommendation, CRM and other platforms to provide data support. NetEase Mengma, a one-stop big data development and management platform included in the NetEase big data product system, can provide basic capabilities such as data transmission, computing, and job flow scheduling for user portraits and subsequent business goals, effectively reducing the technical threshold for big data applications, and is an example of the combination of big data and user portraits.

3.1.7. Dynamic Pricing

Generally speaking, the dynamic pricing of enterprises is based on past sales data, which analyzes seasonal and cyclical trends to predict market demand and prices. As can be seen from Figure 2, when

the price of commodities undergoes dynamic pricing, it will change with the change of inventory and market demand, etc., using factors such as market demand and product specificity, using mathematical models to price products, and enterprises adjust pricing strategies and increase profits by collecting and processing data in Figure 2. In general, a dynamic pricing strategy for e-commerce businesses is based on a variety of factors, including inventory levels, competitor prices, and even the geographic location of shoppers. But now, with the blessing of big data and user portraits, the processes involved in dynamic pricing have become more diverse. An example is Amazon: Amazon. com's dynamic pricing system monitors competing prices and alerts Amazon every 15 seconds, which has resulted in a 35 % increase in all sales. To offer competitive prices to customers on the eve of possible increases in sales (such as at Christmas or other festive times), Amazon processes big data by considering competitors' pricing, product sales, actions of customers, and any regional or geographical preferences [14]. With the support of big data, companies are able to collect more sales data and market demand than ever before. In today's market environment, the e-commerce industry is facing fierce competitive pressure and dynamic pricing is used to attract customers' desire to buy and improve corporate profits.
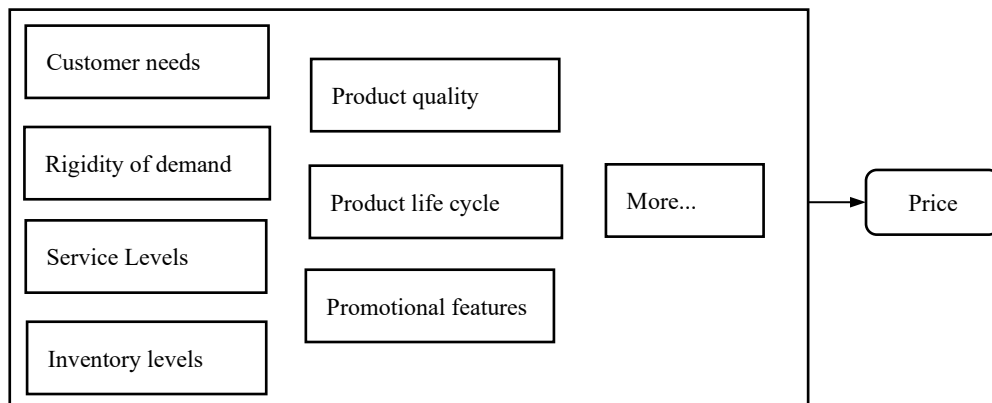

Figure 2: Dynamic pricing principle

3.1.8. O2O Mode

In the e-commerce industry, as an e-commerce model that combines online and offline, O2O is in line with the development of localized e-commerce on the Internet, and the product of closer integration between information and physical objects, offline and online, needs to be more integrated. The key to the O2O model lies in how to guide the consumers searched online to consume in offline physical stores, that is, how to combine the advantages of online traffic with offline high-quality services so that the transaction is highly sticky, with the development of enterprise digitalization and big data, the O2O model has been improved in the new era. In China, the most typical example of a platform website that uses big data for O2O e-commerce is Meituan. In Meituan's big database, there are special analysts for in-store catering, in-store integration, hotel tourism, movies, takeaway delivery, advertising platforms, and other services to analyze the data and access, calculate, and mine the data in the data development platform. In the future, the O2O model will become an indispensable part of consumers' lives, making the operation of enterprises and customers more convenient through online and offline interaction.

3.2. Problem Identified Analysis

3.2.1. Data Security and Privacy Protection Leakage

Big data technology is characterized by huge data volume, diverse data types, and fast processing speed. A large number of e-commerce industries collect a large amount of customer data through big data technology, which contains customers' personal information, shopping habits, payment information, etc. The security and privacy of this data has become an important issue. If data is leaked or misused, it will not only cause losses to customers but also affect the reputation and credibility of the business.

3.2.2. Supply Chain Transparency and Traceability

The digital transformation of enterprises can make the supply chain of the e-commerce industry more transparent and traceable. Through digital technology, the e-commerce industry can monitor and analyze all aspects of the supply chain in real time, including production, warehousing, logistics, etc. This helps improve the efficiency and accuracy of the supply chain, but it also introduces new problems. For example, once a problem arises in the supply chain, the e-commerce industry needs to respond and deal with it in a timely manner. Otherwise, it may have a negative impact on the user experience and corporate reputation.

4. Suggestions

4.1. Improve the Security Measures of Database and Privacy Protection

Due to the active Internet, e-commerce transaction information, criminals or hackers will inevitably attack network systems, network information, transaction information leakage, information tampering and forgery, and computer viruses and other hazards have always existed, and these security risks may cause serious damage to the image and reputation of enterprises. Therefore, the following measures and suggestions are put forward to strengthen the security measures of enterprise databases and privacy protection:

4.1.1. Strengthen Access Control

Ensure that only the necessary personnel have access to sensitive data by implementing strong password policies, such as changing passwords regularly to complicate password settings, using multi-factor authentication (e.g., fingerprints, facial recognition, OTP tokens, etc.), regular review of access rights, and the principle of least privilege.

4.1.2. Data Encrypted Storage

Encryption technology is used to protect enterprise servers and ensure data security and privacy. For example, use a new type of encryption algorithm to protect and encrypt the data to prevent hackers from hacking the server; Arrange for employees to ensure the secure storage and management of encryption keys, and hardware security modules (HSMs) are used to encrypt storage media (such as hard disks and tapes).

4.1.3. Employee Safety Training

Raise the employees' security awareness with security training so they can identify and respond to potential security threats to the corporate database servers. These include regularly holding database security training courses to improve employees' security awareness and skills, arranging simulated

attacks or drills on a quarterly basis to test employees' emergency response capabilities, and establishing a reward mechanism to encourage employees to find and report security vulnerabilities in e-commerce platforms to improve database security.

4.1.4. Compliance with Laws and Regulations

Ensure that the company's database security policies and practices comply with local laws and regulations, understand and comply with database security and privacy protection laws and regulations in the country or region, and work with local legal authorities or consultants to ensure that the security measures comply with legal requirements. Complying with the laws and regulations of the local country or region can also protect the database and privacy protection of the enterprise in a different direction.

4.2. Supply Chain Development and Protection Measures

As a network of tools and distribution options, the supply chain performs a range of functions from raw material procurement, conversion of raw materials into intermediate and final products, and distribution of finished goods to consumers. In today's digital enterprise, the supply chain involves many units, such as retailers, distributors, transporters, storage providers, and suppliers at multiple levels, as well as sales, distribution, and customized production activities, whether it is a manufacturer or a service industry. Therefore, the following options can help enterprises develop supply chain networks:

4.2.1. Strengthen Supply Chain Audits

Establish a sound supply chain audit mechanism, regularly conduct a comprehensive review of suppliers, manufacturers, logistics service providers, and other links to ensure that each link of the supply chain meets the requirements of enterprise standards and laws and regulations, and helps maximize the benefits of enterprises.

4.2.2. Strengthen the Information Disclosure System

Enterprises should establish a strict information disclosure system to disclose relevant information about the supply chain (such as supplier information, raw material sources, production processes, etc.) to consumers in a timely and accurate manner. Such collaboration provides consumers with accurate information on product inventory and prices. As a result, business benefits are maximized, and customer satisfaction is improved.

5. Conclusion

In the future, the rapid development of computer information technology and the continuous in-depth development of the Internet will make e-commerce based on a virtual economy gradually enter the historical stage and develop into a pillar of emerging industries.

In the era of the information economy, the impact of e-commerce on economic development shows an obvious "multiplier effect", which drives the second take-off of the traditional economic field, creates a large number of employment opportunities, and plays a vital role in promoting the rapid and stable growth of the economy.

Nowadays, the rise of big data and enterprise digitalization has brought the second spring of development to all enterprises, including the e-commerce industry born from the Internet. Small and medium-sized enterprises can enter the international market to compete at a lower cost. Therefore, the impact of enterprise digitalization on the e-commerce industry is far-reaching and huge. At the

same time, it can increase the number of consumption choices for the majority of online consumers so that consumers get more benefits.

The development of big data and enterprise digitalization is also a revolution for e-commerce, which breaks the limitations of time and space, changes the form of trade, and makes the Internet an important business transmission carrier, gathering information, generating new business and generating new income; It enables enterprises to carry out interconnected transactions so that business transactions are personalized and have dynamic characteristics, so as to win the popularity of users and obtain benefits. In the future, in order to adapt to the development needs of the new market, the business model of the e-commerce industry is facing new challenges, and enterprises must immediately develop the digital transformation of enterprises and adjust their business methods and industrial structure in order to be invincible in the fierce international competition.

References

[1] I. Yaqoob, I. Hashem, A. Gani, S. Mokhtar, E. Ahmed, N. Anuar, et al. (2016). Big data: From beginning to future, Int. J. Inf. Manage., vol. 36, no. 6, pp. 1231-1247, Dec.

[2] P. Mikalef, I. O. Pappas, J. Krogstie and M. Giannakos. (2018). Big data analytics capabilities: A systematic literature review and research agenda, Inf. Syst. e-Business Manage., vol. 16, no. 3, pp. 547-578, Aug. 2018.

[3] P. Maroufkhani, R. Wagner, W. K. W. Ismail, M. B. Baroto and M. Nourani. (2019). Big data analytics and firm performance: A systematic review, information, vol. 10, no. 7, pp. 226.

[4] Jarach, D. (2002). The Digitalisation of Market Relationships in the Airline Business: The Impact and Prospects of e-Business. J. Air Transp. Manag. 2002, 8, 115–120.

[5] Abed, S.S. (2020). Social Commerce Adoption Using TOE Framework: An Empirical Investigation of Saudi Arabian SMEs. Int. J. Inf. Manag. 53, 102118.

[6] Barnes, S.J. (2020). Information Management Research and Practice in the Post-COVID-19 World. Int. J. Inf. Manag. 55, 102175.

[7] Mainardes, E.W.; de Souza, I.M.; Correia, R.D. (2020). Antecedents and Consequents of Consumers Not Adopting E-Commerce. J. Retail. Consum. Serv. 55, 102138.

[8] Bharadwaj, S.; Bharadwaj, A.; Bendoly, E. (2007). The Performance Effects of Complementarities between Information Systems, Marketing, Manufacturing, and Supply Chain Processes. Inf. Syst. Res. 18, 437–453.

[9] B. A. Alyoubi. (2019). The impact of big data on electronic commerce in profit organisations in Saudi Arabia, Res. World Economy, vol. 10, no. 4, pp. 106-115.

[10] Furjan, M.T. (2020). Tomičić-Pupek, K.; Pihir, I. Understanding Digital Transformation Initiatives: Case Studies Analysis. Bus. Syst. Res. J. 11, 125–141.

[11] Frattini, F.; De Massis, A.; Chiesa, V.; Cassia, L.; Campopiano, G. (2012). Bringing to Market Technological Innovation: What Distinguishes Success from Failure. Int. J. Eng. Bus. Manag. 4, 15.

[12] Lee, J.; Bagheri, B.; Kao, H.-A. (2015). A Cyber-Physical Systems Architecture for Industry 4.0-Based Manufacturing Systems. Manuf. Lett. 3, 18–23.

[13] Liu, D.; Chen, S.; Chou, T. (2011). Resource Fit in Digital Transformation: Lessons Learned from the CBC Bank Global E-banking Project. Manag. Decis. 49, 1728–1742.

[14] Akter, S., Wamba, S.F. Big data analytics in E-commerce: a systematic review and agenda for future research. Electron Markets 26, 173–194 (2016).