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A study of Activity-Based Cost Evaluation for the performance of modern shipbuilding enterprise

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A STUDY OF ACTIVITY-BASED COST EVALUATION FOR THE PERFORMANCE OF MODERN SHIPBUILDING ENTERPRISE

By

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China

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DECLARATION

I certify that all the material in this dissertation that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me,

The contents of this dissertation reflect my own personal views, and are not necessarily endorsed by the University.

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ABSTRACT

Title of Dissertation: **A study of Activity-Based Cost Evaluation for the Performance of Modern Shipbuilding Industry**

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Traditional performance evaluation system takes financial evaluation as the principal standard in evaluation system, while activity-based costing extend the evaluate standards to a broader and more effective stage. While the modern shipbuilding industry plays an important role in Chinese modern industry, therefore an advanced evaluation system for shipyards is very necessary. In this dissertation, a case study for a reprehensive a shipyard will be introduced and analyzed by using activity-based costing method in its effectiveness evaluation.

According the case study, will deeply understand the application process the system meanwhile offer a new evaluation method for Chinese modern shipbuilding industry which can be used to practically help Chinese ship building companies upgrade management level, improve operation performance and strengthen their key competitiveness.

KEY WORDS: performance evaluation, Activity-based costing, modern shipbuilding enterprise

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LIST OF ABBREVIATIONS

AHP	Analytical Hierarchy Process
ABC	Activity-based cost
ABM	Activity-based management
R&D	Researching and developing

CHAPTER 1

INTRODUCTION

1.1 Background and significance

1.1.1 Research background

1.1.1.1 Research background for evaluation of enterprises' performance

Performance evaluation is a particular index system though scientific method, with the target of evaluating the operation activities inside a corporation fairly and objectively during a certain period. The performance evaluation is the specific application of the evaluation theory in the economic sphere as well, establishing enterprise performance evaluation system can show the operation status roundly so as to evaluate and amend the management performance as per the evaluation results. Therefore the operator and stuff's behavior will be guided correctly and better.

Enterprises performance Evaluation is a major issue in the 21st century business community under the unprecedented impunities due to the arrival of the knowledge economy for the development of enterprises, meanwhile, It indicates that enterprises will face more intense competition and challenges with tremendous changes to business environment is undergoing tremendous changes. As we know, the innovation is the essential attribution to knowledge-based economy, a series such as

technological innovation, system innovation, organizational innovation, ect. which set up a solid foundation for development of knowledge-based economy, and becomes the basic characteristics of new era of business. Constructing the scientific enterprise performance evaluation system has a huge effect in promoting business ethics stress, increasing economic efficiency and fulfilling their social responsibility. China is on the initial stage of socialist market economy development and keeping the market development in order should be under strict, effective corporate rating system and the evaluation system. Therefore, more and more enterprises have considered establishing their own performance evaluation system for the continuous development.

1.1.1.2 Shipbuilding industry background

Shipping is a reflection of the contemporary industrial and technological level of integrated products; therefore Shipbuilding is a compatible manufacturing and construction of the complex production process. Chinese ship production industry play a pivotal role in to the national economy in many fields: (1) Shipbuilding industry has a tremendous drive to the economic development growth; (2) Shipbuilding industry requires high-level of technology and refers to many technical design fields which can promote Chinese scientific and technological progress toughly. (3) China's shipbuilding industry has promoted the international trade oversea and the maritime transport a lot; (4) Shipbuilding industry is the basis of modern Navy construction. Modern shipbuilding mode has been introduced in the shipyard in the end of the 1970s, which was first used in the technology revolution and after nearly 10 years' practical understand, the new mode has become the main producing mode in modern shipbuilding enterprises gradually. However, this state very incompatible with our production inefficiencies at present, which is only 1/14 of the advanced shipbuilding countries. South Korea takes Japanese shipbuilding

industry as an example of modern shipbuilding, for example, 100 degree is the best performance assessment, and South Korean shipyards' production technology and management techniques performance can be evaluated 90 meanwhile Chinese are only 65 and 55. What's more, Chinese shipyards' stuff wages are only equivalent to the level of South Korea's 1/15 but the total manufacturing cost is 1/10 higher than South Korea. Therefore how to optimize the production mode is a urgent requirement for Chinese shipbuilding enterprises' survival and development.

1.1.1.3 Research background for this dissertation

As we know, quality, price and producing cycle are the most important elements for shipbuilding enterprises, strengthening management and improving technology can help shortening producing cycle in order to improve operational efficiency and gain more orders. Therefore, how to achieve optimal management of resources allocation and how to make the best use of the resources in every aspect in this complex manufacturing process is a serious problem for shipyards and a suitable evaluation system is quite necessary. Not only to meet the industrial, technological progress and to meet the needs of the market in order to boost production efficiency and improve the working environment, also for the optimization and innovation of modern shipbuilding enterprise effectiveness evaluation.

1.1.2 Research significance

1. Enterprise efficiency evaluation is an important economic management and has been extensively applied in evaluating the profit of enterprises, business operators, stuff performance, financial and credit management, and other relative aspects about the enterprise' daily operation. And it will do good to correctly guide the operation behavior of the enterprise and establish incentive and restraint systems in order to enhance the enterprises' competitiveness.

2. Evaluation of the enterprises' performance in China is still at the initial stage, China has not yet established a integrity, scientific and effective evaluation system. Due to the theme of the position evaluation, the evaluation methods and other aspects of diversity, the evaluation process prone to subjective one-sidedness and lead to the difference to the valuation results. Therefore, it is imperative to continuously improve the enterprise performance evaluation system and establish a scientific integrity of the evaluation system.

3. Activity-based costing (ABC) is aimed at changing the traditional cost accounting and cost management operations and to meet the new manufacturing environment. The activity-based costing not only gives the new methods of business management and cost accounting, but also a big change and revolution in management and costing account especially for large manufacturing enterprises. Meanwhile, ABC has no fixed framework and standard model; different enterprises have different objectives and accounting system. Therefore in many sectors of the specific application, ABC method can play its role excellently. Under the principle of Excellent Evaluation criteria, combining with the ABC in the evaluation system will significantly improve the objectivity and accuracy of traditional performance evaluation.

4. An excellent performance evaluation has realistic significance to strengthen the shipbuilding industry management, improve the efficiency of shipping enterprises and the modernization level of management. Chinese shipbuilding industry although has a lot of progress still far behind the advanced shipbuilding countries, if a more scientific evaluation system be introduced, it should help the operators reach better analysis and better decision-making as to improve the level of profitability.

1.2 Research scope

This paper mainly starts from the introduction of modern shipbuilding enterprises and performance evaluation theories and focuses on the production characteristics and financial characteristics of the shipbuilding enterprises, in order to prove the applicability and advantages when using activity-based costing in the modern shipbuilding enterprises, meanwhile the writer introduce some relative theories about activity-based costing and be combined with the *Excellent Performance Evaluation Criteria*, through the principle of activity-base costing, the writer will establish the evaluation system for modern shipbuilding enterprise based on the activity-based thoughts, which expanded the traditional evaluation focusing financial index to a more wider and more effective integrated evaluation system. And what's more, a particular case of a shipbuilding enterprise will be introduced to further describe the activated-based thought in order to enhance its application value in performance evaluation for modern shipbuilding enterprises.

1.3 Research Methods

1.3.1 Qualitative and quantitative analysis

Everything's development is combined by qualitative and quantitative analysis, so does shipbuilding industry whose development is certainly the combination of the quality and quantity of ever-changing process. To evaluate modern shipyard's performance should be analyzed both from qualitative and quantitative aspects, as to get a fair and objective result. In this dissertation, qualitative analysis will be used in the financial indicators' analysis meanwhile the quantitative analysis will be used in analysis of the indicators which should be based on the non-financial levels, in order to reach a more scientific and more objective evaluation results. What's more, the mathematical model is an important research tool as well, therefore the AHP analyze model will be used in the analyzing process.

1.3.2 Examples of combining research and literature

There are many relative articles concentrating on Shipbuilding enterprises' performance evaluation, but fewer researching materials refer to the shipbuilding enterprises' evaluating models and at present most of the analysis are based on the financial level. In order to take full advantage of the achievements we owned the author has not only read a lot of literature to support researching, also went to Yangzhou Da Yang Shipyard which is a representative shipbuilding enterprise to do some researching and get some data information, combined with the relative theory to improve dissertation's practical value.

CHAPTER 2

LITERATURE REVIEW

2.1 Basis theory of activity-based costing

2.1.1 Basic concept of activity-based costing

Activity-Based Costing (ABC), activity-based costing method is the calculation method based on activity, which means to allocate the indirect costs to certain customers or product by recognizing, measuring the material motivations. Which offers a more accurate allocating indirect costs and supporting resource method for enterprises' activities, operation process, produce process and customer service. ABC system takes the idea of that the organization's resources are not only consumed in the production process, also consumed in many auxiliary operations, different customers usually consume with different materials due to the different activity requirement. Thereafter, the goal of ABC is to calculate the different cost for each activity by different customers and different products', and then allocate the costs to all unique customer and product.

2.1.2 Theory of cost driver

The basic theory of ABC is the cost driver. This theory takes the idea of that allocating indirect cost should focus on cost and cost sources, overhead costs and that

the allocation of these costs linked to the causes such as the cost of power generated can be traced back to the domestic consumption of machine hours because of the machine-hour drive power consumption. Therefore, the usage of machines to distribute power hour is a reasonable fee. Activity-based costs focused on the analysis of the costs due to the different reasons, control, pooling and allocation in different ways. The activity driver is related to the classification of activities. If the activity is in unit and equivalent level, the activity driver is the product quality while if the activity is batch activity the driver is the activity is motivated by the batch. When the activity drivers measurable cost are equal to or close to the product to the actual activity consumed, product cost then can be accurately calculated. Activity driver is the linkage by product and activity, on behalf of an opportunity for a product or process design improvement. Its main purpose is to reveal what is necessary for the activities and which are surplus activities, and to minimize the value of those activities which will not bring profit increase. Ultimately to determine how to reduce domestic consumption of the activities and reduce the activity cost and product costs.

2.1.3 Theory of ABM

1. The basic idea of Activity-based management (ABM) is “enterprise itself is an aggregation of a series of activities for meeting the needs of customers’ requirement” [1]. Each activity is the customer of another one and every one can be considered as the customer of each other, therefore an activity chain will be formed as a whole activity chain which is to provide service to the external customer of enterprise. The enterprise itself is a activity chain from inside to outside and one by one. Every activity should consume a certain amount of resources and form a certain value and

[1] Melees (1971). "multinational corporations empirical investigation of a financial control system. *Ocean Development and Management, 01.*

the activity chain can be seen as the value chain as well. ABM is the value chain which has the function of optimizing the enterprise by using the dynamic information from the calculation and analysis of activity costs. If enterprise want to stand on the world market firmly it have to know not only the internal operation cost well but also the related cost in the whole value chain and make a better co-operation with other enterprises in the same value chain in order to reach the greatest profit and do a better cost control.

2. The objective and essential of ABM is the essence of activity chain (value chain) and analyzed the activities process in the chain and then optimize the performance of each activity in the chain continuously, as to improve the enterprises' competitive advantage. The optimization has become the essential driver. From the point of ABM, the main goal for ABM has two aspects: one is from the external customer' point of view and provide more value from the value chain; and the other is from the point of enterprise itself with the goal to gain more profit.

3. Basic steps for ABM

Analyzing activity--is to analyze the major activities and secondary activities, and value-added activities and non-value-added activities. Analysis of activities can reach the requirement of saving resources, saving time and costs, shortening the processing time and reducing duplication of work, enterprises to increase their efficiency;

Exploring drivers -- Analysis of the cost driver, Enterprises can control cost driver or re-construction of the enterprise value chain to further reduce costs.

Establishing performance evaluation system -- activities and cost driver analysis should be conducted periododicaly while the operating performance can be reflected

everyday. To ensure the continued success of the efforts to implement the day-to-day affairs, it is necessary to establish a performance evaluation system

2.2 Performance evaluation theory

2.2.1 The historical evolution and status of the study of Performance evaluation methods at home and abroad

2.2.1.1 Historical evolution of the study of performance evaluation methods at home and abroad

1. Early performance evaluation theory

In the 19th century, the managers of the United State's textile industry, the railway industry, the steel industry and business, have established a corresponding performance evaluation indicators for the evaluation of enterprises using for industry internal production efficiency according to their operating characteristics. As more products and business are easy, these enterprises have used some relatively simple output indicators, such as cost per ton-kilometer, cost per ton of coke tracks.

At the crossing between 19th century and 20th century, with the increase of the species of products and the consumed resources of it, Taylor, the father of science management set up a digital standard of resources and human power consuming for each product through the research of working efficiency. Later, engineers and accountants tried to enlarge the standard into a price standard of the workers' salaries for an hour and the costs for each resource, so as to set up a standard cost for each product. With the use of cost accounting, variation analysis and incentive system, the evaluating indicator will become more and more complete, and the efficiency of enterprises will be largely increase. In other words, the early benefit evaluation is the

one that is mainly led by the costs. Since the production scales of enterprises and outer financed amounts keep increasing, enterprise credit evaluation emerge at the same time.

2. The establishment of financial evaluation indicators' status

In the early 20th century, diversification and decentralization of the management have given further innovational opportunities for performance evaluation. As early as in 1903, the Du Pont powder company began implementing the "rate of return" to evaluate the performance of the company. Clearly this is the first use of this important tool. the financial manager of DuPont Company, Tangnasenbulang (Donaldson Brown) will develop the 'rate of return' law as a performance evaluation means for various departments. Brown established a DuPont formula that rewards investment capital turnover rate of two X-sales profit margins, and the invention is still widely used, "DuPont system map." According to DuPont and DuPont formula chart, investment return rate target plays an important role, the corresponding prediction and control methods have been established for the planning and coordination of the various divisions of the business. in 1923 General Electric Company's Chairman small Alfredo Deshilong (Alfred Sloan) proposed decentralized management with Brown's theory. Furthermore, the situation continued until the 1980s of the 20th century, after which, the operational performance evaluation form to the financial indicators, non-financial indicators complementing the performance evaluation system. Many companies are aware that the excessive emphasis on short-term financial performance of the enterprises at a competitive disadvantage, so, the focus shifted more to the long-term competitive advantage for the formation and maintained. However, their attention is basically focused on how to solve problems rather than production customer requirements and customer loyalty, the manager of compensation or the basis of the main financial indicators, not quality

of work performance. Therefore, it is a financial indicator, non-financial indicators to complement the performance evaluation period.

3. The rise of Non-financial evaluation

1970s in the 20 century, the market competition is becoming increasingly fierce. Enterprises need to become aware of marketing, production, research and development, finance, human resources functions of the various departments harmonization, from the line with the overall consideration, and then they are not separated. Thus, the isolation from a research performance evaluation is meaningless, with the rapid development of high-tech, knowledge-based economy has begun to show signs that the competitive advantage depends increasingly on intangible assets, the development and use, the role of human resources have become increasingly prominent. Financial indicators of short-term staff make the day-to-day operations and long-term strategic business objectives of the line. Purely by financial indicators as a performance evaluation indicator has been more and more criticism, non-financial indicators of the growing role of attention.

In the 20th century, the end of the 1980s, based on the strategic management of the evaluation of the efficiency study rapidly warming, in 1990s, the operating environment has undergone tremendous changes. With globalization of the economy and the globalization of the world economy, the new economy era, the arrival of financial instruments and the frequent use of the fast-changing market, resulting in a global context, increasing competition enterprises to survive and develop. They must have strategic vision and long-term objectives. In order to achieve the strategic goal of enterprises, the performance evaluation system for enterprise strategic competitive advantage in creating and maintaining the service, and strategic competitive advantage is formed and maintained by a variety of factors rather than a

single factor decision, Enterprise Strategy affect the success of the business should be an important factor in enterprise efficiency evaluation index system has been fully embodied. The new corporate strategy and competitive environment need to evaluate the effectiveness of the new system, treated the same as or more attention to quality, market share and other non-financial evaluation, and not when the financial and non-financial criteria contradictory standards, always prevail in financial indicators. In order to evaluate the performance of the financial information and non-financial information integration in the financial report be disclosed, the business community has become an important research topic.And as improving financial reporting and the development of the long-term strategic plans for the development of a significant trend.

2.2.1.2 at home and abroad Performance Evaluation Research

1965 in July the "Michigan Business comments" by Stanley E. seashore (Stanley. S eashore)to be published in the "organizational effectiveness evaluation criteria" which measure various enterprises targets in a detailed analysis and expositions and evaluation of various indicators and their relationship form a pyramid-style hierarchy, so that the original state of chaos at the evaluation indicator system is logical and orderly.

1979 Lindsay (Person) and Lai Xi Luo (Lazzig) in the 400 multinational companies - The status survey analysis, the evaluation of the effectiveness of financial indicators have sales profit margins, earnings per share, cash flow and internal rate of return.

1992 Kaplan and Norton Balanced Scorecard presented in the financial, customer, internal business processes, Learning and Innovation four areas of evaluation criteria, financial indicators constructed with non-financial indicators of combining the

evaluation system and in the subsequent papers presented operable implementation steps to bring the Balanced Scorecard has become a strategic tool for effective management.

In June 1999 the Ministry of Finance, Ministry of Personnel, the State Economic and Trade Commission, State Development Planning Commission, in reference on the basis of the Balanced Scorecard, jointly issued a "State-owned Capital Performance Assessment Rules" and "state-owned capital rules for the operation of performance evaluation." The evaluation system includes four aspects which are the financial results; capital management, solvency and ability develop. It totally concludes 32 indicators, using three-level system to design a basic measurement with eight indicators, 16 indicators and eight appraisals and non-measurable indicators.

It is issued on august 30th 2004, the national standard GB/T19580-2004 'excellent result evaluation criterion' symbolizes that the 'excellent result' has been extended to a new stage in our country. The standards descript the enterprise how to guide, measure, analyze, adjust and improve the departments and the result system in every administrative level. It is the service center of information collecting and analyzing, relying on financial and nonfinancial data and information to integrate the systems of result measurement and result management. the purpose is to guide process management of the enterprise to relies the main operation result and strategy target of the enterprise, to forecast the accidental or unexpected enterprise and external changes with acute sensation, to make quick reaction.' excellent result evaluation criterion' is the accreditation standards of our country's national quality award. The guidelines have seven aspects: leadership, strategy, customers and markets, resources, process management, measurement analysis and improvement. Operating results. The criteria put the main operating requirement of the enterprise into a framework of

presuming the excellent result and to provide a standard platform and theory accordance for solving the limited problem of the result evaluation system in the enterprise.

2.2.2 Elements for constructing performance evaluation system

Usually a complete enterprise performance evaluation system is posed by these elements below: the main evaluation, the evaluation objective, evaluation goal, the evaluation standards, evaluation methods and evaluation reports.

1. Entity of Enterprise Performance Evaluation

The entity of enterprise performance evaluation is the behavioral entity of enterprises' performance evaluation, which needs to make evaluation for the object. According to the accrue and development of the enterprise performance evaluation, it is established for solving the contradictions which exist in the economic activities. These contradictions do not only include the contradiction between the property owner and the manager, but also include the contradiction between the government sector and the other relevant benefit entity and the enterprise. According to the theory of "benefit relevant people", whoever has the benefit relationship to the enterprise could be the entity of enterprise performance evaluation.

2. Object of Enterprise Performance Evaluation;

The evaluation object is something which is made evaluation for, and it is the behavioral object of evaluation. The object is established by the evaluation entity according to its need, and it contradicts to the entity. From the need of the entity, we can see that the evaluation object mainly includes enterprise and all the managers of the enterprise. The different object has the different characteristic. These characteristics have direct influence on the establishment of the indicator system and

the criterion when we design the concrete evaluation system. For example, when we design the evaluating indicator, we should consider the controllability for the enterprise manager, but we do not need consider this for the enterprise.

3. Goal of Enterprise Performance Evaluation

The evaluation goal is established according to the need of the evaluation entity, and it is ranker and summarized from a definite store of need of entity, which is also the guide and goal of the design of indicator and the establishment of criterion. The design and operation of all the evaluation system accord to the goal. For example, if the evaluation entity needs to know the debt paying ability of the enterprise, when we select indicators, we adopt the indicator of liquid ratio, quick ratio and asset-liability ratio.

4. Indicator of Enterprise Performance Evaluation

The indicator of enterprise performance evaluation is something which is made evaluation about for the evaluation object. The enterprise performance evaluation concerns about the aspects relevant to the evaluation object and evaluation goal, which are the factors relevant to the enterprise performance. These key factors are shown on the evaluating indicator. The key factors include both finance and non-finance. Therefore, the indicators of enterprise performance evaluation are divided into financial evaluating indicator and non-financial evaluating indicator. Meanwhile, according to the difference of qualities, the indicators could be divided into quantity indicator and quality indicator. How to accurately realize the key factor on the concrete indicator and how to rationally combine the quantity indicator and quality indicator are the primary questions of the design of evaluating indicator.

5. Criterion of Enterprise Performance Evaluation

The evaluation criterion is the reference and scale to judge the object performance. The evaluation criterions are generated at a certain assumptions. The evaluation criterion should correspond to the variety of the evaluation goal. Meanwhile, the evaluation criterion changes in accompany with the progress of the society, the development of the economy and the change of the external condition. Certainly, the evaluation criterion must be definitive and no variant in the specific time and scope.

6、Method of Enterprise Performance Evaluation

The evaluation method is the concrete means of the enterprise performance evaluation. When we have the evaluating indicator and the evaluation criterion, we still need to adopt certain evaluation method to establish the weight of the evaluating indicator, apply the evaluation criterion, process the original data of the indication and integrate the evaluation result. If there is no scientific and reasonable method, the evaluating indicator and the evaluation criterion would be the isolated evaluation factor, and there would be no value of their existence. At present, the evaluation method could be qualitative method, quantitative method or qualitative method combined with quantitative method. Which method to adopt is established according to the feature of the design of the evaluation system and the relative merits and accommodation limit of the evaluation method.

7. Report of Enterprise Performance Evaluation

The evaluation report is the output result of the evaluation system. It is a conclusive file, and it realizes the value judgment of the object. It mainly has influence on the evaluation entity. The evaluation report usually includes the evaluation entity, the evaluation object, the evaluation executing agency, the data source, the evaluating indicator system, the evaluation criterion, the evaluation method, the fundamental state of the enterprise, the evaluation result and conclusion, the contrastive analysis

of the primary financial index of the enterprise, the environment which has a influence on the operation of the enterprise, the forecast of the future development of the enterprise, the problems existing on the operation of the enterprise, and the advice of improvement. In addition, the exact content of the evaluation report should include some special information according to the actual demand; sometimes the range of use of the evaluation report and so on should be specifically limited. These factors of performance evaluation system are not isolated, but they are interconnected. The running of the evaluation system of a enterprise could be described like this: the specific evaluation entity which is toward to the specific evaluation object, establish the evaluation goal according to its demand and the evaluating indicator according to the goal, combined them to form the indicator system to make evaluation for the objective enterprise, compare the achieved data with the default evaluation criterion by a certain method, and work out the evaluation report to help the evaluation entity determine whether realize the goal or not and which decision to make. The need of the evaluation entity decide the evaluation goal, and the establishment of the evaluating indicator and the evaluation criterion correspond to the goal, and also the selection of the indicator and the criterion has influence on the behavior of the evaluation object and the relative result, and the result finally affect the judgment and decision of the evaluation entity.

2.2.3 Setup of the Architecture of Evaluation system

2.2.3.1 Setup principle

If the evaluation of the enterprise performance want to be objective, availability and overall, the evaluation should correspond to it; it is important to build up an organic architecture of the evaluating indicator, for we should carefully choose the indicator to setup the evaluation system. The basic principles are as follows:

1. Consistency principle. The evaluating indicator should correspond to the enterprise goal and the requirement to actualize the strategy. The evaluating indicator of performance is a kind of institution and arrange of the enterprise. Therefore, it must be considered that whether it could cause the evaluation object to make the decision correspond to the enterprise goal and to realize the optimizing arrangement of the enterprise resource. Meanwhile, it could guide the manager to make an effort to actualize the strategy and take actions to improve the key successful factor.

2. All sidedness principle. The indicator system should have the ability to respond of the every relevant factor and link of the evaluation object all round and reveal the overall perspective of the evaluation object.

3. Controllability principle. The indicator should be in the control range of the evaluation object, that is, it should suffer the influence of the other department and individual behavior as little as possible.

4. Systematicness principle. The indicator system should form a opening and interaction evaluating indicator system making use of the relation between the indicator system and external and the correlativity of the indicators of the system according to the idea of the system.

5. Understandability principle. The selected indicator should be understood by the valuator. Too complicated indicators and the indicator system are hard to understand.

6. Stability and expansibility principle. The evaluation indicator system should keep relatively stable on the intension and quantities of the indicator and the structure of the system and should not change frequently.

7. Materiality and proportionality principle. The selection of the indicator of the system should be determined by the importance extent of the indicator to realize the evaluation and the materiality of the indicator itself according to the materiality principle. At the same time, the indicator should be evenly distributed and quantity balanced. The financial indicator often is a kind of result indicator, and it can not evaluate the performance of the process of the result. Therefore, the process indicator is required.

8. Operability principle. The indicator should be articulation on concept, straightforwardness on meaning, simple and lucid on expression, and convenient on data gathering and operation.

9. Feedback principle. The evaluation itself is not the goal. The key point is to discover the problem in the operation of the enterprise strategy and to solve the problem. Therefore, the evaluating indicator should correspond to the demand of the feedback control and provide the strategy control with the useful information.

10. Compromise short-term and long-term principle. The financial indicator usually emphasize on the short term benefit, so "the balance scorecard" induct several indicators from "study and growth" to lay emphasize on the long term benefit of the enterprise.

2.2.3.2 Choice for the evaluation indicator

1. Choice of financial indicator

For a long time, financial expert from all rounds the world has been taking deeply analysis on the financial evaluation and has achieved relatively consistent

evaluation indicators, that is, from a financial point of view, the performance evaluation is normally from four aspects--profitability, solvency, business and development capabilities.

(1) Capacity of revenue

Which means the capacity of winning revenue to present the finance structure and operation performance, it is a integrated representation of the enterprises' debt capacity, development capacity, and operation capacity.

（2）debt capacity

Which means the capacity of repay the debt, it can be divided into long time repay and short time repay capacity.

(3) Operation capacity

Which presents the ratio of using capital and can be divided in to current capital capacity and fix capital capacity.

(4) Development capacity.

Which presents the continuous development capacity, normally enterprise use absolute profit indicator to represent such as the increasing ratio of sale income.

2. Choice from nonfinancial angle

The operators realize that the limitation in using financial indicator and in the practical operation the nonfinancial indicators has been used more and more widely. But due to the different size and different market environment for different enterprise, there are lots of nonfinancial indicator. Therefore, according to the characteristics of the modern shipbuilding enterprise and the principle of excellent evaluation standards this dissertation set up the evaluation indicators from the angles as below:

(1) Choice from client's angle

1) Satisfaction from client. Which has the purpose of confirming whether the product or the service meet the clients' satisfaction in the greatest degree. The operator take the idea of that the clients only quite satisfy the product or service they will purchase again, therefore the research for the clients' satisfaction is very necessary.

2) Client loyalty. The appearance and goodwill are two abstractive elements for client loyalty. To keep the loyalty is every enterprise's business goal.

3) Analysis of new customers

If the operator want to increase its market share, they share make a plan to gain new customers from larger market. The job of winning customers can be evaluated not only from the quantities of new customers but also from the total quantity of product sailing to those customers.

4）Analysis of profit gained from customer

Enterprises need to analyze the volume of business from customers and should judge whether the business is valuable or not. Long term profitable relationship is a key to keep customers. Although some new customer are not valuable at present, decision makers should take them important because of their growth potential in the future. Meanwhile, if some old customers are not valuable for longtime, the enterprise should consider quite the relationship.

(1) Choices of internal management angle

1）Process innovation

In some opinions, in the modern market full of competition there exist some principles as follow: the enterprises' mission is to create the value for customers, and the success for enterprise is from excellent performance which results from process

management. The innovation process makes a complete analysis and redesigned of business process for a great improvement of enterprises efficiency. In a complex enterprise such as shipbuilding enterprise there is a great gap between strategy and business process. And the strategy is a main thought which leads the all activities inside the enterprise.

2) Processing and Operation

The innovation goal for processing plan and producing process is to solute the unbalance between departments and other problems such as the two long periods, the low quality product and the high cost, ect. The correct indicator will be helpful for those problems.

3) Service after sailing. Which contains the insurance and amendment and become the main method under the competition of non price relationship.

4) Researching and Developing

There are some problems in the researching and developing new kind of product such as long period and high cost. How to develop a product meet the clients' requirement in the shortest period with the lowest cost is a practical problem. Therefore, the activities for R&D play an important role in enterprises' daily economical activities.

(3) Choices of learning and growth angle

Modern performance evaluation system emphasizes on the importance of investment in the future, not confined to the traditional investment area as the purchases of new products and R&D on new products. It is important to invest in the equipment and R&D departments, but the enterprises should also invest in its infrastructure – the

employee, the system and business process to achieve long-term financial goals. The analysis and evaluation of Enterprise learning and growth are divided into two parts, for employees and new products respectively.

Analysis on Employee

Employee satisfaction- Employee satisfaction is a prerequisite to increase productivity, reaction speed and quality of service. The most satisfied employ can make the most satisfaction to the customers. We should consider the factors of this satisfaction during analysis, such as participation in decision-making, approbation of the work, encouragement, logistics well and support to enterprises' overall satisfaction.

Employee loyalty- Loyal long-term hired employee represents the company values. They are not only important guarantee for the enterprise success but also the enormous motivation for enterprise stepping from the bottom to peak. Enterprise makes long-term investments on it employee, but if they left without notify or during the bottom period, it would not only cause intellectual capital losses but also heavy shock on enterprise cohesion.

Employee Ability-It is mainly consisted of the employee skill, working attitude, operating effectiveness and customer satisfaction, which can be reflected in the ratio of productivity with employee number. The simplest method of evaluation employee productivity is the revenue bringing to the enterprise by each employee.

Employee technical training and development of creativity-As the job of employee is to provide customers with a full range of products and services, from the reactive part to positive forecast with respect to customer demand, hence employee should

have training. One of the key points of evaluation is the re-training level, and second is the percentage of employ needed training. It is an important way to enhance employee creativity by technical training. One of the important content for an enterprise in the way of internal growth and learning process is to create internal environment, stimulating employee enthusiastic and creativity.

2) Analysis on new product

Once there is a new product on the market will be good news for enterprise which means the profit will be increased in some certain aspects. Therefore operators pay more attention on the new product which an important expression for innovation capacity as well. More and more modern enterprises have taken the new product researching and innovating as one of the development strategy. It will do strengthen the corporation's competitive advantage and inject new vitality to the long-term development if the product's output will continuously meet customer's need. And the main evaluation indicators contain the number of new products, new product sales ratio of the total and the introduction of new products such as speed.

2.2.4 Selection of Evaluation Criteria

It is not enough to make final judgment on benefit evaluation only by a guide line, hence there must also be a frame of reference. The reference is effective evaluation criteria. Evaluation criteria are a standard rule of analysis on evaluation object, which is also the base of the assessment result. Generally speaking, there are several ways of setting effective evaluation criteria for enterprise as following:

2.2.4.1 Basis on experience

It means that enterprise can set criteria according to the rules of economic

development and long-term management experience, such as the current ratio of internationally recognized standards for two, interest rates have been multiples of internationally recognized standards for three, and so on;

2.2.4.2 Basis on time sequence

It refers to the entity's previous profit level, which can be divided as measured by different basis period. It is the optimal self-judgment way, which can conduct own vertical comparison with exclusive nature. The advantages are: (1) the enterprise can compare with itself, responding to self growth, hence the comparability is really good; (2) The beginner industry enterprise should not adopt the same industry standards, it is much proper for the beginner to apply time sequence standard to reflect self growth. It can compare with those in the same industry after having stable market share. However, such a lack of evaluation results comparable between the industry wins, hence more enterprises using as their own appraisal. Time sequence standard is usually used with combination of competitive criteria. If the former is used only frequently with too low standards in base period, it is easily lead to "reactive dole." While the very high standards in the base period, easily lead to "whip fast cattle." At this time, comparing with the industry average level is the ideal means of support.

2.2.4.3 Basis on Objective Industry Standard

It refers to the performance of other enterprises in the same industry as an evaluation criterion. It is an average figure from relevant data calculated in a certain way, also basing on a certain period within a certain range of enterprises in the same industries. To enterprises in the same industry average level of performance evaluation, the industry system risk and common risk can be swapped, which is particularly effective when enterprises with a large number in the same industry. An effective

evaluation system should operate with the efforts of highly relevant. Using objective industry standards can exclude the impact of enterprises uncontrolled changes in the economic environment, which can more objectively reflect the entity's actual operating performance. But even such standard has some inadequate, it neglects the enterprise stage of development, ignoring the unique enterprise strategy, also requiring entity to follow the others.

2.2.4.4 Basis on budget

It refers to the pre-established annual budget and expected target as the evaluation criterion. To compare the actual performance with budget can reflect the business conditions better when using the budget standard as a basis. The incentive effect on enterprise management is relatively good if making a scientific and rational standard. However, the budget standard used to evaluate requests a favorable budget system and exclusion of the impact of external factors, hence such standard has a strong subjective nature and human factor.

2.2.5 Data Processing

Integrated treatment on data is the critical step in assessment on enterprise integrated performance. The indicators can be divided into

Qualitative indicator and quantitative, during which the quantitative indicator should take up the majority part.

1. Qualitative data processing

Questionnaire survey is the international common method in qualitative data processing. To avoid errors caused by subjective judgment, evaluating the subjection can increase accuracy of qualitative indicator. The qualitative indicators can be divided into seven grades (excellent, good, preferably, average, below average, poor,

very poor), corresponding to 7 -1 point for different levels. The difference between each level only stands for different views on the indicator. As the judge assignment process self has the embedded standard, it can be used in calculating evaluation value directly, Using the weighted average method of calculating results of the investigation.

2. Quantitative data processing

The quantitative indicator data can be collected according to the meaning of this indicator and specific enterprises situation, needing cooperation of difference departments. It is very difficult to integrate all the indicators directly as of the difference in content and dimensionless, therefore those indicators must be treated to non-dimensional one, that is converting the original quantitative indicator to the estimated value.

3. Confirming indicator significance process

Since each indicator has different importance level in different indicator system, it is necessary to ascertain the relative importance of indicators weights. The weight of indicator stands for the significance level of the very indicator in its system, 10,006 to a maximum value generally, and to distribute the significance level to difference indicators in the same level, usually adopting expert scoring together with analytic hierarchy method. Expert structure must be reasonable, which should get not only high-level management and technical employee from the enterprise involved, but also the expert who is familiar with the enterprises or the industry as third party. Meanwhile, it should be in accordance with the different industries and enterprises characteristics when scoring. For example, the innovative learning indicator should take material position for the high-tech enterprise since technology updates fast; for large enterprises, the smooth operation of the process becomes very important, as a

result such indicator weights are relatively high; for banks and other financial enterprises, financial indicators occupy the significant position according to the industry nature.

2.2.6 Compilation of evaluation report

The evaluation report is a summarization on benefit assessment system, which is an important item of internal control system to enterprises, as well as information output of the benefit assessment system, hence it must be compiled periodically to report on the overall enterprise or departments operating efficiency, so that the various departments can understand their working conditions and harvest, also enable management at each level understand the class work and the results of the profile.

The evaluation report should be prepared in consistent with the following principles:

1. Cooperate the organization structure. The design of benefit report should tie to enterprise organization structure. Management at each level can receive an evaluation report, listing beneficial information of all direct subordinates in the scope of its responsibilities. Such report can be found in all parts of the enterprise and also can be linked to one another.

2. Focus on the exception report. The "exception" mentioned here means difference with the original calculations. Management often faces of the information that is difficult to understand and also often fells it difficult to find out the major potential error, since modern enterprise scale and effect is in rapid expansion. Hence internal report should be designed to guide the management attention, focusing them on the few major exceptions to the incident. For example, report which suggested a number indicating the difference between the actual figure and benefit time standards is one

of the exception report formats.

3. As concise as relevant. Since report users are usually not accountant, data links should be aggregated and used words to illustrate this under the premise of no damage to the integrity of the statements. Users should also pay attention to the report relativity, that is, the content can be used in management decision-making.

4. Separation on controllable and uncontrollable item. Controllable item refers to the one that may be impacted by management decision-making action directly. Management should not be responsible for the uncontrollable item, in addition, separation method and principle should be rational and consistent.

5. Appropriate to the design the report format. Considering the following requirements during report format design: nature of statements and readability; Amount detailed level according to the user-level; Comparing the actual number with standard parallel with difference or ratio showed; Distinction between statements usage or emergency purposes; Using the graphic method to improve the conveying ability of the figures.

6. Provide timely. As management decisions have immediate and continuing impact on the operating results, the time difference should be as short as possible between "to make decisions" and "report". The major reasons are as follows: adverse circumstances and problems can raise management attention to tracing the cause and correction when they happened. The time adverse situation persists longer, the company suffered losses is larger. With the passage of time, management will tend to treat disadvantaged situation as a normal phenomenon.

7. Assistance rather than criticism. In addition to conveying information, the evaluation report should have incentives function. Constructive expressive way using in the report can lead management to improve self work performance.

2.2.7 Modern Shipbuilding Enterprise related performance evaluation method

2.2.7.1 The production and financial characteristics of modern shipbuilding enterprise

The production characteristic of modern shipbuilding enterprise is small batch production of large single pieces, which has the following management characteristics:

1. Product variety and standard are large while the quantity of production is small. Design and production are based on the customer's order. The nature of the work varies according to the variety, specifications, delivery time, price the customer required.

2. There are strict requirements of timing constraints and sets between the various components. Ability balance and utilization rate of key equipment is the core part of production and control.

3. There are strict requirements of due date, besides that, every time the product ordered in the list are mostly different from the past. Although they are not totally new, probably there are some changes in the design, size and shape. Based on the due date, the production is organized with the independent requirement in the order list.

4. Production structure is complex so correspondingly it has long production circle and low percentage of repeat operations. Therefore, it is difficult to apply pipeline

and exclusive equipment to produce. In order to assure the due date, enterprise is doing the work of design, production and revising at the same time instead of starting to produce after everything is ready, which is one of the dominant characteristics of large-single-piece production enterprise.

5. Difficulties of production organization: only after the completion of production and technology of the single large piece production organization, it is possible to code a reasonable production plan. The preparation circle is comparably long, therefore, with the condition of manual management, because of the poor timely communications between various departments and projects, it is inevitable to have such problems: disagreements of the technology material of the same parts other; inevitable conflicts of production resources; ineffective matching of product assembly; unsureness of materials supply; difficulties to achieve quota materials during the production.

6. Dynamic difficultly to control costs: large single pieces: large single piece of production is organized by the order. The cost and composing of product is set after the completion of product design, process planning, materials list forming, process lines, and fixed working hours. The control of fixed product cost differs from the projects. Huge amount of data brings the obstacles of cost control.

7. Guaranteeing the delivery and controlling the goal cost is the target that large single pieces production management pursues.

2.2.7.2 Current performance evaluation method of shipbuilding enterprise

Based the characteristics of ship building enterprise described above, right now the performance appraisal system of domestic ship building enterprises is “financial

performance evaluation system", which applies integrated financial indicators, such as the output, profits, return on investment, rates of assets and liabilities to evaluate the effectiveness of shipbuilding enterprises.

In addition, Chinese shipbuilding enterprises have adopted expert's evaluation and economic analysis, etc as the performance evaluation methods. Expert evaluation method is a kind of standard based on subjective judgment of experts, usually assessed by the "score", "index", "ordinal", and "reviews". Methods commonly used are: scoring, grading, weighted scoring and outranking. Because these methods are relatively simple, they are easy to use. The shortcoming of the method is too subjective. Although shipbuilding enterprises need experts to guide production, obviously, the method is not dependable in the performance evaluation of complex structure shipbuilding enterprise.

Economic analysis is an evaluation method with a agreed comprehensive economic indicators. Common methods include: direct present of comprehensive economic indicators formula or model, a cost-benefit analysis, and so on. Such kind of methods are usually used in the development of new products and technology achievements, economic evaluation, imbalance extent of regional economic developments and various investment projects evaluation. Economic analysis had the advantage of well-established to facilitate the comparison of different target; the shortcomings is that formula or model is not easy to establish, furthermore, for more factors involved evaluation targets, it is often difficult to provide a unified formula. Therefore, the method in modern shipbuilding enterprise is practicality far less than that in the application of economic department.

Today with the increased competition in the market, the development of enterprise

performance evaluation shows descending trend; non-financial indicators play a increasingly important role, such as social responsibility of the enterprise; customer satisfaction survey orientation; from the emphasis on the results of appraisal process to focus on the innovation and process assessments.

In the same very competitive shipping market, how to take the initiative to find and capture the needs of the owner, effectively transmission through effective evaluation system within the enterprise becomes a major issue that every shipbuilding enterprises facing. If the shipbuilding enterprise evaluation system lacks of effective owner-driven transmission system, enterprise will not find and meet the needs of owner timely and consistently, which makes “the owner is God” a empty talk, of course it will be impossible to cultivate the loyalty of owners, and make Chinese shipbuilding enterprises lack of sustained ability to realize the value of market. In order to enhance the strength of shipbuilding enterprises to achieve the sustainable development of society, it is necessary to establish a more comprehensive evaluation of the performance evaluation system.

CHAPTER 3

THE ANALYSIS ON THE NECCESSITIES AND FEASIBILITY OF ACTIVITY-BASED COST FOR MODERN SHIPBUILDING ENTERPRISES PERFORMANCE EVALUATION

3.1 The effect of cost analysis for modern shipbuilding enterprises

The competition under a condition of market economy is actually the competition of costs in a great extent. The ability of competition will largely depend on its cost level. Therefore, cost is the most influential factor for enterprises' profit; the cost analysis surely becomes the most important factor for performance evaluation.

Ship manufacturing enterprise is a sort of condense material producing branch, which is consisted from interaction between capital, technology and laboring. The internal economical management system is very complex which has a complex internal economic management system. Not matter a small boat cost thousands of dollars or a VLCC cost around 100 millions, both need to consume lots of labor, material and financial, and have long producing circle. Therefore, it is very important

in accounting and controlling costs. Even a little fluctuation in the cost brings huge impact on enterprises' performance. Only the accounting is based on scientific method the cost control for prepared producing stage especially for product design stage could be done correctly in order to increase the profit. Therefore, the scientific and object evaluation should be based on the true cost information which is applied for modern shipbuilding enterprises as well.

3.2 Necessity analysis of activity-based costing for modern Shipbuilding enterprises

3.2.1 Limitations of traditional cost accounting system

Traditional cost accounting system focuses more on the mathematician and controlling of the raw materials and raw labor (such as direct working hours and machine hours) and other direct costs and the system is suitable for the enterprise whose product has fewer categories and has less proportion indirect expense. With the development of advanced technology and the global competition, the manufacturing environment for modern shipbuilding enterprise has changed a lot. The proportion for direct labor cost has reduced and the indirect expense has increased very much. Under this condition, traditional costs accounting and traditional management has been impact a lot and gradually exposed some defects.

3.2.1.1 Unprofitable aspects of traditional accounting

Traditional cost calculation allocate the manufacturing cost simply based on the working hours or machine hours, which is obviously effect the accuracy of the products costs. That is during the manufacturing activities, a considerable part has nothing to do with the volume, if this non-relationship manufacturing cost being

allocated by the standards based on volume cost, the products cost will be misunderstood as to an incorrect performance evaluation and even worse a wrong operation decision.

3.2.1.2 Scope restriction of the traditional accounting in cost calculation

Traditional calculating systems pays more attention on the cost in the process of producing and ignores the cost in the process of management, focusing more on the cost control after producing and ignore the developing cost before producing. Actually, the enterprises' producing process and construction has changed a lot and the product cost has reduced due to the producing activities' development, meanwhile the cost caused by management activities has increased day by day. From the point of management, the cost has expanded to each field in the enterprise such as management and producing process in order to meet enterprises' requirement. What's opposite, it will cause the unfair evaluation about the products cost if still using traditional accounting system, as to a serious impact on the accuracy of enterprise performance evaluation.

3.2.1.3 Invalid cost control of traditional accounting

Traditional cost controlling system usually ask accounting stuff to research the information which are easy calculated and seems good to enterprises' operation activities. But actually this information has limited value and others are hardly to be calculated or collected. Take the scrap as an example, traditional accounting system can help calculating the cost of the scrap but what about the time producing the scrap? Which is hardly to calculated and collected, perhaps actually the time cost is several times than the scrap cost itself. We usually ignore the waste time cost due to it is an invisible cost and hard to collect. It is a restriction for enterprise to make good operation decision.

3.2.2 Advantages of using activity-based costing

The traditional cost accounting is not so incompatible with the new manufacturing environment which makes ABC used more and more widely. The ABC treats the direct and indirect costs fairly as the expense consumed by product. The affirmation and allocation for direct expense using ABC is the same as traditional accounting method while the affirmation and allocation for indirect expense is based on the activity driver which is to adopt diversified allocation standards which is in keeping with the actual criteria as well, as to enhance the belongingness for all of the costs. Therefore, from the point of the allocation accuracy of manufacturing cost, the cost information from ABC is more objective, reliable and correct, as to improve the necessity of using ABC in modern shipbuilding enterprises.

3.3 Feasibility Analysis of Activity-based Costing for Modern Shipbuilding Enterprise

3.3.1 Universal applicability of activity-based costing

1、Qualitative evaluation principles

(1) Whether or not the enterprises provide more than one product of service?

(2) Is there any difference between all kinds of product?

(3) Is the manufacturing cost plays a very important role in the total cost?

(4) Is the manufacturing cost growing fast?

(5) Is the important elements in manufacturing cost has the close relationship with the activities such as planning, balancing, quality controlling?

(6) Is the manufacturing freight based on the traditional accounting method of working hours or machine hours?

(7) Is the marketing though different ways?

(8) Do customers need the different services from different levels?

If the answers over above eight questions are all yes, the enterprises should seriously consider adopting the activity-based costing system.

2、The cost-lowest principle

Adopting ABC system needs to weight both the mathematic cost and the error cost. The introduction of a cost accounting system should include the related factors below:

(1) Mathematic Cost.

As the initial information for ABC accounting method required has been produced, the cost is often measured as: for calculating of the cost of the information producing the product system necessarily and the necessary calculation for measuring product cost. With the development of new measurement technology, the mathematic cost has a trend of being continuously reduced which leads a result that the requirements for the accuracy of each product's cost should be raised.

(2) Mistake Cost

Mistakes cost refers to the loss arising from the cost by wrong cost guidance for producing costs and erroneous policies and the wrong strategies' normal performance are: bad related strategies for product such as producing commodities which are not profitable due to not appropriate pricing decision or product design or investment decision or incorrect cost budget. Mistake costs' higher or lower is highly related with the enterprises' facing competition from external and internal. The more intense the competition, the higher the mistake cost. What's more, the mistake cost is effected by the structure fluctuation of manufacturing cost, that is because the increase of the organic composition of capital is an inevitable trend, manufacturing

costs grows continuously as to a growing complexity of the components, leading to mistakes cost showing an upward trend day after day. The more important the manufacturing cost, the higher the mistake cost, and the stricter requirement for accuracy of product cost.

Mathematic cost and mistake costs has the relationship of negative related which means the mathematic cost in simple cost calculation system is low while the mistake cost is high. That is because only rough cost information can be provided in order that the operation managers have to pay a lot to do economic decision; while in complex cost calculating system, the mathematic cost is high and the mistake cost is low. The perfect calculating system is to minimize the total sum of mathematic cost and mistake cost. If the accuracy in optimal point is higher than the existing cost accounting system for the accuracy, which means the existing system is no more fit the management requirement, therefore it is necessary to adopt the ABC system to improve the accuracy performance.

3.3.2 Activity-based costing in the applicability of modern shipbuilding industry

Shipbuilding Enterprises are typical multiple types of small batch enterprises and ship producing is the complex orders-production processing which needs large investment and has a long life cycle, This means that the traditional shipbuilding industry in a very long time it is difficult to shake off hand workshop production model. But as the development of modern shipbuilding model which focus more “group technology”, more and more advanced shipbuilding technique has been used in shipbuilding, Shipbuilding has achieved large industrial assembly line production in order time and space and leads to a substantial increase in the degree of automation and mechanization, as to satisfy Owners’ individual requirement better. Thus, the proportion of manufacturing cost in total costs has increased continuously,

which indicates that it will be more suitable for building activity-based costing account system.

According to the statement about the modern shipbuilding characteristics and feasibility analysis for establishing ABC system, this advanced modern shipbuilding mode has the feasibility to use ABC, therefore it is feasible to use ABC in accounting the manufacturing cost in modern shipyards

CHAPTER 4

THE APPLICATION OF ABC IN MODERN SHIPBUILDING ENTERPRISES' PERFORMANCE EVALUATION SYSTEM

In the previous chapter, the necessity and feasibility of ABC is analyzed, from which we can conclude that, using ABC principle has many advantages for shipbuilding enterprises in aspects such as cost analysis. Therefore, through introducing successful samples in this chapter, performance evaluation of modern shipbuilding corporation will be studied using operational cost theory, and to verify feasibility of operational cost in benefit evaluation of modern shipbuilding enterprises.

4.1 Case Study of analysis of performance evaluation for Company A

4.1.1 Background Details of Company A

Company A is a shipbuilding enterprise with 30 years history. Due to financial predicament, Company A was purchased by XX Corporation Group and became a subsidiary company. It has advanced shipbuilding technology; its annual shipbuilding capacity already exceeded 300,000 tons, mainly bulk carriers below Panama Class. In the past few years, because of flourishing shipbuilding industry,

this newly reformed company after reformation senses competitive pressure as well, which urges them to focus on external effects as well as internal. Performance evaluation has to comply with this change too. Therefore, comprehensive performance evaluation appears to be especially important.

Company A is undergoing a series of reforming measures, such as capital and business process reformation, client service enhancement, setting up corresponsive enterprise and employee performance evaluation system, and relating performance with employee's salary, so as to motivate employee and achieve increase in revenue.

4.1.2 Establishment of Company A's Guideline System

Firstly, company A gave definite orientation for its future development; it then created its development blueprint follow outstanding principle. It also picked up sufficient key points in benefit of modern shipbuilding mode, combined with procedural targets and successful standards, to found evaluation guideline system.

Company A realized that, long term development of the corporation involves every production departments and aspects, including System and mechanism, labor organization structure, innovation mechanism, salary distribution system, production management system, financial control system, human resource system and talents structure, etc. It is not only transformation in shipbuilding method, but also significant revolutions in shipbuilding management mode, design ideas and technology innovation. It makes material, capital and information to be sufficiently used, in order to meet the needs of adapting market competition and improving competitive ability. Thus, company A's performance evaluation guideline should comprehensively reflect the corporation's management mode, management ability,

comprehensive capacity, improvements in economical benefit and increased targets. In general, company A has the following strategic goals:

1. Shorten shipbuilding period, enlarge total shipbuilding capacity and increase corporation's economical benefit

2. Expand shipbuilding quantity, increase corporation productive efficiency.

3. Improve ship design ability; actually implement combination of bulk, launch and paint.

4. Increase ship export and earn more foreign exchange.

5. Strengthen management level by information technology; Accelerate modernizing shipbuilding industry and improve international competitive ability.

6. Train professional ship building technician.

Evaluation guideline exists in all links of enterprise operation. According to theory discussed in previous chapter, integrating with company A's strategic goal, the following indicators are picked to be analyzed.

1. Client indicator

Client indicator is the outcome from the enterprise. Outstanding customer service must provide enterprise the advantage to bypass its competitor. Therefore, improving customer service is always an effective method to create permanent competitive advantage. Within the relationship between service provider and customer, enterprises provide excellent pre-sale and post-sale services in order to become the

real source for client's asset. The clients, on the other hand, get satisfactory services. A smart measure to handle clients' objections is very important for an enterprise to be differentiated from competitors and attract more clients.

2. Financial economical benefit indicator

It is mentioned in the second chapter, a company's benefit evaluation is usually judged from four aspects: profit-earning ability, debt-paying ability, development ability and operation ability. Due to particularity of shipbuilding companies themselves, key indicators need to be chosen, as well as the goals of different enterprises on different stages, and standards of success application of modern ship building mode. They can be divided into more details as:

(1) Cost indicator

Cost is a fundamental indicator for judging economic benefit. Any benefit evaluation can not be divided apart form cost indicator, including modern ship building benefit evaluation. These are chosen to be cost indicator: direct cost, production cost and specific cost. Direct cost includes raw material cost and labour cost. Production cost includes management employee's salary, welfare, tear and wear, water and electricity, insurance, repair, low value consumable goods, travel charge, transportation, labour protection, CPF savings, single child charge, etc. Specific cost includes dock charge, berth charge, pier fee, test sailing fee, examination fee, insurance fee etc…

(2) Periodical indicator

As well known, ship manufacture has long input-outcome period. (as table 4.1)As a result, the manufacturing period becomes an essential indicator to evaluate its economic benefit. Ship manufacturing period is the time between the date contract signed and the date ship handed over. Also ship manufacturing period is also generally referred to as in the chart below. Because berth and dock resources are

limited to ship manufacturers, they become significant factors restricting the effort to shorten ship manufacturing period. Therefore, ship building period, berth period and dock period are chosen to become indicators

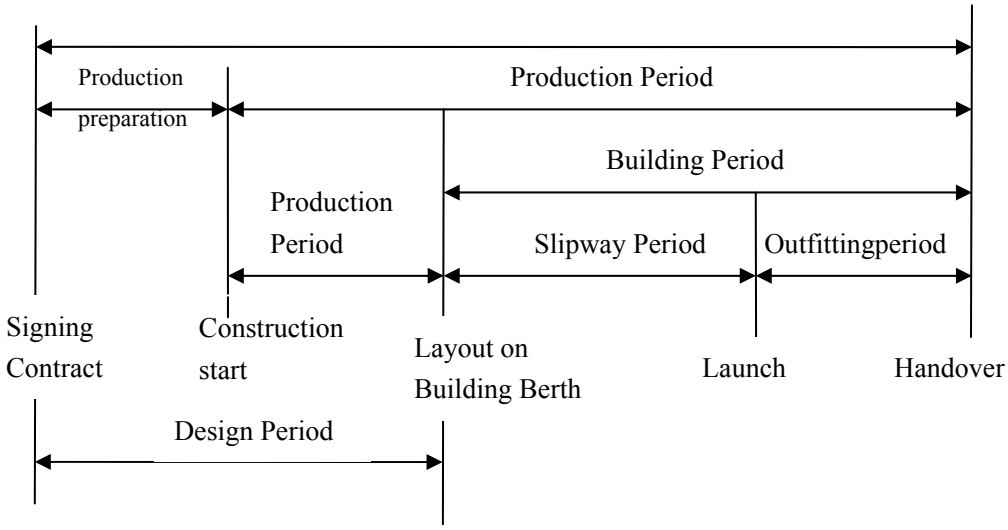

Table 4-1 The processing period for shipbuilding

(3) Quality indicator

Shipbuilding enterprises always target on improving quality. It is because they can only seize their position in intensive competition and create world famous brand by building high quality ships. Thus, quality certainly becomes one of the essential indicators in modern shipbuilding mode. What are selected as quality indicators including: level one quality in classified projects, X-ray scan one off pass rate, and main machine parts level one quality.

(4) Revenue indicator

Revenue is the most direct reflection of enterprise's economic profit, so as to be one of the essential indicators for profit evaluation. The revenue indicators chosen are: sales income, per capita added value, per capita revenue tax.

3. Internal management

Normal internal revenue indicators' evaluation indicators are mentioned in Chapter Two, company A mixed it with enterprise's characteristics. It is because modern shipbuilding mode is a revolution to production and management system of shipbuilding companies in our country, which is a combined management mode including producing bulk, boat and paint. In more details, it combines design, craftwork and management; it is based on hull and boat assembly; it uses regional construction as principle; it also expands computer aid design and manufacturing, rational craftwork flow and distribution; it achieves pallet control and regional assembly, strict plan management and man-hour management. Thus company A chooses following internal revenue evaluation indicators: management modernized level, shipbuilding technology level, pollution level, safe production and civilized production etc.

4. Innovation and study

Modern shipbuilding mode can don't be divided from new technology and professional's development. Internal enterprises achievement comes from enterprise's core competitive ability. Table 4-2 can be made from above points.

4.1.3 Data processing procedure

After founding comprehensive evaluation for achievement, relevant historical data can be used to score pre-set key indicators, which reflects achievement status and development trend of enterprises' finance, clients, external revenue and improvement. The key is to calculate scores for each individual indicator. The following steps are used to calculate scores after physical research of company A.

First class indicators	Strategy goals	Second class indicators	
Client	Better satisfaction from client	Market share	
		Client satisfaction	
		Lodging	
		Lodging limitation	
Finance	Increasing profit	Cost	Direct cost
			Manufacturing cost
			Professional cost
		Period	Processing period
			Slipway period
			Outfitting period
		Quality	Level one quality in classified projects
			X-ray scan one off pass ratio
			Main machine parts level one quality
		Revenue	Sales income
			Per capita added value
			Per capita revenue tax
Internal management	Promotion shipbuilding industry harmonious development with society	Modernization management	Environment pollution
			Safe production
			Activity consistency
		Advanced shipbuilding techno	Eligibility level
			Product recycle indicator
			GIT level
Innovation and study	Increasing individual effective investment	Intelligence capital ratio	
		Innovation product ratio 创新产品比率	
		Employees training increasing ratio	
		Suggested increasing employees ratio	

Table 4-2 Enterprise strategic goal system

(1) Design indicator's weight according to research result

Based on confirmed concrete achievement evaluation, each indicator's weight from both levels is ensured through expert grades. Enterprise's strategy (target level)is set as A, four evaluation aspects in achievement comprehensive evaluation system are set to B, indicators on level two are set to C. Take confirmation process of level one indicator for instance:

A	B1	B2	B3	B4
B1	1	0.25	0.33	2
B2	4	1	1	2
B3	3	1	1	0.25
B4	0.5	0.5	0.5	1

Table 4-3, estimated matrix A-B

① Normalization of each rows in matrix

$\Sigma a11$= 1+4+3+0.5=8.5

$\bar{a}11$= 1/8.5=0.1176, $\bar{a}21$ =4 /8.5=0.4706,

$\bar{a}31$=3 / 8.5 =0 .3529, $\bar{a}41$=0 .5/8.5=0.0588

For same reason:

$\bar{a}12$=0.25/2.75=0.0909, $\bar{a}22$=1/2.75=0.3636,

$\bar{a}32$=1/2.75=0.3636, $\bar{a}42$=0.5/2.75=0.1818

$\bar{a}13$=0.33/2.83=0.1166, $\bar{a}23$=1/2.83=0.3534,

$\bar{a}33$=1/2.83=0.3534, $\bar{a}43$ =0.5/2.83=0.1767

$\bar{a}14$= 2/5.5=0.3636, $\bar{a}24$=2/5.5=0.3636,

$\bar{a}$34=0.25/5.5=0.0909, $\bar{a}$44=1/5.5=0.1818

② summarization of normalized matrix

$$\begin{pmatrix} 0.1176 & 0.0909 & 0.1166 & 0.3636 \\ 0.4706 & 0.3636 & 0.3534 & 0.3636 \\ 0.3529 & 0.3636 & 0.3534 & 0.0909 \\ 0.0588 & 0.1818 & 0.1767 & 0.1818 \end{pmatrix}$$

$\overline{W}$1=0.1176+0.0909+0.1166+0.3636=0.6888

$\overline{W}$2 = 0.4706+0.3636+0.3534+0.3636=1.5512

$\overline{W}$3 = 0.3529+0.3636+0.3534+0.0909=1.1608

$\overline{W}$4 = 0.0588+0.1818+0.1767+0.1818=0.5991

③ Normalizing vector

$\overline{W}$ = (0.6888 1.5512 1.1608 0.5991)^T

$\sum \overline{W}$i=0. 6888+1.5512+1.1608+0.5991=4

$\overline{W}$1=0.6888/4=0.1722 $\overline{W}$2=1.5512/4=0.3878

$\overline{W}$3=1.1608/4=0.2902 $\overline{W}$4=0.5991/4=0.1498

W= (0.1722 0.3878 0.2902 0.1498)

④ Calculating λ max

$$AW = \begin{pmatrix} 1 & 0.25 & 0.33 & 2 \\ 4 & 1 & 1 & 2 \\ 3 & 1 & 1 & 0.5 \\ 0.5 & 0.5 & 0.5 & 1 \end{pmatrix} \begin{pmatrix} 0.1722 \\ 0.3878 \\ 0.2902 \\ 0.1498 \end{pmatrix}$$

: $(AW)_1 = 1\times 0.1722+0.25\times 0.3878+0.33\times 0.2902+2\times 0.1498=0.9647$

$(AW)_2 = 4\times 0.1722+1\times 0.3878+1\times 0.2902+2\times 0.1498=1.0742$

$(AW)_3 = 1\times 0.1722+2\times 0.3878+1\times 0.2902+0.5\times 0.1498=1.0936$

$(AW)_4 = 1\times 0.1722+0.5\times 0.3878+0.5\times 0.2902+1\times 0.1498=0.9595$

$$\therefore \lambda_{\max} = \sum_{i=1}^{n} \frac{(AW)_i}{n \cdot W_i} = \frac{0.9647}{(4\times 0.1722)} + \frac{1.0742}{(4\times 0.3878)} + \frac{1.0936}{(4\times 0.2902)} + \frac{0.9595}{(4\times 0.1498)}$$

$= 4.0921$

$$C.I = \frac{\lambda_{\max} - n}{n-1},$$

CI = (4.0921 - 4)/3= 0.0307

⑤ consistency check

It can be found in the table that n=4, RI=0.9, CR = CI /RI = 0.0307/0.9 = 0.034< 0, so it is consistent. So matrix A-B has acceptable consistency. Therefore, four

indicators can get weight coefficients as in Table 4-4

A	B1	B2	B3	B4
Weight	17.22%	38.78%	29.02%	14.98%

Table 4-4, Company A's weight coefficient distribution

As what can be known from above table: client evaluation has a weight of 17.22% comparing with total target level; financial evaluation has a weight of 38.78% comparing with total target level; internal revenue evaluation has a weight of 29.02 %; comparing with total target level; Study and development evaluation has a weight of 14.98%comparing with total target level

B2	C1	C2	C3	C4	Weight
C1	1	3	4	2	45.58%
C2	0.33	1	1	0.33	11.89%
C3	0.25	1	1	0.25	10.3%
C4	0.5	3	4	1	32.23%

$\lambda max = 4.0709$, $CI = 0.0236$, $RI = 0.9$, $CR = 0.026 < 0.1$

Table 4-5. Estimated matrix B2-C

As in the table, Cost indicator has a weight of 45.58% comparing with financial comment indicator; Periodic indicator has a weight of 11.89% comparing with financial comment indicator; Quality indicator has a weight of 10.3%comparing with financial comment indicator; Revenue indicator has a weight of 32.23% comparing

with financial comment indicator.

C1	D6	D7	D8	Weight
D6	1	2	3	52.78%
D7	0.5	1	3	32.25%
D8	0.33	0.33	1	13.97%

λmax=3.0536, CI=0.0268, RI=0.58, CR=0.046<0.1

Table 4-6 Estimated matrix C1-D

As in the table, direct cost has a weight of 52.78% comparing with cost indicator evaluation; production cost has a weight of 33.25%comparing with cost indicator evaluation; Profession cost has a weight of 13.97% comparing with cost indicator evaluation. Therefore,

Indicator D6's relative weight to A = 38.78%X 4 5.58%X 5 2.78%=9.33%

Indicator D7's relative weight to A = 38.78%X 4 5.58%X 3 3.25%=5.88%

Indicator D8's relative weight to A = 38.78%X 4 5.58%X 1 3.97%=2.47%

For the same reason, Matrix Bl-D, B4-D, C2-D, C3-D can be acquired, as well as λ max, CI, RI, CR. All attached in attachment.

According to above result, weight distribution for each evaluation indicator can be achieved, its consistency test is done through $CR_t = CI_t / RI_t$.

Then Table 4-7 is filled up with indicators' weight from each level.

(2) Calculation of comprehensive evaluation value

Quantized value of revenue evaluation indicator multiply weight of achievement evaluation indicator gives comprehensive evaluation value for enterprise achievement evaluation. Level one indicator values can be derived from level two indicator values. Level two indicator values = level two indicator values × level two indicator weight. Level one indicator values = level one indicator values × level one indicator weight.

4.1.4 Performance evaluation report

Using daily collection of information, comparing with fixed indicator system and annual budget standard, evaluation report can be planed for enterprise establishment evaluation. Comparing actual achievement with evaluation standard, analyse the reason difference derived. The formal of evaluation report will be attached.

4.2 Suggestions for enterprise management mechanism according to work cost evaluation

According to Table 4-7, each part's weight of the total revenue is obvious. For instance, financial indicator is only 32% of the comprehensive indicator. Too many factors will be lost if solely analyzing from finance. Shipbuilding market is continuously bullish, competition become more intensive. All shipbuilding factories will lower production expenses and direct cost, although technology, equipment and management are all improving, remedy from overall interest is the key for efficiency increase. It is more systematic to evaluate enterprise's revenue if utilizing work cost, and it improves enterprise's core competitive ability by analyzing from the big picture. Therefore, according to documented report and outstanding principles, following suggestions can be made:

4.2.1 Realise the excellence motivated for customers

Customers are the only and final judge for enterprise's achievement and quality. Excellent customer motivation is a strategic concept, its soul is about customer's royalty and increase in market share. It also requires listening to customer's real need, predicting market changes, grasping technology development, clearly acknowledging competitor's position and reacting flexibly to customers and changes in markets.

4.2.2 Organise group and individual study

"Study" means acquire new knowledge and skills through comments, research, experience and innovation. Organized study is achieved through research and development, evaluation and circular remedy, employee and clients' assumption and comments, analysis of goal enterprises. Individual study is through education, training and promoted personal development chances. In order to acquire highest operational achievement, organizational and individual have to be effective. Study evolves into better products and services; it also improves enterprises' response ability, adaptive ability, innovative ability and efficiency, so that organization would have strengthened market power and achievement superiority, also employee will be more satisfied and have the demand for excellence.

4.2.3 Set up agile production

Agility refers to enterprise's ability to quick response. All enterprises have to face the shortened launch time for new product and service, at the same time they have to face quicker customer response. In order to improve response time (such as shipbuilding period), enterprises need to simplify work unit and process, and they have to have the ability to swap quickly between different procedures. Time-consuming performance becomes more and more important in all fields

nowadays. Duration has become a key procedure indicator.

4.2.4 Innovative management concept

Innovation means executing practical modification, in order to amend enterprises' products, services and processes, and to create value for beneficiaries of the enterprises. Innovation is not a specific area only for development department any more, it is very important for all aspects of enterprises. Enterprise leaders should make innovation part of company culture, and integrate it with daily work. Innovation is founded onto company and its employee's accumulated knowledge. Sufficient use of this knowledge is essential for promoting innovative management.

4.2.5 Update production concept

Building consistent concept as revenue evaluation system under operational cost is also critical. Executing advanced shipbuilding mode, encouraging scientific and environmental production, enhancing advertising campaign and theoretical study, building new production concept, organizing manage concept, letting every person fully understand teamwork concept, comprehensive concept, dynamic concept and priority concept…All these seem to be straightforward, however, its advantage in mode-swapping and abundant scientific meaning can only be understood by assiduous study.

4.2.6 Enhance technology innovation

Enhancing technology innovation should persist in shipbuilding technology development, deeply research productive technology of semi finished product and integrated production technology, so computer integrated construction system is accelerated to be put in use. Detailed measures are, confirming people, equipment and location for all semi-finished products. At the same time, defining boundaries by

products' appreciated activity, reconstructing clear duties and shared target work groups, so the advanced manufacturing technology and design are firmly implemented into production of semi finished products. These products can then be differentiated from specialized manufacturing and massively produced. After being applied with "turnover" technology and information technology, all independent units during shipbuilding can be mapped into cooperative network.

	First class indicators	Strategy goals	Second class indicators		Wight (%)		
Performance evaluation sys	Client B1	Better satisfaction from client	Market share D1		5.92	17.22	17.22
			Client satisfaction D2		1.75		
			Lodging D3		1.85		
			Lodging limitation D4		3.21		
			Revenue from clients D5		4.49		
	Finance B2	Increasing profit	Cost C1	Direct cost D6	9.33	17.68	32.78
				Manufacturing cost D7	5.88		
				Professional cost D8	2.47		
			Period C2	Processing period D9	2.04	4.61	
				Slipway period D10	1.79		
				Outfitting period D11	0.78		
			Quality C3	Level one quality in classified projects D12	1.97	3.99	
				X-ray scan one off pass ratio D13	0.78		
				Main machine parts level one quality	1.24		

t e m A				D14			
			Revenue C4	Sales income D15	5	12.5	
				Per capita added value D16	5		
				Per capita revenue tax D17	2.5		
	Internal management B3	Promotion shipbuilding industry harmonious development with society	Modernization management C5	Environment pollution D18	5.8	14.5	29.02
				Safe production D19	2.9		
				Activity consistency D20	5.8		
			Advanced shipbuilding techno C6	Eligibility level D21	5.8	14.5	
				Product recycle indicator D22	5.8		
				GIT level D23	2.9		
	Innovation and study B4	Increasing individual effective investment	Intelligence capital ratiD24		4.67	14.98	14.98
			Innovation product ratio D25		3.51		
			Employees training increasing ratio D26		1.83		
			Suggested increasing employees ratio D27		4.97		

Table 4-7, Company A's annual comprehensive evaluation indicators weights calculation table

CHAPTER 5

SUMMARY OF THE DISSERTATION

5.1 The main conclusions of this dissertation

This dissertation use the principle of activity based cost; choose the performance evaluation system in shipbuilding modern industry as the reaching issue and with the expectation to provide some useful suggestions for the enterprise management operators. And following points are the main researching conclusions.

1. Has introduced the traditional performance evaluation system and compared with of evaluation system which based of activity costs. Therefore get a obviously advantage of using the principle of activity-based costing in the evaluation of modern shipbuilding enterprises. On the other hand, through the analysis of the shipbuilding enterprises' characteristics in the aspects of management and manufacturing can get a basic index system in order to make a foundation for establishing a performance evaluation system based on activity cost.

2. Has introduce the principle of activity -based cost and theory of cost driver and showed the difference between traditional accounting system and ABC system then proposed the cost management which can be based on activity, as to help enterprise to get a through data from the whole manufacturing process. Which present the fair data and act as a linkage between performance management and cost driver. What's

more, ABM connects the activity center and the responsibility center and declare the difference between economical responsibility and rights responsibility. Meantime, throughout the analysis of appropriate cost driver, the cost index and the performance information should be taken reliable and true. As to establish the evaluation system from the nonfinancial point and optimize the performance evaluation system.

3. Has point out the disadvantage of the traditional cost calculation of shipbuilding enterprise using at present, as we know, cost has a very closely relationship with the result of performance evaluation, therefore, the writer make a combination with ABC and the principle of Excellence Standards and setup a evaluation system in modern shipbuilding enterprise, improve the necessity and feasibility of using ABC principle in shipbuilding performance evaluation.

4. With the inspiration of new evaluation method, especially with the principle of the excellent performance evaluation, decompose the whole stratagem and development foreground, propose to make a composite evaluation in to fours aspect: finance performance, customer, internal management course, as to study and promote the system. And combined with the idea of ABC as well the writer established the evaluation system in modern shipbuilding enterprise，as it is presented in the above related chapters, it is a good linkage between quantitative analysis and qualitative analysis which makes the evaluation more scientific and more objective. According to the results it can be gained that improving Chinese shipbuilding effectiveness, reducing direct cost is not the only solution, but also from the deeper thought such as employee management, technology management, innovation management, ect, therefore the profit and competitions of shipbuilding industry will be truly enhanced and improved though the cost driver management.

5. Taking the cost driver information in ABC as the method of performance

evaluation and tool of behavior correction, which brings not only benefit for operation management but also for strategic management. According to the reaching of performance evaluation in modern shipbuilding enterprises, we can see the weakness and strengthens more clearly if the principle based activity cost, as to provide the relative suggestions and solutions.

5.2 Expectation for Shipbuilding Enterprises' Performance Evaluation

As we know the high developing speed of communication of technique and electronics, the enterprise impossibly depend on industrial ages to manage nowadays large-scale produce and install a way to carry enterprise management large-scalely, all the systems including the evaluation system of the business should be adjusted. At this times whatever shipbuilding enterprise but other professions regardless, management layer can't just reflect the after the event accomplishment of sex and summary index sign, but dynamic and instant to the supervision of the enterprises operation processes even is a great deal of before the event of, have omen accomplishment index sign. In regard to shipbuilding enterprise, the performance evaluation system will also present following development trend:

(1) The scope which evaluates contents improves continuously with extension, no longer limiting at influence to be a relevant factor of expecting the accomplishment, the accomplishment will also drive a factor to bring into accomplishment evaluation system in the future. Each accomplishment of stage of business enterprise contains two kinds of manifestations, one is performance of profits, cash discharge and the improvement of the finance accomplishment in the near future; the one is to those which can promote business enterprise of farsighted development namely strategic

target of realization and contribute to the exaltation of the accomplishment of future, such as research devotion, manpower capital investment etc. These devotion not only can't body period performance, but will also lower period of investment guerdon rate, cash discharge and finance accomplishment. But for the farsighted development of business enterprise it will be play an important part. Business enterprise in the future will pay more attention to those factors which can drive accomplishment of enterprise such as guest satisfaction, market share; product kimono works quality, human resource character, knowledge and information productivity etc.

(2) The financial indicators play the same important role with nonfiancial indicators which focus on the long term or short term development of enterprise. The information contained in the nonfinancial aspects represents the enterprises' activity more directly, not only the financial results, also the indicator for the future financial performance, as to improve the enterprises' performance in all related fields.

(3)Performance evaluating is no longer only the method of control with incentive of premise, also has become a valid tool for strategic management. Its communication and direction function becomes more and more useful. It will guide the employee's behavior, and affect carrying out the strategy of enterprise. The strategic accomplishment evaluates system is not only a kind of accomplishment evaluation system, but also a kind of strategy management system. Pays attention to the ability of management process of the development and related evaluation of enterprise exterior's benefit

Due to the writer's lack of theoretical and practical experience, there are some unavoidable mistakes or some problems needs further research in the dissertation, and any criticize will be welcome, meanwhile, the writer will go further research

such as ABC method in practical and studying process in the future.

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APPENDEX

B1	D1	D2	D3	D4	D5	Weight(%)
D1	1	4	2	2	2	34.39
D2	0.25	1	2	0.33	0.25	10.17
D3	0.5	0.5	1	0.5	0.5	10.73
D4	0.5	3	2	1	0.5	18.66
D5	0.5	4	2	2	1	26.05

λmax = 5.1906, CI = 0.0477, RI = 1.12, CR = 0.043< 0.1

Estimated matrix B1-D

C2	D9	D10	D11	Weight(%)
D9	1	1	3	44.34
D10	1	1	2	38.73
D11	0.33	0.5	1	16.92

λmax=3.0183, CI=0.0009, RI=0.58, CR=0.016<0.1

Estimated matrix C2-D

C3	D12	D13	D14	Weight(%)
D12	1	2	2	49.34
D13	0.5	1	0.5	19.58
D14	0.5	2	1	31.08

λmax=3.0356, CI=0.0268, RI=0.58, CR=0.046<0.1

Estimated matrix C3-D

C4	D15	D16	D17	Weight(%)
D15	1	1	2	44
D16	1	1	2	40
D17	0.5	0.5	1	20

λmax=0, CI=0, RI=0.58, CR=0<0.1

Estimated matrix C4-D

B3	C5	C6	Weight(%)
C5	1	1	50
C6	1	1	50

λmax=0, CI=0, RI=0, CR=0<0.1

Estimated matrix B3-D

C5	D18	D19	D20	Weight(%)
D18	1	2	1	40
D19	0.5	1	0.5	20
D20	1	2	1	40

λmax=0, CI=0, RI=0.58, CR=0<0.1

Estimated matrix C5-D

C6	D9	D10	D11	Weight(%)
D21	1	1	2	40
D22	1	1	2	40
D23	0.5	0.5	1	20

λmax=0, CI=0, RI=0.58, CR=0<0.1

Estimated matrix C6-D

λmax=3.0183, CI=0.0009, RI=0.58, CR=0.016<0.1

Estimated matrix B4-D

B4	C24	C25	C26	C27	Weight(%)
C24	1	2	3	0.5	31.18
C25	0.5	1	2	1	23.4
C26	0.33	0.5	1	0.5	12.22
C27	2	1	2	1	33.19

Company A comprehensive revenue evaluation report						
	Start date：200X/XX/XX			End date：200X/ X X / X X		
	current month		Difference	Last month		Difference
Indicators	Actual value	Estimated value		Actual value	Estimated value	
Client						
Finance						
Internal management						
Innovation study						
Comprehensive evaluation						
Experts' evaluation						

Company A evaluation report

Company A comprehensive revenue evaluation report						
	Start date：200X/XX/XX			End date：200X/ X X / X X		
	current month		Difference	Last month		Difference
Indicators	Actual value	Estimated value		Actual value	Estimated value	
Client						
Finance						
Internal management						
Innovation study						
Comprehensive evaluation						
Experts' evaluation						