

The Analysis of Corporation Life Cycle and Sustainable Management by the Manager of Human Resource

Chun-Hung Chen and Yu-Hsin Su

Abstract—This study is an issue of the industry’s opportunity and challenge as well as the talent education. This study is an original theoretical paper on industrial organization and human resources. Based on the original mathematical model, the research aims at the trade-off between corporation life cycle and sustainable management. We analyze an application of assets to life cycle and sustainable management for policymakers during the corporation life cycle, this strategy is based on the rocket model which combines industrial economics and physics. The main findings of sustainable management can subdivide into two points. First, the ratio of the core asset and manager’s retirement pension and reward to the total assets is smaller, the competitive pressure of market is lower, the efforts of manager and corporation are bigger, the profit at present is higher that can be promoted to sustainable management. Second, the corporation is experienced with higher effort in the beginning of the operation can promote to sustainable management.

Index Terms—Human resource, life cycle, sustainable management, corporate assets.

I. INTRODUCTION

This research is based on the industry opportunity and challenge of industry 4.0 and the topic of cultivating talents. It is a theoretical paper with profound original industry development and human resources. In December 2001, Enron Corp., the nation’s largest energy trading company, broke out in America’s biggest bankruptcy in the history of the United States, which has caused the uproar to the world’s largest bankruptcy in the history of the United States. The biggest scandal and the very serious business collusion case, because of its energy investment and cooperation throughout the world, so it is declared bankruptcy may lead to a wide range of impact. Most of these problems come from the wrong allocation of human capital, which is one of the important assets of the enterprise. It affects the sustainable operation of the enterprise or falls into the life cycle. This paper further explores the pressure of the enterprises in the use of assets. This paper analyzes the relationship between the “life cycle” and “sustainable management” of the enterprise, and establishes a set of theoretical models as the background and motivation of the research and the background of the research and development of the enterprise. explores the pressure of the enterprises in the use of assets. This paper analyzes the relationship between the “life cycle”

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There are many factors that affect small and medium enterprises, but many scholars believe that the survival rate of small and medium enterprises will be affected by the industry. Reference [1] points out that the life cycle between different industries is different. For example, the financial industry, insurance industry, agriculture, real estate and fitness services and other industries have a longer life cycle, on the other hand, retail, construction, mining have a shorter life cycle. Reference [2] found that the causes of the life cycle of small and medium enterprises are: industrial type, enterprise characteristics and the nature of the enterprise.

This study argues that companies must plan and build a complete set of measures to incorporate new energy to drive change, based on the characteristics of the company, the difficulties that will be encountered in the business, and the overall environmental changes. In this way, it will have the ability to survive in a competitive environment, where the enterprise’s life cycle and sustainable management are the necessary policy guidelines that we deserve to study. Because there is no literature to take the rocket theory model to explore the enterprise’s life cycle and sustainable management, in the existing social science research are mostly combined with mathematics to analyze the problem, which is the combination of natural science and social science, so when the natural science progress, the social sciences are also moving forward. But there is no literature to use physics or astronomy to study the social sciences. This paper attempts to combine the social sciences and physics, and the use of natural science to explain the phenomenon of social science. So this paper for the enterprise life cycle and sustainable management and social science are unique on the contribution.

In this paper, the rocket model is used as the theoretical basis. There are two phenomena in the operation of the rocket theory. The first phenomenon is to carry satellites around the earth. The second phenomenon shows that the rockets are parabolic and run back to the ground and hit the target. The first phenomenon is consistent with the sustainable operation of the enterprise, and the second phenomenon is consistent with the life cycle of the enterprise. Therefore, this study uses the rocket theory to explore the motivations of sustainable development and life cycle. This model is based on the concept of the rocket theory model, and establishes a set of theoretical models of asset concept and competitiveness in the enterprise life cycle and sustainable operation. References [3], [4] found that enterprises at different stages to take the corresponding strategy, they continue to inject and stimulate

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new vitality and the use of appropriate asset allocation, so that the lives of enterprises can achieve sustainable.

Assuming that firms are affected by market pressures and consumer preferences, they will have an impact on profits over time. This paper is defined and described the theoretical model in a rocket theory model. Therefore, this study intends to discuss how to choose a suitable enterprise production theory to maintain sustainable management from the perspective of decision analysis. Therefore, the purpose of this paper is as follows: First, this paper explores the role of portfolio in the business. Second, this paper explores the impact of the pressure on profits in the face of market competition pressures and consumer preference pressures.

The main contributions of this research are as follows: First, this paper attempts to combine the principles of physics and social science to produce theoretical models, and it provides new ideas and rich originality in literature. Second, the author derives the conditions for enterprises to obtain sustainable management. Second, to derive the conditions for enterprises to obtain sustainable management, when the core assets of enterprises and managers reward and pension accounted for the smaller the total assets, the lower the competitive pressure, managers and business efforts, the greater the current profits, then the more likely the enterprise to reach a sustainable business. When the enterprise experience is stronger, the greater the initial effort, the more the enterprise can meet the necessary condition for sustainable management, and the enterprise must follow the natural environment changes, and it needs to adjust the internal and external management and asset allocation, and it continues to enhance creativity to maintain the sustainable operation of enterprises and competitive advantage.

This paper is divided into four sections, in addition to this section describes the research motives and the research purposes, the follow-up structure of this article is as follows: Section II is a literature review, which reviews the life cycle and sustainable management of the literature, and it defines the rocket model used in this article. The third section is the model and analysis, this paper will establish a rocket model used to analyze the relationship between the enterprise life cycle and sustainable management, it will explore the relationship between the enterprise life cycle and sustainable management, and what kind of assets should be a combination of enterprises, in order to cope with the competitive pressures they face, and they set up their own propositions to analyze the economic implications of these propositions. The fourth section is the conclusion.

II. LITERATURE REVIEW

A. Life Cycle

This research is based on the theory of enterprise life cycle and the rocket model. The enterprise life cycle is a series of processes created by the initial creation, growth, maturity to the recession and even being eliminated. In the process of the evolution of the growth of enterprises, both from the creation to the growth, or from the maturity to the recession and even through innovation and then grow, business with the life cycle of continuous evolution, in every stage, the enterprises will face the development of the risks and obstacles, so

enterprises in the face of various difficulties and challenges in the operation, they must make good use of resources so that enterprises continue to operate.

The theory of enterprise life cycle is concerned by many academia. Reference [5] is the first paper to put forward the concept of enterprise life cycle. It found that the development process of enterprises will follow some of the same pattern, and it found that enterprises in the process of growth will experience different stages of life cycle, in general, enterprises will experience the creation, growth, maturity, recession and regeneration stage, In the enterprise development process will show a clear cycle of the phenomenon. Reference [6] explores the theory of corporate strategy and management decision-making. It observes that the enterprise can be divided into several stages in the life cycle, it then sets the concept of each stage into the life cycle model. The growth stage theory suggests that the firm's strategy and structure will vary with the stage of life. References [7]-[12] are all discussing how firms affect the company's overall operational decisions and corporate performance and value at different stages of the life cycle. References [13], [14] argue that the challenges and opportunities are different as companies enter different life cycle stages. Reference [15] argues that a multi-class integration model (MCELCCh-FDP) based on the enterprise life cycle and the Choquet integral is considered to be more accurate than the financial crisis forecast based on single classification shows the importance of the enterprise life cycle model for financial forecasting. If the enterprise is in recession and the lack of efficiency and efficiency of the crisis, the market for such enterprise is not confident, and the source of funding is problematic. So the enterprise continues to vicious cycle eventually lead to collapse.

B. Sustainable Management

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In recent years, some enterprises have been aware of the importance of developing a sustainable management strategy, but how to develop and implement that is still a challenge. Reference [16] pointed out that if we want to promote sustainable management, we need to provide a sustainable structure of enterprises, such as the following conditions: (1) Sustainable management must be part of the enterprise strategy; (2) Leaders must be committed to sustainable action and build other organizational skills; (3) It must support sustainable strategies with appropriate management, performance evaluation and reward systems; (4) It must support sustainable strategies with appropriate mission, culture and staff; (5) Managers must incorporate sustainable considerations into all strategic and operational decisions and introduce systems and incentives that support sustainable management; (6) Sustainable performance management is not only to avoid risks and comply with regulations, it must also be seen as can bring innovation opportunities and competitive advantage.

C. Rocket Theory and Symbol Definition

According to the rocket theory [17], it uses Newton's three laws, the following are the Newton's law:

1. Newton's First Law: Everybody perseveres in its state of

rest, or of uniform motion in a right line, unless it is compelled to change that state by forces impressed thereon.

2. Newton’s Second Law: The alteration of motion is ever proportional to the motive force impressed; and is made in the direction of the right line in which that force is impressed.
3. Newton’s Third Law: To every action there is always opposed an equal reaction: or the mutual actions of two bodies upon each other are always equal, and directed to contrary parts.

The Application of Newton’s First Law: When the rocket fuel is exhausted, gravity will force the rocket back to Earth. However, if the speed of the rocket reaches the threshold speed, the centrifugal force caused by the threshold speed will be equal to the centripetal force caused by the gravity, which will allow the rocket to run continuously in the orbit of the satellite without any further fuel.

The Applications of Newton’s Second Law & Newton’s Third Law: The power of the gas emitted by the rocket is the product of the mass and the acceleration of the gas discharged by the rocket according to Newton’s second law. According to Newton’s third law, and the rocket’s discharge of gas down the power is equal to the rocket to the rising thrust.

TABLE I: CORRESPONDENCE BETWEEN ROCKET MODEL AND MODEL SYMBOL OF THIS STUDY

Symbol	Physical explanation	Definition of this study
G	Constant of gravitation	Pressure index
R	Earth radius	The gap between zero profit and maximum negative profit level (assumed to be fixed)
r	Satellite orbital radius	Gross profit
g	Gravity acceleration of the Earth’s surface	When the normal profit, the competitive pressure indicators of each unit of generalized assets
m ₀	Rocket mass	Generalized assets

III. MODEL AND ANALYSIS

The basic model of the study to establish and set the initial rocket theory model is based on the model of enterprise growth, that is, the ideal stage of the enterprise life cycle. Table I is the definition of five variables, which is a comparison table between the rocket theory and this study. The model variables are defined as follows: G is the total pressure index of competition, that is, the actual pressure faced by enterprises, which includes both market pressure and consumer preference pressure; m₀ is the generalized asset; g is the competitive pressure per unit of the generalized asset when the normal profit; m₀g is the total pressure index of competition, that is, the total pressure faced by the firm under the normal profit; R is the gap between zero profit and maximum negative profit level (assumed to be fixed), and the profit is zero when the firm is initially established.

Definition 1: G is the “total competitive pressure indicator” actually faced by the firm:

$$G = \frac{m_0}{r^2} \tag{1}$$

where r in Equation (1) is the difference between the current profit level and the maximum negative profit level, where r is hereinafter referred to as “gross profit”; r – R is the actual profit level; G is the sum of the market pressure and the consumer preference pressure. The reason for this definition is that the greater the asset, the greater the pressure on the total profit to meet the return on assets (ROA) for a particular target, the overall pressure is proportional to the total assets. When a large-scale enterprise assets, the greater the expectations of consumers for the company’s higher, so the greater the pressure on the consumer’s preference. Second, when the enterprise's profit level is greater, it may be due to the current monopoly power and the capital is abundant. Therefore, the current pressure on the smaller, and the reason why the negative quadratic relations, because this study emphasizes high-profit enterprises in the face of competitive pressures with pressure.

Definition 2: m₀g is the “total competitive pressure target” facing the profit level of the firm as normal profit:

$$m_0g = \frac{m_0}{R^2} \tag{2}$$

The reason why the definition of a closed form is defined by definitions 1 and 2 is that if the open form is set, the exact equilibrium analysis cannot be obtained. For the sake of analysis, it is necessary to define a definition of a specific function, Equation (2) is the total pressure on the firm’s normal profit level. Although the normal profit is zero, we assume that the difference between this “normal profit level” and “maximum negative profit level” is R. Derived from Equation (1) and Equation (2) yields the following formula:

$$G = \frac{m_0}{r^2} = gR^2 \frac{m_0}{r^2} = m_0g \left(\frac{R}{r}\right)^2 \tag{3}$$

From another aspect to the concept, when the more efforts of managers, the more able to lead enterprises to increase the level of higher profits. So as to define the “indicator of the ability to increase the profitability” or “reduce the profitability of the indicators” or “centrifugal force”, this paper is defined as the “indicator of the ability to increase the profitability”.

Definition 3: L is “the indicator of the ability to increase the profitability”:

$$L = m_0 \times v^2/r \tag{4}$$

L is the ability to earn more profit. The opposite of centrifugal force m₀ × v²/r is the “centripetal force”, that is, the total pressure faced by the enterprise, that is, m₀gR²/r² is “centripetal force”. The above mentioned centrifugal force m₀ × v²/r, where v is the effort of the firm (the profit level increased per unit time). The reason for this definition is that the greater the effort of the enterprise, the stronger the ability to earn high profits; Second, if the current “gross profit” r is already high enough, the firm’s ability to increase the higher profit margins is lower.

When the enterprise’s “centrifugal force” and “centripetal force” is equal, that is, the enterprise’s “ability to earn higher profits” and “total pressure caused by the decline in profits” is equal, the enterprise will be in the balance, so the enterprise neither grow nor decline, enterprise can therefore achieve

sustainable development. Therefore, the equilibrium conditions are as follows:

$$m_0 \frac{v^2}{r} = m_0 g \frac{R^2}{r^2} \quad (5)$$

Equation (5) can be further sorted as follows:

$$v = R \sqrt{\frac{g}{r}} \quad (6)$$

The symbol t is defined as time, and the symbol u is the effort of managerial talent plus the effort of the enterprise. That is, the talent or the effort of that managers can promote the enterprise to the high profits, and add the talent or the effort of enterprise, both are measured in terms of profits that can be added per unit of time. The amount of “generalized asset” m_0 varies over time, that is, the generalized asset includes three assets: “the core asset of the enterprise”, “manager’s entrepreneurial talent and stage productive asset”, and “manager’s rewards and pensions”. The manager’s talent, when the manager’s efforts to contribute to the enterprise, the remaining talent will be less and less, so the generalized assets will decrease over time.

The symbol m_0 is “generalized asset”, and this “generalized asset” includes the sum of the following three items $m_0 = m_p + m_s + m_F$. Where m_p is “the core asset of the enterprise”; m_s is “manager’s rewards and pensions”; m_F is “manager’s entrepreneurial talent and stage productive asset” (manager’s talent, production equipment, patent and so on).

The amount of change in assets is reduced by “manager’s entrepreneurial talent and stage productive asset”. Since Δt approaches zero, we use the basic definition of differentiation:

$$m_0(t) - m_0(t + \Delta t) = -\frac{dm_0}{dt} \cdot \Delta t \quad (7)$$

Assumption 1: The asset multiplied by the enterprise’s efforts to maintain the constant value, that is, the so-called “conservative hypothesis”, that is, the product of asset and enterprise’s efforts remain unchanged. If the larger the assets of the enterprise, it is relatively difficult to promote the overall business operation, which will lead to a smaller level of effort. If the enterprise assets are smaller, it will be easier to promote the overall business operation.

$$m_0(t)v(t) = m_0(t + \Delta t)v(t + \Delta t) + [-\left(\frac{dm_0}{dt} \Delta t\right)](v(t) - u) \quad (8)$$

The reason that Equation (8) can be used as a conservation hypothesis because the right hand side of Equation (7) $-(dm_0/dt) \Delta t$ is the loss of managerial talent, So the left hand side of Equation (8) represents the original assets multiplied by the enterprise’s efforts, which equals the assets at the later time $(t + \Delta t)$ multiplied by the enterprise’s current level of efforts, plus the loss of managerial talent multiplied by the enterprise’s efforts, then the level of the enterprise’s effort is $(u - v(t))$. The reason why $(v(t) - u)$ is used in Equation (8) is that the level of effort of the manager is contrary to the enterprise’s level of effort. Only managers can make efforts to sacrifice talent in order to promote enterprises to upgrade. where u is the level of effort of manager with the level of

enterprise effort, $u - v$ is the level of effort of manager. The direction of the manager’s effort is just the opposite of the enterprise’s effort, that is, only the manager to consume his own talent (downward direction), enough to produce the level of enterprise effort to increase profits (upward direction). We arrange Equation (8) as follows:

$$-\frac{dm_0}{dt} \cdot u \Delta t = m_0(t + \Delta t)v(t + \Delta t) - m_0(t)v(t) - \frac{dm_0}{dt} v(t) \Delta t \quad (9)$$

On both sides of the equation is divided by Δt , and $\Delta t \rightarrow 0$, the following equation can be collated:

$$-\frac{dm_0}{dt} \cdot u = \frac{[m_0(t + \Delta t) - m_0(t)]v(t + \Delta t) + m_0(t)[v(t + \Delta t) - v(t)]}{\Delta t} - \frac{dm_0}{dt} v(t) = \frac{dm_0}{dt} v(t + \Delta t) + m_0(t) \frac{dv}{dt} - \frac{dm_0}{dt} v(t) = m_0(t) \frac{dv}{dt} \quad (10)$$

Equation (10) can be obtained by the manager for the enterprise to increase profits as follows:

$$m_0 \frac{dv}{dt} = -\frac{dm_0}{dt} u \quad (11)$$

By dividing the left and right sides of Equation (11) by m_0 , the following equation can be obtained:

$$\frac{dv}{dt} = -u \frac{d(\ln m_0)}{dt} \quad (12)$$

Equation (13) is obtained by integrating the two sides of the Equation (12). If the period t is the time that manager’s talent exhausted, then $m_0(t) = m_p + m_s$, we get the second equation relationship of Equation (13):

$$v(t) = v_0 + u \ln \left(\frac{m_0}{m_0(t)} \right) = v_0 + u \ln \left(\frac{m_0}{m_p + m_s} \right) \quad (13)$$

Since v_0 in Equation (13) is the effort level of time 0, the time has not yet begun. If the enterprise is a new business, the initial effort is zero, so we can define $v_0 = 0$. Thus Equation (13) can be obtained $v(t)$:

$$v = u \ln \frac{m_0}{m_p + m_s} \quad (14)$$

If is the ratio of manager’s reward and pension m_s to $m_s + m_F$, if λ is defined as $\lambda = m_s / (m_s + m_F)$, and $m_0 = m_p + m_s + m_F$. That is:

$$m_s = \lambda(m_F + m_s) = \lambda(m_0 - m_p) \quad (15)$$

Therefore, we bring the above Equation (15) into Equation (13), we can get the following equation:

$$v = v_0 + u \ln \frac{m_0}{\lambda m_0 + (1-\lambda)m_p} \quad (16)$$

Therefore, we can obtain the following equation by the above Equation (16) and $v_0 = 0$:

$$v = u \ln \frac{m_0}{\lambda m_0 + (1-\lambda)m_p} \quad (17)$$

[Proposition 1] The necessary condition for the enterprise to be sustainable is $v_0 + u \ln[m_0 / (m_p + m_s)] \geq R\sqrt{g/r}$:

1. When the enterprise is a new enterprise, the ratio of the core asset and manager's bonus and pension to the total assets is smaller, manager's and enterprise's efforts are more, competitive pressure is higher, the current profit level is higher, then the more likely this enterprise to reach a sustainable management. On the contrary, when the above conditions are reversed, the enterprise is more likely to fall into the process of life cycle.
2. When the enterprise is an experienced company, the enterprise's experiences are more, the initial efforts v_0 are greater, then the greater the likelihood that it will meet the necessary conditions for sustainable management. On the contrary, when the enterprise experiences are less, the initial efforts v_0 are smaller, then the more able to meet the fall into the enterprise life cycle process.

Proof: Equation (13) is at least greater than or equal to Equation (6): $v_0 + \ln[m_0/(m_p + m_s)] \geq R\sqrt{g/r}$, so we get that $m_0/(m_p + m_s) \geq e^{R\sqrt{g}/(u\sqrt{r}) - v_0/u}$.

- (1.) When the enterprise is a new enterprise, $v_0 = 0$, Equation (14) is at least greater than or equal to Equation (6), so we get that $\ln[m_0/(m_p + m_s)] \geq R\sqrt{g/r}$, The following formula is obtained by rearranging: $m_0/(m_p + m_s) \geq e^{R\sqrt{g}/(u\sqrt{r})}$.
- (2.) If v_0 is larger, it is difficult to satisfy the condition of

$$m_0/(m_p + m_s) \geq e^{R\sqrt{g}/(u\sqrt{r}) - v_0/u} \quad \text{Q.E.D.}$$

Among the above propositions, the ratio of the core asset and manager's bonus and pension to the total assets is smaller, manager's and enterprise's efforts are more, competitive pressure is higher, the current profit level is higher, then the more likely this enterprise to reach a sustainable management. These factors are in line with economic intuition. The smaller the proportion of remuneration and pension to total assets in the above, the greater $m_0/(m_p + m_s) = 1 + m_F/(m_p + m_s)$. The reason for the sustainable operation is that the greater the "manager's entrepreneurial talent and stage productive asset" m_F relative to $m_p + m_s$, the more the ability to increase the competitiveness of the enterprise. In addition, the "more profitable current level" is, the more likely it is to achieve sustainable operation, because the enterprise has a high level of profit when it is sufficient to compete with the pressure of competition to achieve the goal of "sustainable development".

In the above proposition 1 mentioned that there is an experienced business ($v_0 \neq 0$), in the beginning it can play its talent, it may be the establishment of the branch, the industry has a similar technology, business operators have talent, and so on, so as to enable enterprises to accumulate enough experience, so when the more mature business experience, the more help enterprises in sustainable development.

IV. CONCLUSION

This paper builds on the opportunities and challenges of industry and the topic of cultivating talents, and develops a theoretical model of industrial development and human resources. After experiencing the financial crisis of 2007-2008, the global economy has not yet recovered.

Enterprises have been faced with the challenges of business, coupled with the trend of trade liberalization and internationalization, leading to rapid market changes, diversification of innovation and globalization of division of labor and competition. The interaction between core assets and competitive pressures is one of the important findings in this study. Enterprises seeking to have both the ideal and progress, the core consciousness is to provide consistency and stability to lay a solid foundation.

This study is based on the cross-field analysis of economics and physics, the preliminary findings are as follows. First, when the enterprise is a new enterprise, the ratio of the core asset and manager's bonus and pension to the total assets is smaller, manager's and enterprise's efforts are more, competitive pressure is higher, the current profit level is higher, then the more likely this enterprise to reach a sustainable management. On the contrary, when the above conditions are reversed, the enterprise is more likely to fall into the process of life cycle. Second, when the enterprise is an experienced company, the enterprise's experiences are more, the initial efforts are greater, then the greater the likelihood that it will meet the necessary conditions for sustainable management. On the contrary, when the enterprise experiences are less, the initial efforts are smaller, then the more able to meet the fall into the enterprise life cycle process.

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