Management Science and Engineering **ISSN 1913-0341**
Vol. **4**, No. **2**, **2010**, pp. 82-91 **www.cscanada.net**
www.cscanada.org

Building up a Performance Indicator System of International Projects, Based on the Balanced Scorecard

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Abstract: This paper is established on the in depth analysis of Balanced Scorecard （BSC）in which the BSC has been made necessary amendments so as to be use in establishing the performance indicator system of projects. This paper preliminarily builds up a performance indicator system based on performance scorecard considering the characteristics of international projects.
Keywords: international projects; balanced scorecard; performance indicator

1. INTRODUCTION

As the international economic is performing as an all-in-one pattern, there are more and more companies in China began to go overseas as the contracting company of certain international projects, during which they began to participate into the international competition in the market of international engineering contracting. Up to 2008, there are already 51international engineering contracting companies which entered the rank of world top225 international engineering project contracting companies, provided by Engineering News Record, USA. Their total turnovers reach the sum of 22.678 billion US dollars[2]. In recent years, international engineering projects are becoming upsizing and complex. Still, the environment of international contracting market is changing rapidly. These factors make the traditional performance evaluation system, which were based on costs, processes and quality, could no longer meet the needs of project performance evaluation. In order to perform better in the competition of international contracting market, and to achieve the "Go Out" strategy, there is an urgent need to build up a set of scientific and perfect international engineering project performance indicator system. This paper uses the idea of balanced scorecard to establish a set of indicator system, so as to evaluate international project in a more comprehensive and accurate way.

2. CONNOTATION OF BALANCED SCORECARD

Balanced Scorecard is put forward by Professor Robert S. Kaplan and David P. Norton in their Theory of

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[2] http://www.dh.gov.cn/bofcom/43347699175732019 2/20080822/204403.html.
Received on March 18, 2010; accepted on June 3, 2010.

Performance Evaluation (Robert & Norton, 1992) in 1990's, which is recommended by Harvard Business Review as one of the most valuable theory innovation in management among the last 75 years at that time. BSC takes vision and strategy as the core business, starting from finance, customers, inner-business process, study and development, which are interrelated with each other, to establish the performance evaluation system (Robert & Norton, 1996), as is shown in figure 1.BSC separates the gross strategy into the four parts as above as the performance targets. Then, it design proper evaluating indicators according to every different stages in the life cycle and relevant strategy. By given different weights, BSC forms a set of complete performance evaluating indicator system, so as to explain and quantify the strategy, which realizes the transformation from abstract and qualitative strategy to specific and quantitative one.

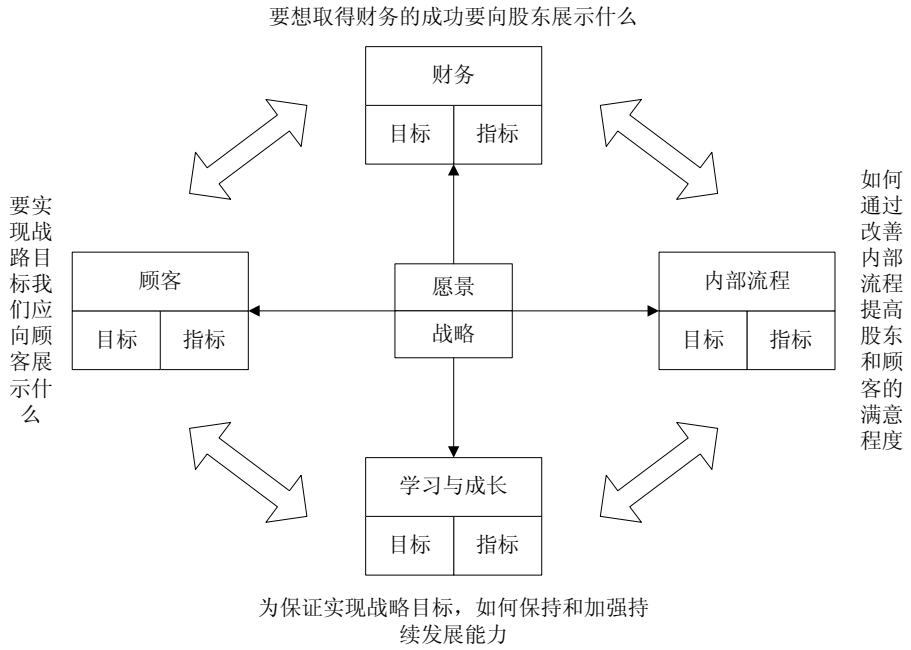

Figure 1: Basic Structure of Balanced Scorecard

The indicators in BSC have progressive layers in between and are inner-related to each other, which could be able to balance between different segments on the value chain, short term and long term profits, objective and subjective measurement factors, financial and non-financial indicators, main and secondary indicators, and between the results and the motivating reasons. That is the connotation of "Balance", and is the core idea of BSC (XU & YU, 2008).

3. APPLICATION OF BSC IDEA IN CONSTRUCTING PERFORMANCE INDICATOR SYSTEM OF ENGINEERING PROJECTS

3.1 Feasibility of BSC Idea's Application in Constructing Performance Indicator System of Engineering Projects

The designation of BSC is based on enterprises performance evaluation, while as the research is

approached into every other deeper stage, BSC is steadily developed into a strategic tool, which is not only used in constructing enterprises performance indicator system, but also in constructing engineering projects performance indicator system. BSC idea's application in engineering projects is feasible because of the reasons below:

（1）Construct the indicator system based on strategy. One of the most important characteristics of BSC is that it is built up under the consideration of strategy. As the core indicator system of the engineering project performance management, its construction must include the consideration of dynamic, foreseeable, logical. It must combine the target of performance management and the production routine in a harmony way, so as to combine the performance management activities to the long term strategic target and the management philosophy of the company to achieve a kind of synergistic effect in a row. BSC could achieve the effective combination of engineering project and company strategy, and helps the engineering contracting company and the project department to make clear whether or not a certain engineering project is contributable to the company strategy, and the contents and degree if the contribution is there are any. In that way, the company as a whole and the project department could achieve agreements on certain engineering project with targets and priorities, in order to optimize the resource allocation.

（2）Face to the customer. BSC stresses the influences of customers' satisfaction degree to the strategic target of the project. It believes that only if the customers are satisfies, could the success be achieved in finance. As to a project, customers are the owners of the engineering project. To communicate and cooperate with the owner is the key point of whether a project could be successful. Owners' satisfactory degree of the services and the final deliverables from the contracting company or project department of the engineering construction is an important indicator for the contracting company to evaluate the performance of the project. Use the idea of BSC to construct a performance indicator system of the project could thoroughly reflect whether or not the engineering project contracting company or project department have been well cooperated and communicated with the owners, in order that it could incentive the project to contribute to improve the satisfactory degree of the owners, which could do good to finally achieve target of the project.

（3）The idea of Balance. The core idea of BSC is "balance", under which its evaluation system does not focus on optimization of partial benefits, but stresses the coordinating and unifying of the whole value chain. BSC organically combines the results and the processes, which could reflect the achievement of the target and guide to perfect the process management by evaluating processing performance. Engineering project is a systematically project, which runs after the unifying among costs, time schedule, and quality in a row; and it is also a dynamic progress, which not only considers the performance of the project, but also takes into account of how to make a correction under the condition of biases between performances and the predetermined target of the process management. Furthermore, it takes into account of the analysis on different practical effects of every step. Therefore, the construction of engineering project performance evaluating system should overall thoroughly reflect every management factors, and it should overall take charge of indicators of processes and results, only by which it could be able to reflect the reality of the project performance. These highly match the idea of BSC.

3.2 Application of BSC Idea in Amendment of Constructing the Performance System of Engineering Projects

Project performance evaluation is much different from company performance evaluation. If directly use BSC to evaluate the performance of a project, there must have been a lot of disadvantages. The performance of an engineering project indicates two aspects: the operating efficiency of the project and the contribution of the project manager, which stands for the results performance of the project; and the efficiency of management activities for this project to gain all these benefits and achievements, which stands for the processing performance of the project (Yu et al., 2005). Therefore, the system of project performance indicators could thoroughly reflect the performance lying in results and processes of the

project. In addition, non-financial indicators and qualitative indicators should both be put into the central position of the project performance evaluation process. For that reason, we should amend the BSC system from several aspects as below according to characteristics of engineering project management, in order to make it more practical as one of the managing tools of engineering project performance evaluation.

（1）Finance

In the company performance evaluation of BSC, financial evaluation mainly reflects the financial condition of the company in certain period, including indicators such as asset-liability ratio, mercantile rate of return, Revenue growth rate, and cash flow. While, the main target of engineering project management is to improve profit rate as long as to make sure the cash flow keep moving on, the financial indicators should be selected from the view of profit capacity and operating condition of funding of the projects.

（2）Customers

The performance indicators of customers in company performance evaluation system are mainly including market share, customer retention rate, customer acquiring rate, customer satisfactory degree and profit gained from customers, and so on. However, as to a certain engineering project, the customers have much less liquidity than the ones for company. The customers of an engineering project is probably identified, who are the owners of the projects. As a result, the indicators associated with customers should focus on the satisfactory degree and relevant aspects of the owners. Meanwhile, as the contracting activities should also follow the laws and legislations of local governments, the customers also include government and public in a broad sense. The satisfactory degree of governments and public should also be a part of the indicators of customers.

（3）Inner-business Process

The indicators of inner-business process mainly focus on whether or not the company has established proper routine and managing mechanisms, and what inefficiencies still exist. As to a project, the inner-business process is the management activity. Therefore, the indicators of inner-business process mainly focus on cost control, process control, quality control, and other relevant aspects. The establishment of these indicators should consider whether they have established a set of scientific managing methods and regimes; whether they strictly follow such predetermined methods and regimes; and the communication and cooperation between departments of the project.

（4）Study and Growth

Following up with the times, the companies should continuously train their employees for new technology and new knowledge so as to form up a team of steady and well-trained stuff. At the same time, they should also establish a well incentive mechanism to arise the initiative and creativity of the whole stuff. In the process of a project, a team of steady and well-trained stuff is also necessary. Relevant incentive mechanisms should also be established to cheer up the project employees to achieve accomplishments. Therefore, study and growth indicators for a project are likely to the ones for a company. While, as the projects are often performed once only, they should be more focused on short term incentives and experiences.

4. ANALYSIS ON INTERNATIONAL ENGINEERING PROJECT PERFORMANCE INDICATORS

There are significant differences between international and domestic engineering projects. As a result, the performance indicators are different from each other. This paper will take finance, customers,

inner-business progresses, and study as four aspects to analyze the specific and apparently more important indicators of international engineering projects, according to its characteristics.

（1）Form the aspect of finance, international engineering contracting company should use part of domestic currency to cover up domestic costs and expenses of headquarters, as well as to use local currency to cover up local costs, and it should also cover up purchasing costs of materials and equipments by various currencies. In an international engineering project, contracting company needs to use various currencies. What's more, international engineering project should be used to various payment patterns, such as bank credit, international collection, bank remittance, and pay in king, beyond cashes and checks. As the money paid by owners is different from the money used by contracting company, and the project payment are gradually paid according to engineering contents gradually finished in a long term construction period, the contracting company is placed into a complex international financial environment which has currency exchange rate fluctuating and rate changing in a row. Therefore, the evaluation of an international engineering project should add the indicators of financial stability, so as to lower the risk of exchange rate and rate fluctuating.

That makes the

（2）From the aspect of customers, as the contractors of an international project are often from different countries, different national laws and legislations should be taken into account. Besides, there might be some communication difficulties as to different traditions and customs. So, there should be some indicators to evaluate the communication condition between contractors, the influences to local society and economics, the compliance to local laws and legislations, and the respects for the project to local traditions and customs.

（3）From the aspect of inner-business process, as the international engineering project has a consistent object, the engineering construction project, the evaluation indicators are more or less similar. However, there should be some considerations about different environments which might affect normal engineering project construction, for example, there might be such cases that as to customs local labors refuse to work in certain time; and there might be serious corruptions in local areas.

（4）From the aspect of study and growth, there might be probably two years at last for each international project to cover the processes of giving the bid, forming the contract, performing the contract, and closing the contract, adding the maintenance period. There might be lasting for ten years and above for some large and huge projects. In between the lasting period, different traditions and environment might have significant affect to mental and physical conditions of the employees. Therefore, in order to build up a steady, well-trained engineering project team to promote the accomplishment of the project, they should pay highly attention to the mental and physical conditions of the employees in international engineering project construction process. So, there should be some indicators to evaluate the adapting condition of the employees to local traditions and customs, the developing and operating condition of health and safety managing methods, and such.

5. CONSTRUCTION OF PERFORMANCE INDICATOR SYSTEM OF INTERNATIONAL ENGINEERING PROJECTS BASED ON BALANCED SCORECARD

According to the analysis above, under the principle of SMART in constructing performance indicators, which stands for specific, measureable, attainable, realistic, and time-based, this paper preliminarily establishes a performance evaluating indicator system to aim at international engineering projects, which is based on numerable literatures.

Table 1: International Engineering Project Performance Indicator System

	Dimension	1st class indicators	2nd class indicators
Project Performance Indicator System	Finance	Profit potentiality of the project	Project profitability
			Project value margin
		Operating conditions of the finance	Project funding condition
			Working capital turnover rate
			Equipment and material turnover rate
		Stability of the finance	*Exchange rate stability
			*Inflation rate
	Customer Satisfactory Degree	Owners satisfactory degree	Qualified rate at the first check
			Differences in rates of project cost
			Contract performance fulfillment rate
			The number of quality and safety incidents
			The response time on the instructions of owners
			Owners' satisfaction on change processing
			number of disputes
			Training provided during the test run
		Government and public satisfactory degree	Environmental investment rate
			The formulation and implementation of pollution measures
			Resource conservation and use efficiency
			* the host country's social and economic impact
			* the level of compliance with laws and regulations in Host country
	Inner-business Process	Quality control	Rationality of quality assurance system
			Rework rate
			Subsection（subentry）project c qualification rate /superior rate
			Supervision of materials testing
			timeliness of Quality issues deal
			Rationality of quality test methods
			Quality check and accept of subprojects

To be continued…

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	Dimension	**1st class indicators**	**2nd class indicators**
Project Performance Indicator System	Inner-business Process	Progress control	Rationality of progress control program
			Review of subprojects' time schedule
			Bias degree of every milestone process to the plan
			Timeliness of time schedule adjustment
		Cost control	Rationality of cost control plan
			Asset lost rate
			Idle machinery and equipment
			Bias degree of every milestone process to the costs
			Bargaining power in procurement of equipment and materials
		Internal communication and cooperation	Project collaboration between different sectors
			Reasonable settlement of internal conflicts
	Study and Growth	Staff case	Scientific degree of performance evaluation system
			Staff satisfaction on the pay
			Scientific degree of Staff Training System
			Loss rate of key technical or management stuff
			Level of education of employees
			* Development and implementation of health and safety measures
			*Adaptation degree to the culture and customs in host country
		Innovative capability of the project	Utilization of new materials and equipment
			The development and use of new construction technology
			Introduction of new technology standards
		Knowledge management	Rationality of Document Management System
			The degree of project information construction
			Lessons summary

* representing that the indicator is specially established for international engineering projects or has

significant influences to international engineering projects.

The international project target performance indicator system is established based on the idea of BSC. About how to decide the first class and second class indicators according to finance, customers, inner-business process and study and growth, the paper provides analysis as below:

5.1 Designation of Performance Indicators from the Aspect of Finance

As stated in part four of this paper, the performance indicators of finance conditions of an international engineering project should focus on the steadiness of finance beyond the profitability and operating condition of funding. To reflect profitability there are indicators such as project profit rate (profit/ revenue) and project production profit rate (profit/ cost); to reflect operating condition of funding there are indicators associated with currency flow such as project funding condition (actual funding/due funding), working capital turnover rate, and equipment and material turnover rate; to reflect the stability of finance there are indicators of exchange rate stability and inflation rate.

5.2 Designation of Performance Indicators from the Aspect of Customers

As to international engineering contracting company, the customers are owners and government & public. The customer satisfactory degree should be divided into two parts as owner satisfactory degree and government & public satisfactory degree.

There are two considerations of the owner satisfactory degree, the satisfactory degree to product (the final handed project), and the satisfactory degree of the service of contracting company (the communication and cooperation between owner and the contract company). Products satisfactory degree could be reflected by project quality, process and costs, which specifically are bias in project costs, agreement fulfillment rate of the contracting time limit, qualified rate in the first check, and the number of quality and safety incidents. Service satisfactory degree could be reflected by respond time to the owner instruction, satisfactory degree of the owner to change address, number of project disputes and training provided by period of test run.

Government and public might pay attention to whether the contracting company has followed the local laws and legislations and what influences the contracting company has brought to local environment, economics and society. So the satisfactory degree indicators of this part could include environmental protection investment rate (money amount of environmental protection/ project costs), development and operation of pollution methods, recourse conservation and using rate, social and economical affects to local area, and the abidance condition of the project to local laws and legislations.

5.3 Designation of Performance Indicators from the Aspect of Inner-business Process

As to an international engineering contracting company, inner-business process indicators mainly focus on whether well managing legislations and operating mechanisms have been constructed, that reflects the quality of the project management. Therefore, to reflect the inner-business process of a project, there are four aspects including quality, progress, costs and internal communication and cooperation. What should be noticed is that different from the aspect of customers, although indicators of inner-business process also includes quality, progress and costs, they mainly focus on whether or not the management activities are performed well enough. So the inner-business process indicators are lying on process. While, from the aspects of owners, they do not care about the process but whether the company could finish the project within certain time and financial limits. So the customer indicators are lying on the results.

Specifically, from the aspect of inner-business process, quality control could be reflected by 7

indicators including quality assurance eligibility, rework rate, subproject (sub items) qualified/ excellent rate, material test supervision, timeliness of quality problems handling, rationality of quality test methods, and quality inspection of subprojects. Process management indicators includes 4 sub-indicators such as rationality of process control plan, inspection of subproject, bias degree of every milestone process and timeliness of process plan adjustment. Cost control could be reflected by 5 indicators including rationality of cost control plan, capital loss rate (unexpected equipment and material loss and damage money/ gross investment of equipment and materials), idle rate of machinery and equipment, bias degree of every milestone cost and the bargaining power of the equipment and material procurement. Internal communication and cooperation are mainly reflected by 2 indicators as cooperation between departments and internal disputes.

5.4 Designation of Performance Indicators from the Aspect of Study and Growth

The designation of study and growth indicators of an international engineering project could consider two aspects as process and results. To improve the satisfactory degree of employees, to enhance the level of technology and information utilization of the project, in order to improve working efficiency and quality is the main consideration from process. To pay attention to accumulate knowledge and experiences during project construction is the main consideration from results.

Study and growth indicators include 3 aspects as stuff case, technology innovative capacity and knowledge management. Among those the stuff case could be reflected by 6 sub-indicators as scientific level of the evaluation system, stuff satisfactory degree of the salary, scientific level of stuff training system, degree of attrition of technical and management stuff, education condition of stuff and adaptation of the stuff to local traditions and customs. Project innovative capability could be reflected by 3 sub-indicators as new material and new equipment utilization rate, new techniques' development and utilization, and new technology inducing degree. Knowledge management could be reflected by 3 sub-indicators as rationality of profile management system, information utilization degree of the project and the conclusion of lessons and experiences.

6. CONCLUSION

This paper analyzes the connotation of BSC idea in depth as a start, based on which it takes the views from finance, customers, inner-business process and study as four aspects to make a necessary modification of BSC, in order to make it suitable for establishing the project performance indicator system. In the end, considering the characteristics of international engineering project, this paper preliminarily establishes a international engineering project evaluation system based on the idea of balanced scorecard. However, this established performance indicator system is lack of the amendment of practical experiences, which should be made up to by survey in follow-up studies. Quantitative approaches should be taken into account to calculate the weights of different indicators in order to perfect this indicator system.

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