The Analysis of Modeling and Simulation on Inventory Management

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Abstract: According to the rapid development of science and technology, which bringing the new means of modern society production was the economic germ that causes the coming knowledge economy age. Meantime, the simulation of industry got developing flourishingly. The research of simulation system has made contributions to the economic development. In this paper, it was proposed to solve strategy for the management which based on the simulation model of inventory management. The theory of simulation system can solve practical problems, and provided reliable basis for decision-making of enterprises.

Keywords: Inventory; System Simulation

1. Introduction

Simulation System was a new technology which has developed after World War Ⅱ. Simulation industry has become the new industry, which has considerable scale with the development of simulation technology. At present it has been widely used in many fields, such as national defense, energy, power, transportation, logistics, manufacturing, education, biopharmaceuticals, ship, social and economic operation, environment and safety science. Electronic technology provided technical support for simulation analysis. The modern logistics will continue to be rapidly developed. It urgently demands to be modernized. Currently, computers occupy very important position in the logistics system. Developing modern logistics may strengthen the key competition ability of enterprise. Simulation technology plays an increasingly important role when logistics enterprise to make decisions. The development of modern management theory which made traditional stock values changed. Zero inventory concept was the result of transformation (Just-in-time system (JIT) is designed to produce or deliver goods or services as needed, using minimal inventories). Inventory was the reasonable basis for both production and service system, and rational organization production and service process. Keeping a high availability rate with lower cost, not only in theory was established, but also in practice was completely achieved. Set safety inventory and ensure inventory control management of all materials at a reasonable level. Inventory control was an important part of supply chain management, which was the key both to exert collaboration and to perform the integrated management

2. The Theory of Simulation System

The simulation system was established on the basis of real system model, which carried on various experimental researches instead of real system in order to study the system performance. Successful simulation system model can directly or indirectly reflect on real system in various situations, which contributed to people grasp the essence rule on the basis of analysis of model system operation. The concept of system refers to mutual relation and interaction of the object. From the generalization, the system consisted of engineering system and non-engineering system. Engineering system refers to achieve a specific function by means of a structure, such as mechanical, electrical, inventory and weapons. Non-engineering system was established in the process of natural and social development, which gradually known in long-term productive labor and social practice. For example: society, economy, management and traffic system.

No matter what a system was a larger or smaller, which have three elements: entities, attributes and activities. The entity refers to the concrete object which composed the system. For instance, the entity of commodity sale system has manager, department, commodity currencies and warehouse. The various entity of system not only has the relative independence, but also has mutual interrelated. Attribute refers to the entity which has an effective characteristic. For example, date of manufacture, purchase price, sales data and selling price. For the activity which refers to the process of internal system changed on the basis of various reasons. Such as the increasing retail commodities prices. System has constantly movement, development and change. Because the interaction of system entities caused it attributes changed, created a diverse between entities and it attributes in different times, the changes usually described by the concept of state. At any given moment, the entity attributes and the information of activities combined, which called state of system in the moment; it's usually to indicate the system state variables as state variables. The all things of natural world have relationship with each other. Any system usually under the influence caused by the

changed of outside system, it has influenced the results of activities of system, which called system environment. It's primary to divide the border of system environment when the system was analyzed. Under this background, studying system research has great effect on theory and practice. System research consisted of system analysis, system synthesis and system forecast. The first step of system research was to clearly describe the entities, attributes, activities and environments. That's because the concept of system not only has related with entities, but also has related with research purposes. The system was determined after clearly description of the entities, the attributes, activities, and environments.

According to the model of state variables can be divided into continuous change model and discrete model. The state variables of continuous change model changed with time. The state variables of discrete model discontinuous, that means the state variables remained unchanged   in particular system status. The mainly categories of discrete event systems studied on inventory system, the changes in the inventory level caused by two factors which were demand and order. According to the laws of demand and order, inventory system was divided into two categories: Fixed type inventory system and Random type inventory system; The research purpose of inventory system was to determine or compare various inventory strategies, included when and the quantities of ordering goods under different demand situation. The general evaluation measures to inventory strategy with low cost, the three aspects as follows:

(1) Storage Cost: warehouses, equipment and manpower, preservation, the damaged goods.

(2) Ordering Cost: Cargo handling fee, Order commission charges and transport.

(3) Shortage cost: due to the lack of goods, miss sales opportunities or hold up work for lack of materials.

3. The Analysis of Model

3.1 Materials data

The required time of product was the random variables of 0.1 months index, the quantity demand was random variables, the quality of probability function as follows:

D= 1 Probability for one-sixth
    2 Probability for one-third
    3 Probability for one-third
    4 Probability for one-sixth

Ordering strategy: Monthly order, check inventory level on the beginning of every month, as if inventory level>L, no orders, or<L, orders, the quantity of goods orders Z:

Z= S-L （I < L）

Z= 0 (I >= L)

Ordering: from order to storage time for a month

(1) Ordering cost (C_1)

If the ordering cost of per piece for m=3, ordering ad-

ditional fees for K=32, every months Ordering cost:

$$C_1 = K + m*Z = 32 + 3Z$$

(2) Storage charges (C_2)

The storage charges of every months of per piece expressed by h=1, obviously, when inventory level I(t)>0 needed to figure out Storage charges.

$$C_2 = \int_0^n hI(t)dt / n = \int_0^n I(t)dt / n$$

N: the months of simulation

C_2 : storage costs of average months

Average monthly storage costs

(3) Shortage cost (C_3)

The Shortage cost of per piece expressed by p=5, I(t)<0, Shortage costs of average months

$$C_3 = \int_0^n p|I(t)|dt / n = \int_0^n 5|I(t)|dt / n$$

3.2 The Establish of Simulation Model

The Lanner Company of British issued a powerful simulation software system. It can be used in the simulation of discrete event systems, also can be used for continuous fluid (such as hydraulic pressure, chemical and hydraulic system). According to the simulation software system, the simulation model interface of inventory management as follows:
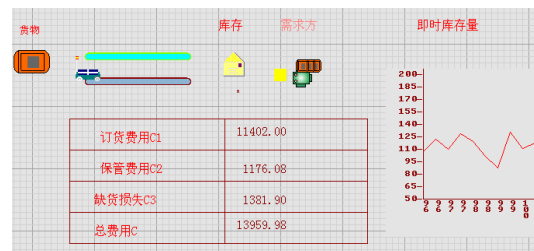
The operation data of nine kind schemes as follows：

Schemes(l s）	Total Cost	Ordering Cost	Storage Charges	Shortage Cost
20 40	13959.98	11402.00	1176.08	1381.90
20 60	14847.06	11462.00	2029.76	1355.30
20 80	15814.24	11522.00	3249.59	1042.65
20 100	16560.23	11582.00	4030.08	948.15
40 60	14952.32	11462.00	2981.47	508.85
40 80	15900.90	11522.00	3845.40	533.50
40 100	17249.80	11582.00	5128.85	538.95
60 80	16981.70	11522.00	4959.70	500.00
60 100	17900.70	11582.00	5818.70	500.00

According to the results of various schemes, The result showed that L=20, S=40 was the best schemes. In summary, based on simulation study and computer technology can realize the requirements of modern inventory management. Working well to simulation study will create larger profits space for the business enterprise, and enhanced the competitive of enterprise in the market.

4. Acknowledgment

This paper discusses the application of simulation system, using digital simulation software tools and simulation principle, can make beforehand assessment for existing or build system on the basis of simulation. To select the best construction scheme based on the results of data, can reduce cost, the conservation of resources and avoid failure, which realized the maximization of the limited resources utilization. With the improvement of science and technology, simulation results will be getting closer to the target system of real world and more accurately predict assessment.

References

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