Research on Flexibility of Financial Management of High-tech Enterprises

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Abstract

High-tech enterprises are characterized by high risk, traditional financial management cannot fully adapt to the development of high-tech enterprises. This paper concerned with high-tech enterprises flexible financial management, reducing the impact of financial environment uncertainty and financial needs uncertainty, lowering financial risk. This paper analyzes the characteristics of the high-tech enterprise financial management and the environmental basis of implementing flexible financial management and the operability and introduces the method of the metric of the level of financial management flexibility. Through the above analysis, the implementation of flexible financial management in high-tech enterprises is considered feasible.

Key Words: High-tech enterprises, Financial management, Flexible management

1 Introduction

The research on flexibility and flexible management abroad had started from 1930s. Steers,R.M. (1975) first introduce the concept of flexibility to the management area. Slack,N(1983) considered flexibility as the ability to change with change, at the same time, he believed that flexibility can be represented by scope, time and cost. Wang Huacheng(1992) put forward that in financial management must comply with the principle of elasticity and this principle is conducive to enhance the flexibility of financial management. Deng Mingran(2000) defined financial system flexibility as the ability to deal with the environmental change or the uncertainty caused by the change from time to time . This ability consists of the buffering capacity, adaptability and innovation ability.

They regarded flexibility as adaptive responses to the environment uncertainty, the ability to handle the change and uncertainty. The flexibility often exists along with the uncertainty. In short, the flexibility is the resilience of environmental change. Flexible financial management is the ability that the financial system adapts to the financial environmental change quickly and effectively and to deal with the uncertainty caused by the environment. Specially speaking, it is the ability to make financial decisions according to the variation of inner and outer environment quickly and correctly and to handle the uncertainty in the financial management continued and systematically through achieving the financial decisions timely and cost-effectively. When compared with the traditional financial management, the flexible financial management emphasizes flexibility and takes non-programmed methods in the financial management methods, focuses on diversification strategy and market-leading strategy to attract and retain customers in the dominant strategy and prefers a flat structure to a vertical structure to make the corporate organizational structure flexible and the enterprise easy to be managed in the organizational structure when compared with the traditional financial management.

2. The Features of High-tech Enterprises Financial Management

2.1 The Gradual Increase in the Proportion of Intangible Assets

In the knowledge-based economy, the tangible assets such as equipment, plant and inventory is no longer occupy a major position in high-tech enterprises. Instead, the intangible assets such as patents, trademarks and goodwill play an important role in the existence and development of the enterprises. Therefore the intangible assets will become the main investment object in the era of knowledge economy.

With the increase in the R&D expense of intangible assets, the corporation should adjust its own investment decisions according to its own investment situation. The corporation should enhance the ability of the collection, tracking and feedback of the information of intangible assets. The high-tech enterprises should establish their own competitive advantage through the independent research and development of the intangible assets and technological innovation.

2.2 The Cash Flow Management Becomes an Important Element in Corporate Financial Management

The cash flow volatility of the high-tech is high. The flexibility of the cash investment timing and the number of the cash investment are high due to the R&D activities is frequent. It must readjust the cash budget for the reason that the company has to cope with the emergency situations and seize new opportunities. The characteristics of high-risk may lead to the failure of the new product, this means that there's no guarantee when to recover the cash and how much cash can be recovered. The company faces the risk that the cash flow will be cut off at any time. And due to the low proportion of tangible assets available for secured in the high-tech enterprise, which determines the external financing becomes more difficult, the company has to use the internal financing, this means the company must retain sufficient cash flow.

2.3 High-tech Enterprises Should Strengthen the Risk Management

The main risks faced by the high-tech enterprises are in three respects. The first respect is the uncertainty of the technology development. The cornerstone of the survival and development of the high-tech enterprises is the technological innovation and development. The investment, the facilities and the period in the technological innovation and development are unprecedented. And it is hard to predict the program's success or failure and the economic benefits. Once the market does not accept this new product, the business will be severely affected. The third respect is the timeliness of the scientific and technical knowledge. The high-yield of the high-tech enterprises is often fueled by the monopoly and exclusivity contained in the corporate goods.

2.4 Human Capital Participates in the After-tax Profit Distribution

The high-tech enterprises must consider the question that how to motivate the scientific and technical staff for the reason that these staff grasp the core technology of the corporation. In order to retain the talents, the enterprises give the employees more benefits and a lot of the high-tech enterprises even distribute the residual profit among the employees.

3. The Environment Basis and the Operability in the Implementation of the Flexible Management in the High-tech Enterprises

3.1 The Environment Basis in the Implementation of the Flexible Management

There must be a certain environment basis in the implementation of the flexible financial management in the high-tech enterprises. In the legal environment, the income tax rate for the high-tech enterprises is the preferential tax rate of 15%. This is more inclined to the high-tech enterprises and more conducive to the implementation of the flexible financial management. In the financial market environment, the commercial banks are often reluctant to provide loans to the high-tech enterprises in the seed stage due to lacking of tangible assets can be secured. The enterprises can absorb the risk capital as it gradually transit to the start-up period and the public financing is also an important way to raise funds. The financial market provides a variety of fund-raising ways for the development of the high-tech enterprises. The corporation should select the appropriate financing methods on the basis of the finance of itself. The implementation of the flexible financial management can raise the flexibility of the financing. In the technological environment, the high-tech enterprises develop rapidly with the advancement of technology in China.

3.2 The Operability of the Implementation of the Flexible Management

Financial management includes the budget management, financing management, investment management, working capital management and income distribution management in general.In terms of budget management, the financial budget should be in line with market trend and be guidable development of the enterprise, and it can be able to make adjustments to make the budget more flexible according to the changing market environment. It can adjust in accordance with the specification process based on the change in the market environment in the budget implementation process. In the budget evaluation, it should take the risks and changes into account to evaluate the budget. In short, it can implement the flexible management in the various steps of the financial budget.

In the financing management, the high-tech enterprises are in large demand of fund-raising and need the support of various social sectors. Therefore, the corporation should select the appropriate mode of financing according to the corporation's stage to improve the flexibility of the funding management.

In the investment management, the high-tech enterprises conduct the flexible management of the investment structure mainly based on the stage of the enterprises. In terms of the R&D investment it can select the investment program by analyzing the investment opportunity and the investment value to ensure the R&D investment is in line with the market trend and the actual situation of the enterprises in terms of the R&D investment.

In the working capital management, the high-tech enterprise should select the working capital management program based on its life cycle characteristics. In the seed stage, the corporation is not involved in the management of inventory or accounts receivable. In the start-up stage, the corporation retains part of liquidity and a small part of inventory need to manage. The cash management and the receivables management are mainly related to the growth stage.

In the income distribution management, the high-tech enterprises should select appropriate dividend distribution policy according the corporation's financial situation. The corporation can retain the key technical personnel by allowing the employees to participate in the distribution due to the high-tech enterprises are talent-intensive enterprises. It can achieve the effect of incentives by allowing the employees to hold company stock to improve the employees' subject consciousness or let the employees participate in the income distribution by the virtual stock.

4. The Measurement of Financial Management Flexibility

The rapid development of science and technology is one of the reasons for the interference sources to high-tech enterprises. It will not produce financial interference when the source occurs, but it occurs with finance for the media of information. There is a process of evolution to interfere in corporate finance from the occurrence of interference sources. The interference intensity curves in Figure 1:

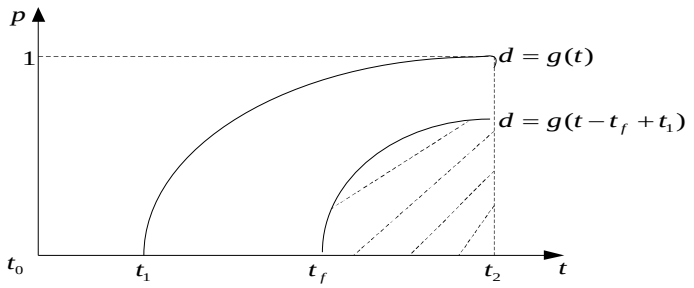

Figure1: The Interference Intensity curve

The strength is weak when the interference just occurs, the intensity increases faster as the interference increases. The intensity begins slowly when the curve is near the maximum interference intensity time t_0 and declines after t_2, the interference intensity curve is convex in this period.

Let: e is the source of interference, t_0 is the time of the occurrence of the interference source, t_1 is the time of the interference, t_2 is the maximum time of the interference intensity, f(t) is a function of the probability of occurrence of interference, d=g(t) is the interference intensity, e=e(t) is the financial decision, an estimate to g(t), the $q(t_s)$ is the probability of the implementation of the decisions, t_d is the time from t_0 to making decisions, t_s is the time of achieving decisions,

$t_f = t_d + t_s$ is the decision reaction time, v is the rate of the reaction, then:

$$v = \begin{cases} 1 & t_f \le t_1 \\ \dfrac{\int_f^{t_2} g(t - t_f + t_1)\,dt}{\int_{t_1}^{t_2} g(t)\,dt} & t_1 < t_f \le t_2 \\ 0 & t_f > t_2 \end{cases} \quad (1)$$

In Figure 1, v= the avoided interference/ the total interference prior to t_2 when $t_1<t_f<t_2$. $\int_{t_1}^{t_2} g(t)dt$ is the total interference prior to t_2, $\int_{t_1}^{t_2} g(t-t_f+t_1)dt$ is the avoided interference due to achieving decisions. The probability of correct decisions is p.

p= the avoided loss/ the total loss= $\int_{t_1}^{t_2} e(t)\,dt \Big/ \int_{t_1}^{t_2} g(t)\,dt$. (2)

The decision-making uncertainty is $u = -\log_2 f(t_0 + t_d)$. (3)

The degree of the uncertainty of making decisions, the probability of making correct decisions, the probability of achieving decisions and the rate of the reaction reflect the financial ability to deal with the uncertainty.

u(the flexibility)= $L = up\,q(t_s)v$ $(0\le p\le 1, 0\le q(t_s)\le 1, 0\le v\le 1)$.(4)

As $0\le p\le 1, 0\le q(t_s)\le 1, 0\le v\le 1$, and $0\le u\le +\infty$, in order to indicate the equal importance of these four, limiting u in [0,1].Selecting a critical value of the occurrence probability according to the actual situation, the event that the probability is lower to the value that can be ignored, the corresponding uncertainty is u_0, with u/u_0 substituting u ,and $0\le u/u_0\le u_0\le 1$.

5. The Measurement of Net Benefit of Financial Management Flexibility and the Monitoring of Flexibility Level

5.1 The Economic Principles of Financial Management Flexibility

The flexible benefits of high-tech enterprise financial management are the net benefit and the avoided loss with the appropriate flexibility of the adaption of the change of internal and external change. The net benefit of financial management flexibility is the difference between the flexibility benefit and the corresponding flexibility cost, which is not an independent economic benefit. The flexibility offers the possibility to obtain huge profit and development opportunities.

The financial flexibility of high-tech enterprise should be in a certain range. It is a kind of waste if the flexibility is too high due to a certain level of flexibility needs to pay. It will result in the unnecessary loss of opportunity if the lower flexibility is insufficient to deal with the financial uncertainty. According to the principle of the flexible economy, the flexibility has the principle of the diminishing marginal amount of savings and incremental marginal cost. Let the level of flexibility is L, the saving brought by the flexibility is Y_a, there exists $Y_a = f_a(L)$. When L increases, the amount of saving increases, that is to say the marginal saving of the flexibility is non-negative ($\frac{dY_a}{dL} = \frac{df_a(L)}{dL} \ge 0$). But the marginal amount of saving is diminishing with the improvement of the level of the flexibility, namely: $\frac{dY_a^{\,2}}{dL^2} = \frac{df_a^{\,2}(L)}{dL^2} \le 0$. It should enhance the flexibility when the financing flexibility, investment flexibility and allocation flexibility reach a certain level. The marginal cost is ascending and the marginal cost function is a monotonically concave curve. Let flexibility expense is $Y_b = f_b(L)$, when L increases, the marginal cost of the flexibility is ascending($\frac{dY_b}{dL} = \frac{df_b(L)}{dL} \ge 0$, $\frac{dY_b^{\,2}}{dL^2} = \frac{df_b^{\,2}(L)}{dL^2} \ge 0$). Clearly, there exists economic zone in the financial management flexibility.

5.2 The measurement of the net benefit of the financial management flexibility

Let the total cost curve of the flexibility is $Y_b = f_b(L) = b_0 + b_1 L + b_2 L^2$, the flexible saving is $Y_a = f_a(L) = a_0 + a_1 L + a_2 L^2$. b_0, b_1, b_2 and a_0, a_1, a_2 are undetermined coefficients in the formula. These coefficients are determined by the following formula

$$\begin{cases} nb_0 + \sum L_i b_1 + \sum L_i^2 b_2 = \sum Y_{bi} \\ \sum L_i b_0 + \sum L_i^2 b_1 + \sum L_i^3 b_2 = \sum L_i Y_{bi} \\ \sum L_i^2 b_0 + \sum L_i^3 b_1 + \sum L_i^4 b_2 = \sum L_i^2 Y_{bi} \end{cases} \quad (5)$$

$$\begin{cases} na_0 + \sum L_i a_1 + \sum L_i^2 a_2 = \sum Y_{ai} \\ \sum L_i a_0 + \sum L_i^2 a_1 + \sum L_i^3 a_2 = \sum L_i Y_{ai} \\ \sum L_i^2 a_0 + \sum L_i^3 a_1 + \sum L_i^4 a_2 = \sum L_i^2 Y_{ai} \end{cases} \quad (6)$$

Let the net benefit of the flexibility is Y_c . $Y_c = Y_a - Y_b = f_a(L) - f_b(L) = (a_0 - b_0) + (a_1 - b_1)L + (a_2 - b_2)L$ (7)

When the difference between the flexibility saving and the flexibility cost is zero, there are two intersections between the curve Y_a and the curve Y_b, the intersections are the turnaround point and incur losses point. Let $a_0 - b_0 = C$, $a_1 - b_1 = B$, $a_2 - b_2 = A$, the corresponding flexibility of the point d and e are L_1, L_3.

$$\begin{cases} L_1 = \dfrac{-B - \sqrt{B^2 - 4AC}}{2A} \\ L_3 = \dfrac{-B + \sqrt{B^2 - 4AC}}{2A} \end{cases} \quad (8)$$

$L_1 \sim L_3$ is the economic region of the flexibility-level changes, there exists optimal level (L^*) in $L_1 \sim L_3$.The necessary condition to achieve the optimal level is $\frac{df_a(L^*)}{dL^*} - \frac{df_b(L^*)}{dL^*} = 0$. The economic implication is that the level of the flexibility achieves the best when the marginal cost is equal to the marginal saving. Its second-order condition is $\frac{dY_c{}^2(L)}{dL^{*2}} = \frac{df_a{}^2(L^*)}{dL^{*2}} - \frac{df_b{}^2(L^*)}{dL^{*2}} \le 0$

Since $\frac{df_a^2(L^*)}{dL^{*2}} \le 0$ and $\frac{df_b^2(L^*)}{dL^{*2}} \ge 0$, as long as there is a point that meets the first order of condition, the point will meet the second-order condition. The optimal point of the financial management flexibility is

$$L^* = L_2 = \frac{b_1 - a_1}{2(a_2 - b_2)} \quad (9)$$

The greatest net benefit for the flexibility at this point is

$$Y_{cL^*} = Y_{CL_2} = Max\Delta L = (a_0 - b_0) + (a_1 - b_1)L^* + (a_2 - b_2)L^{*2} \quad (10)$$

The analysis of economic area of the financial management flexibility is shown in Figure2.

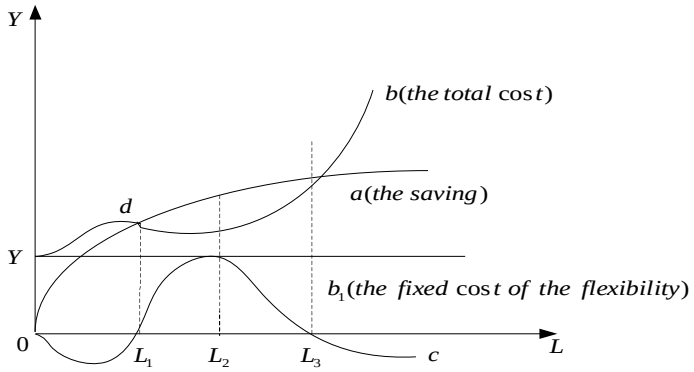

Figure 2: The Analysis Chart of Economic Region of Financial Management Flexibility

In Figure2, the curve c is the composite between curve a and curve b. $Y_c = Y_a - Y_b = f_a(L) - f_b(L)$ represents the net benefit of the flexibility. In the range between 0 and L_1, Y_c is negative, this is not the economic zone of the flexibility. In the range between L_1 and L_3, Y_c is positive, this is economic especially in $L_2 = L^*$, $Y_{cL_2} = Y_{aL_2} Y_{bL_2} = Max\Delta L$, at this is the optimal level for the financial management setting. And L_2 represents the most economical value of the flexibility. When the value exceeds L_3, it represents the setting is excessive and will cause unnecessary waste, it is uneconomical.

5.3 The monitoring of the level of the financial management flexibility

The implementation of the financial management flexibility can deal with the changes of the market calmly. The financial management will become chaotic and uneconomical if the flexibility is excessive. It is helpful to monitor the level of the flexibility, to keep it within reasonable limit. The high-enterprises can do the monitoring to the flexibility of financial management by the pre-control chart. The enterprises make judgments of the level of the flexibility by observing the change trend. According to the economic zone analysis chart of the flexibility, the flexible financial management is uneconomic in the range between L_0 and L_1, in the range between L_1 and L_3 is economic and it will be uneconomical when it exceeds L_3. Therefore, defining the economic zone between L_1 and L_3 as the Green Zone and the two uneconomic zone as the Yellow Zone in the pre-control chart.

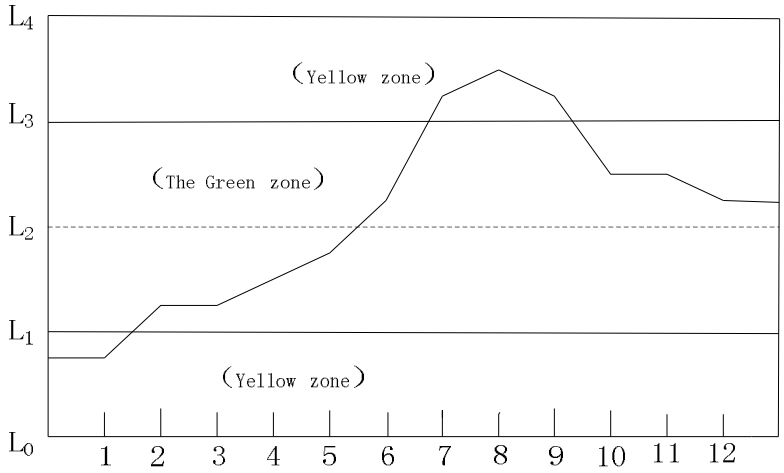

Figure3: The Pre-control Chart of Financial Management Flexibility

6 The application example

According to the market research results, a high-tech enterprise intends to invest in the development of a new product in January 2009 and the interference source appears. The completion of the development of the product line takes about a year and a half; the enterprise informed there is another company has invested in the development of the product. The product appears in December 2009 and puts into production in the market in December 2012 and this means the interference. The product forms industrial in December 2011 and the scale is larger, the interference is greater. The new product expands the scale and replaces the traditional product, the interference is the maximum. The recent financial management flexibility, the flexibility cost and the flexibility saving are shown in Table 1.

Table1: Flexibility, The Total Cost of Flexibility and The Saving of Flexibility

Flexibility(L_i)	The total cost of flexibility(Y_{bi})	The saving of flexibility(Y_{ai})
0.15	1.375	1.200
0.30	2.092	2.225
0.45	2.652	3.040
0.60	3.280	3.860
0.75	4.225	4.700
0.90	5.850	5.400

When the enterprise plans to invest the development of the product in January 2009, the issues considered are A_1-whether to invest the development of the product, A_2-whether to develop successfully, A_3-whether to have the market of the product, A_4- whether to form an industry and guarantee the fund, A_5-whether to recover the investment and bring huge profit.

According to Figure 1, it is easy to obtain the interference intensity curve: $d = -1/4(t-4)^2 + 1$, the decisions for interference is $e = -1/5(t-4)^2 + 4/5$. The purpose of this decision is to estimate the interference intensity curve of the interference source.

The correct decision probability p=0.80. If you develop these financial policies in June 2009, the probability of the interference is p(0.5)=1/16, u=4.00. Take 2^{-5} as the critical value, the uncertainty u=4.00/5=0.80. Assume t_s as the time of implementing decisions, the probability is

$$q(t_s)=\begin{cases}1 & t_s>2\\ t_s/2 & 0<t_s\le 2\end{cases}$$

If using 1.5 years, namely to implement this decision in Dec.2010, by equation (1) was v=1, the realization probability $q(t_s)=q(1.5)=1.5/2=0.75$, by equation (4) was L=0.48. If using 2.5 years, namely to implement this decision in Dec.2011, the realization probability $q(t_s)=1$, v=0.32, L=0.20. The flexibility cost curve is $Y_b=b_0+b_1L+b_2L^2$. Calculate the coefficients of equation (5) by the data listed in Table 1 and substitute the calculation data into equation (5), we can obtain

$$\begin{cases}6b_0+3.15b_1+2.0475\,b_2=19.474\\ 3.15b_0+2.0475\,b_1+1.4884\,b_2=12.429\\ 2.0475\,b_0+1.4884\,b_1+1.1517\,b_2=9.0522\end{cases}$$

The calculated undetermined coefficients are b_0=1.322, b_1=0.512, b_2=4.836 and the flexibility cost curve is $Y_b=1.322+0.512L+4.836L^2$.By the same method, we can obtain the flexibility saving curve $Y_a=0.224+6.858L-1.228L^2$. We can obtain the turnaround point L_1=0.22 and the incur losses point L_3=0.82 from equation (8). We can obtain the optimal level L^*=L_2=0.52 and the maximum net benefit $Y_{cL^*}=0.28$ of financial management flexibility from equation (9) and (10).

7. Conclusion

With the acceleration of the economic globalization process and the advancement of technology, the high-tech enterprises enter the rapid development period. It is necessary to reform the financial management of high-tech enterprises owing to the fact that traditional financial management can't fully adapt the development of high-tech enterprises. It can cope with the environmental uncertainty when the flexible management theory is applied to the financial management. By analyzing the analysis of the financial management of high-tech enterprises and combining with the characteristics of high-tech enterprises, the results show the high-tech enterprises should implement flexible financial management. This paper also analyses the feasibility of the implementation of flexible financial management from the financial budget, financing, investment, working capital management and income distribution. It can draw a conclusion that it is feasible to implement flexible financial management in high-tech enterprises.

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