

The Development of Operation Management in Industrial Enterprises Under Digital Transformation-Taking the Footwear Industry as An Example

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Abstract. With the development of Data Technologies, the digital transformation of industrial enterprises is imminent. The demand for individuation in the market also pushes enterprises for innovation. Thus, the realization of digital transformation has an important impact on supply chain cost management and labour resource management. Through empirical research, this paper uses empirical study and finds that new technology and the combination of the existing industrial chain and operation chain are the main problems in enterprises during digital transformation. Solving these problems can be achieved through the development of digital strategic planning, using digital operation, and optimism technological innovation operation management and technological production mode. At the same time, industrial enterprises should also pay attention to the balance between human costs, technology costs and industrial upgrading costs. Under the condition that the basic stability of the enterprises is granted, industrial enterprises should make digital exploration gradually to avoid the negative impact of high-tech enterprise management.

Keywords: Enterprise Digital Transformation; Industrial Enterprises; Operation Management; Footwear Industry.

1. Introduction

With the emergence of a series of new technologies and management methods, such as Big Data, AI, and digital marketing, enterprise digital transformation has become an inevitable path for every industry to maintain sustainable development. With the rapid development of the economic environment, the individual market demand is also getting stronger. As one of the representative industries of the industrial industry with a high degree of contact with the public and easy to carry out digital transformation, the footwear industry has essential study and development significance on optimising industrial structure and cultivating sustainable market development competitiveness ^[1]. Based on the current development of the footwear industry, considering the innovation of digital enterprise engagement, there are several problems appear, such as poor marketing means, lack of marketing opportunities, and the sales of offline physical stores compared to online stores ^[13]. To address these issues, the footwear industry can choose to use Internet marketing methods, enter the e-commerce platform and carry out live streaming, for example, to improve the sales volume ^[2]. Second, the footwear industry also could through digital means locate the user portrait to ensure sales and revenue maximization. Also, through the combination of high-performance materials and emerging styles to enhance product specificity to help market positioning ^[3]. However, according to the current study, the application and understanding of digital management strategy in the footwear industry are mostly superficial. Thus, this passage aims to discuss how the industrial industry with a certain scale develops in the digital transformation background and seek out the methods for industrial enterprises to reinvigorate to ensure the resilience of the industry.

2. The development of the Footwear Industry under the Digital Transformation

The footwear industry is a fourth-level sub-industry under the GICS industry classification, which belongs to the clothing industry and has a high sensitivity to business cycles. The increasing demand for quality and design pushes the footwear industry to confront higher challenges, but it also has more

opportunities ^[10]. The development of the footwear industry is mainly focused on digital transformation management.

First, digital transformation is underpowered and there is a serious shortage of professionals ^[4]. In the context of globalization and complexity, the demographic dividend in Southeast Asia has disappeared, which means enterprises need a more intelligent and efficient supply chain to support development. In this context, leading enterprises with sufficient professionals can quickly complete the transformation and equip professional facilities. But as opposed to that, middle and small-sized enterprises lack digital professionals which restricts the transformation ^[5].

Secondly, digital transformation requires enterprises to realize the intelligence and automation of the whole industrial chain, but this contradicts the concept of “putting people first”. A future Factory project for the footwear industry, called Erasmus+ Footwear 5.0, was launched in Europe in 2022. This project draws on the Japanese government’s concept of “Society 5.0”, which focuses on worker welfare and hopes to use new technology to provide a prosperous society that goes beyond employment and growth while respecting the planet’s productive limits. However, it is difficult to realize in regions with amount populations and an urgent need to face digital transformation ^[6].

Third, a mature supply chain management system requires high cost. Many processes can be done by machines instead of people, but flexibility and diversification still need to be completed manually. The high cost of precise machines and the increasing cost of manpower have led to an increase in the overall cost of the supply chain ^[7].

3. The Digital Transformation Methods in Footwear Industry

3.1. Operation Management under the Digital Intelligence

Under the traditional industrial technology system, the creation of commercial value of shoe-making enterprises is centred on the product, focusing on the production efficiency and product quality of the product, and with the continuous improvement of market requirements, enterprises have changed from a simple product supplier to a solution of the overall solution, from providing standardized products to providing diversified customized products ^[7]. From "product-centric" to "customer-centric", in line with the trend of The Times, enterprises need to be closer to the market and customers to open up information, through digital means to improve their real-time insight ability, for customers to participate in product design, production, manufacturing, service and other life cycle to create a good experience environment ^[12].

By selecting two Chinese local footwear industries for comparative analysis of digital operation management methods (see Table 1), it can be found that with the rapid development of the digital economy, enterprises can be developed through the following path. First, attach importance to digital strategic planning, and then, attach importance to supervision and evaluation in the value chain control segment. Therefore, adapts to changes in the environment and focuses on whether the digital process is compliant ^[8].

Table 1. Comparative Analysis of Operations Management

Enterprises	The original operational management methods	Digital operational management methods
Belle	Belle used a self-owned and agent multi-brand strategy to open counters in dense areas of department stores until controlled more than half of the floor space at the shoe and sportswear counters in department stores. However, with the emergence of the e-commerce model, the advantage of the original offline marketing model has gone ^[9] .	Aiming at the integration of online and offline, Belle makes full use of the advantage of having a large number of offline stores with the help of big data and Internet tools to achieve a full-process digital transformation ^[9] .
Topscore	By creating the operation model of vertical integration offline physical stores with multiple brands and the whole industry chain, the brand effect was successfully formed. But as same as Belle, after the emergence of the e-commerce model, the supply chain and industrial chain could not be transformed rapidly, which led to a crisis in development ^[9] .	Topscore launched a project called “Cloud Shoe Warehouse”, which includes an “Omni-channel new retail consumer operation trading platform” and an “Omni-channel product life cycle operation platform”. Besides, through a partnership with IBM, Topscore has launched a digital layout based on brand omnichannel since 2015, which finally realized the transformation from a single-channel business model to an omnichannel business model ^[9] .

3.2. Technology Empower Footwear Enterprise Product Research and Development

In the realization of supply chain and automation, 3D printing, and vision technology can be well used in practical production. The demand for personalised consumption has led 3D printing companies to join forces with shoe manufacturers to offer personalised running shoes or sneakers, which can develop athletes’ potential furthest. However, due to the long production time and high material cost, this technology cannot be widely used in an assembly line. However, 3D machine vision technology solves this problem perfectly. In the process of sole glue spraying, a 3D vision system is integrated into the glue spraying equipment. Once the sole is scanned and imprinted, the vision processing algorithm can generate precise motion tracking for the robot's glue spraying based on the collected point cloud images ^[10]. This greatly saves the cost of manual training and management systems, improves the quality of spraying glue and ensures product stability ^[11].

Because 3D printing technology has the characteristics of low cost and high return, the following part will use the PEST analysis method to explore the opportunities brought by 3D printing technology to the development of footwear enterprises (see Fig. 1).

After analysis, it is found that whether the needs of the social environment urgently promote the innovation and development of industrial technology, or the government's strong support in policy, 3D technology is one of the core technologies for the secondary development of footwear enterprises. The core reason is that 3D technology has the technical advantages of high design efficiency and design quality ^[10]. First, 3D virtual simulation technology enables rapid design and sample production. The traditional shoe design method needs to go through many hand-drawing and sample making, which is time-consuming and has certain errors. By using 3D virtual simulation technology, designers can design and change clothing models directly on the computer, view the design effect in real-time, and display the clothing effect through virtual models. This not only saves time and costs but also reduces errors in the design and production process ^[11].

Secondly, 3D virtual simulation technology can provide a better design display and communication platform. Traditional shoe design methods mainly rely on hand-painting and physical samples to show the design effect and cannot intuitively show the effect of products in different angles and different scenes. Through 3D virtual simulation technology, product models can be put into virtual scenes to simulate the effects of different lighting, angles and actions, so that designers and customers can more intuitively understand and evaluate the design effect. At the same time, the virtual simulation technology also facilitates the communication and cooperation between designers and can easily transmit the design intention and modify the scheme ^[11].

In addition, 3D virtual simulation technology enables rapid modification and optimization of designs. Using 3D virtual simulation technology, designers can directly modify product models and parameters in the virtual environment, view the modification effect in real-time, and quickly optimize the design. This can not only improve the flexibility and innovation of the design but also effectively reduce the repetitive work and cost of the design ^[11].

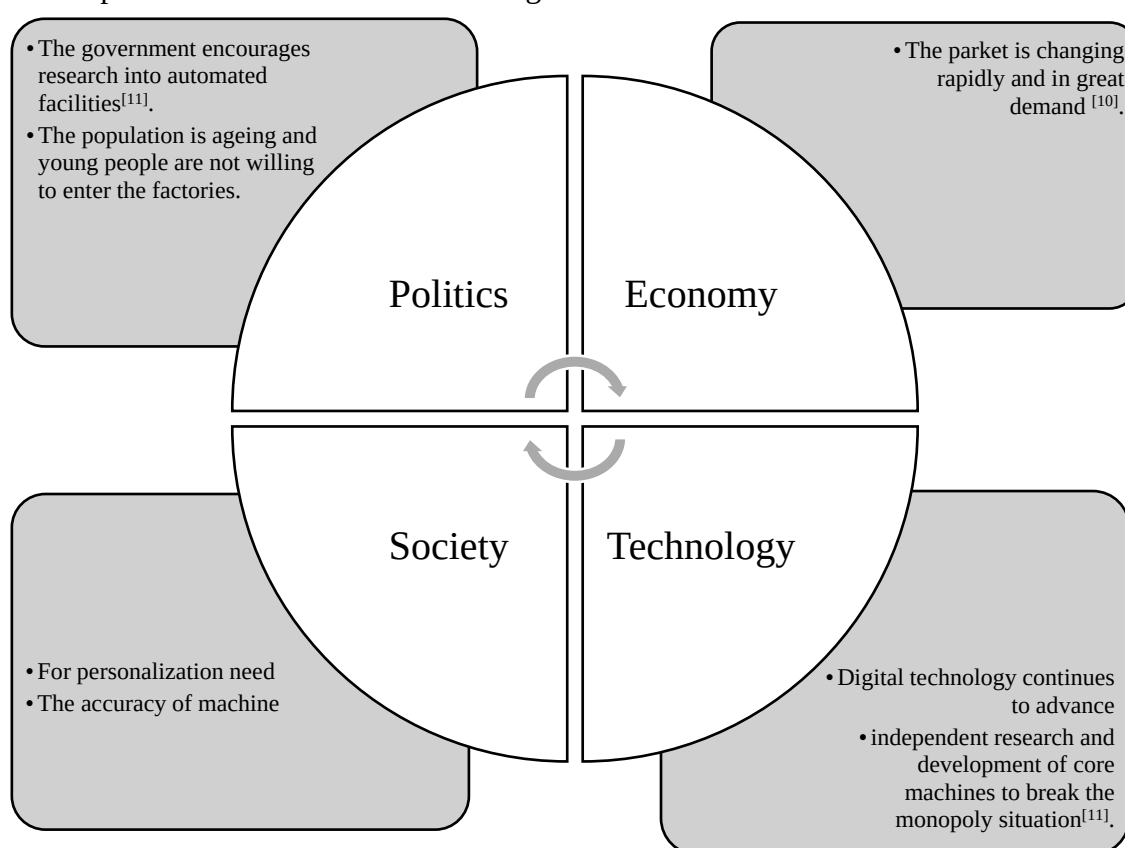


Fig 1. 3D Printing Technology in the System Shoe Industry

4. Suggestions

4.1. Enhance the role of digital project management.

Enterprises could choose digital software or cooperate with digital enterprises to save offline control costs and improve management efficiency. For this approach, companies with a certain social scale are recommended to adopt it, such as companies with large amounts of physical stores and companies that can transform into an omnichannel business model. As for small-sized enterprises, it is recommended to consider the improvement of technical methods in cost management ^[7,8,10].

Besides, enterprises could also notice that live broadcasting or participating in activities and exhibitions held by large shopping malls improves popularity, which is an efficient way to increase profit.

Although, in human resource management, the labour cost of the factory plays an important part. By improving the assessment or adopting the form of mentoring training, factories can improve the basic quality of workers to cut costs. Cost can be greatly reduced by placing workers only where high precision is required ^[1,7].

4.2. Enhance the application of technology in the production segment.

Enterprises can use 3D vision technology to ensure the precision of products and use 3D printing technology to enhance the comfort of products with high-tech materials.

In terms of enterprise management, enterprises can carry out Product lifecycle management (PLA). PLA has the ability of predictability and rapid self-healing ability, which can break through the barriers between development and operation, help projects reduce time loss and work more efficiently. However, the initial cost of investment and the exploration of enterprise adaptability also difficult for manufacturing enterprises to adopt this technology. Therefore, it is also necessary for enterprises to combine their situation to try PLA ^[13].

5. Conclusion

In conclusion, this paper analyzes the phenomenon of digital transformation of industrial enterprises and finds that insufficient power and core technology problems of digital transformation are common problems of digital transformation of industrial enterprises. Through the empirical analysis of the footwear industry, it is found that the footwear industry needs to quickly carry out digital reform in the application of product technology, to cope with the market trend of the decline in the growth rate and the decline in export growth. At the same time, it can adopt cooperation with digital enterprises, improve the assessment system and other ways to optimize and upgrade the latest technology in the enterprise management and production chain. However, the using of new technology and new machines in digital transformation may result in technical unemployment of workers. Therefore, it is of great practical significance to find a way to balance human and technical resources in the digital reform of enterprises. In the follow-up research, the "human-oriented" elements will be discussed as the core, aiming to help industrial enterprises more comprehensively complete their digital reform from multiple angles and help them steadily achieve another take-off.

References

- [1] Lu Hua. Research on the competitiveness of China's footwear industry based on industrial organization theory[D]. Shaanxi University of Science and Technology, 2019.
- [2] Yang L. Digitization: A New Opportunity for the Sustainable Development of China's Sportswear Industry[J]. 2022.
- [3] Bu Yuebin. Analysis of the development path of the footwear industry under the background of intelligent manufacturing [J]. Western Leather, 2019, 41 (11): 20-23.
- [4] Dwivedi A, Moktadir M A, Jabbour C J C, et al. Integrating the circular economy and industry 4.0 for sustainable development: Implications for responsible footwear production in a big data-driven world[J]. Technological Forecasting and Social Change, 2022, 175: 121335.
- [5] Spahiu T, Almeida H, Manavis A, et al. Industry 4.0 for sustainable production in footwear industry[C]//International Conference on Water Energy Food and Sustainability. Cham: Springer International Publishing, 2021: 699-707.
- [6] Vaz D M. Digital transformation in the footwear industry: assessing the potential of IoT on Portuguese SMEs in the footwear industry[D]., 2020.
- [7] Tran M D, Tran T H, Vu D T H, et al. Case Study: Prototyping a Low-Cost Integrated Automation System in Footwear Industry for Small and Medium Enterprises in Vietnam[C]//Proceedings of the 2nd Annual International Conference on Material, Machines and Methods for Sustainable Development (MMMS2020). Springer International Publishing, 2021: 85-93.

- [8] WANG Yuehan. Research on the Development Path of Enterprise Value Chain Cost Control in the Context of Digital Economy [J]. Market Weekly, 2024, 37 (04): 131-135.
- [9] Yiqing. Accelerating the digital transformation of the footwear industry [J]. Beijing Leather, 2020, 45 (09): 44-45.
- [10] Gong T, Kang L. Application analysis of 3D printing technology in design field: taking shoe design as an example[J]. Scientific Programming, 2021, 2021: 1-8.
- [11] Spahiu T, Bogdan S, Piperi E, et al. Roadmap for footwear production: 3D last scanning–3D designing–industrial manufacturing[C]//7th International Conference of Textile. 2016.
- [12] Bär M, Vandepaer L, Shah V, et al. Performing Life Cycle Assessment at Scale in the Footwear Industry[M]//Progress on Life Cycle Assessment in Textiles and Clothing. Singapore: Springer Nature Singapore, 2023: 231-260.
- [13] Babkin A, Mylnikova E, Chernovalova G, et al. Information-infrastructure mechanism for managing industrial enterprise self-development in the setting of digitization[C]//XIV International Scientific Conference “INTERAGROMASH 2021” Precision Agriculture and Agricultural Machinery Industry, Volume 1. Cham: Springer International Publishing, 2021: 762-770.