

Article

Exploring the Factors Influencing Business Model Innovation Using Grounded Theory: The Case of a Chinese High-End Equipment Manufacturer

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Abstract: Business model innovation is vitally important for firms to gain competitive advantages and improve their performance. While it has attracted much attention recently, considerable work is still needed to properly understand business model innovation. This study aims to examine the factors influencing business model innovation through a case study of Shaanxi Blower, a high-end equipment manufacturer in China. Using grounded theory in terms of open coding, axial coding and selective coding, this case study found seven main factors that influenced business model innovation, namely, market pressure, government policy, entrepreneurship, culture and strategy, technology, human resources, and organizational capabilities. Market pressure, government policy and information technology are external factors, whereas, entrepreneurship and technological innovation are internal factors. Culture and strategy, human resources, and organizational capabilities are the guarantee factors. This study's findings add to the growing literature by developing a more holistic understanding of the factors that influence business model innovation in the Chinese context, which indicates a possibility for Chinese high-end equipment manufacturers to improve their competitiveness and performance through better management of their business model innovation.

Keywords: grounded theory; business model innovation; high-end equipment manufacturing; influencing factors

1. Introduction

While overall Chinese manufacturing industry is seen to have made a significant contribution to the rapid growth of the Chinese economy over the past 30 years [1], the high-end equipment manufacturing industry, characterized by high-technology, high investment, high added value, and high information density, is seen as providing the foundation to revitalize and enhance the development of the economy. However, there are indications in the literature that this industry lacks steady improvement in efficiency and productivity growth [2]. This could be because the current high-end equipment manufacturing industry tends to focus on technological innovation, but ignores business model innovation, that is, how to make money and profits. In fact, business model innovation and technological innovation are all important means for enterprises to improve their competitiveness and performance. Moreover, there is a certain relationship between business model innovation and technological innovation. Chesbrough et al. [3] believe that an important role that business models can play in early stage research and development (R&D) is to release the potential value of technology and obtain as much value as possible. At the same time, business model innovation can also drive technological innovation [4], and promote enterprises to produce reliable

products to gain competitive advantage. In an effort to enhance the international competitiveness of Chinese firms, the Chinese Ministry of Industry and Information Technology emphasized at the “China Development Forum (CDF)” that the development of strategic emerging industries must insist on taking business model innovation as a powerful driving force. This echoes the observation made by Drucker (2004) that “competition among enterprises today is not competition between products, but between business models.”

While business models are generally concerned with firm-level value creation and capture [5–8], business model innovation can be defined as “designed, novel, non-trivial changes to the key elements of a firm’s business model and/or the architecture linking these elements” [9]. Thus, business model innovation is seen as a new way of value creation to allow a firm to improve its performance and acquire core competitiveness [5,10]. Despite being regarded as a crucial organizational competence [11] and having attracted much academic attention of late [5,9], business model innovation remains to be properly studied [7,12]. A recent literature review indicated that it still “has gaps with respect to the identification of antecedent conditions, contingencies, and outcomes” [9]. In an attempt to advance our understanding of business model innovation, this study aims to examine the following research question: what are the key factors that influence business model innovation in the context of high-end equipment manufacturing in China?

Whilst existing studies have suggested that business model innovation can be affected by numerous factors [13–16], such as technology [17], strategic orientation [18], and corporate social capital [19], research on the internal and external antecedents of business model innovation has not yet been sufficiently investigated [9] as limited knowledge exists about the enablers of business model innovation [11]. Moreover, past authors have often examined the influencing factors discretely, which fails to capture the complex nature of business model innovation, which involves multiple interrelated factors [7,8,11]. Furthermore, although China is now the world’s second largest economy, there have been few attempts to examine the practice of business model innovation in the context of the Chinese high-end equipment manufacturing industry.

This study addressed the above research gaps by further examining the factors that influence business model innovation through a case study of Shaanxi Blower, a leading Chinese high-end equipment manufacturing group in business model innovation. Using grounded theory in terms of open coding, axial coding and selective coding, this study explored the factors influencing Shaanxi Blower’s business model innovation. In doing so, this study seeks to contribute new work on an under-researched phenomenon [7,9,11,12]. First, based on an in-depth understanding of a single case, this study adds to the existing knowledge base by developing a more holistic understanding of the complex nature of how business model innovation is affected by multiple internal and external factors in a Chinese context. Second, this study provides additional empirical evidence in support of the findings of existing research on business model innovation by extending their generalizability to the Chinese manufacturing context. Third, the present study’s findings indicate a possibility for Chinese high-end equipment manufacturers to improve their competitiveness and performance through better management of their business model innovation.

The next section presents the study’s overview of the theoretical underpinnings of its main concepts. Then, the research design is discussed including the research method, case selection, and data acquisition, followed by the detailed data analysis and presentation of results. Finally, theoretical and managerial implications, study limitations, and directions for future research are provided.

2. Literature Review

2.1. Business Model and Business Model Innovation

Scholars have different definitions and understandings of business models from different research fields and perspectives. Business models are concerned with not only how companies make money [20] and how to obtain revenue and profits [21], but also how they operate to deliver

value to customers within a reasonable cost [7]. Chesbrough [8] suggested that companies can use their business models to commercialize ideas and technologies, and gain profit by delivering value to their customers. From a resource-based view, George et al. [22] considered a business model as the configuration of organizational resources to generate new profit opportunities. From the perspective of organizational operation, a firm's business model is a description of the entire business process of the firm through the establishment of a value network to meet the demands of its customers and stakeholders [23]. From the perspective of system integration, Amit et al. [24] noted that a business model is a system of interdependent activities that transcends the focal firm and spans its boundaries including transaction structure, transaction content, and transaction governance. Ricart et al. [25] proposed that a business model is an activity system consisting of many interconnected activities including value chain activities, customer choice, product or service selection, etc. Zott et al. [26] suggested that business models emphasize a system-level, holistic approach to explaining how firms "do business". To sum up, researchers appear to have understood this concept from different perspectives such as value proposition, value creation, value delivery and value capture [27]; however, there are no commonly accepted definitions and understanding of what business models are yet [11,26]. Nevertheless, Foss et al. [9], based on a systematic literature review, suggested that researchers now tend to understand business models as the "design or architecture of the value creation, delivery, and capture mechanisms" of a firm [7].

Business model innovation, as an important source of the core competitiveness of enterprises, is a way to create value by discovering new opportunities, new markets, and new profit-making methods, etc. [28]. Business model innovation creates value and captures value for stakeholders by searching new business logic and methods [10]. Mitchell et al. [29] believe that the business model should seek to improve the 5W2H ("who", "what", "when", "why", "where", "how" and "how much" involved in providing customers and end users with products and services) and find an optimal combination. In the study of disruptive innovation, Markides [30] stated that business model innovation is the subversion of the existing business model. Based on the viewpoint of dynamic capabilities, Hana et al. [31] pointed out that the best strategy for small businesses who face difficulties such as technological and organizational change to achieve sustainable competitiveness was to integrate various platform resources and build an omni-channel platform for business model innovation. Based on the value chain perspective, Magretta [32] pointed out that the adjustment of the value chain or the elements of the value chain belonged to business model innovation. Osterwalder [33] proposed that organizations could innovate business models by changing the nine components of the business model, including value proposition, customer relationships, channel access, customer segmentation, key business, core resources, key partners, revenue sources, and cost structure; moreover, Johnson et al. [34] stated that business model innovation could be carried out through the innovation of four elements: customer value proposition, profit model, key resources, and key processes. Despite being regarded as a crucial organizational competence, there is no commonly accepted definition of what business model innovation is. We argue that business model innovation is an important way of gaining sustainable competitiveness through value creation and delivery to the customer.

Nevertheless, research on business model innovation has received increasing attention across various fields including innovation management [5,30,35], strategic management [24,36], and entrepreneurship literature [22,37]. Based on a review of the extant academic literature on business model innovation, Schneider et al. [11] suggested that existing research on business model innovation include three main streams: (1) the prerequisites of conducting business model innovation; (2) the elements and process of business model innovation; and (3) the effects achieved through business model innovation. More recently, Foss et al. [9] conducted a systematic literature review of 150 articles on business model innovation and suggested that four main research streams exist: business model innovation conceptualization, business model innovation as an organizational change process, business model innovation as an outcome, and consequences of business model innovation.

Furthermore, they identified a number of research gaps in the business model innovation research, of which one is the study of antecedents of business model innovation.

In short, business model innovation is yet to be further investigated and understood. For this purpose, this study seeks to develop an understanding of the key influencing factors of business model innovation in the context of high-end equipment manufacturing in China. The next section will discuss what factors have been identified by existing studies to affect business model innovation.

2.2. Factors Influencing Business Model Innovation

A number of factors have been identified to influence business model innovation. First, some studies have described business model innovation as an attempt to seize new opportunities introduced by the advent of, for example, platform technology by biopharmaceutical firms [38], “Internet +” technology in the traditional manufacturing industry [39], or in the context of e-commerce [40]. Second, firms innovate their business models to cope with environmental changes in customer demand, business, competitors and market competition [34], for example, small and medium enterprises (SMEs) in South Korea have innovated their business models as a result of globalization [41]. Third, entrepreneurship and risk-taking are shown to play a positive role in business model innovation based on data collected from 192 manufacturing SMEs [42]. According to the 71 Slovenian SMEs that participated in the study, Andreja et al. [43] believe that the innovativeness of enterprises and business environment can promote business model innovation. Fourth, organizational capabilities such as “dynamic consistency” [44] or “critical capabilities” [45] have been suggested as enabling firms to transform their business models. Additionally, corporate social capital [19], organizational learning [19], organizational inertia [46], and organizational culture [47], have also been found to influence business model innovation.

However, little research exists to examine business model innovation in a Chinese context. Zhang Tieshan et al. [48] suggested that the industrial links in the high-end equipment manufacturing industry could be divided into three phases: front-end, middle-end and back-end. They believed that the application of big data to these links could help business model innovation. Based on the value chain system put forward by Porter, Wang Shengzhou [49] introduced the resource interface and customer interface to build business models including the resource relation, the enterprise operation, and the revenue realization elements. They proposed that the transformation of these three elements could lead to business model innovation in the equipment manufacturing industry. Duan Qingquan [50] pointed out that equipment manufacturers could use the “Internet +” technology to innovate business models by providing value-added services of products, software, and comprehensive system solutions as well as format innovation integrated into the user value chain.

While these studies have conjectured that a few factors could influence business model innovation, they have tended to focus on SMEs and discussed the influencing factors discretely without providing empirical evidence. Thus far, little is known about the factors that influence business model innovation in the Chinese high-end equipment manufacturing industry. Given that this industry plays an important role in revitalizing other Chinese industries, it is central to understanding the factors that influence business model innovation in this industry.

3. Research Design

3.1. Research Method

Grounded theory is a systematic inductive methodology involving the construction of theory through analyzing and summarizing data [51]. Grounded theory emphasizes improving the theory by facts and experience and proposes the formation of the theoretical framework through several steps, such as continuously collecting and analyzing data, comparing and supplementing data, summarizing data, refining concepts, developing categories and the relationship among them (Figure 1).

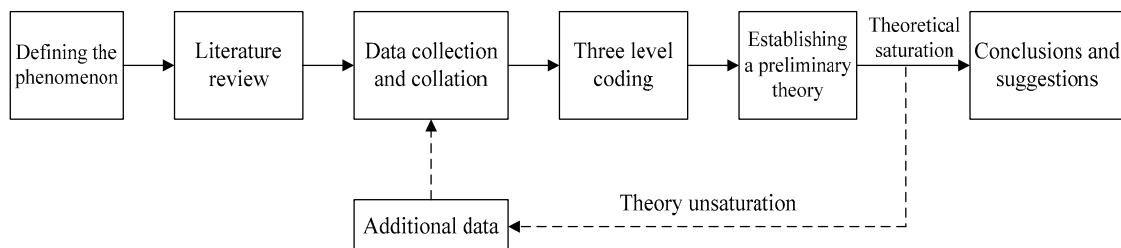


Figure 1. Flow chart of grounded theory (Source: Adapted from Pandit [52]).

The analysis of grounded theory is mainly carried out through three types of coding, namely open coding, axial coding and selective coding. Coding is used to decompose and label the observation records and transcribed interview materials word by word, sentence by sentence, and paragraph by paragraph. It gives a conceptual definition to individual events or phenomena, and gradually conceptualizes and categorizes to develop the relationship between categories until theoretical saturation is reached, before the theory is finally constructed.

Grounded theory has been commonly used in qualitative research. There are four main reasons for choosing grounded theory in this study: (1) there are many factors influencing the business model innovation of high-end equipment manufacturing enterprises, which is difficult to study through traditional hypothesis testing; (2) grounded theory can be used to extract and summarize the empirical data in real life from the bottom up, and then construct and perfect the theory; (3) the influencing factors of business model innovation are yet to be sufficiently examined; and (4) business model innovation is complex and involves multiple interrelated factors. Therefore, grounded theory is suitable for the present study to systematically collect and analyze empirical data to generate conceptual categories, that is, the factors that influence business model innovation in the context of high-end equipment manufacturing in China.

3.2. Case Selection

Shaanxi Blower, a high-end equipment manufacturing group in China, was selected as a single representative case [53], which is typical of many other Chinese high-end equipment manufacturers and is a single holistic case in the sense that the global nature of business model innovation will be investigated. Shaanxi Blower was founded in 1968 and put into production in 1975. In 1996, it was reorganized from the Shaanxi Blower Factory to the Shaanxi Blower (Group) Co. Ltd. Located in Xi'an China, and currently has 2761 employees. First, Shaanxi Blower has been transformed from a single product supplier to a system solution provider and system service provider in the energy conversion field. Second, it has been transformed from product management to brand management and capital operation. As a result, Shaanxi Blower has successfully formed three major business segments in its continuous transformation such as intensifying its research and development of core technologies, quitting low value-added business, and shifting from selling single blower products to selling overall solutions and services. In addition, through internationalization development practice and the integration of global resources, Shaanxi Blowers has comprehensively developed its core businesses and competitiveness in the areas of, for example, equipment, engineering procurement construction, service, operation, finance and distributed energy. Consequently, it has significantly improved the quality and efficiency of its operation and firm performance year by year. As a leading high-end equipment manufacturer in transforming its business practice, Shaanxi Blower provides an innovative business model for the operation and development of high-end equipment manufacturing enterprises.

Using a single holistic case, this study was not intended for generalization to a larger population; rather, as suggested by Yin [53] and Simon [54], it was expected to be generalizable in the sense that the context and particularity of the case described in this study would allow other Chinese high-end equipment manufacturers to generalize the findings to their own similar contexts.

3.3. Data Acquisition

Generally, the data was collected from the enterprise files, relevant documents, field observations, interview records, observation of participation, material evidence, etc. In this research, primary data were collected from several visits to Shaanxi Blower on 15 April 2017, 20 May 2017, and 15 June 2017. We interviewed middle and senior managers who participated in the business model innovation process and designed an interview outline including 11 open questions (see Appendix A), and conducted semi-structured interviews with selected personnel. Typical questions included: Please introduce the process that you participated in business model innovation recently. What were the factors/reasons that triggered business model innovation? What were the problems that your company had encountered in business model innovation? How did you solve them? With the interviewees' consent, the interview process was fully recorded. Before starting the interview, we introduced the purpose and main contents of the interview to the interviewees. In order to ensure the validity and completeness of the obtained information, we explained the core concepts of "business model" and "business model innovation", and asked for the interviewees' views on the above concepts. Meanwhile, we reached an agreement on the understanding of business model innovation. During the interview, first, we understood the working conditions of the interviewees and the process of the business models innovation in which the interviewees participated. Then, we made appropriate questions based on the responses of the interviewees and expanded the content of the interview statement as much as possible to ensure the authenticity and integrity of the interview materials. A total of 18 people participated in the interview and each interview lasted around 1.5 h. After each interview, we transcribed the recording material and collated the interview data promptly. When there was ambiguity or doubt, we communicated with the interviewees by phone or WeChat, and then we supplemented the interview data. Secondary data mainly came from: (1) open internal information, internal promotional video, etc.; (2) Shaanxi Blower' official website under the dynamic section of the media summary, effectively guaranteeing the comprehensive online reports about Shaanxi Blower; (3) news reports, interviews with people about the feature documentaries of Shaanxi Blower, such as the "Great Power and Heavy Equipment" on the website; and (4) "Shaanxi Blower", "Transformation", "Business model innovation" and other key words were used to retrieve and collect literature related to this study on the website of Chinese periodicals. As a result, a total of 46 pieces of secondary data items were collected.

4. Factors Influencing Business Model Innovation

4.1. Open Coding

Open coding was used to initially process and sort the collected interview materials, news reports, books and materials, in accordance with the analysis in the sentence or paragraph, to generate conceptualization and categorization. Conceptualization refers to selecting or creating a concept that best reflects the essence of a sentence. Categorization refers to a more abstract concept higher than a general one in a hierarchy. After many data analyses, 12 categories were finally identified and the process of open coding is shown in Table 1.

Table 1. Open coding analysis example.

Category	Original Statement (Initial Concept)
Government policy	In recent years, the "Made in China 2025" ¹ and strategy of the "Belt and Road Initiative" ² promulgated by the state has given us a great guiding role. In line with the state policy and the current development of the Company, we have put forward the concept of service-oriented development in the field of intelligent manufacturing. Another example is the acquisition of the Czech Republic ³ as a country along the Belt and the Road, in a sense, this is a political task for state-owned enterprises in responding to the policy need (Policy guidance).
	The state will give preferential tax treatment for the manufacturing industry and provide financial support for scientific research projects. In 2014, it declared six government funded scientific and technological projects and obtained a number of government grants (Preferential policy).
	The government has also recognized and encouraged entrepreneurs to innovate. They have held many exchange meetings and forums about business model innovation and government leaders on many occasions to conduct business seminars and visits (Government behavior guide).

Table 1. Cont.

Category	Original Statement (Initial Concept)
User needs change	We started with the customer's needs and focused on the customers who bought the blowers and bought the service and operation. So, at that time, we proposed "two changes" (Customer needs change).
Market environment change	The threat of alternative technology and the competition in the market environment are increasing, which has forced enterprises to transform their existing work process. In order to keep abreast of the changing times, continuous adjustment and change are being carried out within the company (Market competition intensified). "Made in China 2025" and "Belt and Road" have also brought many market opportunities for enterprises such as the technology and market breakthroughs brought by the inclusion of the Czech Republic (Market opportunity).
Entrepreneurship	A graduate from the engineering department, our Chairman became the leader in charge of the first change from technology to sales transformation when he was 44 years. Full of courage and insight, he is a very good at learning from experts and peers (Adventure and innovation spirit). Two transitions were closely related to the recognition, understanding, judgment and continuous self-reflection and self-denial awareness of the Yin manager (Self-reflection and negation). Realizing the appearance of the ceiling in traditional industries or manufacturing, Yin proposed. Consequently, he proposed changing from a single product to a service, and from a single product to brand and capital operation (Vision). In the first year of the strategic new layout, he felt that a new bottleneck appeared. He believed that in the field of distributed energy, the market space in the past was tens of billions, and the market space now is one trillion (Forward looking).
Information technology	Nowadays, the development of the Internet has led to the innovation of the Shaanxi Blower business. Since 2003, the application of network technology has greatly helped us to promote the service (Network technology application).
Technological innovation	The internal research and development investment in Shaanxi Blower now account for 8–10% of its sales. Technological innovation is also emphasized in all aspects of the enterprise. In particular, the improvement of internal intelligent management can help enterprises to continually change business processes (Internal technological progress).
Culture change	Culture is a banner. Reviewing the Shaanxi Blower development in the past 10 years, culture has played a very good role in promoting development. The culture follows the process of production. The quality department has its culture, the same as the strategy department and others. Through the implementation of these cultures, the business development has been promoted (Cultural matching).
Strategic transformation	In the past, we created green power for human energy and are now talking about human green energy services. We will redefine our vision mission (Redefine the vision and mission). Culture should follow as well as interact with the strategy changes. The culture is supported by the system and is then integrated into the process. Culture is supposed to protect the development of the enterprise (Cultural and strategic interaction).
Dynamic capability	When considering the business model innovation, we must first analyze the existing resources of the enterprises, not only to integrate internal resources, but also to take into account the utilization and integration of external resources (Resource integration ability). As a system integrator, similar to contractors, we are able to bring together all enterprises of the industrial chain and to lead our cooperative enterprises to complete the project contract (System integration capability). We are now developing in the field of energy conservation, combining our own advantages to expand new markets. In addition, overseas markets are also in our key directions. Our products, technologies, and services should go into the global markets, enhancing our competitive competence (Market expansion capability). In order to further shorten the process and improve the ability to solve problems as well as respond to the market rapidly, the company started the reengineering process of the Shaanxi Blower power operating production line at the end of 2014 (Process reengineering capability). Shaanxi Blower actively learned from Europe's experience in Industry 4.0 and has integrated with various supporting manufacturers, industry technologies, and various data generated in the whole industry chain (Learning ability).
Innovation capability	We have set up an innovative position within the company to stimulate staff' innovation. In the process of employee innovation, we require leaders to actively support and guide staff innovation (Full innovation awareness). Company provides a wide range of staff training. The company opened the Shaanxi Blower Network University, staff Weekend Learning Day, and has encouraged employees to learn from each other to form a good learning and innovation atmosphere (Employee innovation capability improvement). The company set up special bonuses, recommending awards for crowdfunding wisdom activities, achievement implementation awards, and creating the implementation of financial support, etc. (Innovation incentive).
Talent introduction	In recent years, Shaanxi Blower has introduced many talented peoples who are capable of supporting business units independently in the professional field, which is considered as a basic condition for business development (External introduction of talent).
Talent cultivation	Shaanxi Blower has established a professional channel suitable for the development of those passionate employees seeking their proper positions through competitive recruitment (Internal emphasis on the cultivation and selection of innovative talents).

Notes: ¹ "Made in China 2025" is a Chinese strategic plan issued by Chinese Premier Li Keqiang and his cabinet in May 2015. China is moving away from being the world's factory floor (cheap goods and low quality) to higher value products and services. In essence, this is a blueprint to upgrade the manufacturing capabilities of Chinese industries. ² The Belt and Road Initiative, also known as the One Belt, One Road (OBOR), is a development strategy adopted by the Chinese government involving infrastructure development and investment in countries in Europe, Asia, and Africa. ³ The Czech Republic is one country along the "Belt and Road Initiative" countries, and Shaanxi Blower bought the company EKOL, a leading medium steam turbine manufacturer based in the Czech Republic, which benefitted from China's "Belt and Road Initiative" corresponding policy.

4.2. Axial Coding

Axial coding was used to cluster the category of open coding and find the internal relations between different categories [55]. Based on the relationship between 12 different categories presented in open coding, it was found that the change in user demand and market environment belonged to the pressure category brought by the external environment for the company to change. Therefore, it was summarized as the pressure field of the market environment. The development of external information technology and internal continuous technological innovation were seen to drive the firm to innovate its business model; thus, they were unified as the technology category. In the process of business model innovation, it is necessary to carry out the corresponding strategic transformation and cultural reintegration as the guarantee, both of which were named as strategy and culture. Dynamic ability and innovation capability helped to improve the firm to innovate; therefore, they were summarized as organizational capabilities. The introduction and training of talents focused on the development of human resources so the firm could have the knowledge and skills required to innovate its business model. Therefore, they were named as human resources. While government policy was external and entrepreneurship was internal, they did not belong to the higher category so each was individually named as a main category. The main category corresponding to the spindle encoding and the relationship between the content is shown in Table 2.

Table 2. Seven major relationships based on axial coding.

	Relationship Category	Relation Category	The Connotation of the Relationship
1	Government policy	Government policy	In the field of high-end equipment manufacturing, the state actively fostered markets, deepened international cooperation and guided it at a macro level. The government held many seminars in the Shaanxi Blower Group that emphasized, encouraged, and supported innovation.
2	Entrepreneurship	Entrepreneurship	In the background of industry development trends, the Chairman of Shaanxi Blower proposed the development strategy of transforming the enterprise into a service provider. He ventured boldly to implement administrative management in the enterprise, due to which he is regarded as one of the major promoters of “strategic transformation”.
3	Market pressure	User needs change Market environment change	In the face of overcapacity in the manufacturing industry, the accelerated development of the industry, and the individualized needs of customers, Shaanxi Blower has reshaped its business processes, enhanced dynamic momentum to cope with changes in the internal and external environment, and extended the industrial chain to provide customers with comprehensive life-cycle services.
4	Technology	Information technology Technological innovation	The development of various technologies quickly integrates industrial normalization, locating customer needs accurately and optimizing the business process. Therefore, it is considered as the core force to transform Shaanxi Blower into a service-oriented company and toward “two changes”.
5	Strategy and culture	Strategic transformation Culture change	Shaanxi Blower promoted cultural reconstruction and administrative management, and guided the staff to change their thinking and behavior. Under the guidance of strategy and culture, employees reinforced the awareness of learning and innovation, thus supporting the strategic choice of the service-oriented transformation of enterprises in agreement.
6	Organizational Capabilities	Dynamic capability Innovation capability	In order to implement the service-oriented strategy, it is necessary to reshape the original internal business processes, business structure, and change employee’s behavior, thinking, and awareness. Therefore, Shaanxi Blower has implemented a high investment in many aspects such as resource integration, system integration, process reengineering, organizational learning, and innovation policies to enhance brand image, realize economic benefits, and meet the needs of transformation.
7	Human resources	Talent introduction Talent cultivation	Service-oriented transformation is rooted in the cultivation of innovative talent and the fusion of innovative awareness. By introducing middle and high-end talents, Shaanxi Blower has not only set up a sound training and compensation system, but also increased its investment in research and development including training professionals in innovation and applying “core technology” into service.

4.3. Selective Coding

Based on the analysis of the concept genus generated in the previous stage, selective coding was used to select the core category, which is characterized by strong generalization ability, high abstraction, and strong correlation, to relate many relevant concepts in a broad theoretical range, and to supplement categories that have not been completely developed [56]. We compared and analyzed the relationship

between case data, concepts, and categories continuously, and then developed the core category of “factors influencing business model innovation” to guide other areas. Based on the main categories summarized, the story seemed to be as follows: facing the overcapacity in the traditional industries, the strategic planning of the “Belt and Road Initiative” and “Made in China 2025”, and the rapid technological progress, Shaanxi Blower realized that restructuring including business model innovation was the only way for the firm to be successful. Therefore, Shaanxi Blower actively implemented the “two transformations” to innovate its business model based on the analysis of the customer needs, market trends, the development of domestic and foreign advanced peers, and the consideration of building core competitiveness. To meet the needs of the transformations, Shaanxi Blower implemented a series of institutional innovations such as strengthening the strategic guiding significance of “two transformations” in top-level planning, establishing a sound human resources system, and forming an enterprise culture with innovative features, thus continually improving one’s own capability building, expanding market, integrating resources, strengthening the high-end capabilities of the value chain, and continuously providing impetus for the enterprise’s service-oriented transformation and innovation development. As a result, seven main categories of factors were identified to influence Shaanxi Blower’s business model innovation. These are market pressure, entrepreneurship, culture and strategy, technology, human resources, organizational capability and government policy. Market pressure and government policy are the direct external factors that promote business model innovation. Entrepreneurship is the direct internal factor that promotes business model innovation. Information technology and technological innovation, as the two technology-driven factors, directly affect business model innovation, but belong to different variables. Information technology together with government policy behavior and market pressure are exogenous variables, and technological innovation together with entrepreneurial spirit are endogenous variables. However, culture and strategy, human resources and organizational capability are the guarantee factors for business model innovation. Culture and strategy are changes in the strategic direction of the enterprise so belong to the strategic level. Organizational capability and human resources are the specific implementation direction of the enterprise, which belong to the operational layer. As a result, the factors influencing the high-end equipment manufacturing business model innovation can be summarized below (Figure 2). Factors written in ellipses are the main category, factors written in a rectangle are the initial category, and factors written in ellipses include corresponding factors written in a rectangle.

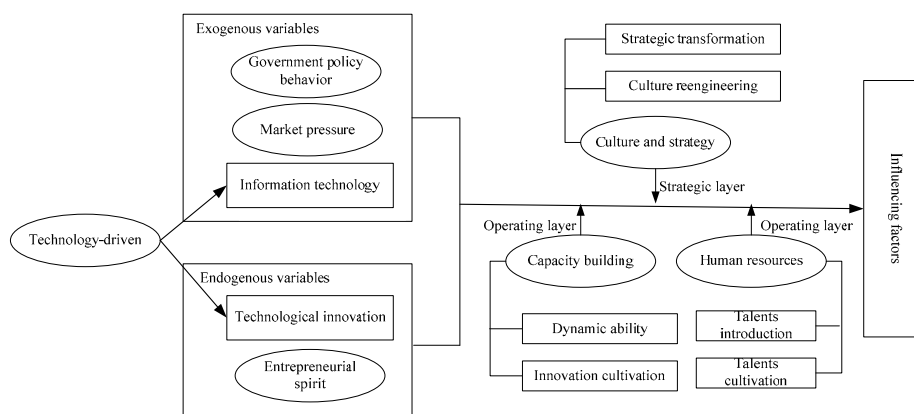


Figure 2. Factors influencing business model innovation.

4.4. Theoretical Saturation Test

Unlike traditional sampling methods, grounded theory requires researchers to continuously collect and analyze data, constantly supplement and perfect concepts and categories, and requires that all concepts and categories have been well interpreted and defined [57]. If there are no new categories for the analysis of newly collected information, it indicates that it has reached a saturation level.

In line with this, we encoded the remaining three primary materials and five secondary data items in third-level coding, which did not generate a new category. In addition, when the various categories and the model proposed in this article were fed back to some interviewees, they agreed with their conformance to the actual development of the enterprise without any new opinions or suggestions. Given that no new similarities or differences were identified, the data collection was stopped.

5. Discussion and Conclusions

Research suggests that business model innovation is vitally important for firms to improve their competitiveness and performance; thus, understanding business model innovation is central to research by both firms and scholars. Even though research on business model innovation has recently gained much academic attention, more work is needed to properly understand business model innovation. This research gap is especially pronounced regarding the factors influencing business model innovation, and even more so with respect to the high-end equipment manufacturing sector in China.

In this context, we conducted a case study to examine the factors that influenced business model innovation using grounded theory. Our findings suggest that Shaanxi Blower's business model innovation is influenced by three types of factors: external, internal, and guarantee factors.

5.1. External Factors

The study's findings indicated that there were three different external factors that influenced Shaanxi Blower's business model innovation. First was market pressure, which was mainly due to customer demand and market competition. Market pressure drives companies to continuously seek market gaps, expand research and development efforts, and develop new products. Market pressure is seen to play a key role in upgrading and transforming Shaanxi Blower. This is because if the firm can identify relevant development in its environment, it is highly likely to innovate its business model to respond to the market pressure [9]. In line with this, market pressure has compelled Shaanxi Blower to rethink its business model, thereby identifying new opportunities such as developing new products, lowering costs and providing additional services, and to improve firm competitiveness and performance.

Second, government policy including, but is not limited to government support policies, government funding support, and preferential tax policy, is another factor that has motivated Shaanxi Blower to innovate its business model. In recent years, the Chinese government sponsored "mass entrepreneurship and innovation" and "Made in China 2025" strategies have provided directional guidance for the development of the manufacturing industry. As a result, these policies have laid a solid foundation for encouraging high-end equipment manufacturers in China to gain more markets (especially international markets), acquire more resources (finance, technology, talent, etc.), and create a better development environment (policy guidance, government cultivation, etc.). Given that most high-end equipment manufacturing enterprises in China are state-owned enterprises, they and their business models are greatly influenced by Chinese government policies.

Third, the advent of advanced information technologies has resulted in significant changes in Shaanxi Blower's entire production process and logistics. First, the integration of informatization and industrialization has reduced Shaanxi Blower's response time across the entire value chain as well as changed its business model and collaboration with other enterprises. As a result, this integration has enabled Shaanxi Blower to conduct a cross-border search and integration of resources. Second, the widespread use of information technology, especially the development of "Internet +" technology, has raised Shaanxi Blower's level of intelligent manufacturing and flexible production and accelerated its restructuring and optimization of organizational structure and business processes. Therefore, the application of information technology has directly influenced Shaanxi Blower's business model innovation.

The three external factors identified in the present study are seen to add to the literature on business model innovation. Past studies have suggested that business model innovation is a necessary response to a shifting basis of competition [34], intense global competition [58], digital technologies [40], or green policy [59]. However, such research has rarely been done in the context of high-end equipment manufacturing in China.

5.2. Internal Factors

The present study's findings showed that there were two types of internal factors that influenced Shaanxi Blower's business model innovation. First, entrepreneurship includes entrepreneurial awareness and foresight, so the entrepreneur's self-reflection and negation, innovation, and risk-taking is the key driving force for Shaanxi Blower to innovate its business model. This is because entrepreneurship drives the firm to perceive future trends in the environment, identify and meet customer needs, and boldly implement a new business model. This finding provides empirical evidence to support the notion that entrepreneurship is inherently linked to business model innovation, as suggested by Foss et al. [9] based on a systematic review. Similarly, Schneider et al. [11] suggest that understanding business model innovation from an entrepreneurial perspective is particularly suitable as it allows a firm to identify opportunities from the firm's specific perspective.

Second, technological innovation is conducive to business model innovation [60]. Compared with traditional industries, Shaanxi Blower requires more investment in R&D, and technical support. While technological innovation has driven Shaanxi Blower to commercialize new product ideas more effectively, business model innovation is also more likely to emerge from this process. This is in agreement with the idea that technological innovation based on R&D investment provides the necessary resources to change the business model [61].

5.3. Guarantee Factors

The guarantee factors of the business model innovation in high-end equipment manufacturing enterprises include three aspects: "culture and strategy", "capability building" and "human resources", supporting and enabling business model innovation.

Shaanxi Blower's strategy and culture are the guarantee factors for business model innovation. Strategy not only has a clear guiding role in the direction of development, behavior choice and resource allocation of enterprises, but also is the antecedent of business model innovation. Shaanxi Blower's culture supports the implementation of business strategy by providing the unifying values and ideals that encourage experimenting with innovative ways of conducting business. Therefore, Shaanxi Blower's culture and business strategy should be closely integrated. It can be expected that firms with an organizational culture that supports both the business strategy and testing new ways to conduct business will lead to business model innovation.

Shaanxi Blower's capabilities generally enable the firm to innovate its business model more effectively. In particular, the firm's dynamic capabilities allow it to be able to sense the development of internal and external environment and seize market opportunities by (re)configuring its resources in response to changes in the market, which could lead to business model innovation. In addition, the firm's innovation capability, developed from, for example, employees innovative experiments, mutual learning, and knowledge sharing, could generate new ideas about product, technology, process and so on, which in turn could lead to business model innovation. Our findings in the Chinese context provide additional empirical evidence to support the notion that organizational capabilities are required for successful business model innovation [9,11]. For example, Achtenhagen et al. [45] suggest that firms need to have "critical capabilities" to support value-creation processes while Demil et al. [44] point to the importance of developing "dynamic consistency" to renew business models.

Finally, the key to business model innovation lies in the talents a firm has. The case of Shaanxi Blower indicates that the firm's nurturing and motivating talents and establishing a set of mechanisms, systems and platforms to promote innovation and entrepreneurship could lead to innovative and

entrepreneurial activities such as setting up new ventures/projects, tackling key projects, and developing new markets. Therefore, innovative human resources are a powerful guarantee for business model innovation.

5.4. Theoretical Contributions

Based on the case of Shaanxi Blower, this paper was deeply rooted in Shaanxi Blower's practice and systematically analyzed the empirical data using grounded theory. We explored the factors influencing Shaanxi Blower's business model innovation in the context of high-end equipment manufacturing in China.

Our finding offers several contributions to the literature. First, while past authors have investigated factors influencing business model innovation separately and have had difficulty in capturing the complex interrelatedness of multiple factors [7,8,11], this study adds to the existing knowledge base by developing a more holistic understanding of how business model innovation is affected by multiple internal and external factors in a Chinese context. Second, while the antecedents of business model innovation have not been sufficiently investigated yet [9,11], this study provides additional empirical evidence in support of the findings of existing research on business model innovation by extending their generalizability to the context of high-end equipment manufacturing in China. Thus, this study's findings provide an advance in knowledge by not only supporting prior research in the Chinese context, but also highlighting the need to understand the holistic nature of how business model innovation is influenced by multiple factors.

5.5. Managerial Implications

Furthermore, this study's finding has significant managerial implications. First, firms wishing to effectively innovate their business models to improve their competitiveness and performance should simultaneously consider multiple influencing factors to mitigate cognitive biases. Second, firms should actively scan their external environments to perceive changes in competition and customer needs thereby identifying new marketing opportunities and new ways of doing business. Third, firms should take advantage of the development of information technology to digitalize existing business processes to improve their efficiency and effectiveness. Fourth, firms should pay attention to nurturing entrepreneurship and actively cultivate their employees' innovative consciousness and innovation capability. Finally, firms should develop an organizational culture that values learning and innovation.

5.6. Limitations and Future Research

Any conclusions drawn from this study should be considered in light of several limitations, some of which provide avenues for future research. First, the present study was based on a single case study of a high-end equipment manufacturer in China. It would be worthwhile extending this work to firms in other contexts or countries. Second, this study is an exploratory research; future research could test the factors and the relationships between them using quantitative analysis. In addition, since a single case study is not intended to generalize to a larger universe; future research could consider using cross-sectional studies to further explore the key factors that affect business model innovation.

5.7. Conclusions

Using grounded theory and through a case study of a Chinese high-end equipment manufacturer, this study's findings reinforced the premise that business model innovation is influenced by multiple factors, and provide an advance in current knowledge by identifying seven main influencing factors, including market pressure, government policy, entrepreneurship, culture and strategy, technology, human resources, and organizational capabilities in a Chinese context. This study's findings also suggest the need to holistically understand these factors.

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Appendix A. Interview Open Questions

Dear Sir (Madam):

Thank you for your participation and assistance in this in-depth interview. The purpose of this in-depth interview is to explore the influencing factors of business model innovation in the high-end equipment manufacturing industry, in order to promote high-end equipment manufacturing enterprises to carry out business model innovation and promote their transformation and upgrade. This interview is for academic research only, and all information is strictly confidential. I would like to express my heartfelt thanks and wish you all the best in your work and good health!

- (1) Please briefly introduce your work experience, position, education background and so on.
- (2) How do you understand business model and business model innovation?
- (3) How did the idea about your company's business model innovation come into being? How is it implemented? Can be exemplified.
- (4) Please introduce the process in which you participated in business model innovation recently.
- (5) What are the contributing factors to implementing business model innovation in this process? What are the obstacles? How are they solved?
- (6) What are the internal factors that you think affect your company's business model innovation? What are the external factors?
- (7) What problems have your company encountered in the process of business model innovation? How was it resolved?
- (8) What do you think are the effects of business model innovation on the company?
- (9) In what areas do you think the company is working hard to be more conducive to the company's business model innovation?
- (10) What advice do you have for related or similar companies or companies that want to innovate their business models?
- (11) Do you have any other views or ideas about enterprise business model innovation?

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