ISSN: 2688-9323

Challenges and Countermeasures of Enterprise Operation and Management in the Big Data Era

Yitao Ge[1], Yilv Ge[2]

[1] University of California, Los Angeles, USA

[2] Viewpoint school, State of California, USA

Abstract

In the wave of the digital economy, big data has become a crucial force in reshaping the operation and management models of enterprises. While it brings significant dividends to enterprises, such as enhancing the scientific nature of decision - making, optimizing business processes, and promoting product and service innovation, it also subjects enterprises to multiple challenges. At the data level, there are problems of high storage pressure, difficult - to - guarantee quality, and high security risks. At the technical level, enterprises face technical shortcomings, backward equipment, and upgrading pressure. At the talent level, they encounter shortages of professional talents, fierce competition, and insufficient skills among internal employees. At the concept level, there are phenomena of insufficient understanding of big data and lagging traditional thinking. In view of this, this paper analyzes the positive impacts and challenges of big data on enterprise operation and management, and proposes countermeasures such as strengthening data management, cultivating professional talents, changing management concepts, and adapting to environmental changes, providing a reference for enterprises to improve management efficiency and achieve sustainable development.

Keywords

Big Data; Enterprise Operation and Management; Challenges; Countermeasures.

1. Introduction

The rapid development of the digital economy has made big data an important factor that cannot be ignored in enterprise operation and management. Against this backdrop, the operation models and decision - making methods of enterprises have been profoundly influenced by big data. Big data can provide enterprises with a vast amount of information, helping them to more accurately grasp market trends, understand customer needs, and thus gain advantages in decision - making, business process optimization, and product and service innovation. However, at the same time, big data also brings many challenges to enterprises. The massive growth of data puts forward higher requirements for storage and processing capabilities. The rapid iteration of technology subjects enterprises to upgrading pressure. The shortage of professional talents restricts the realization of the value of big data, and traditional management concepts are difficult to adapt to the development of the new era. Therefore, in - depth research on the challenges and countermeasures of enterprise operation and management in the big data era has important practical significance.

2. Positive Impacts of Big Data on Enterprise Operation and Management

2.1. Enhancing the Scientific Nature of Decision - Making

Big data technology can collect, organize, and analyze massive amounts of internal and external data of enterprises, covering multiple dimensions such as market trends, consumer behavior,

ISSN: 2688-9323

supply chain status, and competitors' strategies. By means of algorithm models, it explores the hidden laws and trends in the data. Take Norman Sanitary Ware as an example[1-2]. Before its digital transformation, the enterprise's production management model was rather traditional, relying on experience for material procurement and production scheduling, and it was difficult to accurately grasp the production rhythm and product quality. With the increasing intensification of market competition, the drawbacks of the traditional model began to emerge. Problems such as delayed order delivery and unstable product quality occurred frequently, greatly affecting the enterprise's reputation and market share. After fully recognizing the significance of digital technologies such as big data, Norman Sanitary Ware actively sought changes and introduced the T8 management system. By changing the management concept and adopting a digital, data - driven management model, Norman Sanitary Ware has significantly improved in production efficiency, product quality, and delivery capabilities, winning back the initiative in market competition. This clearly demonstrates the powerful driving effect of the change in management concepts on enterprise development in the context of the big data era, as shown in Figure 1.

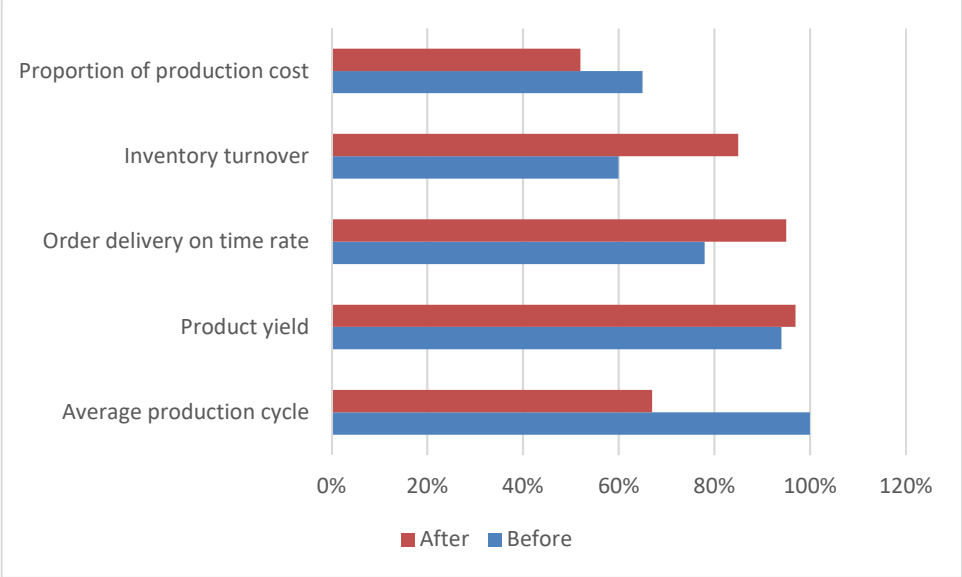

Figure 1. Comparison of Enterprise Operating Indicators before and after the Change in Management Concept

2.2. Optimizing Business Processes

The business processes of an enterprise are the core path to value creation. Redundancy and inefficiency in processes will directly erode the enterprise's profit margin. Against the backdrop of increasing cost - control pressure, process optimization has become the key to enhancing the enterprise's core competitiveness. Whether the enterprise's business processes are smooth or not directly affects its operational efficiency and cost control. Big data technology can monitor each link in the business process in real - time, capture key data indicators such as production progress, inventory levels, order processing timeliness, and customer feedback through sensors, information systems, etc., and construct a visual process diagram. By analyzing these data, enterprises can accurately identify bottlenecks and problems in the process, such as complex approval procedures, unreasonable resource allocation, and poor departmental cooperation, and make adjustments and optimizations according to specific situations. This process can eliminate unnecessary links, shorten the business processing time, reduce the unnecessary consumption of human, material, and other resources, thereby reducing the enterprise's operating costs, optimizing the overall business operation efficiency, and enhancing the enterprise's response rate to the market[3-4].

ISSN: 2688-9323

2.3. Promoting Product and Service Innovation

The trend of personalized and diversified market demands is becoming increasingly prominent. If an enterprise cannot respond to demand changes in a timely manner, it will face the risk of being eliminated from the market. The strength of innovation ability is related to the depth of demand insight. The continuous change of market demands requires enterprises to continuously carry out product and service innovation. Big data technology can help enterprises deeply understand customers' consumption habits, preferences, and potential demands. By analyzing the data generated by customers in terms of purchasing behavior, usage feedback, and social media interactions from multiple dimensions, accurate customer portraits can be formed. Through the analysis of customer data, enterprises can accurately grasp market trends and predict the changing trends of customer demands, such as changes in functional preferences and upgrades in service experiences. Based on these data, enterprises can adjust technical parameters and material selections in product research and development, optimize processes and add value - added items in service design, and launch new products and services that better meet customer needs, thereby enhancing the enterprise's competitiveness in the market and consolidating its market share.

3. Challenges Faced by Enterprise Operation and Management in the Big Data Era

3.1. Data - related Challenges

In the big data era, data has become the core asset of enterprises. Its scale and complexity continue to rise with business expansion, and traditional data processing models are difficult to cope with this change. During operation, enterprises generate and collect a large amount of data. These data come from various sources and are of diverse types, including structured, semi - structured, and unstructured data. The sharp increase in data volume puts great pressure on enterprises in terms of data storage. A large amount of resources must be invested in the construction and maintenance of data storage systems, and the storage cost will continue to increase with the increase in data volume. Some data may have drawbacks such as incompleteness, inaccuracy, and repetition, and it is difficult to maintain data quality, which directly affects the reliability of data analysis results. As the value of data gradually becomes prominent, the issue of data security becomes more and more serious. Enterprises face risks such as data leakage and tampering. If a data - security - related incident occurs, it will cause damage to the enterprise's reputation, and may also lead to economic losses and legal risks.

3.2. Technology - related Challenges

The professionalism of big data processing requires enterprises to have a complete technical chain, and the gap between the rate of technology iteration and the degree of enterprise technology accumulation constitutes a significant challenge. Big data processing relies on the support of advanced technologies, involving a series of technologies such as data collection, purification, analysis, and mining. Many enterprises have weaknesses in big data technologies, lacking mature technical architectures and solutions, resulting in poor data processing efficiency. The technical equipment and software systems used by some enterprises are relatively backward, making it difficult to efficiently process large - scale data and meet the needs of real - time analysis and decision - making. Big data technology is updated rapidly. Enterprises need to continuously invest funds and energy in technology upgrading and innovation to keep up with the pace of technological innovation. This sets high standards for enterprises in terms of technology research and development capabilities and financial strength, especially adding a heavy burden to small and medium - sized enterprises.

ISSN: 2688-9323

3.3. Talent - related Challenges

The application of big data technology requires an accurate match between human resources and technical needs. However, there is a significant misalignment between the current industry talent supply structure and the actual needs of enterprises. To effectively utilize big data, a professional talent team is needed, including data analysts, data scientists, big data engineers, etc. These talents not only need to have a solid foundation of professional knowledge in mathematics, statistics, computer science, etc., but also understand the enterprise's business processes and industry characteristics. There is a clear shortage of big - data - professional talents in the market, and enterprises are facing the trouble of talent shortages. There is a relative lack of compound talents who are proficient in both technology and business. Given the high salary level in the big data field, enterprises face great competition pressure in attracting and retaining talents[5-6]. Some employees in enterprises lack big - data thinking and related skills and cannot keep up with the new requirements of enterprise operation and management in the big data era, resulting in the inability of existing talent resources to fully play their roles.

4. Countermeasures for Enterprise Operation and Management in the Big Data Era

4.1. Strengthening Data Management

Table 1. Main Methods and Purposes of Strengthening Data Management

Management dimension	Specific way	Purpose
Data storage	The appropriate storage method is selected according to the data type, and advanced technologies such as distributed storage are adopted	Improves the efficiency and security of data storage and avoids the risk of data loss caused by single storage node failure
Data quality	Establish a monitoring mechanism, clarify the input standards, and regularly clean the verification data	Ensure the accuracy and integrity of the data, and provide a reliable basis for subsequent data analysis
Data security	Encryption technology is adopted, access control is implemented, and backup and recovery mechanisms are established	Prevent data leakage, tampering and other risks, and ensure the orderly development of data management

The complexity and diversity of data are becoming more and more obvious. Enterprises should establish a complete data management system to enhance the management of the entire data life cycle, as shown in Table 1. In terms of data storage, appropriate storage methods should be selected according to the type and characteristics of the data. For structured data, relational databases can be used, and for unstructured data, methods such as distributed file systems can be adopted. The use of high - end technologies such as distributed storage can effectively improve the efficiency and security of data storage, eliminating the risk of data loss caused by the failure of a single storage node. In terms of data quality, a data - quality monitoring system should be established. Starting from the data - collection link, data - entry standards and specifications should be clarified. Data should be regularly cleaned and verified, duplicate and incorrect data should be screened out, and missing information should be supplemented to ensure that the data meets the standards of accuracy and integrity, laying a reliable foundation for subsequent data analysis. In terms of data security, data - security protection measures should be strengthened. Encryption methods should be used to encrypt sensitive data, strict access - control measures should be implemented, and data - access rights should be allocated according to the level of job authority to prevent unauthorized personnel from accessing core data. At the same time, a data - backup and recovery mechanism should be established to cope

ISSN: 2688-9323

with risks such as data leakage and tampering, ensuring the efficient development of data management.

4.2. Cultivating Professional Talents

The application of big - data technology further raises the requirements for the professional quality of talents. Currently, there is a significant gap between the market supply of such talents and the needs of enterprises. Enterprises should strengthen the cultivation and introduction of big - data professional talents. By cooperating with universities and research groups, carrying out industry - university - research cooperation projects, jointly formulating talent - cultivation plans, and integrating the actual needs of enterprises into the teaching content, professional talents who not only master solid theoretical knowledge but also are familiar with the enterprise's business processes and meet the needs of the enterprise can be cultivated, reserving available talents for the enterprise. A competitive talent - introduction policy system should be established[7-8]. Combining the industry's salary level and the individual abilities of talents, attractive salary, benefits, and career development prospects should be provided to attract high - quality external talents to join the enterprise and fill the gaps in internal talents. Enterprises should further strengthen the training of internal employees, design personalized training courses according to the needs of each position, improve employees' big - data knowledge and skill levels, cultivate employees' big - data thinking habits, and encourage employees to actively use big - data analysis to handle practical problems in their daily work, providing a talent guarantee for the application of big data in enterprises.

4.3. Changing Management Concepts

The traditional experience - based management model is difficult to keep up with the rapid development needs of enterprises in the big - data era. Backward management concepts will cause enterprises to miss development opportunities and fail to fully release the potential value of big data. Enterprise managers need to fully recognize the significance of big data in enterprise operation and management, form big - data thinking concepts, include big - data technology in the enterprise's strategic plan, and plan the application of big data from the perspective of the long - term development of the enterprise[9-10]. They should increase their learning and research on big - data knowledge, master the development trends and application cases of big - data technology by participating in industry seminars, professional training, etc. Combining with the actual situation of the enterprise itself, they should actively promote the practice of big data within the enterprise, and integrate the data - driven concept into all links such as decision - making, production, and marketing. Further, the cultivation of big - data culture within the enterprise should be improved. Through internal publicity materials, special lectures, etc., big - data knowledge and application cases should be popularized to employees, enhancing employees' understanding and acceptance of big data, guiding employees to change traditional work methods, and mobilizing employees' enthusiasm and initiative in using big data, creating a good atmosphere for all - employee participation in big - data application, so that big data can truly become an internal driving force for the progress of the enterprise.

5. Conclusion

In summary, the big - data era has brought significant positive impacts on enterprise operation and management, playing an important role in enhancing the scientific nature of decision - making, optimizing business processes, and promoting product and service innovation. However, enterprises also face challenges in multiple dimensions such as data, technology, talent, and concepts. These challenges are intertwined, testing the adaptability and transformation ability of enterprises. To address these challenges, enterprises need to start from aspects such as strengthening data management, cultivating professional talents,

ISSN: 2688-9323

changing management concepts, and adapting to environmental changes, and build an operation and management system suitable for the big - data era. Only in this way can enterprises seize opportunities in the fierce market competition, achieve sustainable development, and contribute positively to the development of the industry.

References

[1] Aguboshim, F. C., Obiokafor, I. N., & Emenike, A. O. (2023). Sustainable data governance in the era of global data security challenges in Nigeria: A narrative review. World Journal of Advanced Research Reviews, 17(2), 378–385.

[2] Subeesh, A., & Mehta, C. R. (2021). Automation and digitization of agriculture using artificial intelligence and internet of things. Artificial Intelligence in Agriculture, 5, 278–291.

[3] Musti, K. S. S., & Baporikar, N. (2023). Industry 4.0-based enterprise information system for P2P lending. Journal of Science and Technology Policy Management, 14(1), 6–24.

[4] Soltani Delgosha, M., Hajiheydari, N., & Fahimi, S. M. (2021). Elucidation of big data analytics in banking: A four-stage Delphi study. Journal of Enterprise Information Management, 34(6), 1577–1596.

[5] Gebremeskel, B. K., Jonathan, G. M., & Yalew, S. D. (2023). Information security challenges during digital transformation. Procedia Computer Science, 219, 44–51.

[6] Gaurav, A., Gupta, B. B., & Panigrahi, P. K. (2023). A comprehensive survey on machine learning approaches for malware detection in IoT-based enterprise information system. Enterprise Information Systems, 17(3), 2023764.

[7] Tavera Romero, C. A., & others. (2021). Business intelligence: Business evolution after Industry 4.0. Sustainability, 13(18), 10026.

[8] Khan, M. A., & others. (2023). The role of post-implementation strategies for projects of enterprise information systems in enhancing management system: A case study approach. Human Systems Management, 42(2), 247–256.

[9] Mijwil, M. M., & Aljanabi, M. (2023). From analog to digitization: Rethinking management and operations through eHealth integration in Industry 4.0. Mesopotamian Journal of Artificial Intelligence in Healthcare, 27–30.

[10] Lachenmaier, J., Weber, P., & Lasi, H. (2023). Enterprise information systems vs. digital twins: A case study on the properties, purpose, and future relationship in the logistics sector.