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Research on management changing of chemical and pharmaceutical enterprise

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ABSTRACT

There are more environment pollution because of chemical and pharmaceutical enterprise development. Management Changing model has become a key question for chemical and pharmaceutical enterprise by means of information technology. In this paper, a investment model of information technology is constructed by use of regarding investment as parameter based on system dynamics, analyzes the cause of giving birth to information paradox，and points out that when enterprises invest information technology，maybe achieve anticipated income by means of changing management.

Keywords: Information Technology, Information Paradox, Investment, Changing Management model.

INTRODUCTION

The so-called information paradox refers to put a lot of money and time into the application of information technology, expect improving competitive advantage by the application of information technology, but do not achieve anticipated income by investment in information technology, or even worse the relationship with customers, employees and suppliers. Sales profit is not growing, customer complaints, employees negative emotions and conflicts are increasing, organization and management are still intact, and the enterprise put capital and money into information technology continuously increasing.

The introduction of MRPⅡ/ERP system, only 10% to 20% can implement it successfully on time and budget, and achieved good economic results; 30% to 40%enterprise do not carry out the system integration perhaps just carried out the part of the integration; about 50% implement item failed. Even widely used in the U.S., about 30% enterprises make good economic efficiency by ERP project [1]. According to U.S. statistics, in the 1980s U.S. enterprises invest in information technology nearly ＄1 trillion. Huge investment, but the white-collar worker productivity during the 1980s did not fundamentally change. In the 10 years from 1975 to 1985, the number of blue-collar workers decreased by 6%, real output growth of 15%, labor productivity increase by 21% in surface. However, during the same period, the number of white-collar workers rose 21 percent, with 15% compared to the real output growth, productivity fell by 6%. That is to say investments in information technology did not achieve the expected benefits. Economists call this phenomenon "productivity paradox", and many enterprises think that their information technology investments fall into the "black hole."

SYSTEM DYNAMICS MODEL OF INFORMATION TECHNOLOGY INVESTMENT

Hit shows the productivity-Production theory to evaluate benefits of information technology, use production function analysis tools to analyze the benefits of information technology investment [2]. The basic production function is Cobb-Douglas production function:

$$Q(t) = AL^{\alpha}K^{\beta}$$

In order to facilitate analysis, the Cobb-Douglas production function is divided into the following two production function, formula (1) that has nothing to do with the information technology output, but investment in information technology to promote the role of output, taking the enterprise workforce (non-information technology) L_0, investment (non- information technology) K_0 and information technology investment on enterprise output-promoting factor A (K_1), formula (2) that the output of information technology, consider the labor (and information technology-related) L_1, information K_1 and information technology investments, technological progress factor B [3].

$$Q_0(t) = A(K_1(t))L_0^{\alpha_0}(t)K_0^{\beta_0}(t) \tag{1}$$

$$Q_1(t) = BL_1^{\alpha_1}(t)K_1^{\beta_1}(t) \tag{2}$$

Assumptions:
1. To illustrate affect of the information technology investment on enterprise outputs, assuming other technology investments remain unchanged;
2. Assuming that $K_0 + K_1 = 1$, $L_0 + L_1 = 1$. The output has a certain effect on business investment of information technology, you can use information technology investment growth rate express:

$$\frac{\Delta K_1(t)}{K_1(t)} = \varphi(\frac{\partial Q_0(t)}{\partial K_1}) \tag{3}$$

Formula (3) illustrate that information technology investment growth rate is that information technology investment is the marginal contribution of the enterprise output function. Take θ as the extent of information technology, θ depends on the trust level of the investment performance of information technology by decision-makers it can be assumed $\varphi(.)$ that is multiplied by a constant θ, then:

$$\frac{\Delta K_1(t)}{K_1(t)} = \theta \cdot \frac{\partial Q_0(t)}{\partial K_1} \tag{4}$$

From an economic point of view, the contribution of investment in information technology have a limited level, to the generally assumed that technological growth in line with the S-curve model of development [4], that is, A (K_1) meets the following conditions (η for the S-curve inflection point):

1. $\frac{dA}{dK_1} > 0$, $K_1 \to 0$, than $\frac{dA}{dK_1} \to 0$;

2. $\frac{d^2A}{dK_1}\begin{cases} > 0, 0 < K_1 < \eta \\ = 0, K_1 = \eta \\ < 0, K_1 > \eta \end{cases}$

Arctangent curve to meet the above conditions, assume that the arc tangent function of the form of A (K_1) as formula (5):

$$A(K_1) = \frac{2}{\pi} \cdot \omega \cdot \arctan \lambda (K_1 - K) \tag{5}$$

Where: t = 0, there are $K = K_1(0)$, that K is the initial value of $K_1(t)$, which is the basic needs of information technology investment of the enterprise to maintain the normal operation. (K_1-K) indicate that information technology investment can not be less than the minimum afterwards. ω represents the influence of technological progress on output growth of enterprises. λ indicates the growth rate of technological progress.

Substituting $K_0+K_1=1$ into formula (1), than we can receive the dynamic equation of information technology investment K_1:

$$Q_0(t) = A(K_1(t))L_0^{\alpha_0} K_0^{\beta_0} = A(K_1(t))L_0^{\alpha_0}(1-K_1(t))^{\beta_0} \quad (6)$$

By the formula (6), we can receive the derivative of $K_{1:}$

$$\frac{\partial Q_0}{\partial K_1} = [\frac{d}{K_1} A(K_1(t))]L_0^{\alpha_0}(t)(1-K_1(t))^{\beta_0} - \beta_0 \cdot A(K_1(t))L_0^{\alpha_0}(t)(1-K_1(t))^{\beta_0 - 1} \quad (7)$$

By the formula (5), we can receive the derivative of $K_{1:}$

$$\frac{dA}{dK_1} = \frac{2}{\pi} \cdot \omega \cdot \frac{\lambda}{1+\lambda^2(K_1 - K)^2} \quad (8)$$

Substituting formula (3) (8) into formula (7), than formula (4), then we can receive:

$$\begin{cases} \dfrac{\Delta K_t(t)}{K_1(t)} = \theta \cdot L_0^{\alpha_0}(t) \cdot \dfrac{2}{\pi} \cdot \omega \cdot \{\dfrac{\lambda \cdot (1-K_1(t))^{\beta_0}}{1+\lambda^2(K_1-K)^2} - \beta_0 \cdot (\arctan\lambda(K_1(t)-K))(1-K_1(t))^{\beta_0-1}\} \\ K_1(0) = K \end{cases} \quad (9)$$

Formula (9) is the system dynamic model of information technology investment in continuous-time variable. Facilitate iterative calculation, let formula (9) discrete receive the dynamic model of the discrete time variable, namely formula (10):

$$\begin{cases} K_1(t+1) = K_1(t)\{1+\theta \cdot L_0^{\alpha_0}(t) \cdot \dfrac{2}{\pi} \cdot \omega \cdot \{\dfrac{\lambda \cdot (1-K_1(t))^{\beta_0}}{1+\lambda^2(K_1-K)^2} - \beta_0 \cdot (\arctan\lambda(K_1(t)-K))(1-K_1(t))^{\beta_0-1}\}\} \\ K_1(0) = K \end{cases} \quad (10)$$

Formula (9) and (10) describes the relationships between different state variable, every solution of equation indicates dynamic process of state changes with time. Since in practical applications the solution is unlikely to be resolved, only the system dynamic model of information technology investment can be iterate by seeing of computer, in order to illustrate the behavior of information technology investment trends with changes of parameters.

Computer iteration results suggest that when the parameters (assuming other parameters remain unchanged) and the parameters and changes (assuming other parameters remain unchanged), there will be random behavior in the long-term process of the investment in information technology, and gradually into chaos region, policy makers lost control of information technology investment in order to ensure productivity, additional investment in information technology have to continue. Also, because the generation of random behavior has sensitive dependence on initial conditions, a little change of value in initial conditions, the results with the passage of time t, resulting a more and more around between the two sides, causing a huge difference in future long-term behavior, or that is "butterfly effect" [5].

CHANGING MANAGEMENT MODEL OF CHEMICAL AND PHARMACEUTICAL ENTERPRISE ENTROPY

Entropy originated in thermodynamics, second law of thermodynamics describes widespread irreversible phenomenon in the nature, but lack of a measure such as the energy scale. German physicist Clausius proposed the concept of thermodynamic entropy in 1865. He pointed out that the thermodynamic entropy is similar to energy, but unlike energy; he thought that the entropy is like heat, embodied discrete tendencies within the system. The relationship between the system entropy changes ds and the system temperature T and heat changes dQ are as [6]:

$$ds = dQ/T \quad (11)$$

In order to reveal the nature of entropy, the physicist Boltzmann proposed the concept of statistical interpretation of entropy in1872: As the difference between the entropy and Boltzmann's H function integral equation is only one symbol, you can use it to quantitatively describe the second law of thermodynamics, and there is a certain relationship between the entropy and logarithm of System number of microscopic states. This relationship is expressed by the United States, Gibbs:

$$S = Kb \log W \quad (12)$$

Where, K_b: Boltzmann constant; W: System number of microscopic states.

Obviously, the more the number of possible microscopic states the more average of state distribution of microscopic particles within system, or that they have different of motion states, that is performing that the interior of system is very confusing. Can be seen, the size of entropy can be as the confusing degree of scale.

Shannon and Wiener proposed the concept of information entropy is the entropy concept in 1948. Views by Wiener: entropy is the negative logarithm of the message, which represents the things exchanged between the system and the outside world. Understanding by Shannon Shannon: the entropy is the same as the Boltzmann H function, which represents the degree of uncertainty of the message. Therefore, the system of the degree of uncertainty is reduced means that his degree of certainty is increasing, mean the increase in degree of organization. Mathematical expression for the information Entropy [6]:

$$S = -K \sum_{i=1}^{n} P_i \log p_i \quad (13)$$

In the formula: $\sum_{i=1}^{n}$ represents the sum of all possibilities;

P_i: the probability of state i, when P = 1, S = 0, the system is only one state; when $P_1 = P_2 = ... = P_n = 1 / n$, the value of system entropy is very great.

Prigogine linked the entropy to the evolution of system, regard the entropy as the core of the evolution of system, the entropy is said that the entropy chaotic degree of physical quantities, the increase in entropy is not only confusing, but under certain conditions, it will promote the evolution of the system, let the order and complexity the system of increase.

ENTROPY AND CHANGING MANAGEMENT MODEL OF CHEMICAL AND PHARMACEUTICAL ENTERPRISE

For businesses, a far from equilibrium open system, through continuous exchange matter, energy and information with the outside world, pull in negative entropy from the surrounding environment to offset the increase in entropy. As there are non-linear interactions within the various subsystems, by fluctuations, so that all subsystems may produce co-operative movement, to form some kind of time, space and function are stable and orderly dissipative structures [7].

From the mathematical expression of the second law of thermodynamics starting, to the open system which is exchanged with the energy and material, we can see:

$$dS = d_e S + d_i S \qquad d_i S \geq 0 \quad (14)$$

Entropy change dS consists of two parts, one $d_e S$ is the increase in entropy within the system itself of irreversible process, and the second $d_i S$ is the entropy flow the system of matter and energy exchange with the outside world entropy. If the $d_e S$ is negative, in a certain outside world parameters control, when $|d_e S| > d_i S$, dS is negative, that is negative entropy introduced from outside ($d_e S$) offset the increase in entropy of interior, the system's entropy is reduced, while the degree of order will continue to improve, stabilizing at a relatively lower value of the entropy balance new ordered state, namely the formation of dissipative structures.

Refer to this theory, enterprise investment in information technology, can be considered a continuous formation of new dissipative structures in the process. To introduce the concept of entropy to such a man-made systems in the enterprise, increase in entropy means that the growth of system complexity. Enterprise uses information technology, constantly introduce information, knowledge from outside the enterprise into the enterprise, only the confusion things caused by the application of information technology in the enterprise and itself operation exit the enterprise, it can reduce the entropy within the enterprises system. so enterprises in the application of information technology, must have changing management, through the adjustments in the management philosophy, strategy, organization, leadership model and enterprise culture , to promote the healthy development of the organization, enhance vitality, to achieve the desired economic benefits.

CONCLUSION

Long-term evolution process of investment in information technology, due to changes in parameters, they lead to the appearance of random behavior, and into the chaotic region. In order to ensure the realization of productivity, decision-makers have lost control of information technology investment, have to continue to increase investment in information technology. Thus resulting in some confusion in the enterprise, the company has only changing information can let the confusion things caused by the application of information technology in the enterprise exit the enterprise, can achieve business performance leap.

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