

The Application of Mathematical Modeling Methods in Business Management

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Abstract. In the current social environment of rapid development of science and technology, mathematics has also penetrated into various fields. Mathematical modeling is a mathematical method that has been widely used in recent years, and it plays a non-negligible role in people's daily life and business operations. This paper explores the application of mathematical modeling methods in enterprise management, finds out the problems existing in the application process, and gives specific measures to improve the application efficiency of mathematical modeling methods in enterprise management.

Keywords: Mathematical modeling methods; enterprise; business management.

1. Introduction

As market competition becomes more and more intense, the survival of enterprises is becoming more serious. Economic globalization has created opportunities for the development of some large enterprises and accelerated the development of these enterprises, but it has also brought certain difficulties to the development of most enterprises, especially small and medium-sized enterprises. For this reason, how to optimize the management system in the process of development, how to set up the operation mechanism to better promote the production and development of the enterprise is a problem that most enterprises need to think deeply. Practical experience shows that the application of mathematical modeling methods in enterprise management can promote the better development of enterprises [1].

2. The Significance of Mathematical Modeling Methods

The application of mathematical modeling methods in business management is mainly through the use of mathematical knowledge and mathematical structures, such as the micro-product method, function method, linear and non-linear planning methods, statistical methods and so on. The use of mathematical modeling methods in the process of enterprise management can significantly reduce the production and operation costs of enterprises, build a perfect economic management system, improve the economic efficiency of enterprises, and promote better development of enterprises. Mathematics is involved in a very wide range of fields (such as medicine, ecology, science and technology, military, etc.), and can enhance the corresponding level of science and technology and optimize the allocation of resources. With the continuous improvement of China's economic strength, each enterprise in the operation process is more and more focus on the development of science and technology, digitalization and accuracy, so that mathematics is also gradually throughout the operation of the entire enterprise process. Entrepreneurs and business managers need to put mathematical thinking methods through the whole process of enterprise operation and management, use mathematics to solve specific development problems, and put forward corresponding rectification measures and accurate development directions, so that enterprises can continue to operate stably [1].

3. Mathematical Models Commonly Used in Bbusiness Management

The application of mathematical models is like a train running along a railroad track. It provides enterprises with the most basic thinking analysis methods, and then helps enterprises to make

judgments and ultimately help enterprises make decisions to maximize the interests of enterprises. In enterprise management, some of the mathematical models commonly used at present include extreme value method, Shapley method, probability method, D-S synthesis method, decision theory, and expected value method.

3.1. Application of the expected value method

The ultimate goal of an enterprise is to make profit, otherwise the enterprise cannot survive. The most common problem encountered in enterprise management is how to help enterprises earn profits, that is to say, enterprise managers need to make correct decisions when the enterprise faces certain risks to help enterprises resolve crises. So how can an enterprise manager be sure that he is making the right decision and not the wrong one? This is the problem that the expected value theory model of mathematics solves. The expected value method is a statistical tool commonly used in project management and decision-making to evaluate the potential value of a project or decision by calculating a probability-weighted average of different outcomes. This approach can help project managers and decision-makers understand uncertainty and risk to make more informed choices.

3.2. Application of extreme value theory model

The application of extreme value theory in enterprises often focuses on how decision-makers make decisions to maximize the output and profits of the enterprise. When using extreme value theory analysis to solve this problem, it is necessary to take into account the production cost of the enterprise and use the necessary conditions for the establishment of the equation to achieve results.

3.3. Application of Shapley model

Both the expected value model and the extreme value model are used in enterprises to solve how to maximize the benefits of enterprises, while the application of Shapley model in enterprises is mainly to help enterprises solve how to distribute the benefits obtained more fairly and reasonably. This theory is based on the theory that if the interests of a cooperative group are to be maximized, then the cooperation between them must be non-adversarial, so that the number of partners will not reduce the total benefits of their group, that is, their benefits will be maximized.

3.4. Application of D-S Synthesis Law

The full name of the D-S synthesis law is Dempster-Shafer theory, which is named after two outstanding mathematical theorists in the mathematical field, Dempster and Shafer. Both of these mathematicians contributed to the development of mathematics in the field of probability theory. The ideological origin of D-S theory is also probability theory, which is a sample space measurement theory developed from probability theory. According to this theory, the uncertainty principle in mathematics can be described by trust functions. For uncertainty, two basic metric functions can be used, namely the trust function and the likelihood function. The main application of this theory in enterprise management lies in the integration of various points of view, to draw a conclusion that is most helpful to the enterprise, and then to implement.

3.5. Application of the theoretical model of probability

The application of the theoretical model of probability in enterprise management is mainly reflected in its statistics, and plays an important role in the price control and quality control of enterprise products.

3.5.1 Application of probabilistic model in enterprise market management

In an enterprise, especially in the marketing department, it is often necessary to analyze and count various data in order to obtain market trends and create profits for the enterprise. In this process, how to collect, analyze, and model huge market data requires the support of probability and statistical

theory. Although today's computer technology can also perform modeling and analysis, it still uses mathematical modeling ideas and methods in essence.

3.5.2 Application of probabilistic models in enterprise financial management

In an enterprise, the most important management decision is the decision on the financial management of the enterprise. Because in this decision-making process, every decision involved is critical to the survival of the business. If there is a problem in the company's capital chain, then the company is likely to go bankrupt and eventually go bankrupt. There are countless examples of this. In the decision-making process, how can decision-makers judge that the decisions they make are correct for the financial management of the enterprise? There is uncertainty in any decision. What we can do is try to minimize uncertainty. According to the relevant definitions and formulas in the probabilistic model, in the decision-making process, take a long-term view and try to win the maximum benefit with the least risk. When referring to probabilistic models, variance and expected values can be used to make risk decisions [3].

3.6. Application of decision theory

The decision-making model is a model that reduces risks and losses and maximizes returns by readjusting and designing actors' action plans under the condition of an external environment that cannot be changed. According to the different problems of decision-making, there are three types of decision-making, namely: risk decision-making, deterministic decision-making, and uncertain decision-making. Both deterministic and indeterminate decisions are directed at events that have either been determined to have occurred or have been determined not to have occurred. In the decision theory model, the above two are only used as a reference object for theoretical refinement. It is the theory of risk decision that really plays a practical role in the enterprise. In order to apply risk decision-making in specific practice, it is necessary to set a set of index systems associated with events at the same time, and it is necessary to assign contribution coefficients and effort cost coefficients through professionals according to the relevant natural state and action plan, so as to evaluate the risk decisions made in enterprise management.

4. Problems in the Application of Mathematical Modeling Methods in Enterprise Business Management

4.1. Insufficient attention is paid to mathematical modeling methods

In the development process of the enterprise, the person in charge of the enterprise and some managers do not recognize the significance of mathematical modeling methods in the process of enterprise development, and do not use mathematical methods to empathize according to the current form of enterprise development and existing problems, and think that mathematical modeling methods are just a way to judge the product quality and equipment production performance in the ordinary production process, and do not play a role in the operation and management of the enterprise. This outdated concept makes the mathematical modeling method unable to play its real role in the development process of the enterprise, and limits the economic operation of the enterprise [4].

4.2. Employees do not have professional knowledge and skills in mathematics

In the operation and development of enterprises, in order to make mathematical modeling methods can be used in the operation and management of enterprises and drive the economic growth of enterprises, it is necessary to ensure that enterprise staff have corresponding mathematical knowledge, can analyze mathematical modeling methods thoroughly, and apply modeling methods according to their own structural conditions and development status, so as to formulate scientific development plans. However, some enterprises lack talents, staff do not have certain mathematical professional knowledge and skills, weak work ability, poor mathematical foundation, and cannot apply mathematical modeling methods.

4.3. Improper use of mathematical methods

In the process of application, mathematical modeling methods have the characteristics of strong thinking logic ability and high abstraction, which brings certain difficulties to the development of some enterprises. Due to the diversity of mathematical modeling methods, the relevant users in the process of enterprise application are easily misled by superficial phenomena, so as to choose the wrong mathematical modeling method, which not only cannot improve the economic operation of the enterprise, but also bring a burden to the operating cost of the enterprise, resulting in failure in the competition.

5. Measures to Improve the Application of Mathematical Modeling Methods in Enterprise Operation and Management

5.1. Disseminate mathematical modeling methods according to development needs

In the application process of mathematical modeling methods, in order to enable enterprises to achieve long-term development, it is necessary to integrate with the current development situation, continuously optimize the operation mode of enterprises, and enhance their own economic strength and market competitiveness, so as to achieve corresponding advantages in the future development. Therefore, it is necessary to fully understand the current development situation of the enterprise, implement the development concept of mathematical modeling methods in the enterprise, and disseminate mathematical modeling methods in combination with the current development situation of the enterprise. Drive enterprise employees to integrate into the learning of mathematical modeling methods, and popularize the development concept of mathematical modeling methods. According to the current development status of the enterprise, the skills training for the staff should be implemented, and a perfect training plan should be established according to the specific implementation of mathematical modeling methods. During the training process, employees can stimulate their own mathematical awareness and fully devote themselves to the learning of mathematical modeling. Develop employees' thinking ability and innovation awareness, improve their mathematical core literacy, and equip employees with certain mathematical modeling skills. In the operation of the enterprise, the use of certain mathematical modeling methods can build a digital and scientific operation mechanism for the operation mode, cost management, human resource management and so on of the enterprise [5].

5.2. Improve the ability of employees to use

Many economically weak companies often lack awareness of the need to upskill their staff. Therefore, in the application of mathematical modeling methods, it is necessary to meet the needs of employees, combine the mathematical knowledge mastered with the skills of professional positions, and apply mathematical theoretical knowledge to specific practical activities. The problems and defects in the process of enterprise development are solved by mathematics, give full play to the mathematical knowledge and skills of enterprise employees, carry out abstract modeling of practical problems, and implement them in the whole process, so as to stimulate the enthusiasm of employees and actively invest in the modeling link of enterprise development. Pay attention to the creation of various mathematical modeling activities, encourage employees to actively participate in them, purposefully stimulate the innovation consciousness of enterprise employees, and improve employees' ability to apply mathematical modeling methods with the help of specific practical activities [6].

5.3. Construct a mathematical system in combination with the enterprise structure

Based on the current needs of enterprises in the development process, we should not only start from the perspective of employees' corresponding mathematical literacy and application awareness, but also pay attention to the expansion of employees' mathematical thinking ability, so that they can carry out accurate calculations with the help of mathematics in some complex programs, and cultivate

their management ability and decision-making ability. When using mathematical modeling to solve practical problems, they can go deep into the problems, solve the problems in the development of enterprises from the root of the problems, and actively exert their own innovation consciousness and ability. In the process of practical application, the practical problems are transformed into mathematical problems, a sound mathematical system is constructed, multi-angle thinking, in-depth research, and development problems are solved through mathematical modeling from the perspective of economy and practicability [7].

5.4. Effectively control the cost of the enterprise

Effective control of enterprise operating costs is one of the functions of mathematical modeling methods applied to enterprises. In the specific application process, the mathematical modeling method focuses on economy from the perspective of the development of the research object. In the modeling process, there is no need for a large amount of money to purchase professional equipment and tools, which avoids the equipment maintenance costs incurred in the later operation and accelerates the efficiency of enterprise operation. The use of some high-tech and technical means has changed the limitations in the development process of enterprises in the past. The use of advanced mathematical calculation methods combined with computer technology to plan the direction of enterprise development, the abstract content for reasonable and necessary simplification, with accurate language to make assumptions, flexible application of various mathematical knowledge, refining effective mathematical models, so as to carry out mathematical modeling scientifically. With the support of modern information technology, the method of solving mathematics has been continuously scientific and accurate, based on the background of big data, it has opened up a new development direction for the application of mathematical models to solve practical problems, and the solution methods have also been simplified, which has improved the development rate of enterprises [8].

6. Summary

In the context of the continuous development of science and technology, in order to implement the application of mathematical modeling methods in enterprise operation, it is necessary to comprehensively consider the development status of the enterprise itself, improve the learning of mathematical knowledge of enterprise employees, cultivate the core literacy of mathematics, expand knowledge and skills, and improve the application ability of mathematical modeling methods, so as to improve their management budget ability. Under the application of mathematical modeling methods, the development cost of enterprises is reasonably controlled, scientific guidance is provided for the development direction of enterprises, and the harmonious, stable and sustainable development is promoted.

References

- [1] Eilon, S. Mathematical Modelling for Management. Interfaces, 1974, 4(2): 32-38.
- [2] WANG Siqi. Application Analysis of Applied Mathematics in Marketing. Modern Marketing (Information Edition), 2019, 5: 90.
- [3] Mattessich, R. Mathematical Models in Business Accounting. The Accounting Review, 1958, 33(3): 472-481.
- [4] ZHAO Qian. A Brief Discussion on the Application of Decision Tree Method in the Risk Management of Small and Medium-sized Enterprises. Journal of Modern Economic Information, 2017,3: 59-60.
- [5] Zheng Zhiyong. Improvement of Depreciation of Fixed Assets Based on Mathematical Modeling Method. Journal of Fuqing Branch of Fujian Normal University, 2016, 2: 4-11.
- [6] SUN Gang. Application of Probability and Statistics in Enterprise Risk Management. Enterprise Science and Technology & Development, 2018, 436(2): 199-200.

- [7] Wu Yifan. On the Application Value of Applied Mathematics in Modern Economic Management. Economic Research Guide, 2018, 8: 195-196.
- [8] WANG Xingliang. Analysis on the Application of Mathematical Statistics in Enterprise Management. Shanxi Agricultural Economics, 2018, 3: 114.