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Exploring the Synergy Between Technological Innovation and Business Model Innovation—Taking NIO as an Example

Lu Jiang[1,a,*]

[1]*Zhejiang Wanli University, Zhejiang Province, China, 315100*
a.1375215535@qq.com
**corresponding author*

Abstract: In the age of the digital economy, many enterprises use new technologies to empower their enterprises, and their technological innovation is closely related to their business models. In the era of digital economy, how companies achieve business models and technological innovation is an important issue. The support and driving business model innovation of new technologies, and business model innovation can guide technological innovation, thereby achieving the coordinated development of the two and jointly promoting the rapid development of the enterprise. Based on the longitudinal analysis of the case of NIO, a typical enterprise, this paper analyzes the dynamic co-evolution mechanism of technology innovation and business model innovation, and establishes the relevant model. By summarizing the results of the case analysis, this paper concludes that technological innovation promotes business model innovation, and business model innovation drives technological innovation, and the co-dynamic evolution mechanism of the two has three main modes: one-way, interactive, and integration.

Keywords: technological innovation, business model innovation, co-evolution, the digital economy

1. Introduction

The global digital economy is developing rapidly. In this context, many enterprises use a variety of new technologies, such as Big Data, Cloud Computing, Internet of Things and Blockchain to empower the development of enterprises, thus affecting the innovation of technology and business model. Technological innovation is closely related to business model innovation. In the era of the digital economy, if enterprises want to gain competitive advantages, they should grasp how to realize the synergy between business model and technological innovation so that digital technology can support and drive business model innovation, and business model innovation can also guide technological innovation, and finally realize the collaborative development of the two and jointly promote the rapid development of enterprises. At present, scholars at home and abroad have studied the relationship between technological innovation and business model innovation from multiple perspectives. Foreign scholars Haetliger, Chesbrough, Christensen, Zelong et al., through investigation and analysis of enterprise cases, respectively, verified that the relationship between

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technological innovation and business model innovation is interactive, and believed that only two kinds of innovation behaviors match each other. Only in this way can the competitiveness of enterprises be enhanced to the greatest extent [1-4]. Some Chinese scholars have used classical research methods such as entropy change theory to study some large companies, so as to summarize the relationship between the complicated relationship two. [5-7]. Some scholars also made a summary and constructed the co-evolution model and innovation system framework of the two kinds of innovations [8,9]. This paper will conduct a vertical analysis on the case of NIO, a typical enterprise, and combine the analysis of the business model innovation of NIO by domestic scholar Wang Xiaoshu, so as to analyze the co-evolution mechanism of technological innovation and business model innovation, establish a dynamic co-evolution model, and analyze the mechanism of action of the two [10]. The results of relevant research will provide guidance for new enterprises under the digital economy to realize the synergy of technology innovation and business model innovation.

2. Analysis of dynamic co-evolution mechanism

Through the study of the case materials of NIO, it is found that there is a complex and dynamic synergy between technological innovation and business model innovation of new enterprises, which mainly consists of three aspects: one-way mechanism, interaction mechanism and the mechanism of integration.

2.1. One-way mechanism: technological innovation guides business model innovation

Technological innovation occupies a dominant position in the enterprise, and NIO has invested a lot of human, material, and financial resources to introduce Tesla's technology and improve it according to the local situation so as to achieve technological innovation. At the same time, vigorously cultivate technological innovation talents, set up technological innovation teams, and realize imitation technological innovation of production processes, production methods and products by constantly learning from benchmark enterprises in the industry. NIO chooses efficiency as the focus of its business model, so as to improve the efficiency of automobile sales, improve corporate profits and occupy a place in the market competition. According to Figure 1, NIO's commercial innovation is changed by technological innovation and carried out in one direction.At this time, NIO has not realized the importance of business model innovation and will not take the initiative to pay attention to its behavior. In order to open product sales, market products and improve the efficiency of internal production management, NIO has carried out some business model innovation behaviors, but these behaviors are the corresponding changes caused by technology introduction and improvement. The starting point is only to promote the rapid realization of technological innovation value, and there is no clear concept of business model innovation.

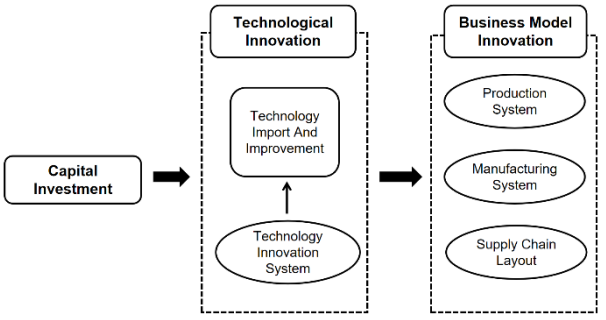

Figure 1: One-way mechanism.

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2.2. Interaction mechanism: the spiral development of technology and business model

Under this mode, NIO has made certain innovation achievements in technology research and development capability, and its technological innovation system has been initially formed. Therefore, NIO began to move from technology introduction to joint development, and automobile research and development is a synergistic industry. Therefore, NIO has established its own research and development centers around the world in accordance with local conditions, and carried out research and development on a number of technologies, such as environmental perception and artificial intelligence. NIO has more energy and funds to explore other profit channels. NIO innovates for business model value creation and realizes value co-creation. According to Figure 2, In this case, NIO's technological innovation and business model innovation are regarded as two parts of the enterprise innovation system, which operate independently of each other but are closely linked to achieve a spiral development.

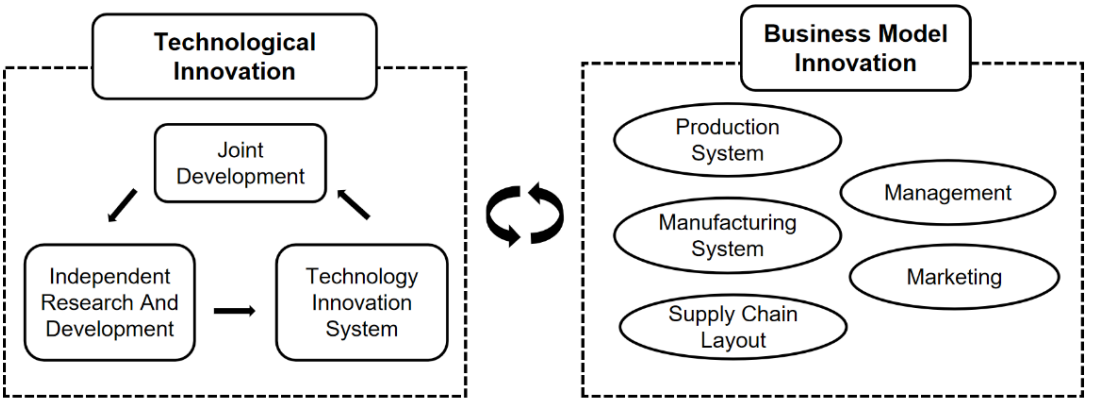

Figure 2: Interaction mechanism.

2.3. The mechanism of integration: the integrated development of technological innovation and business model

Under this model, NIO has realized the importance of business model innovation, so it applies more resources to business model innovation, hoping to achieve the integrated development of technological innovation and business model innovation. In terms of technological innovation, NIO has independently developed several core technologies and is constantly improving its technological innovation capacity and improving its technological innovation system. In terms of business model innovation, NIO must create a matching business model if it wants to obtain satisfactory economic benefits in the face of complex competitive relations in the business environment. NIO has also realized the transformation of business model innovation from efficiency-oriented to newness oriented. According to Figure 3, the mechanism of the integrated development of technological innovation and business model innovation is mainly reflected in the fact that both technological innovation and business model innovation have become important development strategies of enterprises.

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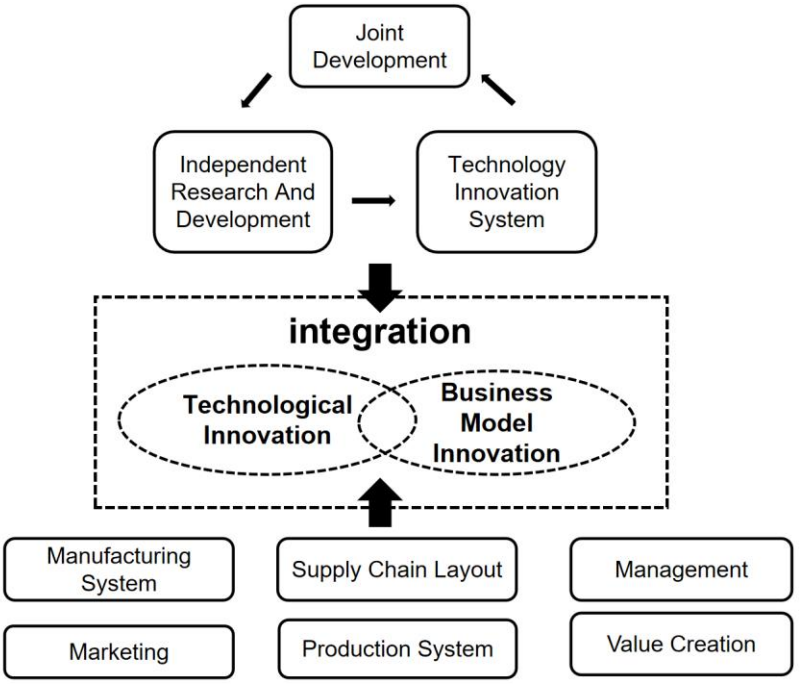

Figure 3:The mechanism of integration.

3. Construction of dynamic co-evolution model

In order to further study the co-evolution process of enterprise technological innovation and business model innovation under the background of digitalization, this paper combines the life cycle theory to sort out and analyze the development process of NIO, which is divided into three stages, namely, the initial stage, the growth stage and the transformation stage. As shown in Figure 4, according to the analysis of NIO in different stages, a set of dynamic co-evolution model of technological innovation and business model innovation is constructed.

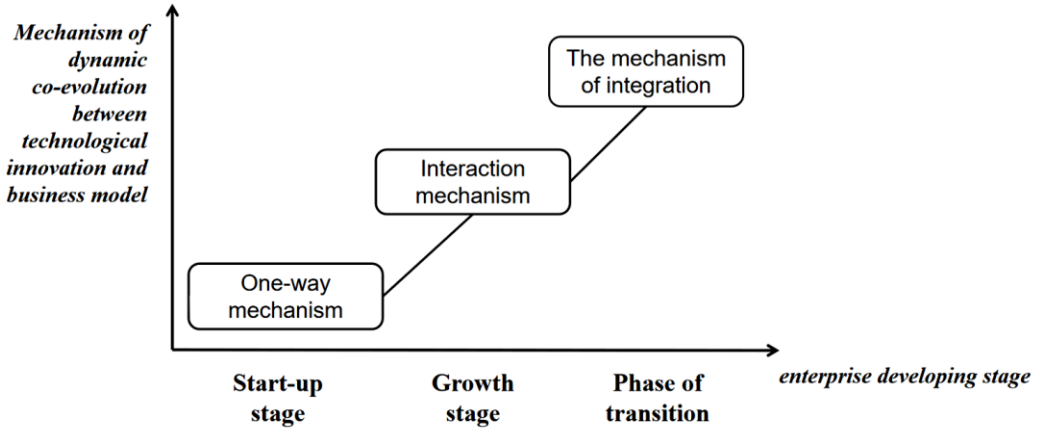

Figure 4: The three-stage dynamic co-evolution model of NIO's technological innovation and business model innovation.

3.1. Start-up stage

At the beginning, due to the limitations of capital and technology, NIO innovated technology, thus promoting a change in business model. With the development of technology, more and more

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competitors have emerged in China's new energy vehicle market. At that time, there were many pain points in China's new energy vehicle market environment, including: the core component technology of new energy vehicles still needed to be improved; the corresponding supporting facilities were not complete; and new energy vehicles had not been standardized. In order to occupy a leading position in the market, NIO adopts the strategy of technology introduction and makes appropriate improvements to the introduced technology. NIO chose to introduce Tesla's battery and charging technology in the initial stage, and improved these technologies in a Chinese way according to the preferences and needs of Chinese customers.

At that stage, NIO's own research and development capabilities were weak, and it did not realize the importance of a business model. Technology introduction and improvement strategies have forced NIO to choose an efficient-oriented business model to reduce the error rate. Under the guidance of technological innovation, the efficiency-based business model creates a set of market feedback mechanisms based on user participation, so that enterprises can communicate with customers more directly in the sales stage, give timely feedback to customers' needs, and constantly adjust the enterprise strategy. While the transaction volume and service efficiency are rising, the management cost of enterprises is also declining.

At this stage, the future production and manufacturing systems and supply chain layout are also improved. Therefore, the relationship between technological innovation and business model innovation at this stage shows a one-way development model, and the connection between them is relatively simple.

3.2. Growth stage

In this stage, with the continuous improvement of NIO's R&D technology level, NIO's technological innovation changed from the original technology introduction and improvement to joint development. At present, NIO has set up design, research and development, and production institutions in Beijing, Shanghai, London, and other places to create a global layout system with the goal of achieving a world-class brand.

On the premise of technological innovation, NIO has also made new adjustments to its business model. The business model of the enterprise has also changed from the original efficiency model to the business model combining efficiency and novelty. On the basis of the original efficient business model, NIO Power realizes the value transfer of the novel business model by creating an "intelligent security system," NIO Power, and realizes the value creation of the efficient business model through its one-click power addition service.

At this stage, NIO not only opened up the market, but also strengthened the ability of resource integration and linkage, which greatly improved the quality of the company's products and services. Under the guidance of business model innovation, NIO also began to look for development opportunities in the supply chain, the value chain, and other aspects, so that an effective feedback control mechanism has been formed between technological innovation and business model innovation. Make the development of the two interlinked, promote each other.

3.3. Phase of transition

With the further improvement of NIO's research and development capability, NIO has obtained the ability of independent research and development in the three core technologies and battery swapping. The battery PACK and electric drive system used by NIO are developed and produced by NIO itself. In addition, the power exchange mode has also been innovated. In 2021, the second-generation power exchange station will have been launched, and the power exchange efficiency and automation degree will have been significantly improved.

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In the transformation stage, in order to adapt to the complex and changeable market environment, NIO has carried out a transformation of its business model to a business model dominated by novelty. At this stage, on the basis of reaching a certain level of product technology, enterprises hope to reshape the industrial chain, serve customers in an all-round way, and improve customer satisfaction. Among them, NIO builds the NIO Service system to improve customer satisfaction, so as to realize the value transfer of the business model; it also creates the NIO Life boutique surrounding system to improve customer experience, so as to realize the value creation of the business model.

At this stage, NIO put the key point of the survival and development of the enterprise on business model innovation. The difference between the elements of technological innovation and the elements of business model innovation is increasingly small, and there are often multiple elements interacting with each other. Sometimes technological innovation leads to business model innovation, and vice versa. The innovation elements of the two are interrelated, integrated and dynamically developed, which is a multi-layer nested synergistic effect. Technological innovation and business model innovation present an integrated development trend.

4. Conclusion

The innovation of technology can effectively promote the innovation of enterprise business models and help enterprises gain competitiveness in the market. NIO's business model has also been changed through technological innovation, which has greatly improved the transaction efficiency of products and the development speed and success rate of new products. Changes in the business model of enterprises will also promote changes in technological innovation. The change in NIO's business model has promoted the development of the company's maintenance and charging technologies, which have led to new breakthroughs and enhanced the company's competitiveness in the market. Through the case study, this paper describes the story context between technological innovation and business model innovation in the digital era, and concludes that the collaborative dynamic evolution process of technological innovation and business model innovation has three modes: one-way, interactive and integration.

The access to relevant information of the enterprise is limited, and data and related information may be missing. Therefore, the research results need to be further improved. Moreover, the enterprise has some particularities of its own and cannot completely represent all enterprises in the industry.

References

[1] *Henry Chesbrough. (2002) Graceful Exits and Missed Opportunities:Xerox's Management of its Technology Spin-off Organizations. Business History Review, 76 (4):803-837.*

[2] *Hwang Jason. (2008) Christensen Clayton M. Disruptive innovation in health care delivery: a framework for business-model innovation. Health affairs(Project Hope), 27(50):54-58.*

[3] *Charles Baden-Fuller, Stefan Haefliger. (2013) Business Models and Technological Innovation. Long Range Planning, 46(6):235-238.*

[4] *Zelong Wei,Dong Yang, Biao Sun, et al. (2014) The fit between technological innovation and business model design for firm growth:evidence from China. R&D Management,44(3):112-119*

[5] *Li, Z. & Zhao, W.(2012) Collaborative research on enterprise technology innovation and business model innovation. China Soft Science,10:117-124.*

[6] *Wu, X., Zhu, P., Wu, D. et al.(2013) How do the latecomers achieve rapid catch-up? - a second business model innovation and technology innovation in model. Science research, 31 (11) : 1726-1735.*

[7] *Tong Xin, Yu Liying.(2014) Research on the Coupling mechanism of technology innovation and business model Inovation based on business ecosystem. Science and Technology Progress and Policy,31(12):17-22.*

DOI: 10.54254/2754-1169/26/20230591

[8] *Ji, H. & Yao, S. et al.(2019) Co-evolution of technological innovation and business model innovation in manufacturing enterprises: a multi-case study. Science and Technology Progress and Policy,36(03):90-97.*

[9] *Yang, L.(2021) Research on the co-evolution path of technology innovation and business model innovation in strategic emerging Industries. Journal of Langfang Normal University (Natural Science Edition),21(04):82-88.*

[10] *Wang, X. (2022) Research on the Business Model Innovation Path of new Ventures in the Digital Economy Era -- A Case study of NIO. Journal of Bohai University (Philosophy and Social Sciences Edition),44(02):61-66.*