**Abstract**

The pharmaceutical industry is an important part of the national economy. It is a comprehensive industry that combines traditional and modern industries and integrates primary, secondary and tertiary industries. It is also an industry with high input, high output, high risk, knowledge intensive, strong professionalism and high degree of internationalization. It is closely related to life science. It does not have a mature period and is less affected by the economic crisis. It is an industry that will grow and develop forever, known as the "eternal sunrise industry". For an enterprise, there are many ways to improve its operation and performance, such as changing its external environment, internal capacity, resource conditions, production links, etc. But for an enterprise, the change of the external environment is difficult to achieve, which needs to pay a lot of cost; and under certain conditions, the level of resources and capabilities is not easy to improve. As a "value creation method", business model does not require the change of internal and external conditions of enterprises and is relatively easy to improve and innovate. Under the specific external environment and resource conditions, business performance can be improved through model activities. This paper defines the definition of business model, and uses questionnaire and in-depth interview to investigate the antecedents of business model. After sorting out and analyzing, six dimensions of the antecedent variables of business model are identified, namely customer demand, technological change, competition intensity, enterprise resources, organizational structure and entrepreneurship. Based on the analysis of related concepts and components, a measurement scale of business model antecedent was developed. Through empirical analysis, the reliability and validity of the scale were verified. Secondly, through literature research, this paper analyzes the concept of business model and business performance, and divides business model into three dimensions: customer value, internal value and cooperation value. Business performance is divided into two dimensions: financial performance and market performance. On this basis, it puts forward the hypothesis relationship between...
business model and its antecedents and business performance, constructs the theoretical model of the relationship between business model and business performance, and verifies the model and hypothesis through empirical analysis. The results show that different dimensions of business model antecedent variables have different effects on business model and business performance. Among them, enterprise resources, technological change and entrepreneurship have significant effects on business model, customer demand, competition intensity and organizational structure have significant effects on some dimensions of business model, and three dimensions of business model have significant effects on business performance. As a supplement, the research also adds the relationship between the three dimensions of business model, that is, internal value and cooperative value have a significant impact on customer value. Through discussion, it is found that: due to the characteristics of Chinese pharmaceutical enterprises, the business model of sample enterprises has the characteristics of external similarity, internal diversification, key relativity, similarity difference and internal connection from the perspective of manifestation; while due to the characteristics of business model and business performance, there are three matching relationships between high-performance enterprises and business model, namely, high performance and enterprise business The matching of model comprehensiveness, the matching of high performance and business model applicability, and the matching of high performance and business model sustainability. In addition, through the analysis of the international pharmaceutical industry environment and the domestic pharmaceutical industry environment, this paper makes a strategic explanation of the matching relationship between the performance of Chinese pharmaceutical enterprises and the business model from three aspects: that is, the business model can affect the business performance by influencing the competitive advantage, the core competence of the enterprise, and cultivating the later development advantage of the enterprise. Finally, combined with the research results of the paper, from the perspective of enterprise and industrial policy, the paper puts forward its own suggestions for the development strategy of Chinese pharmaceutical enterprises.

Keywords: Business Model, Pharmaceutical Enterprise, Performance, Model Innovation

INTRODUCTION

In recent years, although the pharmaceutical logistics industry in China has developed rapidly, it still lags behind the developed countries as a whole due to the regional and industrial gap (Yang & Zou, 2013; Islankina, 2015; Ben, 2017; Li & Sun, 2017; Yang, Liu & He, 2019). At present, most of the domestic pharmaceutical logistics enterprises have evolved from the traditional pharmaceutical wholesale stations in China. However, under the current fiscal and tax system and administrative system in China, some local governments, based on local economic interests, have contributed
to the situation that many pharmaceutical logistics distribution organizations are many, small, scattered and disorderly, resulting in the situation of repeated construction of logistics distribution centers and idle resources. With the further establishment of the universal medical insurance system and the promotion of the construction of the basic drug system, the grass-roots operation mechanism and the reform of public hospitals, there will be a structural expansion of drug market demand. At the same time, in accordance with the requirements of the 13th five year plan of medical reform, the reform and development policies of drug distribution industry will be issued one after another, and the competent departments of the industry are also preparing to issue relevant policies and standards for industry management (Sun & Shen, 2007; Huang, 2013; Gong, 2015). The formulation and implementation of policies and standards will be conducive to further regulating and promoting industry development. Modern pharmaceutical logistics is to develop from the traditional wholesale mode to the supply chain management mode. With the logistics center as the platform, it establishes a market-oriented innovative supply business system with manufacturers, other upstream production enterprises, drug retailers and other downstream distributors, improves the efficiency of drug distribution, and forms a relatively stable production and marketing network with optimized service and minimized cost. What kind of development strategy should be adopted to achieve the economic goal of maximizing the interests of enterprises, break the traditional business development model, and innovate the business model with internet information tools is worth our in-depth exploration and research.

1.1 Background

On November 3, 2010, Wen Jiabao, the Premier of the State Council, delivered a speech on "let science and technology lead China’s sustainable development". He first proposed seven strategic emerging industries in China, among which the biological industry ranked fifth, and the research and development of innovative drugs and medical equipment using biological technology was the focus of the development of the biological industry. On November 29, 2016, Premier Li Keqiang signed and approved the 13th five year national strategic emerging industry development plan, proposing to develop the biological industry into a 10 trillion scale emerging pillar industry by 2020. In his nineteen major reports, general secretary Xi Jinping pointed out the strategic objective of "accelerating the construction of an innovative country", and stressed that "strengthening the building of the national innovation system and strengthening the strategic scientific and technological strength." Premier Li Keqiang pointed out in the report on the work of the government of the State Council in 2018 that "we need to implement the innovation driven development strategy, optimize the innovation ecology, and form an innovation situation of Multi-Agent Coordination and all-round promotion." Under the background of "supply side reform", the development of strategic emerging industries has become an important way to improve the quality of supply.
If pharmaceutical manufacturing enterprises want to develop for a long time, they need to choose a suitable business model to maintain sustainable profits. Because the various industrial links of the pharmaceutical industry are closely linked, complicated and lengthy, some pharmaceutical enterprises have chosen the business model of the whole industrial chain, which can make the various industries cooperate with each other, to integrate the whole industrial chain and open up a new space for the survival and development of pharmaceutical enterprises. The implementation of the whole industry chain business model can not only expand the scale of enterprises, but also obtain rich profits; at the same time, it can effectively improve the supply of upstream goods, reduce costs and transaction costs, seize the market with the advantage of high quality and low price, and improve the comprehensive competitiveness of enterprises.

1.2 Problem Statement

In the face of the development trend that the world economy is constantly undergoing deep adjustment and China’s economy has entered the new normal, if Chinese enterprises want to survive in the fierce market competition and seek development in the current era, they must adjust their business models at all times. In order to meet the new normal of the market, both large and small enterprises need to consider the issue of business models. Only with a business model in line with the market environment, can we help enterprises grow.

Since the 20th century, the rapid development of biomedical industry has brought us into the era of biotechnology. The report of the 18th National Congress of the Communist Party of China clearly puts forward: comprehensively promote the reform of medical service and security, improve the construction of public health management, drug supply and regulatory system, and gradually improve the national health policy. From 2010 to 2018, China’s medical market grew at a high speed of "compound growth rate" of 32%, with a total scale of US $650 billion. Moreover, with the arrival of China’s aging society, the medical market and health consumption will usher in a "golden period" of development, which provides good development opportunities for major medical companies.

However, the quality of economic development is worrying, and the disadvantages of extensive growth begin to appear. According to statistics, most industries in our country have the phenomenon of overcapacity, serious homogenization of products, and enterprises win the market through price war, falling into vicious competition. Even the pharmaceutical industry as a high-tech industry has not been spared. Enhance the international competitiveness, and maintain the healthy and sustainable development of the economy, is an important issue facing the Chinese government and enterprises. An important trend of the world economic development is the transition to a service-oriented economy. Recent data show that more than one-third of the world China’s large manufacturing enterprises provide out of product services, while in the western economic environment, the proportion has risen to nearly 60%. Another study wrote that for ordinary manufacturing enterprises, service sales
have reached an average of 31%, which confirmed that service activities affect the income of manufacturing enterprises and play an important role in the process of optimization and upgrading of manufacturing industry. At the same time, service logic also benefits from this synthesis, which points out how customer value is converted into profitable business.

1.3 Research Question

(1) To explore the business model research ideas of Chinese pharmaceutical enterprises, analyze the current business model types, and provide reference for further research in the future;

(2) This paper discusses the relationship between business model and performance, and analyzes the effect of business model on business performance, as well as the strategic choice of Chinese pharmaceutical enterprises in the current environment.

1.4 Research Objectives

The theoretical purpose of this study is to study the impact of business model and its antecedents on corporate performance, and to verify it through empirical analysis. This paper defines the concept of business model through literature review, focusing on the relationship among business model, antecedents of business model, enterprise performance and dynamic capability. Therefore, the purpose of this study is to solve the following problems:

1. Business model antecedent research. At present, scholars are keen to study the impact of business model on enterprise performance, but rarely explore the antecedents of business model.

2. Study the impact of business model and its antecedents on business performance.

LITERATUR REVIEW

There are two ways to measure the operating efficiency of an enterprise. One is to reflect the situation of debt paying, profit making, operation and development of an enterprise from the perspective of financial statements. The other is to measure the operating efficiency of an enterprise from the perspective of the market the fluctuation of stock price is positively related to the operation efficiency of enterprises, usually measured by Tobin Q value and market value.

Previous Research

At present, Pang Xueqing (2017), a domestic scholar, believes that enterprise performance describes the business results of the enterprise, including the business status, competitiveness and performance of the management. Yang Xue (2019) believes that in addition to the business results, business performance also includes
various business behaviors related to the results.

Enterprise performance has also become a measure of the success of entrepreneurship, which refers to the operating efficiency of the enterprise within a certain period of operation (He, 2011; Hu, 2015; Lou, 2017). From this point of view, performance is one of the ways to measure the business performance of an enterprise or an organization. Whether it is correct or not is relatively important for an enterprise. Therefore, we need to study how to accurately calculate and express enterprise performance (Murphy, 2016). At present, there are a lot of literatures which only study the influencing factors of enterprise performance.

In many studies, Ramamujam (2015) introduced a new non-financial measurement index. They believed that in addition to the financial performance dimension, they could also study from the aspects of the operation effect and the efficiency of the organization. At the same time, Slevin (2017) pointed out the multidimensional problem of enterprise performance dimension, and proposed that enterprise performance is measured by growth dimension and profitability dimension. Borman (2016) analyzed corporate performance from the perspective of task performance and relationship performance. At the same time, Lumpkin (1996) also believed that financial performance and growth performance represent two aspects of corporate performance, and they should be combined to reflect corporate performance. Chrisman (2018) followed the research results of Lumpkin (1996), and verified whether these two indicators can measure enterprise performance well from the perspectives of survival and growth. Web (2015) demonstrates the relationship between corporate growth performance and financial performance. They believe that effective growth will perform in terms of financial performance, and the growth of financial performance also provides more support for corporate growth. Shepherd (2014) pointed out that since enterprises are likely to sacrifice long-term growth for short-term profits, we should integrate different dimensions of enterprise performance.


Technological Innovation

Definition

Technological innovation refers to the change in the production process or the
introduction of new products, so that the same batch of input can get more or more progressive output.

**Previous Research on Relationship with DV**

Technological innovation is reflected in the fact that enterprises can create new value for current customers, gain premium ability by providing value-added products/services, and obtain higher financial performance and non-financial performance (Hu, 2012; Zhang, 2016; Guo & Li, 2017; Liu & Mao, 2018; Yuan, Ran, Zhang & Yang, 2018) (customer loyalty, corporate reputation, etc.). Christensen et al. (2016) found that the degree of technological innovation will affect customer’s acceptance time of new products to a certain extent. In technological innovation, new technologies adopt different working principles compared with the original technologies, so that product performance can be fundamentally improved, and customer value can be greatly improved. With the introduction of such new technologies, products can quickly get customer response, so that new technologies The first adopters of the technique quickly occupied the market.

Thomond (2018) studies that disruptive technology innovation needs to break the original technology paradigm and establish a new technology trajectory compared with improved technology innovation. The value added by this new technology will not only cause competition in the current market, but also attract the attention of potential competitors. In the process of forming the new value creation system, the leading ability of the incumbent enterprises to the supply chain will gradually lose, and even be replaced by the rivals. Therefore, technological innovation will make enterprises pay more attention to the establishment of strategic partnership and strategic alliance, integrate resources and relationships in the supply chain through reasonable positioning, and maintain their competitive advantage.

Sainio (2019) analyzed the empirical case study of Bluetooth technology and grid computing technology on communication operators, and constructed the theoretical framework of the impact of technological innovation on the business model of enterprises. This paper explains the impact of breakthrough technology innovation on enterprises from two aspects inside and outside enterprises, including that technology innovation increases the value of customers in mobile communication, opens up a new market space for enterprises outside the existing market, and at the same time, the potential damage of technology innovation will affect the existing revenue model of enterprises. Therefore, technology innovation is of great significance to the strategic planning of enterprises.

Valerie Chanal (2018) believes that technological innovation will bring changes to the business model of enterprises. In the research, scenario method is used to analyze the impact of different degrees of technological innovation on various elements of business model strategy, organization and operation level, such as adjustments in customer value, sales channels, revenue model, process architecture, resource
acquisition, etc., and how to combine elements in different application fields through technological innovation scenarios to form a new business model. Discussion. Justin (2017) proposed that the application of new technology in technological innovation has expanded the space of customer value. It is necessary for enterprises to adjust and reposition their business model, improve the organization and structure of internal value creation through innovation at the level of customer value, so that enterprises can obtain higher profits and be in a favorable position in the competition. Adamantia (2016) believed that technological innovation affected the innovation of enterprise value activity system. Through the adjustment in infrastructure, human resources, technological development, procurement, production, marketing / service, key resources and processes were integrated and optimized in the value chain and the existing cost structure and profit model were improved to improve performance. For example, business outsourcing is a typical form of cost structure transformation. This kind of innovation makes the dynamic enterprise boundary phenomenon more common, and provides opportunities for enterprises to create value and continue to make profits across organizations (Xia, Jia, & Feng, 2016; Jiang, Ji & Huang, 2016; Wang, Ma & Li, 2017; Wu, 2017).

**Key Resources**

**Definition**

Key resources are the result of the long-term evolution of an enterprise in a certain environment, and also the result of the interaction between internal resource elements and external environment. Therefore, in order to study the mechanism of key resources and the growth performance of cluster enterprises, it is necessary to understand the different characteristics of key resources and non-cluster enterprises in the background of industrial cluster.

**Previous Research on Relationship with DV**

Brush et al. (2018) pointed out that key resources have a positive effect on performance, but with regard to different dimensions of resources and under different circumstances or strategies, the combination of material resources and technical resources can significantly promote the improvement of enterprise performance, and can become the core competence foundation of enterprises.

Based on a survey of 262 enterprises in China, Luo (2016) studied the direct, correlation and synergy effects between customer relationship, business partnership and government department relationship and enterprise performance, and pointed out that relationship resources can broaden channels for enterprises to obtain human, material and financial resources, obtain market opportunities and reduce costs, and help enterprises to compete with suppliers. The research results show that relationship resources can promote the optimization of enterprise value system.
Xia Qinghua (2016) conducted a survey of 185 enterprises in Guangzhou. They regarded the ability of enterprises to obtain resources through vertical, horizontal and social contacts as organizational resources. The results show that organizational resources can improve the position of enterprises in the supply chain and enhance the voice of leading enterprises.

Gulati (2015) explained the impact of key resources on business performance from the perspective of strategic network. Their research shows that different enterprises have different resources and different capabilities of managing relationship networks. Through the exchange and sharing among enterprises, the efficient use of resources can be realized, which has an impact on enterprise performance.

Yang Xiruo (2017) pointed out that resources are the basis of enterprise value creation activities, and the way of resource allocation determines the positioning of enterprises in the value chain. Business model is a function of enterprise value chain or value chain system. In order to create and realize customer value, an enterprise allocates the internal and external resources it owns or controls effectively, and the integration of resources and resources determines the evolution form of business model, that is, an enterprise changes its original value chain positioning through the effective integration of internal and external resources, and then establishes a new cost structure Revenue model is different from the previous business model.

**Intermediate Variable: Business Model**

**Definition**

Among the definitions of many business models, Amit (2012) defines the business model as "an interrelated and interdependent activity system, which determines the way the enterprise and its customers, partners and suppliers do things." That is, the business model is a set of special activities - an activity system - to meet the needs of the understood market, activities that are consistent with the special needs of partners (companies or partners), and how these activities are connected with each other. According to Teece (2016), "business model explains logic, data and other evidences to support customer China’s value proposition, feasible revenue structure and the cost of value transfer of enterprise".

Therefore, as mentioned above, this study proposes:

H1: Technological innovation has a significant positive impact on business model

H1a: Technological innovation has a significant positive impact on customer value

H1b: Technological innovation has a significant positive impact on internal value

H1c: Technological innovation has a significant positive impact on cooperation
Impact of key resources on business model

According to the resource-based theory, the significance of enterprise existence lies in the combination of all kinds of resources and capabilities inside and outside the enterprise, in order to achieve the provision of market value below the market transaction cost, and to obtain economic rent. The heterogeneity of competition is the basis of the resource-based theory, which holds that the internal resources of a company are of great significance for the company to gain profits and maintain its competitive advantage. Physical resources and financial resources constitute the basis of the company China’s competitive advantage and sustainable performance.

Therefore, this paper makes the following assumptions:

H2: Key resources have a significant positive impact on business model
H2a: Key resources have a significant positive impact on customer value
H2b: Key resources have a significant positive impact on internal value
H2c: Key resources have a significant positive impact on cooperation value

METHODOLOGY

According to the definition of business model in this study, the core of business model is value creation. There are not many existing research results on the measurement of business model. This paper adopts the measurement scale of three-dimensional value composition of business model proposed by Harvard University Professors Mark Johnson, Clayton Christensen and heiming Kagermann (2009), as shown in table 3.1. The scale describes business model from three dimensions of customer value, internal value and cooperation value. It is not only universal, but also has high reliability and validity verified by Dr. Wen Liang.

Table 3.1 Business Model Measurement Scale

<table>
<thead>
<tr>
<th>dimension</th>
<th>Item description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer value</td>
<td>Provide customers with high-quality products, reasonable prices, timely and</td>
</tr>
<tr>
<td>(CV)</td>
<td>convenient services, high customer satisfaction and loyalty</td>
</tr>
<tr>
<td>Internal value</td>
<td>Fast response to customer demand resources and capabilities efficient allocation</td>
</tr>
<tr>
<td>(IV)</td>
<td>of core competitiveness of enterprises</td>
</tr>
<tr>
<td>Cooperative</td>
<td>The supply chain revenue of enterprises with extensive cooperative</td>
</tr>
</tbody>
</table>
value (SV) relationship accounts for a large proportion of the whole industry revenue, and the enterprises have a great influence on the supply chain.

**Enterprise performance**

Enterprise performance is the explained variable in the model. Zott C, Amit (2007) try to measure the performance of an enterprise from six aspects: growth, profitability and overall success. Lane, Salk and Lyles (2001) think that the measurement of enterprise performance should include qualitative performance indicators and quantitative performance indicators. Qualitative performance indicators refer to indicators that cannot be simply and directly quantified (such as performance comparison with similar enterprises, market competition advantage, etc.), while quantitative indicators are indicators that can be directly described by digital quantification, such as profit rate, growth rate, etc. In addition, in order to avoid the one sidedness of single year performance data, there are many methods to measure enterprise performance level in a certain period of time.

**Table 3.2 Enterprise Performance Measurement**

<table>
<thead>
<tr>
<th>dimension</th>
<th>Item description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial performance (FP)</td>
<td>Compared with peers, the sales volume of the company has increased rapidly in recent two years</td>
</tr>
<tr>
<td></td>
<td>Compared with peers, the return on investment of the company has increased</td>
</tr>
<tr>
<td></td>
<td>Compared with peers, the company has a higher profit margin</td>
</tr>
<tr>
<td>Market performance (MP)</td>
<td>The market share of the company has increased rapidly in recent two years</td>
</tr>
<tr>
<td></td>
<td>The company has continuously launched new products / services in recent two years</td>
</tr>
<tr>
<td></td>
<td>Compared with peers, the company has a strong market competitiveness in product use and service</td>
</tr>
</tbody>
</table>

Combined with the above scholar’s measurement of enterprise performance, this paper uses six items to measure enterprise performance, including financial indicators (sales volume, profit rate and return on investment) and market indicators (market share growth, new products / services and market competitiveness) as the measurement indicators of enterprise performance (table 3.2).
Pretest and Correction of Scale

From September 15, 2018 to November 20, 2019, a total of 410 questionnaires were distributed to 120 enterprises nationwide, 372 of which were recovered, with a recovery rate of 90.73%. In addition, the research group screened the returned questionnaires and eliminated the unqualified ones, including the phenomenon of many missing answers in the questionnaires, the unclear answers to the questionnaires, the incomplete demographic variables of the questionnaires, and the obvious same handwriting of the questionnaires collected by the same enterprise. Finally, 344 valid questionnaires were obtained, with an effective recovery rate of 83.9%.

Reliability analysis

Through the sample data, Cronbach α coefficient and CITC coefficient are used to test the internal consistency of business model measurement scale.

<table>
<thead>
<tr>
<th>dimension</th>
<th>Item code</th>
<th>CITC</th>
<th>Alpha if Item deleted</th>
<th>Cronbach alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>CV</td>
<td>CV1</td>
<td>0.596</td>
<td>0.741</td>
<td>0.851</td>
</tr>
<tr>
<td></td>
<td>CV2</td>
<td>0.624</td>
<td>0.753</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CV3</td>
<td>0.678</td>
<td>0.745</td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td>IV 1</td>
<td>0.738</td>
<td>0.822</td>
<td>0.913</td>
</tr>
<tr>
<td></td>
<td>IV2</td>
<td>0.726</td>
<td>0.819</td>
<td></td>
</tr>
<tr>
<td></td>
<td>IV3</td>
<td>0.709</td>
<td>0.751</td>
<td></td>
</tr>
<tr>
<td>SV</td>
<td>SV1</td>
<td>0.723</td>
<td>0.819</td>
<td>0.322</td>
</tr>
<tr>
<td></td>
<td>SV2</td>
<td>0.703</td>
<td>0.790</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SV3</td>
<td>0.764</td>
<td>0.854</td>
<td></td>
</tr>
</tbody>
</table>

It can be seen from table 3.3 that the lowest Cronbach α coefficient of the three dimensions of the business model measurement scale is 0.851, which meets the minimum standard of 0.70 required by the internal consistency test, and the CITC value of each item in the scale far exceeds the standard of 0.50. At the same time, if a measurement item in the scale is deleted, the Cronbach α coefficient of the corresponding concept will be reduced, so the business model measurement scale will reduce the Cronbach α coefficient. The model measurement scale has a good internal
consistency reliability, and all items should be retained.

Table 3.4 shows the internal consistency analysis results of the enterprise performance scale. It can be seen from the results that the Cronbach α coefficient of the enterprise performance measurement scale is 0.876 at least, which also exceeds the minimum standard is 0.70, and the CITC value of each item also exceeds the standard of 0.50. For the measurement items in the scale, if one of them is deleted, the Cronbach α coefficient of the corresponding concept will be reduced Low, which indicates that the enterprise performance measurement scale has good internal consistency, and all items in the measurement table should be retained.

Table 3.4 Internal Consistency Analysis Results of Enterprise Performance Scale

<table>
<thead>
<tr>
<th>dimension</th>
<th>Item code</th>
<th>CITC</th>
<th>Alpha if Item Deleteded</th>
<th>Cronbach alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>FP</td>
<td>FP1</td>
<td>0.751</td>
<td>0.859</td>
<td>0.876</td>
</tr>
<tr>
<td></td>
<td>FP2</td>
<td>0.702</td>
<td>0.765</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FP3</td>
<td>0.688</td>
<td>0.753</td>
<td></td>
</tr>
<tr>
<td>MP</td>
<td>MP1</td>
<td>0.723</td>
<td>0.847</td>
<td>0.902</td>
</tr>
<tr>
<td></td>
<td>MP2</td>
<td>0.667</td>
<td>0.717</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MP3</td>
<td>0.732</td>
<td>0.811</td>
<td></td>
</tr>
</tbody>
</table>

Validity analysis

In order to test the validity of the scale for research questions, the content validity and structure validity of the scale should also be examined.

Table 3.5 Results of Exploratory Factor Analysis of Business Model

<table>
<thead>
<tr>
<th>Item</th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>CV1</td>
<td>0.691</td>
<td>0.132</td>
<td>0.025</td>
</tr>
<tr>
<td>CV2</td>
<td>0.715</td>
<td>0.265</td>
<td>0.157</td>
</tr>
<tr>
<td>CV3</td>
<td>0.695</td>
<td>0.223</td>
<td>0.084</td>
</tr>
<tr>
<td>EV 1</td>
<td>0.143</td>
<td>0.779</td>
<td>0.228</td>
</tr>
<tr>
<td>EV2</td>
<td>0.230</td>
<td>0.785</td>
<td>0.258</td>
</tr>
</tbody>
</table>
Content validity refers to the appropriateness of the content of the scale and the consistency with the research issues, generally using qualitative methods for analysis. In this study, the content of the scale was reviewed by professionals to ensure the content validity of the two scales: business model and business performance. In this study, exploratory factor analysis is used to test the structural validity of the scale. The results of exploratory factor analysis of the business model scale are shown in Table 3.6. The results show that there are three factors with eigenvalues greater than 1 in the scale, i.e. CV1-cv3 has a common factor, ev1-ev3 has a common factor, and sv1-sv3 has a common factor. There is no cross load on the three factors of each item, so it is decided to keep the original item.

The exploratory factor analysis results of the enterprise performance scale are shown in Table 3.7. The results show that there are two factors whose eigenvalues are greater than 1, that is, fp1-fp3 has a common factor, and MP1-mp3 has a common factor. There is no cross load on the two factors of each item, so it is decided to keep the original item. The pre-test results show that the business model and enterprise performance measurement scale have good reliability and validity. Therefore, all items of the business model and enterprise performance measurement scale in the questionnaire are retained for the subsequent structural model test.

Table 3.6 Results of Exploratory Factor Analysis of Enterprise Performance

<table>
<thead>
<tr>
<th>Item</th>
<th>Factor 1</th>
<th>Factor 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>FP1</td>
<td>0.693</td>
<td>0.113</td>
</tr>
<tr>
<td>FP2</td>
<td>0.607</td>
<td>0.165</td>
</tr>
<tr>
<td>FP3</td>
<td>0.713</td>
<td>0.213</td>
</tr>
<tr>
<td>MP1</td>
<td>0.231</td>
<td>0.598</td>
</tr>
<tr>
<td>MP2</td>
<td>0.125</td>
<td>0.661</td>
</tr>
<tr>
<td>MP3</td>
<td>0.232</td>
<td>0.609</td>
</tr>
</tbody>
</table>
Internal Consistency Analysis

Reliability analysis is mainly to test whether the scale has stability and consistency when measuring related variables. The test of internal consistency reliability is mainly carried out through two indicators, the two indicators are the overall correlation coefficient of project one, CITC and Cronbach α coefficient. In this study, Cronbach α coefficient (q-coefficient for short) is used to evaluate the internal consistency of multi-dimensional scale. Cronbach α coefficient reflects the correlation between different items under the same variable in the questionnaire, and is widely used to evaluate the internal consistency of multi-dimensional scale. Internal consistency is an important content of reliability analysis, and this index has been proved to be very effective in evaluating the internal consistency of multidimensional scale. It reflects the degree of correlation between items or items in the questionnaire. These items should reflect different aspects of the same independent concept.

Table 3.9 Descriptive Statistical Analysis of Item Data

<table>
<thead>
<tr>
<th>dimension</th>
<th>project</th>
<th>mean value</th>
<th>standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>TI</td>
<td>TC1</td>
<td>3.62</td>
<td>1.122</td>
</tr>
<tr>
<td></td>
<td>TC2</td>
<td>3.79</td>
<td>1.029</td>
</tr>
<tr>
<td></td>
<td>TC3</td>
<td>3.68</td>
<td>0.944</td>
</tr>
<tr>
<td></td>
<td>TC4</td>
<td>3.83</td>
<td>1.072</td>
</tr>
<tr>
<td>Key resources</td>
<td>ER1</td>
<td>3.71</td>
<td>0.971</td>
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<td></td>
<td>ER2</td>
<td>3.47</td>
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<td></td>
<td>ER3</td>
<td>3.83</td>
<td>1.072</td>
</tr>
<tr>
<td></td>
<td>ER4</td>
<td>3.68</td>
<td>0.843</td>
</tr>
<tr>
<td></td>
<td>ER5</td>
<td>4.22</td>
<td>0.954</td>
</tr>
<tr>
<td></td>
<td>ER6</td>
<td>3.83</td>
<td>1.066</td>
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</tbody>
</table>

In this study, the principal component analysis method is used to intercept the data according to the standard of eigenvalue 1, and the orthogonal rotation method of maximum variance is used. The statistical results are shown in table 3.12.

Table 3.12 Exploratory Factor Analysis of Business Model Antecedents
In this study, six factors with eigenvalues greater than 1 were extracted, which accounted for 67.33% of variance changes. The factor load of each item in a single dimension was greater than 0.5, indicating that the measurement scale had good convergence validity and single dimension. In addition, there is no cross loading phenomenon, indicating that there is a certain degree of validity between dimensions. In this way, through a small sample pre-test, this study tests the reliability and validity of each measurement item of the business model antecedent variables, delete the individual items that do not meet the requirements, and obtain a business model antecedent variable measurement questionnaire including 23 items in 3 dimensions. This study is based on the 23 items mentioned above, and the items related to the statistical variables of enterprises are added. Finally, the cost study is used for the questionnaire of large-scale formal survey.

ANALYSIS

Profile of Respondents
The research survey started from September 15, 2018 and ended on November 20, 2019. A total of 410 questionnaires were issued by 120 companies nationwide, and 372 were recovered with a recovery rate of 90.73%. The research team also screened the returned questionnaires to eliminate unqualified questionnaires. Including the phenomenon of multiple missing answers in the questionnaire, the answering of the questionnaire is not clear, the demographic variable part of the questionnaire is not filled in at all, and the questionnaire written by the same company is obviously the same. Finally, 344 valid questionnaires were obtained, and the effective recovery rate was 83.9%. The basic situation of the sample is shown in Table 4-1.

Table 4-1 Sample Description Statistics

<table>
<thead>
<tr>
<th>Descriptive Indicators</th>
<th>Proportion</th>
<th>Descriptive Indicators</th>
<th>Proportion</th>
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<tbody>
<tr>
<td>Gender</td>
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<td>Number of Workers</td>
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<tr>
<td>Male</td>
<td>61.3%</td>
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<td>27.8%</td>
</tr>
<tr>
<td>Female</td>
<td>38.7%</td>
<td>101-200</td>
<td>40.3%</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>&lt;30</td>
<td>23.5%</td>
<td>201-500</td>
<td>22.1%</td>
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<tr>
<td>31-40</td>
<td>24.8%</td>
<td>500-1000</td>
<td>17.4%</td>
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<tr>
<td>41-50</td>
<td>18.9%</td>
<td>&gt;1001</td>
<td>11.6%</td>
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<tr>
<td>&gt;51</td>
<td>32.8%</td>
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</tr>
<tr>
<td>Position</td>
<td></td>
<td>Business Nature</td>
<td></td>
</tr>
<tr>
<td>Chairman</td>
<td>12.9%</td>
<td>State-owned Enterprise</td>
<td>32.8%</td>
</tr>
<tr>
<td>General Manager</td>
<td>27.8%</td>
<td>Private Enterprise</td>
<td>35.2%</td>
</tr>
<tr>
<td>Department Manager</td>
<td>39.3%</td>
<td>Foreign owned</td>
<td>22.2%</td>
</tr>
<tr>
<td>Business Executives</td>
<td>20.0%</td>
<td>Joint Venture</td>
<td>15.3%</td>
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<tr>
<td>Years of Establishment</td>
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<td>Listed Enterprises</td>
<td>13.7%</td>
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<td>&lt;2</td>
<td>17.4%</td>
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<tr>
<td>3-5</td>
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<td>6-10</td>
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<tr>
<td>11-15</td>
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<tr>
<td>&gt;16</td>
<td>13.9%</td>
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Table 4-2 Descriptive Statistics of Business Model Related Items

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<th>Average</th>
<th>Standard Deviation</th>
<th>Skewness Average</th>
<th>Standard Deviation</th>
<th>Kurtosis Average</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>CV1</td>
<td>344</td>
<td>4.03</td>
<td>0.918</td>
<td>0.109</td>
<td>0.119</td>
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<tr>
<td>CV3</td>
<td>344</td>
<td>3.69</td>
<td>0.957</td>
<td>-0.233</td>
<td>0.119</td>
<td>-1.338</td>
<td>0.237</td>
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<td>0.904</td>
<td>0.092</td>
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<td>0.864</td>
<td>0.177</td>
<td>0.119</td>
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<td>0.237</td>
</tr>
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<td>0.944</td>
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<td>0.237</td>
</tr>
<tr>
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<td>0.237</td>
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<td>0.255</td>
<td>0.119</td>
<td>-1.338</td>
<td>0.237</td>
</tr>
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</table>

Table 4-3 Descriptive Statistical Results of Business Performance Items

<table>
<thead>
<tr>
<th>Code</th>
<th>Number of Samples</th>
<th>Average</th>
<th>Standard Deviation</th>
<th>Skewness Average</th>
<th>Standard Deviation</th>
<th>Kurtosis Average</th>
<th>Standard Deviation</th>
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</thead>
<tbody>
<tr>
<td>FP1</td>
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<td>3.04</td>
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<td>0.003</td>
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<td>-0.747</td>
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</tr>
<tr>
<td>FP3</td>
<td>344</td>
<td>3.69</td>
<td>0.932</td>
<td>-0.725</td>
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<td>MP1</td>
<td>344</td>
<td>3.73</td>
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</tr>
<tr>
<td>MP3</td>
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<td>3.64</td>
<td>0.965</td>
<td>-0.113</td>
<td>0.119</td>
<td>-1.546</td>
<td>0.237</td>
</tr>
</tbody>
</table>

The descriptive statistical analysis of the business model and scale is shown in Table 4-2. The average data of each item in the business model scale is between 3.13 and 4.03, and the standard deviation ranges from 0.805 to 0.957. The absolute value is less than 3 and the absolute value of the kurtosis index is less than 10, which indicates that the data of each measurement item of the business model obey the normal distribution.
The data description statistics of each item of business performance are shown in Table 4-3. The results show that the average of the data of each item is between 3.04 and 3.73, and the standard deviation ranges from 0.834 to 1.156. The absolute value is less than 3 and the absolute value of the kurtosis index is less than 10, which indicates that the data of each measurement item of business performance can follow a normal distribution.

**Hypothesis**

1. The impact of customer needs on business models

H1: Customer demand has a significant positive impact on the business model

H1a: customer demand has a significant positive impact on customer value

H1b: Customer demand has a significant positive impact on internal value

H1c: Customer demand has a significant positive impact on the value of cooperation

2. The impact of technological change on business models

H2: Technology change has a significant positive impact on business models

H2a: Technology change has a significant positive impact on customer value

H2b: Technology change has a significant positive impact on internal value

H2c: Technology change has a significant positive impact on the value of cooperation

**Research Objective 1 (R.O.1): Impact of Business Model Antecedents on Business Model**

**Dimensions of Business Model**

This study believes that the business model is a value creation method that exists objectively under the conditions of certain external environment and internal resource capabilities, and value creation is its core function. Many scholars have put forward a similar point. Rappa (2009) believes that the most fundamental connotation of a business model is the method by which a company runs a business in order to maintain itself and earn enough profits. Amit et al. (2002) pointed out that the business model is a combination of trading activities designed to create value in the process of expanding business opportunities. Through empirical research, they found that the value creation of enterprises has four driving factors: novelty, lock-in, complementarity and efficiency. Chesbrough et al. (2002) believe that the business model is a rational income structure established by enterprises in order to obtain value from technology, and the purpose is to maximize the value provided by technology. Afuah et al. (2001) believe that the function of the business model is that enterprises acquire and use resources to create more value for customers than competitors to
make profits. Linder et al. (2001) explained the actual process of business model value creation in a case form, while Petrovic et al. Respectively explained the principle process of business model value creation. Currently more common is the three-dimensional division based on Porter's strategic positioning theory. That is, the business model is divided into three dimensions of value proposition, value proposition object, and value submission method from the three aspects of the product or service type, customer demand, and contact channel, as shown in Figure 4-6. Each dimension can be divided into different ways, that is, the object of the value proposition is the enterprise and the individual, and the content of the value proposition includes four actual types: material products, material services, information products, and information services. The value submission method is divided into traditional physical method and modern network method. The combination of the above 3 dimensions and a total of 8 elements can finally form 16 basic business model types.

The core of the business model concept is value creation and value transmission across organizational boundaries, emphasizing the essential characteristics of the value of the business model and its transformation process across boundaries. Therefore, this paper adopts the three-dimensional model of the business model proposed by He Wenliang, etc., which is referred to as the Mark Johnson business model model later. Its dimensions and specific meanings are shown in the table.

1. Customer Value
Customer value refers to the extent to which an enterprise provides physical products and services to customers and the extent to which the offering can be accepted by customers in order to achieve profitability in market transactions. It includes what specific products or services are provided to target customers, the functions of these products or services are in accordance with the needs of customers, and how satisfied customers are in providing and using the products or services.

2. Internal Value
Internal value refers to the need for enterprises to plan and design processes such as product development, manufacturing, and marketing in order to create value and deliver value, thereby improving operational efficiency and profitability. Including the level of investment in key resources and processes, the type, quantity and quality of products and services, the degree of customization to customer needs, operating costs and expenditure structure, internal value is reflected in value conversion efficiency and profitability.

3. Cooperation Value
The value of cooperation refers to the mobilization of external resources by enterprises to give play to their advantages in the process of value conversion, to achieve resource integration, and to maintain competitive advantages through external
collaboration. Including the establishment of vertical or horizontal cooperation alliances with members of the supply chain, in product development, raw material supply, manufacturing collaboration, market channels and customer information sharing. Cooperate and play a leading role to improve the overall operating efficiency of the supply chain.

The customer value of the three dimensions of the business model reflects what characteristics of the product or service the company provides to meet customer demand and explains the company's source of income. Internal resources and capabilities are the resources and capabilities needed to run an enterprise's business systems, and they are the source of a company's sustainable competitive advantage. Cooperation value reflects the status of the enterprise in the value chain or value network, and it determines the value of the value that the enterprise can obtain.

Table 4-4 Dimensional Composition of Mark Johnson's Business Model

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Content Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer Value</td>
<td>Customer acceptance of the product or service provided by the company and the degree of realization of expectations</td>
</tr>
<tr>
<td>Internal Value</td>
<td>Specific business models that support customer value propositions and profit models</td>
</tr>
<tr>
<td>Cooperation Value</td>
<td>The value of the supply chain and its influence in the supply chain</td>
</tr>
</tbody>
</table>

**Correlation Analysis**

Correlation analysis refers to the analysis of two or more variable elements with correlation, to measure the closeness of the correlation of each two variable factors. Before performing structural equation model analysis, it is necessary to test the correlation between the variables in the research model. Only through the correlation test can the relationship between the variables in the model be studied. Therefore, correlation analysis is the basis of model testing. Table 4.19 shows that there is a good correlation between business models and their antecedent variables and business performance.

Correlation analysis is a preliminary test of the research model. Although it reflects the closeness of the variables, it is not clear how much the specific relationship is. The variables will be incorporated into the structural equations later, and they will be further verified and analyzed.
Table 4-5 Correlation Analysis of Model Variables

<table>
<thead>
<tr>
<th></th>
<th>CD</th>
<th>TC</th>
<th>CI</th>
<th>ER</th>
<th>OS</th>
<th>ES</th>
<th>CV</th>
<th>EV</th>
<th>SV</th>
<th>FP</th>
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</thead>
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<td>0.35</td>
<td>0.38</td>
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</tr>
</tbody>
</table>

Structural Equation Model Construction and Analysis

Structural Equation Modeling (SEM) is a statistical data analysis tool formed by a combination of multiple regression analysis, path analysis, and confirmatory factor analysis methods. It can analyze the complex causality between multiple dependent variables and multiple independent variables. In the structural equation analysis, the covariance matrix of the sample data is used to fit the theoretical model, and the initial model is evaluated and modified to obtain the optimal model with the smallest fitting deviation. Especially with the use of professional software such as LISREL and
AMOS, structural equation analysis has become a powerful tool for solving complex and multivariate relationships in social science data.

SEM is composed of a measurement model and a structural model. The measurement model describes the relationship between the explicit and latent variables and indicates which observation variables are used to measure a latent variable. Structural model describes the relationship between latent variables. It is a group of models like multiple regressions that describe the quantitative relationship between exogenous and endogenous variables. The measurement model and the structural model are logically inseparable. The research hypothesis of the verification is mainly reflected in the structural model part, similar to the multiple regression analysis of the independent variable's influence on the dependent variable. Structural equations deal with latent variables and cannot be directly measured, so a process of variable design is needed to gradually convert from conceptual variables to operational variables. The measurement model is exactly what describes this variable design process.

Table 4-7 Path Analysis of Initial Research Model M1

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Relationship</th>
<th>Normalized Path Factor</th>
<th>T Value</th>
<th>Whether Significant</th>
<th>Hypothesis Test Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1a</td>
<td>CV-CD</td>
<td>0.39***</td>
<td>5.43</td>
<td>Yes</td>
<td>Support</td>
</tr>
<tr>
<td>H1b</td>
<td>EV-CD</td>
<td>0.32***</td>
<td>5.89</td>
<td>Yes</td>
<td>Support</td>
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<tr>
<td>H1c</td>
<td>SV-CD</td>
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<td>1.15</td>
<td>No</td>
<td>Not Support</td>
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<tr>
<td>H2a</td>
<td>CV-TC</td>
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<td>Yes</td>
<td>Support</td>
</tr>
<tr>
<td>H2b</td>
<td>EV-TC</td>
<td>0.24***</td>
<td>2.68</td>
<td>Yes</td>
<td>Support</td>
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<tr>
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<td>SV-TC</td>
<td>0.19**</td>
<td>2.15</td>
<td>Yes</td>
<td>Support</td>
</tr>
</tbody>
</table>

CONCLUSION

1. For the listed pharmaceutical companies in China, their business models have the following characteristics in terms of performance: External similarity, internal form diversification, emphasis, similarity difference and internal connection (Cielik, Kaciak & Welsh, 2012; Guo, 2012; Cai & Dang, 2015; Bao, Cheng & Zhang, 2015; Bai, 2018; Chen & Chen, 2018). These characteristics are determined by the characteristics of Chinese pharmaceutical companies.

(1) The external similarity of business models of enterprises is because Chinese enterprises are often faced with development problems such as small scale,
insufficient funds, weak R & D capabilities, lack of technical content of products, low profitability of enterprises, and imperfect marketing channels. Under similar problems and cruxes, companies' choice of business models will inevitably have a certain degree of consistency (Pradhan, 2003; Kelchtermans, Stijn, Leten, BartBelderbos, & René, 2010; Majumdar, 2011; Feng, Tang & Fu, 2012; Shengxiao, 2013; Zhi-Hua & Rui, 2013; Madian, 2015; Yong, Huan & Jian-Ying, 2017).

(2) Due to the abstractness and broadness of the concept of business model, the specific interpretation of its definition is more diverse. Coupled with the non-standard nature of China's pharmaceutical companies, different operating modes also exist in different links, which makes the business model internally reflect diversified characteristics.

(3) Among the many value activities of an enterprise, due to the imbalance in the allocation of enterprise capabilities and resources in various links. The value created by the enterprise does not come from all links, but from some specific value activities. This also makes the business models of different companies have a certain focus (Gibbons & Henderson, 2012; Xu, 2014; Delft & Kortmann, 2015; Li, 2016; Jiang & Che, 2017; Dai & Zhang, 2018; Zheng, 2018; Zhao, Zhang & Ge, 2019).

(4) The business model is just a means, a method, a set of shapes, without the concept of standards and quantities. Different people use the same business model on different occasions, different companies, or similar companies in a certain link, but they may not achieve the same results (Wu, Zhang & Liu, 2000; Wang, Li & Zhang, 2010; Li & Zhou, 2012; Chen, 2015; Jiang, 2015; Wu, Zhang, Liu & Guo, 2016; Chen, 2016; Polychroniou, Trivellas, & Dahlgaard-Park, 2018). In many cases, the effects are even very different, which makes them reflect the characteristics of similar differences.

(5) At the same time, some activities of the business model divided based on the entire value creation process of the enterprise are only different in space and timing. There is a certain degree of consistency, which also leads to a certain internal connection between various business models of the enterprise.

2. From the perspective of the relationship between business models and business performance, there are three matching relationships between high-performance companies' business models. That is, high-performance matches the comprehensiveness of the business model, high-performance matches the suitability of the business model, and high-performance matches the sustainability of the business model. These matching relationships are determined by the characteristics of the business model and business performance.

First, the business model itself is broad, unique, conceptual, and volatile. This makes the business model different from enterprise to enterprise and can also be adjusted quickly as the internal and external conditions of the enterprise change. Secondly, business performance is a systematic project, and its ultimate realization depends not only on theoretical settings, but also on long-term, stable, and reliable execution.

3. Based on the analysis of the existing literature, this study builds a model of the business model's antecedents, business models, and business performance, and tests the theoretical model empirically.

REFERENCES


