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Research on Innovation Model of Enterprise Management Mode Based on Big Data from the Perspective of Smart City

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Abstract: *With the in-depth research on big data and technology, as well as the increasing public acceptance of smart cities, the innovation of enterprise models has also undergone different changes. Intelligent enterprises should transform and innovate their management models to adapt to market demands and changes, in order to contribute to the healthy and steady growth of intelligent enterprises. This article mainly analyzes and explores the innovation of management models in the context of intelligent enterprise big data. And it analyzes the optimization and innovation of enterprise management organization. Then, a corporate innovation evaluation model was proposed to evaluate the innovation of the enterprise's management model. By dimensionality reduction, the variables that originally had multicollinearity were evaluated using four unrelated factors: quality, category, promotion, and price. The model fitting accuracy of this indicator was good.*

Keywords: *Smart City; Big Data; Enterprise Management; Management Model Innovation*

1. Introduction

Smart city is the extension and development of digital city, and it is a new form of urban development under the background of network information age. Big data refers to datasets that exceed the analysis, storage, and management functions of typical databases. Big data is mainly composed of application data, user data, and network data. Its purpose is to find associations and patterns in complex data information and make full use of them. Big data is a brand new sharing platform that has many advantages such as multiple formats, multiple data resources, fast growth, high data value, large storage capacity, fast processing speed, and large computational load. The advent of the big data era has had a serious impact on traditional enterprise management models.

The innovation process of enterprise management mode and the analysis and processing process of big data exist in a coupled relationship. Big data has functions such as data collection, analysis, processing, prediction, and monitoring in enterprise data platforms. Problem driven or data driven is generally the beginning of innovative management models in enterprises.

2. The Big Data Characteristics of Smart Cities

Smart cities have many unique characteristics, which are mainly reflected in the following aspects. (1) Data extensive coverage. Smart city is an urban form based on data information, so it has extensive coverage. Therefore, a smart city must have a perception network covering data of different time, space, form and nature [1]. It needs the support of big data and other related technologies to manage urban data information based on moderate demand. (2) Data collaborative sharing. Under the traditional urban management concept, the various management structures and resources of the city have obvious modular characteristics. Different modules are responsible for different functions, services and management of the city, and are relatively independent of each other in terms of business and information. In the perspective of smart city, the information barriers between the above modules are broken, and the sharing and intercommunication between information is realized, and the phenomenon of isolated islands at various levels such as resources, information, and applications no longer exist. Then it realizes the organic unity of all aspects of urban resource allocation and maximizes the value of urban resources. (3) Intelligent data processing. With the construction of smart cities, there will be massive amounts of data in the field of urban management. Only by intelligently processing these data,

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can we make scientific judgments on the city's operation status from the macro and micro levels, and propose correct coping strategies and management methods. Of course, the development of modern technologies such as big data and cloud computing makes the above requirements possible, and can play a due role in the intelligent processing of urban data information.

3. Management Innovation Concepts and Modules

Based on the perspective of enterprise growth and evolution, the management innovation of each life cycle stage of an enterprise can be divided into four sub-processes: The first is that changes in the internal and external environment have an impact on enterprise management innovation, which leads to the evolutionary motivation of management innovation. [2]

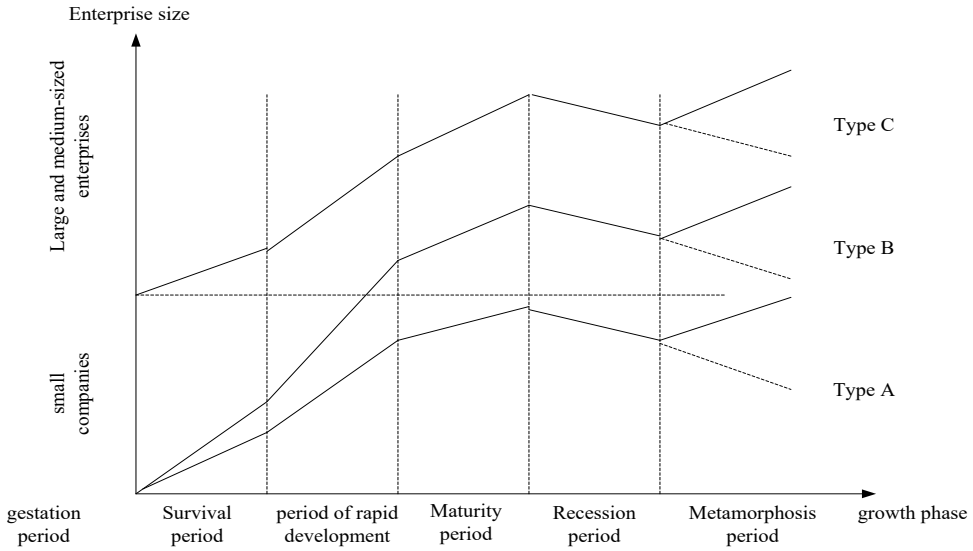

Figure 1: Business life cycle and growth type

The second includes two steps: on the one hand, it refers to the process of enterprises breaking past conventions under the action of evolutionary motivation. Enterprises can make up for their own deficiencies by searching for existing management innovations or self-development; on the other hand, it is to retain the successful and excellent management innovation. The third small process is the interaction between the enterprise's own management innovation behavior and environmental choice. Whether management innovation change can promote the growth of the enterprise depends on the interaction between the enterprise's own behavior change and the environment. In the same way, the evolution of the enterprise will lead to changes in the internal and external environment of the enterprise, which will also prompt the enterprise to generate new evolutionary motivations for management innovation. Under the influence of evolutionary motivation, enterprises will enter a new evolutionary process as shown in Figure 1.

The enterprise needs to carry out the basic construction of the enterprise framework during the incubation period. At this stage, the enterprise funds are weak and the organization scale is single. But whether the positioning is correct directly determines the long-term survival of the enterprise, and its corresponding management focuses on raising funds, market positioning, research and development, planning and publicity. Secondly, in the survival period, the strength of the enterprise is weak, and the sales of products are unstable. The management focus still needs to raise funds and strengthen the innovation of R&D management. Thirdly, the characteristics of enterprises in the rapid development period are that the market share has increased significantly, and the enterprises have begun to develop towards standardization. Its management focus is to control costs, products and production technology continue to update. Then, the characteristics of the mature stage are that the scale of enterprise development and operation reaches the best state, and it has certain brand advantages and corporate image. However, the speed gradually slows down and tends to zero, and the employees' awareness of innovation is weak. The enterprise faces the risk of recession and needs to start a second business. At this time, the management focus of the enterprise is to develop new research fields and business channels, strengthen management innovation and human resource management innovation, and enhance the interaction effect between superiors and subordinates within the enterprise. Finally, the

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characteristics of enterprises in the recession period are that the products of the enterprise are replaced by new products, the income and profit of the enterprise gradually decline, and the turnover rate of the enterprise personnel continues to increase. Its management focus is to realize the second transformation of enterprises through the introduction of new technologies, as well as the reform of organizational structure, management system and supply chain process [3-4].

4. Internal and External Driving Factors of Management Innovation

This paper draws on the definition of other innovation driving factors and believes that enterprise management innovation driving factors refer to the sum of various internal and external factors or forces that promote the benign operation and smooth progress of management innovation in each growth stage of technology-based SMEs.

The level of entrepreneurial quality and ability is the key to the success or failure of enterprise management innovation. The needs and abilities of enterprise employees can directly drive enterprise management innovation. This willingness directs them to exert their innovative spirit, implement innovative behaviors, and promote innovative operation. Corporate culture is the synthesis of corporate operating philosophy, management and control standards, environmental atmosphere, and values generally recognized by all members of the company. It represents the image of the company and is the coagulant and catalyst for corporate development, which has a huge role in motivating employees to innovate, unite, and promote the step-by-step development of the enterprise.[5]

The market competition factors and demand factors will inevitably drive the implementation of enterprise management innovation and affect the formulation of enterprise innovation strategies. Consumer demand and market competition can promote management innovation, and the frequency of demand change and the degree of fierce competition are proportional to management innovation.

The management innovation activities of enterprises are bound to be affected by government policies, and the guidance of government policies directly drives the management innovation of enterprises. For some industrial service support policies, fiscal and tax subsidy policies and supporting policies for scientific and technological talents, the speed of industrial development can be improved; on the other hand, it will force enterprises to take corresponding management innovation measures to match with the innovation of macro policy, for example, tax incentives, government subsidized loans, etc., so as to solve the problem of broken capital flow for enterprises. Positive policy factors can create a good management innovation environment for enterprises, and guide and motivate enterprises to carry out management innovation activities.[6]

The accelerated development of science and technology has shortened the cycle of products and technologies and increased the pressure on enterprises, thus driving enterprises to continuously carry out management innovation. The development of science and technology has greatly promoted the progress of management innovation.

5. Innovative Management Model

5.1 Indicator Selection and Analysis

Table 1: Core competencies of innovation management

Serial Numble	Basic Skill
1	identify
2	adjust
3	acquire
4	create
5	select
6	implement
7	carry out
8	study
9	Organizational development

The concept of innovation management capability also raises the question of how innovation management capability evolves over time, which must include a learning process. It is not enough to have experience (success or failure), the key is to evaluate and reflect on innovation management, and

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then next time a similar problem arises, the organization can be developed with a prepared reflection. This learning cycle is easy to say, but often overlooked by organizations. The result is that organizations often repeat those wrong patterns and fail to learn from the failures of other organizations. For example, there are simply no identifiable points in the innovation process of these organizations, neither doing post-mortem analysis nor spending time trying to extract useful lessons for the next innovation. This happens partly because the staff involved are too busy, but also because of fear of reprimand and criticism. But if you stop and reflect at the wrong time, you can repeat the same mistakes. The management core competencies are shown in Table 1.

5.2 Factor Analysis Results

Table 2: Correlation coefficient matrix of observed variables

	X1	X2	X3	X4	X5	X6	X7
X1	1.0000						
X2	0.8999	1.0000					
X3	0.9999	0.9001	1.0000				
X4	0.7020	0.7487	0.7070	1.0000			
X5	0.7012	0.7524	0.7060	0.9995	1.0000		
X6	0.0291	0.0887	0.0320	0.1078	0.1105	1.0000	
X7	0.3313	0.3054	0.3338	0.3079	0.3124	0.9207	1.0000

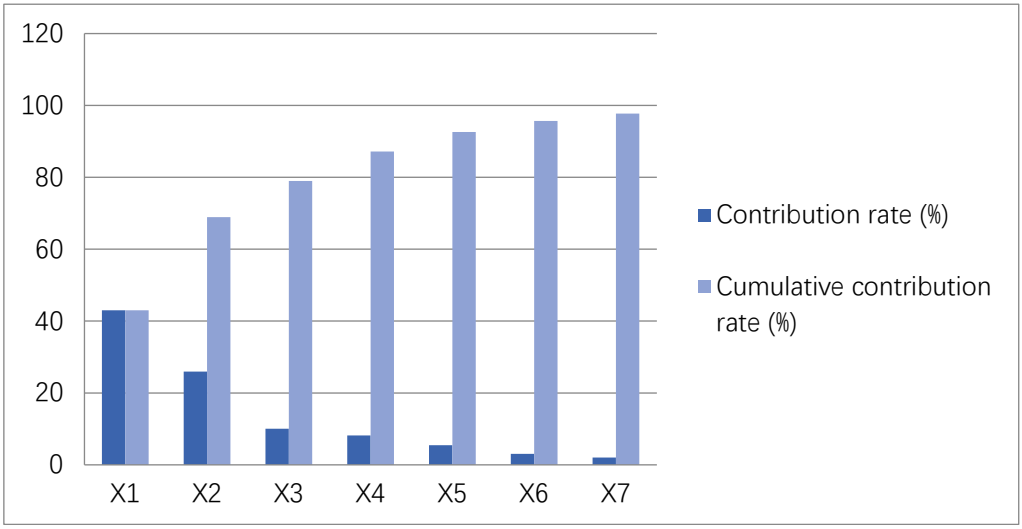

Figure 2: Factor analysis

Table 3: Overall variance interpretation for factor analysis

	eigenvalue	Post-rotation eigenvalue	Post-rotation contribution (%)	Post-rotation accumulation rate (%)
X1	6.881	6.881	43.009	43.009
X2	4.149	4.149	25.932	68.941
X3	1.605	1.605	10.03	78.971
X4	1.312	1.312	8.201	87.172
X5	0.872			
X6	0.493			
X7	0.324			

According to some scholars, in factor analysis, the ratio of the number of each item to the number of pre-survey samples is about 1:5 to 1:10. In this research, there are 13 items in the customer satisfaction survey questionnaire of a certain enterprise, and 280 questionnaires are selected as the survey sample. The factor analysis was carried out with the help of SPSS13.0 statistical software, and the coefficient matrix is shown in Table 2. Table 3 and Figure2 list the total variance interpretation for factor analysis. It can be seen that the cumulative contribution rate of the four common factors reaches 87.172% of the three variables, and it can be considered that the extraction of these four factors is effective.

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Figure 3 also shows that the eigenvalues are very low starting from the fifth common factor, which shows from another perspective that only four common factors need to be extracted.

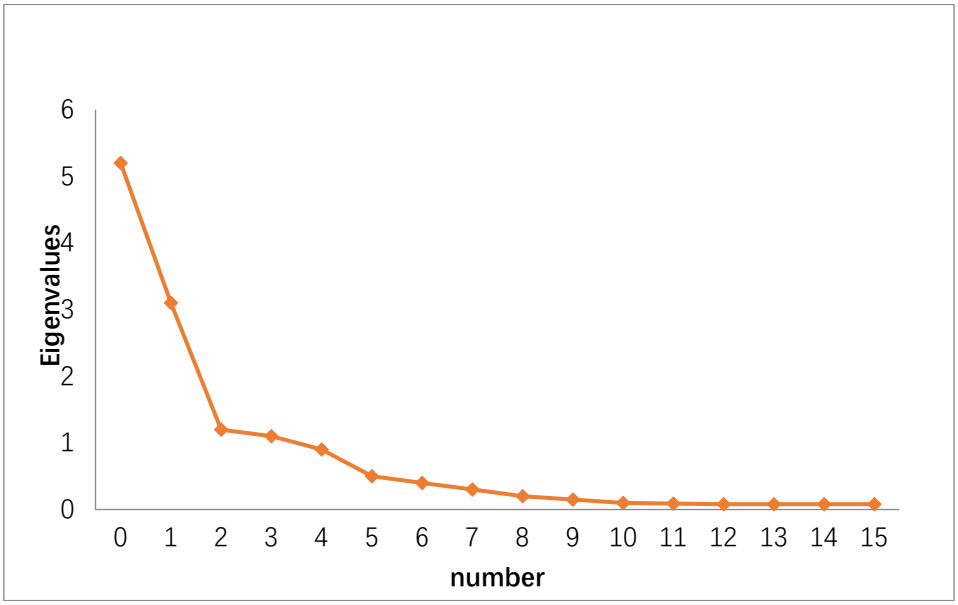

Figure 3: Factor analysis gravel plot

Table 4: Factor loading matrix after orthogonal rotation with maximum variance

	Factor 1	Factor 2	Factor 3	Factor 4
X1	0.911	0.156	2.15E-02	0.342
X2	0.925	0.106	7. 75E-02	3.01E-03
X3	0.912	0.158	2.93E-02	0.338
X4	0.883	0.148	0. 119	-0.224
X5	0.883	0.155	0. 109	-0.229
X6	-6. 47E-02	0.881	0.246	-0. 141
X7	0.198	0.937	0.15	3.02E-02

It can be seen from Table 4 that in the first common factor, the factor loads of variables such as service expectation, service quality, commodity quality, commodity expectation, employee attitude, and comfort are high. These variables are all related to the quality (core value) of the goods and services provided by the enterprise, which is named the quality factor in this paper. In the second common factor, the factor loads of variables such as high popularity, rich variety, and so on are relatively high. These are all related to the categories of commodities placed in the enterprise, and this article names it as category factor. In the third common factor, the factor loads of variables such as promotion information, corporate reputation, and corporate accessibility are relatively high. These are all related to the promotion and brand image of the enterprise, which is named as the promotion factor in this paper. The fourth common factor has the highest load in the two variables of cost performance and price level, and is the most obvious factor. This paper names it as the price factor. In this way, the original variables with multicollinearity can be represented by four uncorrelated factors of quality, category, promotion and price through dimensionality reduction.

6. Conclusions

For the innovation of the management model of the enterprise, the enterprise must rely on technological innovation to seize the market share and enhance its own core competitiveness. Management innovation is also an integral part of the growth and development of technology companies. Appropriate application of management innovation can help solve the problem of high enterprise mortality. Based on life cycle theory and management innovation theory, this paper discusses the matching relationship between enterprise life cycle and management innovation mode, and strives to theoretically deepen the existing management innovation theory, which provides a certain degree of reference and guidance for Chinese enterprises' management innovation activities in practice. However, due to the limited managerial ability of the author, the scope of the enterprise has not been expanded to many fields. In follow-up studies, research will be carried out with this aim.

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