



Challenges in the Digital Transformation of the Manufacturing Industry

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Abstract. It has gradually become a general trend for manufacturing industry to take Digital transformation as its strategy. This is because the realization of digital transformation can bring many benefits to enterprises. Nevertheless, many manufacturing enterprises still face many problems when carrying out digital transformation. The purpose of this study is to figure out the factors that affect the success rate of enterprise reform, so that senior managers can see the situation clearly and promote the manufacturing industry to better realize digital transformation. This study analyzes three assignable reasons for these difficulties and provides targeted and detailed solutions. Helping enterprises make better decisions to a large extent. This study found that the manufacturing industry faces difficulties in obtaining timely and effective information, resistance to change, and building network security. Enterprises can further deepen reforms by using more advanced digital technology applications, training personnel and developing more comprehensive strategies, improving secure networks.

Keywords: Digital, Transformation, Manufacturing industry.

1 Introduction

There are many different areas of innovation in the new round of technological revolution, among which information technology is the most active and pervasive. As the most important technologies, the Internet, big data and artificial intelligence (AI) continue to lead to changes in industrial digitization [1]. This long-lasting and

ever-changing transformation has accelerated the whole world into the digital economy era.

The Internet Center (IDC) investigated and studied the core development strategies of the global top 1000 enterprises. The results show that 67% of enterprises choose digital transformation (DT) as their future goal [2]. This research shows that it has become a major trend for enterprises to take the road of DT, and also shows that enterprises aspire to achieve DT. This is because digital transformation is the only way for enterprises to stand in the market.

Enterprises focus on customers and use cloud computing, the internet, big data, digital twin, AI and other digital technologies, which are specific manifestations of DT [3]. Enterprises have replaced some manual workflows by utilizing digital technology. In other words, digital transformation improves and changes business processes. For example, adding stakeholders such as customers and suppliers to appropriate business processes. DT provides certain conditions for people to share information and value [4].

Cloud computing is an example that can be better understood. Big data analysis is one of the skills of cloud computing. With further extension based on big data analysis, enterprises can understand the causes and impacts of some obstacles in the production process. Enterprises can promptly identify problems, analyze them, and find improvement measures as soon as possible. This is beneficial for enterprises to improve their manufacturing processes to become more excellent, ensuring product quality while improving work efficiency, and greatly enhancing their competitiveness [5].

Advanced digital technology can help the manufacturing industry achieve better performance in the supply, sales, and production stages. In the supply phase, a scientific and reliable supplier evaluation index system can be established through digital technology. This system can enable enterprises to choose suppliers that are more suitable for their own enterprises and provide relevant decision-making solutions. In the sales phase, the manufacturing industry can understand the market demand and potential customer demand through big data, and can also solve the problem of overcapacity in the manufacturing industry and reduce unnecessary consumption. During the production phase, AI can monitor the production process anytime and anywhere, which is beneficial for enterprises to identify problems in the first place, better control product quality, and reduce losses [6].

The use of intelligent robots not only reduces labor consumption but also helps organizations expand their products and services. However, the process of DT in the manufacturing industry is not smooth sailing, and it also faces many problems and challenges. Most manufacturing industries fail because they lack the concept of implementing DT and do not understand the requirements of DT [3].

Therefore, this study can help enterprises better adapt to market demand and seize important opportunities for enterprise transformation and upgrading.

In essence, Digital transformation has changed most of the manufacturing processes, including operation, design, development, production, sales and service [7]. The purpose of this study is to help manufacturing enterprises identify and solve problems. The second part of this study introduces the basic situation, including relevant background, research reasons, and development status. The third and fourth parts respectively introduce three types of problems and their respective solutions. The fifth part is the conclusion of the study.

2 Case Descriptions

The traditional manufacturing industry is almost the most important supporting force in the national economy at any time. In the wave of globalization, the traditional manufacturing industry is facing a more severe situation and facing more and more challenges. For example, how can industry reduce unit cost while ensuring quality, and how can effectively improve the speed of production. In this digital era, manufacturing is required to quickly respond to the market and make decisions, as well as enterprises to have the ability to quickly disseminate information [8].

For an enterprise, the impact of digital transformation is huge, and can even be described as subversive [9]. Innovative and efficient digital technology has been applied by organizations in production and other processes. This helps enterprises better adapt to the opportunities and challenges brought by the business environment. It also provides enterprises with more ways to create value. At the same time, it is necessary for the manufacturing industry to carry out DT, because it can enable enterprises to have excellent competitiveness. The only way for enterprises to maintain a certain position in competitive markets and have more choices is to continuously deepen their digital reforms.

Efforts to achieve digital transformation have also become the future direction of many manufacturing industries. People are increasingly concerned about digital

transformation, which has attracted the interest of many other industries and scholars [4]. This is also because digital DT has also affected people's lives to a certain extent. Although many studies have been conducted on digital transformation over the years, and there are also some successful cases, many enterprises still cannot face the difficulties brought by digital reform.

At the initial stage of this study, the author listed these important factors by searching for data. As shown in Fig. 1, these factors are personnel, leadership, strategy, and technology [10].

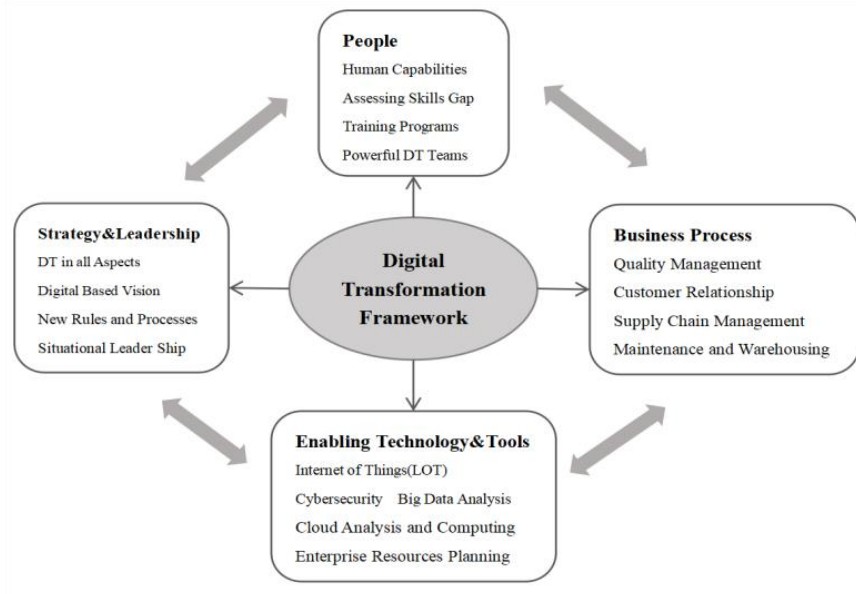


Fig. 1. Digital Transformation Framework [10].

3 Problem

3.1 Information Asymmetry

Much asymmetric information can bring difficult situations to traditional manufacturing enterprises. Because 'selling products and generating revenue' is an essential part of traditional business models, which are commonly used in the creative industry.

In the first place, some information cannot be quickly transmitted or even timely reflected on what has happened. At the same time, some incorrect information may be

published by publicly available industries and companies, and these erroneous messages may even be difficult for people to detect.

Secondly, the organizational structure of some enterprises can reduce the speed and accuracy of information transmission, because the organizational structure is not only one layer but also has many overlapping layers. Thirdly, during the creation process, some product information or data may not be available, as certain activities within the enterprise are separated. Conflicts of interest usually occur between various business activities, it can result in organizational employees retaining information or data and not sharing all information with others [1].

Zhaoqing, China is a typical example of the problem of information asymmetry faced by the manufacturing industry. Especially the problem of information asymmetry in the supply chain is very serious. The first point is that the development speed and scope of each enterprise's supply chain node are different. The direct cause of information asymmetry is the combination of a large number of valid and invalid messages, as well as significant differences in information resources. Secondly, there is mutual distrust among manufacturing enterprises. And upstream manufacturing industries are unwilling to share their rich resources, resulting in downstream enterprises being unable to obtain effective information. Lastly, Zhaoqing does not have a manufacturing-centered information-sharing platform. Unable to know in detail what information the enterprise needs and unable to integrate a large amount of data information [6]. The above problems will certainly restrict the development of Zhaoqing's manufacturing industry and DT.

The conclusions drawn from the above analysis process are as follows: In order to achieve the business tasks and clear goals set by the enterprise, organizers participating in operational activities will stick to their responsibilities in their positions. However, the manufacturing industry may be challenged by a large amount of asymmetric information, provided that the number of uncertain factors in the external environment increases [1].

3.2 Resistance to Change

Enterprises can obtain several new capabilities through digitization, namely cloud computing, data mining, information acquisition and integration capabilities, and artificial intelligence information technology [11,12]. By integrating and storing a large amount of effective data, enterprises can also achieve information and

knowledge sharing. Based on cloud computing, if enterprises can master advanced analysis tools and methods such as predictive models, they can analyze and further mine different types of data, such as real-time and offline data [13-15]. Although digitization can bring many benefits to enterprises, many enterprises are unable to maximize the benefits of digital technology due to resistance to change. According to a literature review, the main limitation of the contemporary manufacturing industry in the process of DT is that enterprises spend most of their human and material time improving digital technology. But enterprises have overlooked one point, they still lack the skills to face the resistance [3].

More and more AI is used by enterprises, it is also a manifestation of digital transformation. The participation of AI in various processes of manufacturing enterprises means that traditional workflows will be affected or even replaced, and new technologies will also be adopted. These new workflows and technologies will be resisted by many employees because the familiar work methods, goals, and environment that were once remembered have changed, greatly affecting employees' sense of stable work. For employees, the addition of robots is a management change and a challenge to their positions or responsibilities. The breaking of comfort zones also means the emergence of some crises, such as threats to job security [16]. In addition, people tend to view uncertain future events as some kind of crisis.

To sum up, one of the challenges is enterprises do not have sufficient capabilities to deal with resistance to change caused by DT [17]. Digital transformation is a threat to many employees in the industry, including unfamiliar work behaviors and the replacement of jobs by digital technology. How enterprises should alleviate this pressure is a major issue.

3.3 Insecure Networks and Information

Unsafe network information is also the reason for the failure of Digital transformation in the manufacturing industry. The emergence of more and more cyber attacks can lead to insecurity in the digital world. Having a secure digital world is an important factor for the effective implementation of DT.

In the context of digitization, information is becoming more and more abundant. And the speed of information dissemination is becoming faster and faster. Everyone can publish and disseminate information through various channels. But there are also many people who become disruptors of online information in order to achieve their

own goals. The network has virtuality, and network security is also a relatively abstract existence. In this situation, it is difficult for digital information networks to avoid a series of imperceptible security vulnerabilities [8]. Hackers and criminals can take advantage of the situation and may cause problems such as information theft and even network paralysis. The importance of data for the manufacturing industry is self-evident, and can cause incalculable losses to the manufacturing industry.

If enterprises want to have a secure information environment, establishing an information security management system is essential. At the same time, this information security system must be sound. Some enterprises have built incomplete and imprecise security management systems, resulting in the inability to effectively supervise and manage information security [18].

The above analysis can indicate that, even though network security technology has developed well today, hackers and criminals will possibly still use more diverse and sophisticated methods to disrupt network information security. It is difficult to avoid a series of security vulnerabilities in the construction of information networks. Only by keeping up with the times and doing a good job in building and protecting network security can enterprises improve the security of digital information and better promote enterprise digitization.

4 Suggestion

4.1 Using Advanced Digital Technology

The manufacturing industry, which is still using traditional business models, can use some advanced digital technology applications. For example, edge computing [19]. can process multiple tasks simultaneously, and better achieve information symmetry by reducing the load of connecting the internet and the cloud, while improving data security. In addition, edge computing enables enterprises to better use object detection, face recognition and other applications [16]. This technology is used to solve the problem of having too much data but difficult to obtain effective data.

Manufacturers must go outside of their comfort zone, redesign their company model, and move forward with business processes that are more effective and have a shorter time to market by utilizing digital technology that is extraordinarily effective inside their current legacy systems [16]. If a company has enough information, digital innovation can be strengthened to encourage independent invention, which can

enhance goods and services and change the old commercial form of "selling goods and creating benefits" to one of "creating goods, satisfying needs, and creating benefits."

Haier Group is a conventional manufacturing business leading the efforts of "intelligent manufacturing" in China. Haier actively integrates digital innovation and has achieved good reform results in the context of big data. Haier's digital innovation is reflected in two aspects. Firstly, Haier focuses more on improving the automatic perception and judgment capabilities of its products. Secondly, Haier uses big data to share and analyze effective learning data in real-time and fully leverages its potential [1].

4.2 Training Employees

The manufacturing industry should not only focus on improving technology but also cultivate employees' skills, which are all very important.

Due to the lack of training for employees in some enterprises. Employees are unable to develop the skills to face the progress of digital technology. They naturally feel powerless to start, even resistant to DT. Companies should invest more money in management innovation and change training courses.

More funds can be invested in training and added to management innovation and change training courses. Through relevant training courses, managers can better understand the impact of change on employees and help them overcome this hardship in a targeted manner [3].

In addition, when formulating a DT strategy, decision-makers should involve the stakeholders most affected by the change in the strategy formulation. Also allows all departments of the company to participate in the development of strategies [20]. This can not only improve the progress of the DT process but also reduce the possibility of change failure [21]. And most importantly, reduce the resistance to change when implementing specific strategies.

Finally, the top management should convey the implementation strategy and objectives to the staff, which will reduce the anxiety of the staff about the replacement of information technology, and understand that DT is to reshape the workflow rather than replace all [21].

4.3 Improving Network Security

The manufacturing industry needs to use a series of methods to improve network security. Firstly, the manufacturing industry should have a reasonable range of restrictions when using the Internet. This can effectively reduce the entry of network intruders [8]. Because there are many open networks that are not secure or even impersonate official websites, even if they appear very legitimate. Secondly, inevitable security vulnerabilities need to be addressed as soon as possible. Inspections, repairs, and protection should not start only when security vulnerabilities arise. Various reliable firewalls or antivirus software can be used to eliminate these security concerns [8]. The manufacturing industry can even build antivirus software that is more suitable for its own enterprise. In addition, manufacturing enterprises can build a more powerful, secure network information system that can protect digital information [3]. Establishing a joint control mechanism with related enterprises that can jointly control and collaborate can also improve the data security and prevention capabilities of the enterprise [8].

After having a series of solutions to improve network information security. Enterprises need to implement them in information security management. Firstly, it is necessary to establish a system for information security management, or continuously improve existing systems. Every employee has a responsibility to jointly build the enterprise's network information security system. Establish a responsibility system to cultivate and improve employees' sense of responsibility and management literacy. At the same time, establish a responsibility system to pay attention to and hold accountable employees for operational errors [15]. If the operation is improper multiple times, corresponding training courses should be mandatory for employees to learn. These measures can enable enterprises to strengthen their management of information, thereby improving the security of information.

Secondly, enterprises should establish targeted information security management teams to inspect and take further protective measures against information management systems. Specifically, team members should regularly inspect and record the operation of the information management system [18]. Resolve minor issues discovered on your own and promptly report major issues that cannot be resolved. And prepare solutions in advance to address various situations. At the same time, training and group meetings are essential. Finally, enterprises should add corresponding positions and introduce personnel with advanced network technology.

New and old members can communicate with each other [18], and work together to improve the security of enterprise information management and build a suitable network protection system for the enterprise.

5 Conclusions

This study found that some enterprises still have difficulties in Digital transformation. Firstly, enterprises are facing the dilemma of information asymmetry. Enterprises are unable to obtain accurate information and the information obtained is not timely enough. This is because some traditional manufacturing industries have not been able to break out of their comfort zone. For example, without the introduction of advanced digital technology applications, or unable to fully utilize digital technology.

Secondly, enterprises are facing resistance to change. Enterprises focus most of their attention on technology but overlook the need to improve their skills in dealing with resistance to change. The different workflow, environment and goals brought about by digital transformation have also been resisted by employees. Finally, unsafe networks and information are also important factors that prevent enterprises from successfully realizing digital transformation.

This study explains in detail three important factors that are easy to be ignored in the process of DT in the manufacturing industry. And provide reasonable and reliable suggestions separately. This helps enterprises accelerate the process of digital transformation and reduce the possibility of failure.

However, there are still shortcomings in this paper. This study did not provide a detailed list of all obstacles. In the future, it can be further refined in the above research. It is more conducive to helping the manufacturing industry successfully achieve digital transformation.

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