The Factors Influencing the Innovation of Unmanned Economic Business Model in the Era of Big Data

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Abstract: Combining with the related literatures and enterprise interviews, this paper constructs the identification framework of the factors of business model innovation from the perspective of value creation in the context of artificial intelligence, and proposes the value proposition. The three dimensions of value creation and value acquisition use exploratory factor analysis to extract the common factors that influence the innovation of Unmanned Economic business model. The results show that the four common factors are resource capability factor, innovation driver factor, internal and external cost factor and customer relationship factor, and the innovation of Unmanned Economic business model is influenced by these four factors. Under the new era, we should actively develop the unmanned economy, combine the traditional industry with the new business pattern of the unmanned economy, promote the upgrading of the traditional industry, and then promote the high quality development of the economy. Driven by innovative products and innovative services, mid-and high-end consumption is becoming more and more popular among the middle-income group. No economy plays a vital role. We should constantly tap into efficient markets, understand consumer needs, and develop multiple models of development. To establish more unmanned economic scenarios and models that accord with the national conditions and extend from the product to the service, so that the unmanned economy can truly meet the national conditions, help the transformation and upgrading of the industry, and better promote the national economy to high-quality development.

1. Introduction

In recent years, with the Internet, big data, artificial intelligence and other technology innovation and progress, the digital economy has been unprecedented development. As a new form of digital economy, unmanned restaurants, unattended retail stores, unattended banks, unmanned gas stations, unmanned factories, unmanned KTV, parking lots and other unmanned economy scenarios are emerging [1,2]. Since Amazon introduced the concept of unmanned economy, unmanned economy has quickly become a hot topic in the current economic society. Internet, artificial intelligence, cloud computing, Internet of things and other new technologies have brought new opportunities and challenges for enterprise management and innovation because of their characteristics of openness, coordination and sharing. With the development of Internet information technology, enterprises spontaneously formulate and implement related Internet management strategies, because the business model determines the core competitiveness of enterprises [3]. Enterprises make use of artificial intelligence technology to optimize and innovate the traditional business models one after another, and form new business models with new products, new services, new technologies, new forms of business and other unmanned economy competitive advantages [4] to use artificial intelligence. Cloud computing, big data, mobile Internet as a link, aims to reduce costs, shorten innovation cycle, get rid of the reliance on service personnel, and provide customers with more convenient and fast service. Because the innovation of unmanned economic business model is in the development period of enterprise practice and the exploration period of academic research, aiming at how to help the enterprise to carry out the innovation of unmanned economic business model reasonably from the

angle of value creation, The first question is: what is the unmanned business model? Further, what are the factors affecting the innovation of Unmanned Economic business models?

2. Literature Review

Up to now, the research on business model is relatively rich [5,6], while the research on unmanned economic business model has just started [7]. Morris et al. think that business model is enterprise economic model and pay close attention to the logical relationship of profit generation [8]; Osterwalder believe that business model is a conceptual tool to illustrate the business logic of an enterprise, and describes the customer value provided by an enterprise [9]. Luo Min believe that business models are a set of strategic innovation intentions, structural systems and institutional arrangements to integrate organizations, customers, employees, shareholders, supply chain partners and stakeholders to obtain excess profits. Yuan Lei and others believe that business model is the logic of value creation, including customer, partner and enterprise value creation logic [10,11]. Throughout the definition of business model, it is obvious that value creation is the core of business model and emphasizes customer value proposition [7]. Therefore, the innovation of Unmanned Economic business model takes the data as the carrier, realizes the link between people and objects, reduces the cost of information exchange, thus greatly reduces the transaction cost, and provides customers with diversified value proposition [12].

The unmanned economic is regarded as a new economic scenario that relies on modern technologies such as the Internet of things, artificial intelligence and so on [7]. The business model of unmanned economy is a kind of innovative business model with the new state of unmanned economy as the object of study [12]. In practice, there have been a variety of unmanned business models, such as unmanned supermarket, unmanned coffee shop and so on. What no one economy impacts first is a people-oriented society, which will not only affect the way consumers consume (completely self-help), but also the way products and services are provided (the process is unmanned), and will also have a profound impact on stakeholders. It may even change the competitive advantage between countries [13]. But so far, although the question about the influencing factors of the innovation of unmanned economic business model has been mentioned [12], it has not been systematically studied, and there is a lack of quantitative analysis.

It can be seen from the existing research literature that: (1) Many theoretical problems of the innovation of Unmanned Economic business model have not been discussed and solved. (2) Although the research on the innovation of business model at home and abroad has accumulated some research results, it is still fragmented and extremely unsystematic. The related research basically stays in the concept discussion or the qualitative elaboration level, especially lacks the theoretical analysis frame of the influence factor of the Unmanned Economic business model innovation, also lacks the quantitative analysis and the appraisal to the unmanned economic business model innovation; (3) unmanned economy is a new economic form in the digital economy, so there are some differences between the innovation of business model of Unmanned economy and that of other economic forms. Therefore, it is necessary to make a more targeted theoretical exploration on the innovation of the business model of unmanned economic.

3. Theory and Analysis Framework

3.1 The definition of concept

The concept of unmanned economy was first put forward by the American Amazon Company. It puts more emphasis on combining the current situation and characteristics of the development of enterprises on the basis of the development of international economy and technology. There is no clear definition of the concept of unmanned economy in academia. Some scholars believe that the unmanned economic is the product of the high development of information technology. With data as the carrier, the link between people and objects can be realized, and the cost of information exchange will be reduced, thus greatly reducing the transaction cost [12]. Jiang Tongming and others pointed

out that the unmanned economy is a new economic scenario behavior based on the Internet of things service, with the help of the sensor technology such as Internet of things (IOT) and artificial Intelligence (AI), to push into the intermediated production and consumption industrial chain activities [4]. This paper sets up a conceptual model of unmanned economic business model (see Fig. 1), defining it as: in economic activities, using Internet thinking and artificial intelligence, cloud computing, big data, The new ecological model created by mobile Internet technology to promote traditional industries has realized the all-around docking between people and things, and reduced the amount of labor and labor costs. To achieve the production and management effect of less or no people, the economic efficiency of the enterprise is improved, the benefit is increased, and the service is better.
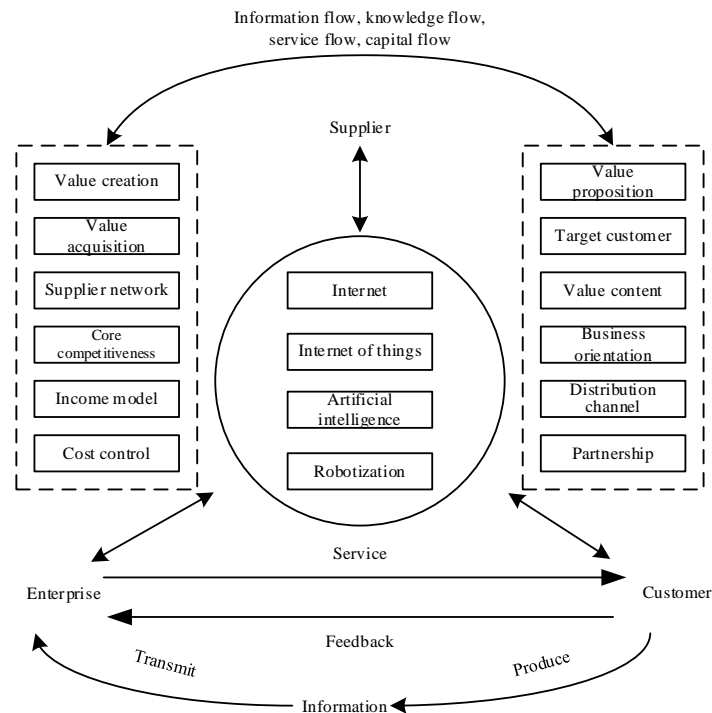

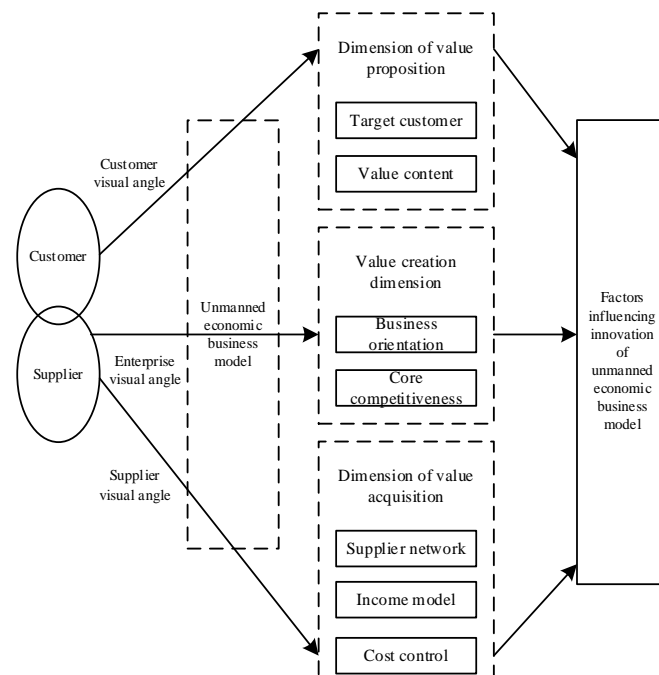Figure 1 Conceptual model map of the unmanned economic business model

Figure 2 Identification framework of factors affecting innovation of unmanned economic business model

3.2 Establishment and construction of identification framework

In this paper, according to Wei Jiang definition of business model, a framework describing the activities of customer value proposition, value creation and value acquisition is presented, which indicates that enterprises create value to satisfy customer value proposition and ultimately obtain value [14]. Therefore, based on the characteristics of customer demand and unmanned economic, from the perspective of "enterprise-customer-supplier" integration, this paper starts from the three dimensions of value proposition and value creation and value acquisition. Establish a framework for identifying the factors affecting innovation in unattended business models (see Fig. 2).

4. Empirical research design

4.1 Establishment of Influence Factor Set

The influencing factors of innovation of Unmanned Economic business model originate from the process of value transmission. Through establishing good communication and cooperation with stakeholders, enterprises can realize the logic of enterprise value creation by using Internet thinking and artificial intelligence technology. From three dimensions of value proposition, value creation and value acquisition, this paper analyzes the influencing factors of innovation of Unmanned Economic business model. By summarizing the 18 factors identified, we get the set of factors influencing innovation of Unmanned Economic business model from the perspective of "enterprise-customer - supplier" integration(see Table 1).

Table 1 Identification table of factors affecting unmanned economic business models

Visual angle	Facet	Explain	Influence factors	Explain	Source of factors
Value proposition Perspective	Target customer	The object of an enterprise providing products or services.	Target user characteristics	In a business environment where communities are the largest common denominator, businesses need to focus on user value and explore niche markets. Users have similarities in behavior, psychology and society.	J. H. Jiang [15]
			User time value perception	The fragmented user thinking is that the user can do many things at the same time, and can arrange the time sequence of the activity flexibly, the user time perception is different, the choice of service mode is different, and then affects the business model of the enterprise.	H. Feng [16]
	Value content	A series of business activities of products or services provided by an enterprise.	Business service expansion and innovation	In the unmanned economic environment, the business scope of enterprises extends to different products or services in different markets, showing significant differences and showing a trend of diversification.	Interview
			Enterprise product positioning innovation	The thought of "one 1 = 10" put forward by Chen Yu is inspired by the orientation of innovative	Y. Chen [17]

Value creation perspective	Business orientation	Business scope of an enterprise		enterprise products. After decomposing the enterprise business, it combines the business with the value to meet the individualized needs of the minority.	
			Marginal user attention	Feng Xuefei believes that it is logical for enterprises to pay attention to the behavior of mainstream customers, while marginal customers have long-term potential, enterprises need to work hard to find marginal customers to expand the regional market.	X. F. Feng [18]
Value creation perspective	Business orientation	Business scope of an enterprise	Enterprise big data application ability	In the unmanned economic, data has become the core production factor of enterprises, and the economic activities of enterprises have become inseparable from the data assets Bulger believes that the potential of enterprises to apply big data determines the intensity of their driving business models. And then decide on the enterprise business model innovation intensity.	H. Christina [19] M. Bulger[20]
			Personalized service	Zhang Baosheng believes that the willingness to cooperate is the premise of choosing the partners, and the thinking of "user-centered" is also reflected in whether the partners can provide customized services, and only the partners with the willingness to cooperate can reach the consensus of commercial negotiation.	B. S. Zhang [21]
	Core competitiveness	Resources that bring competitive advantage to enterprises	Open learning	Gao believes that the ability of employees to absorb and utilize external knowledge is an important part of business model innovation.	S. Gao [22]
			Technological innovation	Piller believes that remanufacturing technology provides a new opportunity to create and capture value for individualized production of products. Enterprises	F. Piller [23] T. M. Jiang [4]

				need to explore new business models under the background of emerging technologies.	
			Senior managers' cognitive ability	Higgins believes that senior managers influence stakeholders cognition by interacting with main stakeholders. When executives have strong technical ability or market ability, it is easier to get customer approval.	M. Higgins [24]
Value acquisition Perspective	Supplier network	Upstream and downstream cooperation networks for effective operation of business models	Supplier network relationship	Stuart believes that the extensive association between partners can help enterprises to acquire more extensive and comprehensive knowledge, information and opportunities, and achieve economies of scale and scope more likely.	S. Bames [25]
			Supplier network stability	Fang Benxin believes that stable partners are more familiar with each other, have a good understanding of cooperation, have a clear vision of the future prospects of both sides, and trust each other to simplify the tedious process.	B. X. Fang [26]
			Win win of supplier network	Huang Changsheng believes that only by realizing the profit growth of the stakeholders and adopting reasonable benefit distribution mechanism to achieve win-win cooperation can the development of cooperative network be promoted.	C. S. Huang [27]
			Supplier network innovation	Peng Xinmin believes that overly stable partnerships may breed corruption, increase the cost of maintaining relationships, and lead to higher indirect costs for enterprises, too old partner groups, and a closed and rigid corporate value network. Make network innovation lose diversity.	X. M. Peng [28]
	Income model	A way or method to increase the	Diversified income pattern	Yang Luming believes that in an Unmanned Economic environment, users will be	D. Kiel [29]

			affected by perceived returns and perceived risks, choosing different payment methods, and the payment behavior taken by users based on their use experience and payment experience. It is an important reference for enterprises to analyze user payment behavior.	
		Product and service charge strategy	Tao ran based on the perspective of information product transfer cost analyzes the behavior of users and proposes that the most direct way for enterprises to make profits is to establish a phased product charging strategy.	Design of this paper
Cost control	A general term for scientific management of costs in enterprise production and operation.	Cost control	Through the innovation of the Unmanned Economic business model, the enterprises can be de-intermediated, and consumers can consume by themselves and reduce the export of intermediary services.	Design of this paper
		Cost layout	Cost layout refers to the arrangement of the distribution of its own cost elements. For enterprises, business activities produce many different cost elements, and unmanned-economy business model can reduce the cost of enterprises.	L. Yuan [11]

4.2 Questionnaire Design and Data Collection

4.2.1 Questionnaire design

Combined with the research ideas of the article, the contents of the questionnaire are designed on the basis of the value proposition, value creation and value acquisition among the influencing factors of the innovation of the Unmanned Economic business model. The questionnaire consists of the following parts: first, the design of the questionnaire. This part includes the title, meaning and background of the questionnaire, as well as the guidance and attention to ensure the effectiveness of the questionnaire; second, the respondents basic information design. This part includes age, gender, working time, the degree of economic understanding of no one, to understand the basic situation of the survey; third, the main part of the questionnaire design, mainly from the value proposition, value creation, etc. The 18 influencing factors in three aspects of value acquisition were investigated, and the respondents judged the cognitive level of the influencing factors. Fourthly, the open topic design, which is the supplement to the questionnaire.

4.2.2 Data collection

In order to ensure the accuracy and reasonableness of the questionnaire design, the internal members of the research team and the school MBA members engaged in the management of emerging industries were the subjects of pre-investigation. A total of 60 questionnaires were distributed, 52 questionnaires were recovered, and the recovery rate was 86.67%.

The purpose of this questionnaire survey is to investigate the identity of the factors affecting the innovation of the Unmanned Economic business model. After the formal investigation, questionnaires were sent out to grass-roots enterprises, business managers, ordinary consumers and business model related researchers. By means of multichannel questionnaire collection, such as in the form of on-site, mail, e-mail, network connection, telephone access, etc., a total of 280 questionnaires have been distributed in Beijing, Shanghai, Xi'an, Chongqing, Chengdu, etc. A total of 255 copies were recovered, 14 invalid questionnaires with incomplete answers and the remaining 241 were excluded. The actual recovery rate of the questionnaire was 91.07 and the effective recovery rate was 86.07.

5. Data analysis and Processing

5.1   Reliability and validity analysis

The reliability of questionnaire in repeated measurement, the statistical results of the degree of consistency. The reliability of the original data to reflect the reliability and stability of the internal consistency reliability usually represents the level. The reliability coefficient in the 0-1 range, the value is close to 1, the test results showed that the questionnaire is close to more stable; 0, the test results showed that the questionnaire is reliable. In general, the Cronbach alpha coefficient of more than 0.8 have use value. This paper uses the SPSS20.0 questionnaire for the "Internet" business model innovation factors and test results are as follows. The Cronbach coefficient is 0.88 > 0.8 show the internal consistency of the questionnaire design is reasonable, the reliability is good.

5.2   Factor extraction

After the questionnaire data was input into SPSS20.0, the common factors were extracted by principal component analysis (PCA), and the total variance interpretation table was obtained. Four factors were extracted and the cumulative contribution rate was 80.072% > 80%. The component matrix after rotation is shown in Table 2. The factor loads of all 18 items are greater than 0.5, without deleting the items.

Table 2 Rotation component matrix

Rotational component matrix[a]				
	ingredient			
	1	**2**	**3**	**4**
Enterprise product positioning innovation	**819**	188	181	118
Open learning	**804**	206	182	168
Senior managers' cognitive ability	**795**	204	165	190
Technological innovation	**775**	248	151	188
Enterprise big data application ability	**685**	197	242	160
Business service expansion and innovation	147	**852**	110	142
Product and service charge strategy	167	**831**	156	154
Supplier network innovation	228	**790**	068	207
User time value perception	237	**775**	151	178
Personalized service	131	**770**	165	118

Cost control	123	131	**814**	051
Win win of supplier network	089	122	**748**	168
Supplier network stability	108	021	**693**	111
Cost layout	232	220	**692**	121
Marginal user attention	182	232	248	**732**
Diversified income pattern	158	209	162	**701**
Target user characteristics	073	106	000	**663**
Supplier network relationship	220	300	263	**626**

5.3 Factor naming

Therefore, this paper extracts four common factors that influence the innovation of Unmanned Economic business model, which can explain 80.072% of the original information. In order to further clarify the connotation of these four common factors and name them, the specific analysis is as follows:

Factor one is named as resource ability factor, it is in the enterprise product positioning innovation, open learning, supplier network stability, technological innovation, The application ability of big data has a great load on five factors, which reflects that the enterprises realize the transformation and upgrading of the real economy through open learning and technological innovation, and adopt the digitization of consumption preference. The online supply channels, the automation of production and manufacturing, and the sales of the new form of unmanned economic.

Factor two is named as the driving factor of innovation. It has a great load on five factors: business service expansion and innovation, product and service charging strategy, supplier network innovation, user perception of time value, personalized service, etc. It reflects the innovation of business service, charging strategy, supplier network, from user mining, business expansion, payment environment change, marketing means innovation and so on, to change the original profit model, which reflects the innovation of the business model of the enterprise through the Unmanned Economic business model, the charging strategy, the network of suppliers, and so on.

Factor three is named as the internal and external cost factor. It has a great load on four factors: cost control, supplier network win-win, supplier network stability, cost layout, which reflects that the innovation of Unmanned Economic business model makes the enterprise disintermediation. Let consumer self-service consumption, reduce intermediary labor export, reduce costs.

Factor four is named as the customer relationship factor. It has a great load on the four factors of enterprises attention to marginal users, diversification of income patterns, characteristics of target users, and supplier network relationship.

6. Conclusion

Through the exploratory factor analysis of the innovation factors of the unmanned economic business model, four key factors reflecting the innovation of the unmanned economic business model are obtained: resource ability factor, innovation driving factor, and so on. Internal and external cost factors and customer relationship factors. The enterprise should strengthen the ability of utilizing the resources of the enterprise, carry on the innovation of the Unmanned Economic business model in the link of value creation and value acquisition through the technological innovation, so as to improve the production, management efficiency and reduce the manpower cost of the enterprise. From the point of view of industry chain and driving agent, expand the channel resources of partners and enhance supplier network innovation. Furthermore, we should strengthen the open learning ability of employees and the innovation ability of enterprise product orientation, and control the replicability of enterprise value-added service on the basis of ensuring enterprise data security. Enterprises should pay attention to marginal users and strengthen the innovation of revenue

channels. Pay attention to data application ability to obtain accurate customer value proposition, and strengthen communication with user to keep user stickiness. On the one hand, the conclusion clarifies the ideas and points out the key points of the research for the innovation of the unmanned economic business model; on the other hand, it also provides a reference value for the practice of the innovation of the enterprise unmanned economic business model.

Under the new era, we should actively develop the unmanned economy, combine the traditional industry with the new business pattern of the unmanned economy, promote the upgrading of the traditional industry, and then promote the high quality development of the economy. In recent years, consumption has become the first driving force of China economic growth. Driven by innovative products and innovative services, mid-and high-end consumption is becoming more and more popular in the middle income group. We should constantly tap the domestic efficient market, understand the needs of consumers, and develop multiple development models. To establish more unmanned economic scenarios and models that are in line with the national conditions of our country, extending from the product to the service, so that the unmanned economy can truly conform to the national conditions of our country and help the industrial transformation and upgrading.

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