

Research on the Innovation of Enterprise Management Model under the Background of Industry 4.0

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Abstract: Technologies such as cloud computing, Internet of things, big data, artificial intelligence and industrial Internet have promoted the development of industry 4.0. Its characteristics of interconnection, integration, data, innovation and transformation have changed the business environment of enterprises. The status of manufacturing enterprises in the supply chain is strengthened; the position of manufacturing links in the value chain is improved. The smile curve will be flat, and the business management model will continue to change. The Mckinsey 7S model provides the framework and ideas for management innovation. Innovation from these seven aspects can improve the efficiency of business management.

1. Introduction

According to Schumbert, an Austrian American economist, innovation is the transfer of production function or the combination of production factors and production conditions which aims to obtain potential surplus profits. In the era of industry 4.0, various production factors and production conditions are combined to form a simple equation of “automation + robot + network = Industry 4.0”. The “Industry 4.0” in Germany means to digitize and intelligentize the supply, manufacturing and sales information in production through the Cyber-Physical System (CPS) and finally achieve the rapid, effective and personalized product supply. In the “Industry 4.0” model, the labour division in the industrial chain will be restructured; the value chain will be reshaped; the “smile curve” will be flattened. The “manufacturing link” with low added value in the “smile curve” will become as important as the “design and development link” and the “sales and service link”; it will bring Chinese manufacturing enterprises the opportunities for transformation and upgrading. In order to seize the opportunities, Chinese enterprises should innovate the enterprise management mode to adapt to the development of Industry 4.0.

Tao Liu believed that since the convention can be the basic unit of analysis when studying the evolution of enterprises' convention pattern, it can also be the replication entity in the analysis of enterprise' management pattern evolution. China's enterprises have been learning from, or even copying the mature enterprise management practices from foreign countries, such as the ISO9000 Quality Management System, the Total Quality Management (TQM) and the Amoeba Management Mode. In the process of e-commerce development, China has witnessed the growth of world-class well-known enterprises such as Alibaba. These companies have innovated and developed their business and management models on the basis of imitation. In the era of industry 4.0, Chinese enterprises will take advantage of new opportunities and innovate management models.

2. Brief Introduction and Composition of the Enterprise Management Mode

Domestic scholars pay attention to the definition of “management mode” and put forward following views.

First is the “resource allocation theory”, which holds that the management mode is the fixed allocation mode of the enterprise. Yanwen Qian and Linyan Sun develop this view, and hold the management mode is the configuration relationship among human factors, finance, technology, information and knowledge in the specific environment of an enterprise.

Second is the “system theory”. Scholars like Ming Xiao think that the management mode

includes the management system, rules, procedures, structures and methods gradually formed in the long-term practice and basically fixed in a certain period.

Third, Guangqi Liu believes that the management mode is a comprehensive set of strict and operable management system designed for some enterprises with similar nature and scale according to the enterprise management theory.

There are two representative views on the composition of management mode. One is the “management function and activity theory”, which is built based on the theory of Management Process School. It believes that the management mode is composed of various functions of enterprise management and activities carried out. Planning, organization, leadership and control are four common management functions. Another point of view is “the theory of management elements”, which holds that management is a system composed of multiple elements, and that the management mode is composed of the operation modes of various elements. The most famous one is the 7S model proposed by the research centre of McKinsey company. It proposes that the management mode is composed of seven aspects: structure, system, style, staff, skill, strategy and shared vision. This model has been widely used by scholars.

3. Innovation of Enterprise Management Mode in the Era of Industry 4.0

German academia and industrial circles believe that the concept of “Industry 4.0” means the fourth industrial revolution or the revolutionary production method led by intelligent manufacturing. The strategy aims to realize the intelligent manufacturing industry through the full utilization of the Cyber-Physical System: the mechanism which integrates the information communication technology and the cyberspace virtual system. At the level of production mode, Industry 4.0 requires the transformation from “analysis and judgment by humans + production and manufacturing by machines” to “analysis and judgment by machines + production and manufacturing by machines”. At the level of business mode, the features of Industry 4.0, such as the “networked manufacturing”, “self-organizing and adaptable logistics” and “integrated customer’s manufacturing engineering”, give birth to new business modes which meet the needs of a dynamic business network. In this paper, the 7S model proposed by the research centre of McKinsey consulting company is adopted to analyze innovations in enterprise management mode in the era of Industry 4.0.

3.1 Strategy: Dynamic Strategies on Enterprise Development

Strategy is the overall plan of the enterprise’s development goals as well as ways and means to achieve the goals. Strategies are made according to the internal and external environment and available resources; the aim is to help the company to survive and develop stably in the long term. “How to defeat competitors” is the focus of traditional strategies. Value innovation is a new concept in modern enterprise competition. It encourages companies to win customers through creating more values for them. To improve the manufacturing industry, we should take the value innovation as the core, the technological innovation as the breakthrough point, and occupy the market through new and unique manufacturing values.

In the era of Industry 4.0, Internet technology has reduced the information asymmetry between production and marketing, and accelerated the interaction and feedback between the two links. Therefore, the business model driven by consumers (C2B2M) has been generated. Industry 4.0 is the key to that mode. The C2B2M mode requires a personalized and highly flexible manufacturing system which can respond to the market quickly. In the era of Industry 4.0, it is possible to connect resources, information, goods and people for the first time. The techniques of Internet and big data connect production enterprises with consumers. Producers and brands can quickly master consumer demand; producers can organize material procurement, production and logistics distribution according to changes of the market demand. The production mode driven by demand and “flexible” management can be realized. The strategy of the enterprise should adapt to the dynamic business environment. Companies should deeply understand the market demand as well as the development trend of personalized product customization.

The business model innovation is one of the hot spots in business management in recent years. The business model itself embodies the enterprise strategy. For example, some Chinese OEM companies have mastered the production experience of well-known foreign companies and products. Under the background of western countries' re-industrialization, domestic OEM companies use their mature production technology to create their own brand products and explore the domestic market. "Necessary" and e-commerce platforms from the factory to the consumer come into being. E-commerce and other marketing channels are less expensive than traditional channels; qualified manufacturing enterprises try to implement the development strategy of changing from OEM to private brand.

More and more attention has been paid to the innovative methods and practices of "integration". In the past, most Chinese manufacturing enterprises were in the production and manufacturing links, namely the intermediate area of the "smile curve" which can only obtain a small profit. But in the era of "Internet + industry", enterprises, customers and stakeholders are involved in various aspects of value creation, value delivery and value realization; the traditional value creation and distribution modes are gradually changed. China has a vast market. Though core parts are imported, China has produced high cost performance products and created many famous brands through its perfect supply chain, the hard-working labour force and the mature enterprise management technology. ZTE, OPPO, Xiaomi and other communication products are world-famous brands. Although the core parts and the system software technique (such as Android operating system) still rely on foreign countries, domestic companies can develop and assemble the finished products which sell well at home and abroad. Manufacturing enterprises in China should pay attention to the development strategy of production integration which aims to create their own products and brands.

In the era of Industry 4.0, manufacturing enterprises implement the strategy of transformation and upgrading. Applying the Internet of things and the service Internet to all aspects of industry can promote the establishment of a highly flexible, personalized and intelligent production mode. The service-oriented manufacturing strategy and innovation driven strategy should also be implemented. The service-oriented manufacturing strategy means, manufacturing enterprises should integrate value-added services that can bring market value to all links in the life cycle of products, and change from providing products to providing the combination of products and service. The innovation driven strategy means to apply the new generation of information technology, to promote user participation, and to carry out collaborative development and innovation in the industrial chain, in order to promote product, process and service innovation and nurture new business forms as well as new model innovation.

In order to meet the Industry 4.0, the government actively promoted the construction of industrial Internet. In July 2018, the Ministry of Industry and Information technology of China issued the *Guide to the Construction and Promotion of Industrial Internet Platform* and *Industrial Internet Platform Evaluation Methods*. By 2020, the industrial Internet platform ecology will initially take shape.

3.2 Structure: from Rigidity to Flexibility

In the era of Industry 4.0, information technology means and modern management concepts promote the recombination of business processes and the reengineering of enterprise organizations; the Cyber-Physical System (CPS) further promotes the optimization and recombination of enterprise business process. Through modern management technology, the organizational structure can be flatter, but each part of the organization can become more rigorous. The information management platform integrates various management functions of the enterprise; the management mode develops from a functional system with clear division of labour to the systematic integration. The working team composed of various talents is widely used in the management practice. The members, functions and problems of the management team are dynamically adjusted. For manufacturing enterprises, more and more machines replace the front-line workers. The rigid organizational structure, such as the Taylorism, changes to the flexible organizational structure which regulates knowledge-based employees. Remote control and remote office also greatly

improve the flexibility of management.

The rapid development of technologies related to Industry 4.0 and the increase of knowledge-based and highly skilled talents further create conditions for the development of team based and network-based organizational structure, which is conducive for enterprises to rapidly respond to the market. The opposite example is that, due to the lack of independent decision-making power, Amazon China acts as the operating centre in the global market, rather than the decision-making centre, which eventually leads to the abolition of Amazon's domestic e-commerce business in China. In recent years, many domestic enterprises have popularized the Amoeba business management mode. They adopted the firm business philosophy and fine department independent accounting management, divided the organization into small departments or groups, and operated through independent accounting. Essentially, it is a quantitative empowerment management mode, making the enterprise organization constantly "transforms" and adjusts to the changing external environment. The flexible organization which adapts to market changes is realized. Technologies such as cloud computing, Internet of things and big data and other improve the level of independent accounting of departments, and promote the implementation of the Amoeba business management model.

3.3 System: from Solidification to Innovation

The development of enterprises and the implementation of strategy need a perfect system as the guarantee. In fact, various systems are the concrete embodiment of enterprises' spirit and strategic thought. Therefore, in the process of implementing the strategy, we should formulate an institutional system consistent with the strategic thought. The system inconsistent, uncoordinated or even deviate from the strategy should be avoided. At the same time, organizational innovation also needs institutional guarantee. In the "Industry 4.0" era, information technology and modern management concept will promote business process reorganization and enterprise organization reengineering. The organizational structure and the business process should adapt to the requirements of intelligent manufacturing. The results of business process reorganization and enterprise organization reengineering will inevitably produce corresponding management system.

For example, in 2010, Wei Miao, the Minister of the Ministry of Industry and Information Technology of China, put forward the idea of establishing a set of enterprise management system integrates information and intelligence with the reference to ISO9000. Through preliminary research, the Joint Working Group believes that a set of management systems can summarize, conclude and refine some basic laws and general experience formed in the process of integration; the system can guide and help enterprises to determine the objectives, formulate the integration plans, and analyze the working process. ERP and other MIS systems provide network management platform, which can solidify the optimized management process and improve the efficiency of work.

In the era of Industry 4.0 with cloud computing, Internet of things, big data, artificial intelligence and other technologies, "multi variety, small batches and fast renovation" gradually becomes the mainstream. In the industrial era, the production mode, equipment, process and system were all prepared for the large-scale production of products with "small variety and large batches"; the management system has great rigidity. The successful practice of some enterprises shows that "small batches and flexible production are more important than large batches and low cost". Accordingly, the management system of enterprises will become more flexible and innovative.

3.4 Shared Values: from Obedience to Innovation

In the McKinsey 7S model, common values are at the centre of the strategy. It governs the making of strategies, which are the guiding ideology of enterprise development. Only when all employees of the enterprise understand this ideology and use it to guide their practical actions can the strategy be successfully implemented. The common values of enterprise members have the functions of guidance, restraint, cohesion, encouragement and radiation, which can stimulate the enthusiasm of all employees, unify the will and desire of enterprise members, and promote them to work together and achieve the strategic goals of the enterprise.

In the era of Industry 4.0, everything is connected, forming the Internet spirit of "equality,

openness, cooperation and sharing”. This spirit and new technology (cloud computing, Internet of things, big data, artificial intelligence, etc.) will transform the internal business management of enterprises as well as the upstream and downstream value chains of the industry. Enterprises pay more and more attention to innovation. The traditional management mode of manufacturing enterprises emphasizes the field management. Examples include the 5S management which emphasizes obedience and unified action. After the machine replaces part of the manual operation, the difficulty of field management is reduced. The focus of manufacturing enterprise management can be extended from field management to designing, branding and sales, so as to improve its position in the supply chain and obtain higher margin.

Under the background of Industry 4.0, productivity has been developed rapidly; people’s ideas have changed dramatically. Work does not only meet the basic needs of food, clothing, housing and transportation, but also meet people’s requirements of respect and self realization. The majority of grass-roots workers are liberated from stuffiness, noise and other working environments that are not conducive to physical and mental health, and get more happiness. Industry 4.0 has higher requirements for knowledge and skills, which promotes enterprises to form the value of respecting knowledge, talents and innovation.

3.5 Staff: Humanization and Personalized Management

From the early classical management theory of “economic man” hypothesis, to the “social man” and “cultural man” hypotheses, to replace the agency and institutionalization management mode with the humanized management mode is a process of the gradual improvement. The Taylor system, which originated more than 100 years ago, allows front-line workers to repeat similar work day by day. Intelligent manufacturing can free a large number of front-line workers from simple, repetitive and unhealthy work, which lay the foundation for human-based management.

In the era of Industry 4.0, Internet of all things meets the demand of a mass customization market. People’s demand level keeps rising. The proportion of customers dominated by physiological and safety demands continues to decrease, while the proportion of customers dominated by advanced demand continues to increase. Enterprises need to restructure Maslow’s hierarchy of needs and enter the blue ocean of value innovation. This requires the implementation of personalized management. The creativity of employees should also be stimulated to better serve customers with personalized needs.

The intelligent and networked working environment allows some employees to choose their working modes, working places and working time freely, which improves the working effect and efficiency, reduces the pressure of rigid rules and regulations on enterprise employees, improves the degree of humanization and personalized management, and enables employees to meet their own needs on respect and self realization.

3.6 Skill: Improve Compound and High Professional Skills

The skill is a regular way of activity formed through practice. It can be divided into practical skills and cognitive skills. Practical skills refer to the sum of a series of external actions under the control of muscle actions; cognitive skills refer to the sum of cognitive activities such as perception, memory, imagination and thinking in the process of processing and transforming things in the brain with the help of language. Enterprise management informatization requires employees to master more cognitive skills. For example, Internet of things requires employees to master the knowledge and skills of the Internet; technology innovation and product innovation require employees to master the knowledge and production skills of technology and products; model innovation and format innovation require employees to master the knowledge and skills of enterprise management innovation and business model innovation.

In the era of Industry 4.0, on the one hand, the enterprise promotes the integration of workshop level and enterprise level system to realize the seamless integration of production and operation, to share information between upstream and downstream enterprises, and to carry out collaborative innovation based on horizontal value network. On the other hand, the enterprise promotes the integration of production and service to realize the service transformation based on the intelligent

factory and improve industrial efficiency as well as core competitiveness. Therefore, enterprise managers need to acquire comprehensive and systematic knowledge. It is the requirement of Industry 4.0 to cultivate employees with compound knowledge and skills. Compound knowledge and skills include product knowledge and skills, software and hardware knowledge and application skills, as well as enterprise management knowledge and skills.

According to statistics of relevant departments of the United Nations, the proportion of occupations affected by automation in developing countries has reached 2 / 3, which is higher than that in developed countries. Low skilled jobs have disappeared in developed countries. Developing countries need to redesign their education policies and embrace the data revolution; the effort should be combined with supportive macroeconomic, industrial and social policies.

3.7 Style: Strengthen the Innovative Style

Style is the whole temperament formed in the long-term business activities of an enterprise; it is manifested in all aspects of the enterprise, such as the external image and the internal working style of the enterprise. When Peters studied the secret of successful enterprises, he pointed out that most successful enterprises combined leniency and strictness. Enterprises give their employees autonomy rights, so that they can give full play to their talents. At the same time, the core value of enterprises can guide employees to work in the best direction. Industry 4.0 requires enterprise employees to master complex high skills, especially cognitive skills, and to show a rigorous, meticulous, logical, systematic and overall working style. As a whole, an enterprise should show its external image of respecting knowledge, respecting talents and continuous innovation. Manufacturing enterprises carry out production activities based on the industrial Internet platform; they should form the style of providing both standardization and personalization products, and give rapid responses to the market.

In the era of Industry 4.0, technological innovation, business model innovation and management innovation need to be continuously promoted. For example, how can manufacturing links in the intermediate area of the “smile curve” be more profitable in the supply chain through management innovation, technology innovation and business model innovation? The “smile curve” should be transformed into the “Musashi curve”. Successful practical experience includes creating brand, integrating, and bringing differentiated services to customers based on the “restructured Maslow’s hierarchy of needs” through service-oriented manufacturing. Innovation atmosphere, innovation consciousness and the innovation mechanism can guarantee enterprises to form the style of innovation and become learning organizations.

4. Conclusion

In the era of Industry 4.0 of the rapidly developing technology, the business environment of enterprises has been changed greatly by the interconnection of everything and the sharing of data. Personalized customer needs, rapidly rising levels of demand and endless new business models require enterprises to quickly adjust their corporate strategies. In order to reduce the risk of operation and management, enterprises should adopt the management mode of improved imitation, innovative imitation or complete original model according to the actual situation. At the same time, the enterprise is required to constantly create the good innovation style, and to produce products that meet the market demand. Facing the rapidly changing market, enterprises need to build flexible and flattening organizational structures, or even adopt new structures like networking, in order to promote technological innovation, manage innovation activities, and quickly respond to the market. The enterprise should carry out humanized management, and encourage employees to actively participate in innovation activities and master advanced skills which adapt to the development of new products, new processes and new management models.

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