

A Study of Performance appraisal System of Construction Project Based on the Perspective of Stakeholder

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Abstract: A variety of stakeholders participate in the construction project from the early beginning to the final completion. As construction project is characterized by rather complicated management procedure, the need of relation coordination by various parties during the construction process and long life cycle of the whole project. During its appraisal process, contract responsibility system, percentage quantization appraisal and other appraisal methodologies are generally adopted. Although it drives the whole project in the initial implementation period of these appraisal methodologies, the current condition of market economy can no longer meet the objective demand of the current project performance appraisal as time goes by. The horizontal and vertical comparison of project on the level of management performance in particular, is quite unfavorable, and is thus in need of correction.

According to the viewpoint of the theory of stakeholders, interest demand satisfaction of all project stakeholders is exerting an increasing influence on construction project performance. This dissertation exactly takes the theory of stakeholders as the research basis and constructs an index system that adapts to the existing construction project performance appraisal. This system brings a fine representation of demand of all stakeholders, and also further helps the construction project to maximize balanced interests of all stakeholders, displaying the highest overall appraisal score.

This dissertation firstly studies basic theories of constructing a performance appraisal index system based on stakeholders, followed by the analysis of appraisal index system of construction project performance on the basis of the theory of stakeholders. On this basis, it constructs performance appraisal system of construction project based on the perspective of stakeholders and offers its econometric model. At last, it provides a case of empirical analysis, prospect and conclusion.

Keywords: Construction project; Stakeholder; Performance appraisal system; Analytic Hierarchy Process
Introduction

1. INTRODUCTION

1.1 Research Background and Application Significance

1.1.1 Research Background

Stakeholders from the perspective of project management generally refer to project stakeholder. Every project has its own specific stakeholder group. Generally, we could divide stakeholders into primary stakeholders and secondary stakeholders according to different influence relations of stakeholders and projects. Primary stakeholders are groups or individuals of legal contract relation with projects, such as proprietor, contractor, designer, supplier, supervisor, and credit institution, etc; secondary stakeholders refer to groups or individuals that have recessive contract with projects, receive influence of project or could influence project rather than formally participating in project transaction, such as government, social public, environment protection department, etc. Obviously, project has formed a relation network with these stakeholder groups, and all relevant parties have an interactive role on each other, exerting mutual influence, and exchanging information, resource and achievement. As the compound of various interests, the project sees intersection and penetration of interest demands of all parties. Out of their respective independence, these interest demands necessarily have contradiction and conflict of all kinds of interests. In this sense, project management is the process of relation

management, which is also the process of the coordination and realization of conflict of interests among stakeholders.

Internationally, analysis of project stakeholders has already become a quite popular analysis tool in the field of the development of investment. Since 1993, analysis of stakeholders has become a part of World Bank to participate in the research methodology. World Bank, Asia Development Bank and other international institutions and development organizations have made clear stipulations in appraisal guideline of its loan project that there must be the analysis of project stakeholders in project decision. It also makes specific provisions of a series of guiding principles of the analysis of stakeholders. In recent years, analysis of stakeholders has already been widely applied to project planning and design, project appraisal, project selection, and a variety of aspects. However, the analysis of project stakeholders in China is still in the infancy, and the majority finds its application in major projects in China, such as south-to-north water diversion project. Moreover, domestic scholars mainly engage in the social appraisal study of loan project of World Bank and loan project of Asia Development Bank. By the end of 2001, the part of social appraisal in Guideline for the Study of Investment Project Feasibility formally issued and recommended by State Planning Commission proposed the analysis of investment project stakeholders.

Therefore, facing enormous demand and market potential produced by our economic development on project management, we should make innovations and continuously improve the theoretical and practical level of construction project performance appraisal based on the perspective of stakeholders while learning the advanced performance appraisal methodologies of foreign projects and making a conclusion of experience of project performance appraisal in China. Through the study of relevant principles, methodologies and technologies of project performance appraisal, combined with the application of other relevant theoretical knowledge, we should fully circumvent risks and improve management efficiency within the reasonable organizational framework of the project.

1.1.2 Application Significance

Theoretical significance: the dissertation makes a study of construction project performance appraisal system based on the perspective of stakeholders, making the project management theory better improved and enriched. Currently, studies related to project management mainly concentrate on forms of fields like multi-project scheduling, resource configuration, multi-project management organization, multi-project management conflict, multi-project management post-appraisal, and etc. There is seldom study of construction project performance appraisal system based on the perspective of stakeholders. The establishment of performance appraisal system from the perspective of stakeholders drives enterprises to attach great importance to business ethics, improve economic benefits and fulfill social responsibility.

Practical significance: this dissertation develops the study of performance appraisal system from the perspective of stakeholders, which supplements the current study of theoretic circle, and deepens and expands the performance appraisal system.

1.2 Research Aim and Objectives

1.2.1 Research Aim

Based on the perspective of stakeholders, this dissertation has constructed a performance appraisal system suitable for its project based on the characteristics of project management of construction enterprises, aiming to construct a performance appraisal index system appropriate for the construction project of enterprises. It aims to improve project management level of construction enterprise, enhance the competitiveness of construction enterprise and increase working efficiency of enterprises, so as to realize the objectives.

1.2.2 Research Objectives

Project performance appraisal system is playing an increasingly significant role in the modern society. The appraisal system of project performance built on the perspective of stakeholders is as follows:

Firstly, it makes an analysis and comparison of project performance appraisal methodology and system of theory of stakeholders.

Secondly, it builds a performance appraisal system of construction project based on the perspective of stakeholders.

Thirdly, it adopts Analytic Hierarchy Process and makes a case analysis with the constructed system.

1.3 Theory Hypothesis

Firstly, construction enterprise belongs to project enterprise, and the project is its cost and profit center. Therefore, project performance is quite important to enterprise.

Secondly, in construction project, stakeholders are quite complicated and multiple, exerting enormous influence to project performance.

Thirdly, the construction of project appraisal system from the perspective of stakeholders is of great significance on the right appraisal project performance and further development of enterprise.

1.4 Research Contents

Firstly, it elaborates the stakeholder relation of project performance appraisal. The project undergoes project initiation, feasibility study, construction, completion, input, use and a variety of links to have interest relation with various interest groups. The project stakeholders have different demands and influence of projects during different construction periods. Moreover, the continuous improvement of the project objective determines this complicated construction process, thus leading to difficulties in project performance appraisal. In addition, as project investment system in China sees continuous changes and capital enters a part of business project investment fields, making the restriction and link between project interest groups even more complicated. The appraisal of project performance must be developed around the performance objective, while performance objective has direct connection with the main appraisal body, core stakeholder relation, contribution and conflict of interests. This dissertation will make an appraisal analysis of project performance appraisal system. In particular, it selects the perspective of stakeholders to make an elaboration of performance appraisal system of construction project, so as to determine the interest demand of core stakeholders.

Secondly, it studies the selection and establishment of the index system of project performance appraisal. It builds its own appraisal system, enabling the managers to understand demand and contradiction of all relevant parties and dynamically adjust the implementation of project. It also makes the project objective more reasonable and easier to be realized and the project performance index more comprehensive. Although the construction project in China has been greatly improved in both quantity and quality, and project performance appraisal receives great attention from all parties in the society and the government, the diversified main body of project performance appraisal and the lack of a unified index system result in the failure of horizontal comparison of project performance and failure of information communication, resulting in the waste of repeated appraisal of human resource and financial resource. The widely applied performance appraisal system of investment project based on profits could not be totally copied in project performance appraisal. On the basis of both domestic and foreign studies, this dissertation will select index system of project performance appraisal, combined with the aforementioned relation analysis of stakeholders.

Thirdly, through case analysis, it further validates the rationality of the theory, and provides experience for similar projects at the same time. Through the analysis of construction project stakeholders and their demands in the construction project, it designs performance index targeted at this project.

1.5 Major Research Methodologies

1. Literature Study Methodology

According to Du Zexun (2001), "literature research methodology mainly refers to the collection, identification and reorganization of literature, as well as the formation of a scientific methodology of looking at things through the study of literature." The retrieval and review of relevant literature information on Chinese Scientific and Technical Journal Database (<http://www.cqvip.com>) and Chinese Journal Full-Text Database (<http://www.CNKI.net>) of online library, the manual consultation of relevant books, newspaper and magazines in the library, as well as dissertations' about the study of performance appraisal system of construction project in 2009, 2010 and 2011 have laid a foundation for this study to collect current domestic and foreign study and makes preparation for the development of this study. This research methodology is mainly applied to Chapter Two.

2. Logical Analysis Methodology

This research methodology is mainly applied to Chapter Three, Chapter Four and Chapter Five. According to Guo Jihai (1999), "It solves traditional issues of philosophy through the analysis of language. It starts from things that best represent the essence and rule of the development of planning object and makes a reorganization and conclusion of the collected

information in an inductive and analytical manner by getting rid of the natural clue of planning the development of object. It makes a conclusive study of the development of planning object in an abstract manner, which is consistent in theory. It reveals the essence of planning object and completes planning through the thinking forms of concept, judgment and reasoning from a pure and abstract theoretical morphology, arriving at a conclusion about the study trend and direction in the current academic circle.” This research methodology is mainly applied to Chapter Three, Chapter Four and Chapter Five.

3. Quantitative and Qualitative Research Methodology

According to Sun Jianjun (2005), “quantitative analysis is a kind of methodology based on statistics, which establishes mathematical model and calculates various indexes and values of analysis objects with mathematical model. So far as Norman K Denzin (2007) is concerned, “qualitative analysis is the analysis of “quality” of research objects. Specifically, it adopts deductive and inductive, analytic and synthesized, and abstract and general methodologies to process thinking of all acquired materials, so as to discard the dross and reserve the essence, eliminate the false and keep the true, transfer from one to the other and the outside to the inside, understand the essence, and reveal the intrinsic rule.”

This dissertation firstly explores the contents on the theoretical level of project performance appraisal. On this basis, it makes a specific analysis of project performance appraisal of problems existing in construction enterprises, and measures to solve problems are also proposed. It is exactly the analysis that gradually makes a transition from the former macro and abstract level to the micro and specific level. Through the application of Analytic Hierarchy Process, it applies little quantitative information to make thinking process of decision mathematic on the basis of thorough analysis of essence of complicated decision problems, influence factor and intrinsic relation, so as to provide simple decision-making methodology for multi-objective, multi-principle or complicated decision problems without structure characteristics. It is especially appropriate for occasions on which the decision-making result is hard to be directly measured. This research methodology is mainly applied to Chapter Four and Chapter Five.

4. Case Analysis Methodology

Case Analysis Methodology is also called Case Research Methodology. It was developed and completed by Harvard University in 1880. Later, it is adopted by Harvard Business School to cultivate senior managers and management elites in their educational practice, and gradually develops to today’s “Case Analysis Methodology”. The research of this dissertation develops around the theoretical study of performance appraisal. Through the review of relevant literature, it proposes index system of construction project performance appraisal and constructs project performance appraisal system of enterprise on the theoretical basis of stakeholders. Lastly, it makes an analysis of problems encountered in the case of practice of construction enterprises, combining with the theory of performance appraisal. This research methodology is mainly applied to Chapter Five.

1.6 Structure of the Dissertation

This dissertation is composed of six parts:

Part One is Introduction, mainly introducing research background, application significance, research aim and objective, major research methodologies and contents;

Part Two Literature Review, which mainly makes a review of relevant literature of project performance appraisal system from the perspective of stakeholders;

Part Three introduces index system of construction project performance appraisal on the theoretical basis of stakeholders, which lays emphasis on the introduction of application of the theory of stakeholders to the field of project performance appraisal, relation analysis of the theory of stakeholders and the construction project, construction of overall index system of project performance appraisal, as well as the representation of stakeholders in the construction of index system of project performance appraisal;

Part Four makes an introduction of index system of construction project performance appraisal on the theoretical basis of stakeholders. It first of all introduces performance appraisal system of construction project, before the introduction of the reflection of appraisal standard system and appraisal methodology;

Part Five makes case analysis with the constructed system.

Part Six is prospect and conclusion, making a conclusive generalization of the whole dissertation.

2. LITERATURE REVIEW

2.1 Review of Appraisal of Construction Project Performance

2.1.1 Review of Performance appraisal

Foreign scholars have a much earlier study of the issue of project performance appraisal than domestic scholars, and rather mature theoretical systems have already taken shape until now. Ibbs CW, Reginato J and Kwak YH (2004) put forward in the research the earlier study of project management performance appraisal draws references from the theory of performance appraisal in enterprise management, mainly focusing on finance. The performance definition takes “result” as the appraisal objective, and appraisal index primarily concentrate on finance, such as Payback Period (PP), Return on Investment (ROI), etc. The appraisal methodologies include Payback Period (PP) and Return on Investment (ROI), etc.

Through the study of domestic and foreign scholars, it gradually develops into project performance appraisal that takes “result + process” as the appraisal objective. The study of process performance appraisal is the same as the study of project performance appraisal, which origins from performance appraisal of the process for the enterprise to manufacture products, the appraisal carried out in consideration of product manufacturing process and product quality improvement process. Representative studies mainly include those by scholars like Peter Kueng. Based on enterprise Business Process Improvement (Harrington, 1991), Business Process Reengineering (Hammer & Champy, 1993), EFQM model (EFQM, 1999), Capability Maturity Model (Paulk, 1995), and the Theory of Stakeholders, they have established the model of Process Performance Measurement System (PPMS).

This model is proposed by Peter kueng in the research project of “process performance appraisal based on computer”. It mainly sets the corresponding appraisal index targeted at every manufacturing process of products of the enterprise and makes appraisal with the corresponding appraisal methodologies of every process. Then, the evaluators feed back the appraisal result to the former process to provide improvement in case of producing the similar kinds of products, forming a circular appraisal system of improvement. This model is put forward to significantly drive the study of process performance appraisal. As enterprises are characterized by continuous production and circular production, their model of “process performance appraisal system” has gained practice application and makes corresponding improvement in the application. Currently, it is more often applied to production of enterprises, rendering satisfying effects. This thinking has certain reference significance on the process performance appraisal of project construction.

Chinese scholar Xia Yueqin (2003) selects performance appraisal index for appraisal from the perspective of stakeholders and establishes “PPMS” model and its supporting software system targeted at enterprise production process based on “Process Performance appraisal System” put forward by Peter Kueng and appraisal model of Balanced Score Card. The emphasis is laid on the contribution to the realization of computer software and the practical and feasible steps of implementation.

On the basis of the study of Xia Yueqin, Song Ke (2005) enriches “PPMS” from three aspects of QFD (Quality, Function, Distribution) and makes a study of supporting software about the process appraisal and analysis technology of process management. Liu Xin of Tsinghua University also proposes the enterprise business process appraisal methodology based on Balanced Score Card. He combines the basic theories of Balanced Score Card and the specific condition of Chinese enterprises and makes a deep exploration and practical application.

A. Sivathanu Pillai (1999) starts from the coverage of the whole life cycle of project and puts forward the definition of integrated performance index. On the basis of the analysis of stakeholders’ demand and expectation, he puts forward a set of project performance appraisal index and gives the calculation methodology of integrated performance index.

It could be seen from the development process of project management performance appraisal that the definition standard of project performance appraisal gradually develops from the initial one taking “result” as the appraisal objective to the one with “result + process” as the appraisal objective. Some scholars have studied process performance, dividing process performance into “process behavior performance + process result performance”.

2.1.2 Review of Construction Project Performance appraisal

In China, the study of performance appraisal starts rather late, and there is no clear definition of relevant definitions. Moreover, the study of domestic scholars is mainly the introduction of advanced foreign theoretic system and the direct application of foreign methodologies that have already taken shape. There are scarcely studies with rather improved

theoretic system and innovative methodologies.

In the construction industry, the study of domestic scholar mainly concentrates on the appraisal of performance of project department from the perspective of the project, rather than the appraisal of performance of project department combined with the overall strategy of the enterprises from the perspective of the enterprises, not to mention the study of management performance appraisal of the project department. Feng Jingchun (1999) puts forward grey overall prediction model of project cost/progress performance, pointing out that project cost/progress controls system index system. Wang Guanghao & Zhou Jian (2004) introduce the most typical project success appraisal index in China currently and gives a rather comprehensive elaboration of project post-appraisal in the analysis of An Exploration into Project Post-appraisal Methodology, which makes a systematic and objective analysis of project to be completed or planning aim, implementation process, profit, role, and influence. Li Dequan (2000) explores the development trend of construction enterprise project management system and construction industry based on network, providing good ideas for the development of project performance appraisal system. Wang Mengjun & Deng Tiejun (2001) give a detailed description of characteristics, development and future reform trend of construction industry in their work, so as to make it possible for the setting of project performance appraisal system to better serve characteristics and development demand of the construction industry. Zhu Xiaolin (2003) elaborates the effective implementation of project appraisal from the determination of the basis of construction project performance appraisal, methodology of project objective management and the analysis of performance appraisal. Liu Jiayi & Lei Hongjun (2003) discuss the performance appraisal of construction industry enterprise from two aspects. Based on statistical data, they analyze a few primary factors affecting enterprise economic benefits and take into account the influence of this factor by introducing correction coefficient. In the article cooperated by Hu Jinying and Feng Yingjun (2004), they creatively take DEA as the tool to establish the second relative appraisal model of construction enterprise performance. Moreover, they apply this model to make a relative performance appraisal of the project of the construction enterprises. Through the overall analysis of the literature above, it could be seen that up until now, the domestic and foreign study of performance appraisal is sufficient both in theory and methodology, all of which have provided favorable conditions for this dissertation to gain relevant theoretic knowledge and draw reference from relevant methodologies during the writing process. However, the current study still sees some problems. Scholars, for example, lay excessive emphasis on the macro-study of performance of a certain kind of enterprise (such as construction enterprise, printing enterprise, etc), and there is seldom the study of project management performance of enterprise, and research achievement of project management performance appraisal of large-scale construction enterprises in particular. Moreover, the existing performance appraisal systems are not comprehensive and scientific enough, with problems more or less. Therefore, the final project performance appraisal result is not comprehensive and accurate enough.

The government of developed countries takes construction efficiency of construction project as an important index of government department appraisal. The study of construction project performance appraisal turns from shallow to deep and forms a research development idea from cost performance appraisal, finance appraisal, influence appraisal and institution appraisal to the comprehensive appraisal.

Study of Management Performance appraisal of Construction Project of Li Juan (2010) sets up a whole set of objective and complete construction project management performance appraisal system from the main body of appraisal, principle, index system, and appraisal methodology, hoping to contribute to the improvement of construction project management consciousness by relevant main bodies and enhancement of management level of construction project. Bai Yunlong mentions that in today's rapid development of real estate industry in China, the increasing housing construction enterprise and increasingly fierce industry competition, the scientific and standard project management has already means an important means to improve core competitiveness of construction enterprise in Study of Management Performance appraisal of Housing Construction Project. The objective, comprehensive, rapid, and accurate performance appraisal of construction project management, the overall grasp of strength of all projects in technology management and business management and efficiency of social economic service are of great importance to improving project management level of housing construction enterprise. Currently, there are many researches about enterprise performance appraisal in the academic field, but there are few studies of housing construction management performance appraisal. Study of Design of Project Performance appraisal System of Construction Enterprise of Mao Ying mentions that construction project is an open system with a long life cycle and complicated management in need of coordination of relation of all parties, reputed as "hematopoietic cell" of construction enterprise. Currently, project appraisal methodologies of construction enterprise include percentage quantization appraisal, project contract appraisal system, etc. These appraisal methodologies have

gained some effects in promoting the work of project department in the initial implementation. However, as time goes by, it could no longer meet the demand of project performance appraisal in the market economic condition. Especially, it is unfavorable for the vertical and horizontal comparison of management level and performance level among projects, and is thus in need of improvement. Study of Project Management Performance appraisal of Large-scale Construction Enterprise of Yu Hao explores that the construction project is the primary source of profit of construction enterprises. Confronted with the increasingly fierce competition environment, it becomes a primary problem of construction enterprise management personnel of the construction enterprise about how to improve performance of project department, and further enhance enterprise profit through effective construction project management. However, with the continuous development of project management performance appraisal technology and people's deeper understanding of its importance, the traditional project management performance appraisal system based on progress, quality, cost and safety could no longer adapt to the needs of the development of construction enterprises. Therefore, it has already become the most important thing about how to effectively appraise management performance of project of construction enterprise. Study of Performance appraisal System of Construction Project Managers of Wang Yan improves performance appraisal index system of construction project managers through the analysis of the current situation of project manager performance appraisal of construction enterprise based on the property of construction project. With Analytic Hierarchy Process of group decision-making, it determines performance appraisal index weight of construction project manager and makes a scientific appraisal with fuzzy comprehensive appraisal, so as to arrive at an objective and equal appraisal of performance of project managers. Performance appraisal of Domestic Housing Construction Project Management of Li Xiaowen determines project management performance appraisal index of housing construction on the basis of the analysis of project management appraisal principle according to objective and primary content of housing construction. Through Analytic Hierarchy Process, it gains the weight of index. Based on fuzzy appraisal methodology, it finally determines the housing construction performance appraisal model.

2.2 Overview of Construction Project Stakeholders

2.2.1 Overview of Theory of Stakeholders

“Stakeholder” makes its first appearance in Oxford Dictionary. This entry was included in 1708, referring to people's “bet” (have a stake) in certain activities or companies that tap or lose in activity result or enterprise business result. Penrose (1959) puts forwards the concept of “enterprise being the combination of human resource assets and interpersonal relation” in Enterprise Growth Theory, laying a foundation for the knowledge of Theory of Stakeholder (Pitelis, 1995). During the 1960s, Stanford Research Institute (SRI) defined “stakeholder” as “a group without whose support, the enterprise could not survive” (Freeman & Reed, 1983), which formally reminds people should not only take interest of shareholder into consideration, but also meet the various demands of interests of relevant crowds of the company. During the 1970s, Pennsylvania Wharton Business School opens the curriculum of “Stakeholder Management” and introduces into “definition of stakeholder” mainly used for the analysis of enterprise strategy management. Milestone masterpiece of Strategy Management: Stakeholder Methodology of Freeman (1984) defines stakeholders as “individual or group that could influence the realization of organization objective or suffer the influence of the realization of organization objective”. It is emphasized in the book that due to the important role of stakeholders on the sustainable management of the organization, a management mode should be established. There should be the overall inclusion of the factor of external environment of the organization, so as to introduce the Theory of Stakeholder into the study of strategy management of the organization.

In 1990, Pennsylvania State 1310 Act of the United States was passed, allowing enterprise management level to consider more about interest demand of enterprise stakeholder in the issue of anti-merger. The major 5 stipulations among them are fiduciary responsibility, holding, equity transfer, compensation for dismissal of staff, and labor contract, so as to resist the hostile takeover and safeguard interest of relevant enterprises. This Act gives a heavy blow to the concept of “shareholder interest first” in the traditional company management and accelerates theoretical study of stakeholders.

In the 1990s, Freeman, Blair, Donaldson, Mitchell, Clarkson and other scholars work together to make an initial formation of framework of theoretic study of stakeholders, getting abundant achievements in the practical application. The Canadian scholar Clarkson (1993) puts forward that “stakeholder constitutes major system of the enterprise” and “enterprise management aim should be the creation of value and wealth for all crowds related to enterprise interests”. He raises the “Clarkson Principle” about stakeholder management: positively take into account the expectation of all legal stakeholders and integrate it in enterprise decision and activity; listen and communicate with them to get to know the demand,

contribution and potential risks relevant to the enterprise; adopt effective behavioral modes; identify the interrelation of pay and reward of stakeholders; reduce risks to the maximum extent through cooperating with others. American scholar Blair Margaret M. (1995) explores the intrinsic relation of American company in management, performance and competitiveness from the perspective of thinking history, law and system in work named Ownership and Control: Rethinking Corporate Governance for the Twenty-first Century. Blair, Margaret M. (1995) points out that it is misleading to view shareholder only as the proprietor of the company. The company manager should be responsible for the long-term development of the company and all stakeholders. Based on the management of the company, owners of the company may also include creditor, worker and base manager. The failure of effective guarantee of interest of mutual interpersonal relationship of any party may lead to the risks of management failure of the company, or even relevant social problems.

2.2.2 Definition of Stakeholder

The question of what stakeholder is has always been open. The thorough theoretical study becomes unreachable if it is unclear about the question of what stakeholder is. Definition of Freeman (1984) is rather broad, “individual or group that could influence the realization of organization objective or suffer the influence of the realization of organization objective”, easily resulting in loss of research objective. Up until now, the various kinds of stakeholders defined in the literature study definition cover shareholder, manager, staff, financial institution, government institution, educational institution, news media, political group, interest group, religious group, trade union, industry association, competitor, supplier, investor, distributor, customer, non-human species, social public, cooperator, next generation of human beings, environmental protection organization, community, natural environment, etc.

All things relevant to enterprise interests are stakeholders from a general perspective of understanding. It is feasible in the understanding of the importance of stakeholders, but from an academic perspective, there should be the introduction of some properties to narrow down this definition, making it possible for this definition to be seized during a specific period in a specific environment.

Mitchell & Wood make a detailed study of research literature of theory of stakeholders from 1963 to 1995, and have concluded 27 definitions. Only the comprehensive definitions of stakeholders are listed here, as shown in the table below.

Table 2.1 A simple table of definitions of stakeholders

| Raiser | Definition |
|----------------------------|--|
| Stanford University (1963) | Stakeholders are some groups, without whose support, the organization could not survive. |
| Rhenman (1964) | Stakeholders depend on enterprises to realize their individual value and enterprise depend on them to maintain survival. |
| Freeman(1984) | Individual or group that could influence the realization of organization objective or suffer the influence of the realization of organization objective |
| Cornell (1987) | People who have contract relation with enterprise |
| Alkhalaji (1989) | Stakeholders are the crowd that enterprises should be responsible for |
| Savage (1991) | People who are capable of influencing organization activities and gain profits from the organization activities |
| Hill & Jones (1992) | People who have legal demands of enterprise. They provide critical resources to the enterprises and expect the realization of the objective of gaining individual interest |
| Langtry (1994) | Enterprises undertake important responsibility for their welfare and stakeholders have demand right in morality and law for the enterprise. |
| Clarkson (1994) | Stakeholders input certain in-kind forms in enterprise, human resource, capital or fund, and thus undertake some risks, or undertake risks for enterprise activities. |
| Clarkson (1995) | People who have ownership, claim right or interest demand for enterprise and its management activities |
| Donaldson (1995) | People who have limited or invisible contract relation with the company and the company behavior or inaction may bring it actual or potential influence of interest |
| Mitchell (1997) | Legal and urgent demands towards the company or sufficient right to influence company |
| Frederic (1998) | Everyone in the social community who has interest relation with the company |

| | |
|-----------------|--|
| Gibson (2000) | People who have interaction relation or mutual dependence relation of the organization, and people who influence or be influenced by company behavior, policy and decision |
| Hendry (2001) | Participants comply with the moral standards, of whom the relation is not only the contract or economic relation, but also social relation of mutual dependence |
| Reed (2002) | The existence of basic interest relation, which may be imagined economic opportunities, or real interest, or political equality |
| Phillips (2003) | Standard stakeholders have their interests directly related to company management; derivative stakeholders have potential influence on the organization or standard stakeholders |
| Newcombe (2003) | Project stakeholders are those who have project interest or expected interest, including user, investor, contractor, subcontractor, supplier, management team, designer, community, etc. |
| Bourne (2005) | Own real project interest or certain rights and interests, capable of providing support or knowledge or skill to the project, influence project or be influenced by it |

Source of Information: Mitchell, A.K. et al. Toward a Theory of Stakeholder Identification and Saliency: Defining the Principle of Who and What Really Counts [J]. *Academy of Management Review*, 1997, 22(4): 853-886. (Definitions after 1997 are added and organized by this dissertation)

Later, there are some scholars who start from their own professional perspectives or research aims, and they also make different definitions of stakeholders. Nutt & Backoff (1992) believe that “stakeholders are those who could influence organization strategy or be influenced by organization strategy”; according to Bryson (1995), “these individuals or groups that have claim right towards the organization attention, resource and output, and are deeply affected by output result of the organization”; PMI(1996) defines it as “individual or organization that positively participates in project or the interest may suffer from the positive or negative influence of the implementation result of the project”; according to Eden & Ackermann(1998), they are “individuals or small groups that are capable of responding to, negotiating with or changing organization strategy in the future”; Johnson & Scholes (2002) believe they to be “those individuals or groups that depend on the organization to realize the individual objective, and correspondingly, the organization also depends on them”; these definitions have not exceeded the scope of definitions mentioned above in the real sense.

These definitions are similar in two ways. Firstly, they point out the relation of mutual influence between the organization and stakeholders; secondly, it makes a certain degree of identification and limitation of the stakeholders.

Based on the definition made by Clarkson (1994), the author of this dissertation defines project stakeholder as “individual or organization that inputs certain special assets in project, which is capable of influencing project process and the interest is influenced by the project”. Special assets could be understood as input, fund input or in-kind capital input of human resource. Some seemingly relevant things such as the natural environment could be excluded, as there is no special capital used for the input. “Being capable of influencing project” indicates that stakeholders’ right or position has different degrees of influence on the smooth operation of the project. “The interest is influenced by the project” indicates that the interest of stakeholders receives the positive or negative influence of the project and the stakeholders need undertake certain degrees of project risks. The greater the degree of special input capital is, and the greater the risks for stakeholders to exit will be, and vice versa. Meanwhile, this definition embodies the two-way interaction and demand relation between the stakeholder and project. This interaction relation is undoubtedly what the project managers should face and understand deeply and integrate in the practice of project management.

2.3 Stakeholders Related to Project Performance

Wang Yong and Zhang Bin (2009) believe the analysis of stakeholders to be systematic collection and analysis of a variety of quantitative and qualitative information, so as to make it clear whose interest should be taken into account in the project. Through the analysis of stakeholders, it identifies the interest, expectation and influence of stakeholders, and link them with the project aim. The analysis of stakeholders also contributes to the understanding of relationship among stakeholders, so as to make use of these relations to establish alliance and partnership and improve the possibility of project success.

In view of stakeholders in construction project performance, different scholars have different classification methodologies

and research processes. The author has made a summary of the category of construction project stakeholders, as shown in Table 2.2.

| | Definition of construction project performance stakeholders |
|------------------------------------|--|
| Zhang Ye (2003) | Construction unit, contractor, supervision unit, reconnaissance, design unit, equipment manufacturer, land occupier, the third party supervisor, government department, bank, insurance company |
| He Lihua (2006) | Proprietor, supervision unit, construction unit, material supply unit, design unit, relevant government departments, financial institution, judicial department, news unit, service department community |
| Zhang Huiping (2006) | Project proprietor, total contractor, local government examination and approval authority, Supervision Company, supplier, surrounding residents, contractor, project team, professional project company, subcontractor unit, project team family members |
| Yan Hongyan (2007) | Investor, project proprietor, contractor, proprietor representative (project consultation unit, project management company or supervision unit), government, bank, insurance company, non-government organization, social public, relevant communities |
| Sheng Feng et al (2005) | Construction unit, construction contracting enterprise, supervision enterprise, relevant government departments, design enterprise, social public, supplier, government examination institution |
| Wang Rui (2008) | Investor, proprietor, all levels of contractors (including exploration and design contractor, construction contractor, material equipment supply contractor), supervision unit, consultation unit, government, loan bank team, community, user |
| Zhu Li (2008) | Government department, construction unit, construction unit, consultation unit, social public, construction personnel, project community |
| Guan Rongyue (2009) | Construction unit, user, relevant government functional departments, financial institution, consultation institution, exploration and design unit, community, public, construction unit, supervision unit, material supplier |
| Bai Li (2009) | Proprietor, design unit, construction unit, supplier, supervision unit, financial institution, operator, government department, public |
| Chen Yan (2009) | Construction unit, staff, investor, bank, material supplier, exploration design unit, construction unit, project supervision unit, all levels of government, environment protection institution |
| Wang Jin et al (2009) | Contractor, construction unit, exploration design unit, investor, social public, material equipment supplier, operator, staff, higher management personnel, government department, bank, third party supervisor, trade union, vulnerable groups, supervision unit, insurance company, project community, subcontractor and environmental protection department |
| Zheng Changyong, Zhang Xing (2009) | Public government department, private department (primary shareholder of project company), project company (responsible for project construction and operation), creditor, user, insurance company, project contractor, supplier, operator, consultation company, media, public |
| He Wei et al (2010) | Government, consultation unit, design unit, construction unit, financial institution, construction supplier, project company, operator, social public |
| Niu Jingmin | Developer, agency institution, government, contractor, customer, designer, fund |

| | |
|---------------------------|--|
| (2010) | institution, material supplier, supervision institution, media |
| Wu Zhongbing et al (2011) | Project proprietor, agent unit, design unit, supervision unit, tender agent unit, cost consultation unit, contractor, material or equipment supplier, government department, media, public |

Source of Information: Wang Jieshi, Study of Project Governance Mechanism and Project Performance Relation Based on Theory of Stakeholder, Anhui Polytechnic University, 2011.

Project stakeholders cover a wide range, and have different degrees of influence on construction project performance. This dissertation divides project stakeholders into two types, i.e. key stakeholders and non-key stakeholders. Those groups and individual who have greater influence on the realization of project objective, undertaken more risks and have stronger participation are defined as key stakeholders.

2.4 Chapter Conclusion

The research content classification of construction project performance appraisal in China is as follows:

(1) Horizontal appraisal study: scholar Bao Liang studies (2008) public project per

formance appraisal in China from management performance, economic performance, social performance, ecological environment performance, and sustainable development performance; Dai Shanlei (2008) divides appraisal contents into four parts, being management appraisal, economic appraisal, influence appraisal and sustainability appraisal. Meng Jianying (2004) studies project construction investment and project appraisal content from three aspects, being technology economy appraisal, environment influence appraisal and social appraisal; Shen Tongde (2001) proposes that project should have decision-making appraisal, technology appraisal, efficiency appraisal, and management appraisal.

(2) Vertical appraisal study: Wang Guanghao (2004) explores the relationship among the early, medium and late period appraisal of project. The appraisal content makes an appraisal from construction necessity, reality, feasibility and market prediction; it studies ten aspects of construction condition appraisal, technology appraisal, finance appraisal, national economy appraisal, qualitative appraisal, institution setting and management system appraisal, environment appraisal, risk appraisal, and overall project appraisal; Wu Yi (2002) makes an appraisal of necessity and feasibility study of construction project process, project bidding implementation, project exploration design, and project construction implementation. However, it just lists the appraisal content, rather than studying the specific appraisal process and appraisal index; Bai Sijun (2004) raises the idea of project early appraisal, medium appraisal and late appraisal and gives a broad definition of project appraisal: project appraisal applies scientific appraisal theory and methodology to measure the system project property of the object targeted at characteristics of all periods of life cycle of the project for better project management during the whole process of the project. Moreover, this property is changed into quantitative objective scaling or behavior of subjective effect.

(3) Management performance appraisal study: Tong Yupeng (2006) makes a study and comparison of relatively mature domestic and foreign benchmarking management idea of in his dissertation of master's degree. He transplants the application of benchmarking management in enterprise to the enhancement and improvement of public project management performance. Through some specific cases, it makes a detailed study of public project management in China and applies means and tools of benchmarking management, so as to specific improvement measures targeted at public project management process performance; Du Yaling (2011), from the perspective of project governance, make an empirical study of G-M-P (Governance-Management-Performance) in the public project through the introduction of industry organization theory of SCP (Structure-conduct-Performance) format, and gains the specific way to improve public project management performance; Ke Hong (2005) studies public project management performance improvement of stakeholders' objective value from the perspective of encouragement of construction agent and raises effective measures for the continuous development of public project management performance; Yan Ling (2008) studies the improvement and enhancement public project management performance from the perspective of the essence and theory of public project contract, principal agent relation, as well as internal and external governance mechanisms. Their study of management performance appraisal and improvement is from the management level and system level, which is rather macro and receive great influence from objective condition (such as imperfect laws and regulations and time needed in formulating systems) in it operation. The true realization asks for a certain period of time.

(4) Process performance appraisal study: in case of the study of process performance, China mainly borrows the theory system of enterprise performance appraisal. It makes an appraisal of process performance through the several indexes of TQCS (Time quality cost sale). These are basically studies of enterprise process performance, and there is little literature related to the study of the process performance of construction project.

In conclusion, the current domestic study of the definition of process performance appraisal has already taken shape, which mainly introduces foreign advanced appraisal theory and national condition of China. A majority of contents targeted at process performance appraisal concentrate on the enterprise, but there is seldom the specific study of construction project process performance appraisal. The study of construction project process performance appraisal by Chinese scholars is rather simple, which is not deep and detailed enough. Even if studied as a special topic, the study of content designer of construction project process performance appraisal could not meet the demand and the key work of all periods of specific construction process of the construction project is not included in the appraisal content. The process performance appraisal should lay emphasis on every stage of construction process, supervise, check and appraise its sub-process and summarize experience, so as to make it favorable for the project construction and reference of construction of future similar products.

From the literature of project performance appraisal from the perspective of the theory of stakeholders comprehensively, viewpoint of Elaine Stembers (2005) is first of all referred to. He holds that the theory of stakeholder studies project performance in two manners, i.e. clear analysis of reminding tool (reminder) of influence scope of enterprise (or organization) and the effective methodology of the elaboration of "social responsibility" in commercial activities. Kelly (2005) studies the role differentiation of performance appraisal from the comparison of project stakeholders, performance appraisal process, construction project performance appraisal and scope, and makes a conclusive analysis of quality appraisal, availability of performance appraisal methodology use and design effectiveness-guided performance appraisal. This design effectiveness orientation also reflects the important influence of satisfaction of stakeholders on performance appraisal. Kim B.clark (2006) makes a systematic analysis of the influence degree of project scope and project progress stage on project construction performance in Japan, and project output products determine the construction scope of the project. The scope of project construction is limited by project strategy, while these scopes and strategies finally reflect proprietors' demand orientation. Fianehini (2007) adopts questionnaire, field research and objective as orientation, which makes a comparative analysis of and studies methodology and procedure of teaching construction appraisal of Polytechnic of Milan University. It emphasizes that the social index of architecture is the core of attention of performance. It also elaborates the social objective that should be taken into account in the project construction of similar social attribute.

3. PRINCIPLE OF PROJECT PERFORMANCE APPRAISAL BASED ON STAKEHOLDERS

3.1 Analysis of Stakeholders in the Field of Construction Project

3.1.1 Literature Review and Selection of Project Stakeholders

Through referring to relevant literature, combined with the practice experience of construction project, this dissertation initially lists 20 kinds of stakeholders related to the project, including: project proprietor, contractor, supervision company, subcontractor, news media, competitor, equipment and material supplier, community, Chinese government, foreign government, social group, educational institution, project management team, staff, investor, social public, religious organization, peripheral cooperator, and financial institution. The definitions above are defined as follows:

Project proprietor: proprietor refers to construction project investor or independent legal person especially set up by investor for construction project. Proprietor is also the payer for the project cost and supervision cost, as well as the ultimate demander and user of construction product. Proprietor is the primary undertaker of project risks, as well as the result undertaker of project failure. Proprietor might be the project sponsor, or legal person company of the project jointly funded by sponsor and other main bodies of investment; during the warranty period of the project, proprietor may be replaced by proprietor committee (constituted by buyers of project property right).

Contractor: the construction project contractor refers to parties with main qualification of specific project construction provided in the project agreement, whose tender is received by the project client. From the perspective of project external stakeholders, contractor is the "face" of project, as the stage of project construction is visible.

Supervision Company: it refers to organization institution with legal person quality and gains supervision unit qualification certificate issued by the construction department, primarily engaged in project construction supervision. The supervisor should be independent third party, who should have no subordinate relation and other interest relations with the contracting construction unit and material supplier. Its responsibility is to raise suggestions and solutions of project based on the objective fact.

Subcontractor: subcontractor is the cooperater of primary contractor of the project. Out of fund, technology condition restriction or risk sharing, primary contractor divides the contracted project into units and hand to subcontractor for construction. However, the subcontracting should be recognized by the proprietor unit, unless the primary contracting agreement has the stipulation that allows subcontracting.

Media: it refers to the medium platform of dissemination information such as TV, internet, and newspaper, etc. Strictly, media is not stakeholder in the real sense, as it does not input any capital in the project. However, either as supporter or the opposed one of the project, media has enormous influence, playing a strong guiding role in the decision-making process of the project. Media is also the tool for some stakeholders to impose influence on other stakeholders. The interest group, for example, resorts to the power of media to give pressure to elected representatives, so as to control the decision-making process of project determiners.

Competitor: peer in the construction market, such as competitor of tendering process of a certain project.

Supplier: supplier of construction equipment and construction material related to the project in the construction market.

Community: it generally refers to the living crowd based on a certain geographical region. Its members depend on and compete with each other. All the members comply with the same social norms and render mutual interaction to create certain social values.

Chinese government: it refers to the central government of the project and the subordinate levels of administrative institution. The examination and approval right of relevant institutions and working efficiency may influence project cost and work duration. Political demand also substantially influences project decision-making.

Foreign government: it refers to the sum of foreign right organs and rights involved in the international project.

Social group: it is social organization voluntarily constituted by public individuals or non-administrative units, so as to realize the common desire of members and activities are developed according to some constitutions, including professional society, industrial society, and academic society, etc. The specific project may bring some groups opportunities, and losses of inherent interest for another part of interest groups at the same time.

Educational institution: it refers to colleges that offer and train talents for the construction industry, including training and certification institutions of relevant qualifications of the project.

Project management team: management organization established to guarantee the efficient operation of project, which undertakes the common project management mission, implemented according to advance directives of proprietor and specific demand. It is constituted by project manager and team members.

Staff: it generally refers to company common employees that finish specific work directives.

Investor: it refers to natural person and legal person, including shareholder, creditor and other investors who input fund in purchasing certain assets of the enterprise in order to gain profits.

Social public: it exclusively refers to public groups participating in social activities. Public has a wide range of definition, and a part of public may benefit from a certain project and another part may suffer from interest losses. It is sometimes in need of subdivided distinction, such as surrounding residents and other public of a certain high-speed train project.

Religious organization: it is a group constituted by people with the same belief and it is the important constituent of ideological culture and social morphology of human beings.

Peripheral cooperater: it is the cooperation institution of reciprocal benefits related to the project, such as the consultation Management Company and scientific research institution.

Financial institution: it refers to medium organizations specifically engaged in monetary and credit activity, including

bank, non-bank financial institution, and security company, etc.

This dissertation adopts expert scoring. Based on the list of initially selected 20 kinds of stakeholders and above-mentioned definitions, it consults 30 rather experienced project experts and management experts in the construction industry. All experts select the stakeholders most relevant to project in their heart according to the understanding of research aim and relevant definitions. The number of selection is not limited (see Appendix 1 for the details in experts' scoring and selection of project stakeholders).

The statistical data of expert scoring is reorganized into the following table.

Table 3.1 Expert scoring table of selecting project stakeholders

| Stakeholder | Selected number | Ratio % | Stakeholder | Selected number | Ratio % |
|---------------------|-----------------|---------|-------------------------|-----------------|---------|
| Project proprietor | 30 | 100.00 | Financial institution | 23 | 76.67 |
| Contractor | 30 | 100.00 | Community | 22 | 73.34 |
| Management team | 30 | 100.00 | Social group | 18 | 60.00 |
| Subcontractor | 30 | 100.00 | Social public | 16 | 53.34 |
| Investor | 30 | 100.00 | Media | 15 | 50.00 |
| Supervision company | 28 | 93.34 | Peripheral cooperator | 12 | 40.00 |
| Staff | 25 | 83.34 | Educational institution | 4 | 13.33 |
| Supplier | 25 | 83.34 | Foreign government | 3 | 10.00 |
| Government | 24 | 80.00 | Religious organization | 1 | 3.34 |
| Competitor | 23 | 76.67 | | | |

It could be seen from the table above that experts have consensus on proprietor, contractor, project management team, subcontractor, and investor as project stakeholders. In terms of competitor variable, although there is no capital exclusive for input, the gaming of bidding process of the project makes experts mainly include it in the scope of project stakeholders from the perspective of transaction cost and opportunity cost. Others such as social group, social public, media and other variables are also included by most experts in the study of stakeholders in the current information era when special attention is paid to environmental protection with an increasingly higher consciousness of human right in spite of the lack of special investment of a specific project, which is rather rational. In terms of the variable of foreign government, special attention may be paid to it in the study of large-scale transnational project management.

3.1.2 Analysis of Stakeholders in the Field of Construction Project

From the survey and analysis in the last section, combined with the literature study of stakeholders above, this dissertation defines stakeholder of construction project as group or individual that could influence the realization of project or be influenced by the project during the whole process of the realization of construction project. According to different influence relations of stakeholders and projects, construction project stakeholders could be divided into “primary stakeholders” and “secondary stakeholders”. The primary stakeholders refer to those groups or individuals that have legal contract relations with the project, including proprietor, contractor, designer, supplier, supervisor, as well as financial institution that provides loaning fund to project; secondary stakeholders refer to those groups or individuals that have intangible contract with the project without formally participating in project transaction, receive project influence or influence project, including government department, environment protection department and social public, etc.

During the different running stages of the construction project, project stakeholders are not totally the same. The following chart describes the stakeholders and their interest relations (different modes of construction management bring differences to project stakeholders of different stages) of different stages of the construction project.

Fig3.1 Decision-making stage

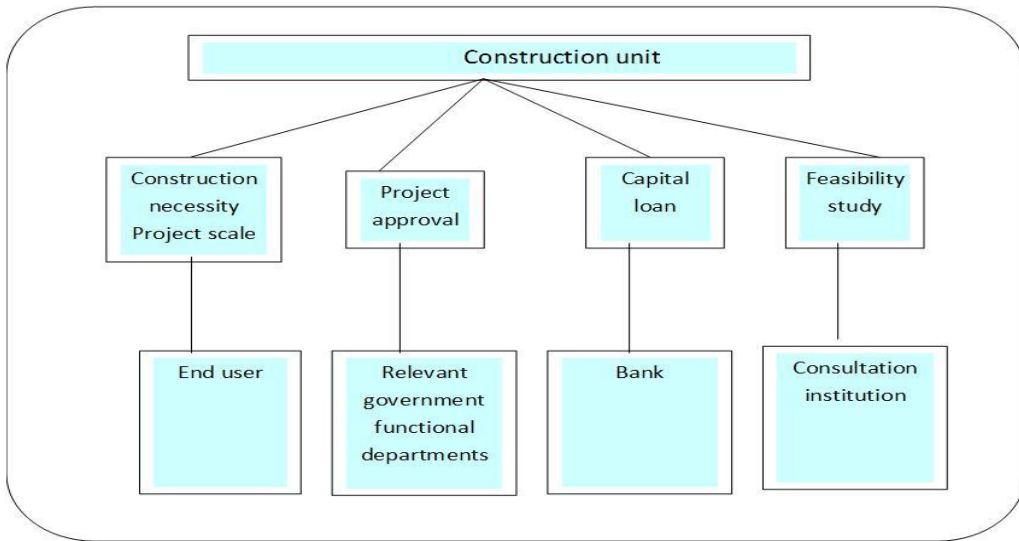


Fig3. 2 Preparation stage

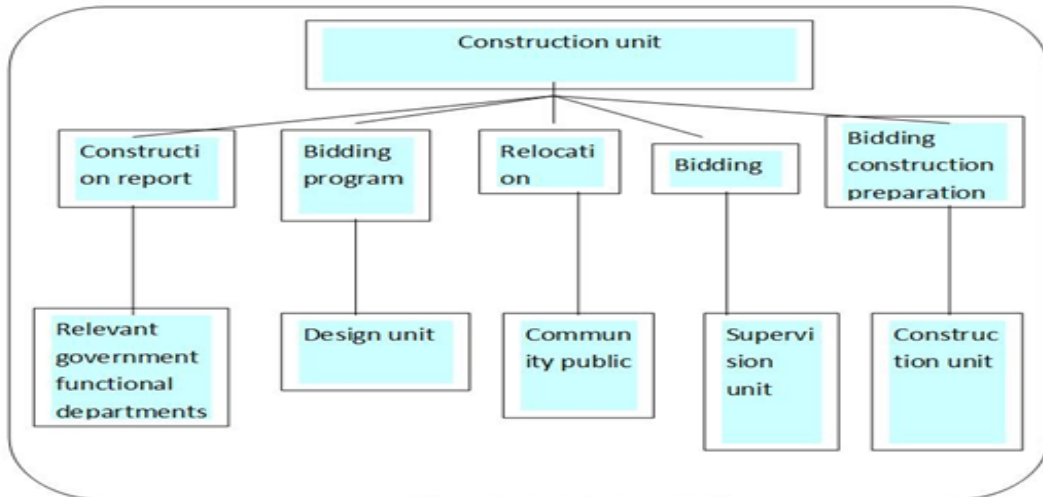


Fig3. 3 Construction stage

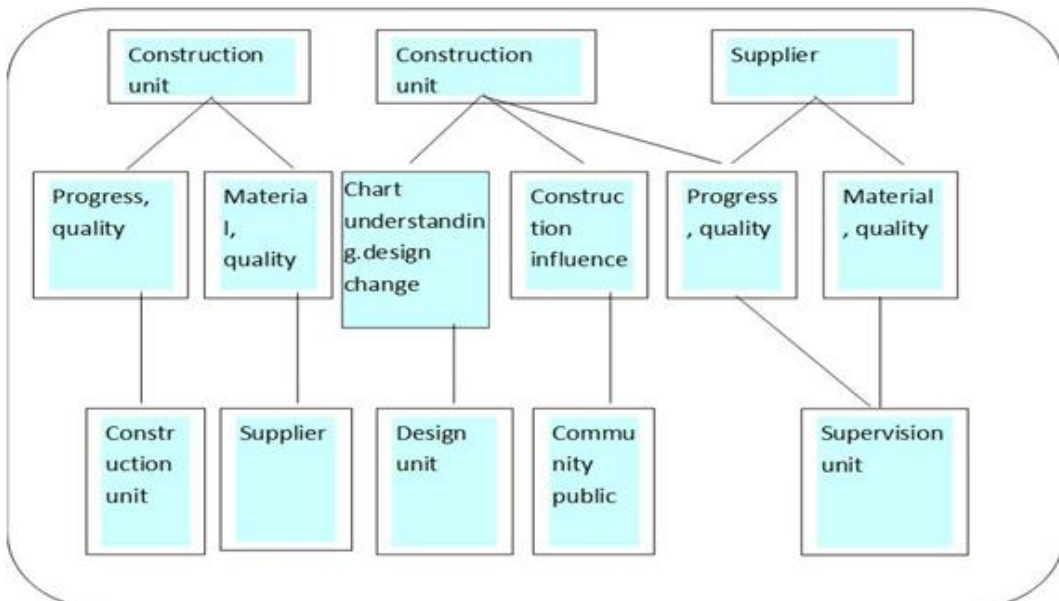


Fig3. 4 Completion and approval stage

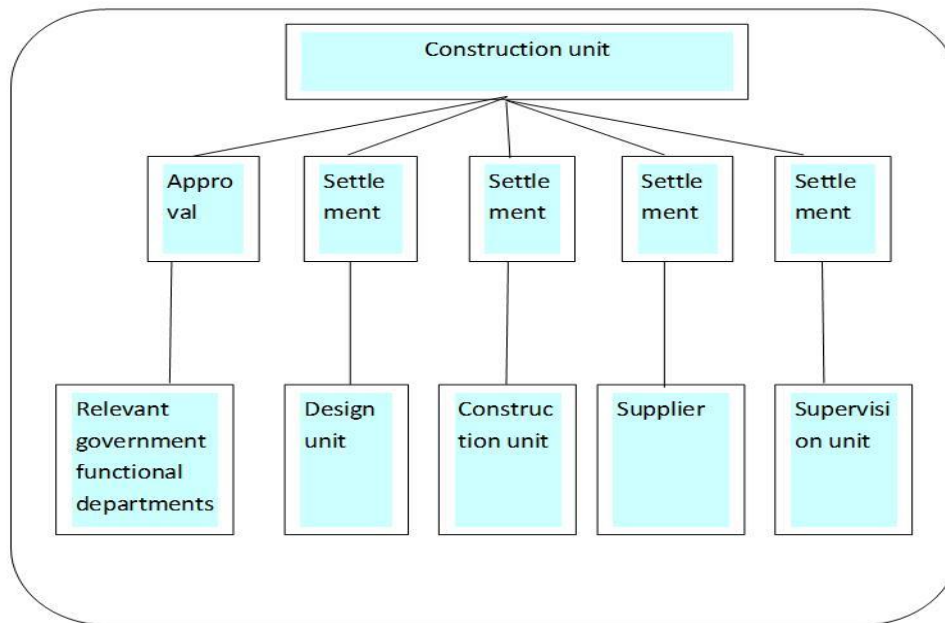


Chart 3.1 Analysis of relation of construction project stakeholders of all stages

Source of information: Guan Rongyue, Yang Guoqiao, Fu Huafeng, Study of Management of Construction Project Stakeholders [J], China High-tech Enterprise, 2009, 02.

The stage of construction project decision-making mainly involves project stakeholders like construction unit, user, relevant government functional departments, bank, and other financial institutions and project consultation institutions. During this stage, as the sponsor of the project, the construction unit has various kinds of interest relation with other stakeholders, mainly including the necessity of construction unit project construction, project scale determination, and the relations among users; the relationship among construction unit in terms of Project Approval and Development Planning Commission, Land Resource and House Administration Bureau, Municipal Administration Commission, and other relevant government functional departments; interest relation among the construction unit and fund loan and bank and other financial institutions; interest relation between the construction unit and consultation unit.

During the stage of construction project preparation, project stakeholders include construction unit, relevant government functional departments, exploration design unit, community public and construction unit, etc. Their interest relation mainly includes the relationship of construction unit in terms of construction report and bidding with other relevant government departments; the relationship among construction unit and the design unit in terms of the determination and exploration of design program; relation among construction unit and the community public in terms of relocation and project; relation among construction unit and construction unit in terms of bidding, construction predation and other issues.

During the stage of project construction, project stakeholders mainly include construction unit, construction unit, material supplier, design unit, community public, supervision unit, etc. During this period, construction unit have interest relation with construction unit in material quality and supplier due to issues like construction progress, and construction quality; to the construction unit, there will be interest relation with the design unit and community public in construction influence due to issues like chart understanding and design change; to supervision unit, there will be interest relation with the construction unit and material supplier due to quality and progress issues.

During the stage of construction project completion, project stakeholders include construction unit, relevant government functional departments, design unit, construction unit, material supplier, supervision unit. The existing interest relation primarily includes the relation among construction unit and relevant government functional departments in terms of project approval, the relation among construction unit and design unit, construction unit, material supplier, supervision unit in terms of settlement.

Obviously, construction project constitutes relation network with these stakeholders groups and all relevant parties influence each other in it. As the complex of interests of all parties, the construction project mixes and penetrates demands of interests of all parties. These interest demands necessarily have various contradictions and conflicts of interests due to their respective independence. Therefore, it is the core problem about how to coordinate conflict of interests of all stakeholders in the management of construction project stakeholders.

3.2 Relationship Between Project Stakeholders and Project Managers

The balance of interest between stakeholders and Parent Company is a difficulty in project management. Project Stakeholder Management is the strategic management activity by project managers to make a comprehensive balance of interest demands of all stakeholders.

According to Xie Juemin & Wei Xiaoping (2006), the study of project stakeholder management could draw reference from relevant theories and methodologies of enterprises and other long-term organizations, but not completely. Compared with enterprise and other long-term organizations, relationship between project organization and stakeholder is special; project, for example, involves relatively more stakeholders and the relation is more complicated. However, the relation maintenance period is relatively short, and this interaction link easily ends once the project ends. Moreover, project and large-scale project in particular, has a more urgent demand for cooperation than long-term organizations. Therefore, the extent for the project to finally realize the expected objective not only depends on the efforts made by all project participants, but on the cooperation efficiency. It brings project stakeholder management its own peculiarity.

3.2.1 Study and Management of Project Stakeholders are the Active Adaptation to the Strategic Transformation of Project Management Objective

Deng Changyi (2009) holds that the traditional project management primary mainly focuses on the control of the three aspects of cost, progress and quality, and all management activities are developed around these three major objectives. However, with the economic development and social progress, the project stakeholders have an increasing demand of project management. The rising status of relevant main bodies of interests and the effective management of project and the stakeholders' relation become the key to project success. Satisfaction of stakeholders, especially the satisfaction of end users becomes one of the important standards measuring the project value and the best sign for project success. It promotes project management objective to transform from the realization of "three controls" to satisfaction of stakeholders. This strategic change of project management objective could be reflected by American project management, which learns to define project management with PMI: project management means to utilize special knowledge, skill, tool, and methodology in project activities to enable the project realize or surpass the need and expectation of project stakeholders.

American project management scholar J.D. Frame once cited an example. The project of Sydney Opera House in Australia proves that satisfaction of users is the key to the success of the project. "This project sees serious progress delay and cost overruns. Measured by the traditional three major restrictions, this project is a failure. However, after the establishment of Sydney Opera House, it immediately becomes the construction that Australians feel proud of. Almost all Australian travel postcards are printed with this opera house. In fact, after the establishment of Sydney Opera House, Australians believe it to have gained enormous success. The success we see here origins from satisfaction of users, even if it fails to meet the demand of the three major restrictions."

It should be noted that all projects are in need of cooperating with their stakeholders, and cooperation plays a role of vital importance in the rational configuration of project resource. In order to realize this cooperation successfully, project managers should fully understand and analyze the various interests and values that the stakeholders wish to gain and take them into account correspondingly in making decision and management activities, so as to enable the stakeholders to feel equal and satisfied. Moreover, the project party should undertake certain social responsibilities and the social costs it produces, in order to build a sound social image and make the project integrate in this environment. Obviously, this kind of project management will gain higher payments. Therefore, in the cooperation and gaming with the stakeholders, project managers should pay attention to the maximization of long-term profits of the project. The objective it pursues should be the realization of "three controls" under the premise of guaranteeing the satisfaction of stakeholders. It is exactly the active illustration of project stakeholder management.

3.2.2 Project Stakeholder Management Strategy Belongs to Strategic Partnership Management

Xie Juemin & Wei Xiaoping (2006) believe that the relation of all project stakeholders is in essence the mutual passing on of cost of all participants in different positions of the project value chain; from the perspective of coordinated competition, these relations are conducive to the establishment of new project cooperation link, the solution of many difficulties in project planning and implementation, and the driving of smooth progress of project. Specifically speaking, project planning and implementation unavoidably have economic or non-economic relations with various kinds of external organizations. In order to seek for the maximization of their own interests, these stakeholders expect to gain special value

from this connection. This value could be economic value, or intangible value of knowledge, technology, reputation, and management. When mutual connection is so strong that all project stakeholders believe the other party to be the best choice for them to achieve their own important objective and devote to realize the added value through the mutual coordination of a series of behaviors, the relationship between the project and the external organization is no longer the simple and short-term buying and selling transaction relation. Rather, it becomes the strategic partnership with a sustainable development.

The project stakeholders should establish a good working relation among all stakeholders, cultivate their trust consciousness and team spirit, coordinate to reduce friction, conflict and transaction cost to realize risk and interest sharing and better realize the objective of project management.

3.3 Principle of Analytic Hierarchy Process

Internationally, project performance appraisal has no general methodology, and evaluators should determine different methodologies according to different aims and objects. Common and feasible methodologies in China and foreign countries include Peer Review Methodology, Analytic Hierarchy Process, Weighted Order Methodology, Comprehensive Appraisal Methodology, etc. This dissertation mainly introduces the use of Analytic Hierarchy Process (APH) to establish project performance appraisal system from the perspective of stakeholders. Analytic Hierarchy Process (abbreviated as AHP) is the simple decision-making methodology about some rather complicated and fuzzy problem. It is especially appropriate for problems of which the quantitative analysis is hard. It is a kind of simple, flexible and feasible multi-decision methodology raised by American operation scientist and Professor T. L. Saaty during the early 1970s.

Analytic Hierarchy Process (AHP) divides the complicated problem into several constituting factors and factor of appraisal expectation objective relevant to decision making into objective, principle and program. Then, it makes the qualitative and quantitative analysis, and makes a comparison between the two based on their mutual relation. Resorting to industry experts' judgment of appraisal index, it determines the relative importance of all factors of all levels and gives the weight of all factors. On the basis, the comprehensive scheduling of the program is calculated. Lastly, the optimal program of project performance appraisal is determined.

While making a systematic analysis of social, economic and scientific management, people are always confronted with a rather complicated system of mutual relevance and restrictions composed of many factors, lacking quantitative data. Analytic Hierarchy Process provides a new, concise and practical modeling methodology for the decision and scheduling of this type of issue. This kind of scientific thinking has many special advantages. It could make a comprehensive appraisal of the overall issue with a hierarchical structure and adopt level-to-level division to become a one-dimensional issue of principle appraisal. On the basis of multiple one-dimensional appraisals, it integrates them. As this dissertation explores project performance appraisal system based on the perspective of stakeholders, it is rather suitable for gradual division, making it simple to study problems. Therefore, the author has applied Analytic Hierarchy Process as the analytical tool, which will be quite significant.

The application of Analytic Hierarchy Process for modeling could be roughly divided and carried out into the following four steps:

- (i) Establish hierarchical structural model;
- (ii) Construct all judgment matrixes of all levels;
- (iii) Level single scheduling and consistency test;
- (iv) Level overall scheduling and consistency test.

What follows is the elaboration of the realization process of all the four steps respectively.

Establishment and characteristics of hierarchical level structure While analyzing the issue of decision-making with AHP, we should first of all make the issues logical and hierarchical to construct a structural model with hierarchies. In this model, the complicated problems are divided into constituents of elements. These elements form several levels according to their property and relation. The upper level of element dominates the relevant elements on the lower level. These levels could be divided into three major types:

- (i) Highest level: this level has only one element, generally analyzing predetermined objective or ideal result of issue, making it also called the objective level.

(ii) Middle Level: this level includes the middle links to realize objective. It could be constituted by several levels, including the principle and sub-principle that need to be taken into account. It is thus also called the level of principle.

(iii) Lowest level: this level includes the various measures and decision programs to be selected by the objective. It is thus also called the level of measurement or the level of program.

The number of levels, the complicated problem and degree of detailed analysis demands of hierarchical level structure are relevant. Generally, the number of levels is not restricted. The number of elements dominated by all elements on each level generally does not exceed 9. It is because that dominating too many elements will bring difficulties to the judgment between the two.

3.4 Influence of Stakeholders on Performance appraisal Index System of Construction Project

Stakeholders engage in the study of performance appraisal theory and make far-reaching influence on the study of performance. Theory of stakeholders gains deepening in the study of performance appraisal and finally forms the comprehensive ideological framework.

The theory of stakeholders influences the stage of survival, and the emphasis of the study of scholars concentrates on “who stakeholders are”, “basis of participation of stakeholders and rationality”, and other issues. The study of this stage is only the issue of definition, and the development of the theory of stakeholders thus influences the stage of survival. Its influence on the performance appraisal is not demonstrated. Meanwhile, during this period, although scholars have started to pay attention to social performance and have appraised the social performance of enterprises from how they deal with social problems and undertake social responsibility without raising specific social performance appraisal model.

As the theory of stakeholders develops to the strategy management, the performance appraisal has already started to stress the role of stakeholders, marked by the appearance of performance appraisal methodology like Balanced Score Card. The project performance appraisal is also driven by the theory of stakeholders, bringing research methodologies of Balanced Score Card, which takes more into account the influence of actual stakeholders.

Domestic and foreign scholars have analyzed the affecting factors of project performance. They generally believe that the core stakeholders’ attention on performance and project performance is positively relevant. In other words, project core stakeholders’ attention on performance represents the project performance.

Kim (2009) believes the existing project performance appraisal methodology to be scattered, and construction project is not only closely related to project progress performance and cost control, but also inseparable from the participation and influence of stakeholders. Kim adopts 64 questions to make an analysis of influence of project performance. These 64 questions include four aspects of project proprietor, project characteristics and construction condition, organization characteristics, participant, and contractor ability. The final result of project performance influence is demonstrated in the table below.

Table 3.2 Statistical table of variables influencing project performance

| Measuring index | Total influence | Indirect influence | Direct influence |
|--|-----------------|--------------------|------------------|
| Attitude and ability of project proprietor | 0.491 | 0.491 | - |
| Organization guarantee | 0.486 | - | 0.486 |
| Early project information | 0.472 | 0.472 | - |
| Cost management | 0.457 | - | 0.457 |
| Quality appraisal | 0.417 | - | 0.417 |
| Ability and experience of contractor | 0.201 | 0.631 | -0.430 |
| Construction condition | 0.026 | -0.223 | 0.309 |
| Project condition | 0.085 | 0.085 | - |
| Bidding competition | 0.082 | 0.082 | - |
| Risk sharing relation | 0.037 | 0.037 | - |
| Project environment | 0.015 | 0.015 | - |
| Design quality | -0.21 | - | -0.21 |
| Project change and claim | -0.316 | - | -0.316 |

Source of literature: Du Y.Kim, Seung H.Han, Hyoungkwan Kim, et al. Structuring the prediction model of project performance for international construction projects: A comparative analysis [J]. Expert Systems with Applications (36), 2009:1961-1971.

Similar as the analysis of Kim (2009), KPI indexes analyzed by Sai On Cheung (2004) on the research basis of project governance framework include project completion, contract arrangement, project participant relation, cooperation of project managers, and ability of key project members. According to David J. Bryde (2005), project key performance index is divided into two parts. One is measurable KPI (cost, duration, quality) of internal concern, and another is KPI in need of qualitative methodology with scarce quantization. In the grading process of project key performance index, the satisfaction of stakeholders is rather important.

4. CONSTRUCTION OF PROJECT PERFORMANCE APPRAISAL SYSTEM MODEL BASED ON THEORY OF STAKEHOLDERS

In this chapter, based on the analysis of stakeholders' interest demands above guided by performance appraisal objective, there will be the construction of project performance appraisal index system based on stakeholders.

4.1 Construction of Index System Framework

Construction of project performance appraisal index system based on stakeholders firstly asks for the recognition of its core stakeholders. Based on the content and index system of project performance appraisal and the analysis and illustration of its core stakeholders, questionnaire is set to determine the key demand of stakeholders. On the basis, the construction of project performance appraisal index system of stakeholders is carried out. The framework process is demonstrated in the following chart.

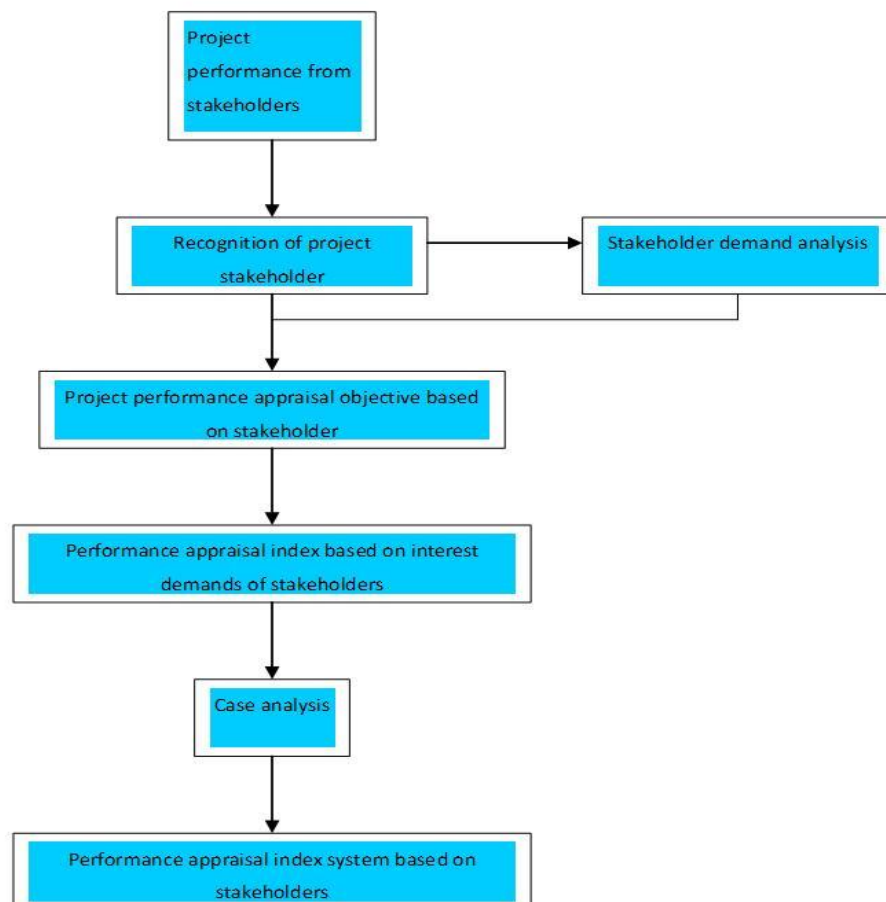


Chart 4.1 Process Framework Chart

The constructed performance appraisal index system includes the following elements:

- (1) Principle: performance appraisal index system generally includes several levels and each level contains several elements, generally referred to as principles. In simple language, principle refers to the standard or principle to appraise the value of things. In an index system, elements on the same level as principles dominate certain elements on a lower level while being dominated by the elements of the next lower level, constituting a hierarchical level relation.
- (2) Objective: the highest hierarchical level is generally called the objective level, and the objective is an expectation value, indicating the final expectation result of the organization level.
- (3) Index: the lowest level of performance appraisal index system is generally called the index level. Index is generally taken as the specific content and sub item of appraisal to measure the realization degree of project objective. The index level is dominated by the principle of the upper level.
- (4) Appraisal program: methodology provided for the selection of appraisal of specific indexes for the index system. Generally, there are several appraisal program to be selected in case of a given index system.

Based on the analysis above, the overall idea of the constructed index system is as follows: analysis and use of mutual relation of decision-making performance index, project management performance index and result performance index to appraise investment project economy, efficiency, effectiveness, and equality. It could finally make an appraisal of investment project performance. Then, combined with interest demand and influence of project performance appraisal combined with the core stakeholders, it distinguishes the weight of indexes.

4.2 Construction Project Performance appraisal System

4.2.1 Analysis of Participation of Stakeholders

4.2.1.1 Analysis of Stakeholders during the Decision-making Stage

1. Contribution and Ability of Stakeholders

Core stakeholders during the stage of project decision are government decision department and project benefit public, project influence public. The government decision department is the main body of management of project decision-making performance. Public is the main body of supervision in decision and performance. Firstly, social public benefit groups have a list of “public demand”. This list is sent to government decision-making department in manner of NPC session, and government decision-making department entrusts to professional institution and industry manager (such as Development and Reform Commission, Urban and Rural Housing Construction, Ministry of Transportation and other management departments) responsible for the formulation of “project demand”. The professional institutions include design unit and consultation service enterprise. Based on the entrustment of government, the professional institution develops “project demand” definition. Once the project demand is completed, the government department and professional institution should make decision-making argumentation. It studies negative influence of project construction on the social public groups. This group is generally regarded as one opposed to the project construction, including vulnerable groups and infringed ones of gained interests. If the argumentation is not feasible, it needs the professional institution to reformulate the project demand until the decision-making argument is feasible. It finally forms decision-making of project construction and project objective. The achievement and public demand of comparison of these two decision-making, the time cost of the whole decision-making process and the resource cost constitute decision-making performance.

The contribution made by the government decision-making department lies in that it provides feasibility argumentation of public resource and organization project. It analyzes the public interest demand of the project and the argumentation for public project influence. The government decision-making department provides the distribution plan of public resource, and thus makes decisions of project construction. The objective of government decision-making performance is the effect for project decision-making process to change social demand into project objective. The clarity of construction objective and the plan approval of project construction conform to relevant requirements.

The contribution of social public is to provide demand support for project construction decision. During the project decision-making process, social public position is rather special. They not only play the role of original principals of the project, but also the primary consumers of project product or service. The attention of social public to project decision-making is a kind of indirect supervision. The realization of project could be realized only when their interest demands are

reasonably reflected to the project construction objective.

2. The requirement of the core stakeholders.

The stakeholders in the decision stage of public relations are the government and the public. The government's demand for benefits is the following three aspects:

(1) The effect of transferring the social need - the measure for the achievements and efficiency of transferring the public demand to the project one. The forms of achieving this performance include: complete information of the social need; its scientific methodology of analysis and its scientific conclusion.

(2) A clear objective of the construction- the achievements and efficiency of transferring the demand of the project to its construction objective. The government, with the decision-making power of allocating common resources, has the greatest enthusiasm to manage the target of the project construction, with the view of upgraded its strategy. The forms of achieving this performance are as follows: documents such as the Project Proposal should be approved by certain approval authority; the construction objective should comply not only with the development plan of the regional economy but also with the demand of the public.

(3) The approval should meet the rules since the scientificity of the decision of the project construction must depend on the system which has to be carried out after approval. Links of the approval concerned by the government are mainly: the completeness of the approval; the execution of the approval in a proper way; a real and effective result of the approval.

The public contribute to provide their support of demand for the decision of the project construction. Their needs in this stage are mainly:

(1) The openness of the decision information. The channels, such as the media, the Internet and the open column of the information, through which the decision information is obtained support the public to take part in deciding a project. The major requirements of its openness are as follows: the number of the information publicity channels of the government; the range of the consultation of the decision.

(2) A clear representation of the construction objective. With little professional knowledge and alternative schemes of decisions, the public need a clear expression of the construction objective. It is measured according to: a clear significance of the construction objective, a benefit that fits most community resident and a construction target that meets the need of the public.

4.2.1.2 The analysis of the stakeholders at the stage of the construction

1. The contribution and ability of the stakeholders.

The core stakeholders at the stage of the project construction involve the government, the construction owner and surrounding communities. The management department of the government is mainly in charge of supervising and managing the project owner who then entrusts professional technology institutions, including construction teams, supervision units, etc., with the construction task. These professional institutions, however, are under the impact and restriction of communities surrounded while carrying out the project.

At the constructing stage, the management department of the government contributes to provide the public resource and policy guidance as well as to its supervision and management for the guidance of the project owner's scheme. The benefit of the government's management department is achieved during the management of the project implementation by the project owner.

The professional institutions, responsible for providing the technology, equipment and professional managers, has its benefit appeal of timely field delivery, capital appropriation without delay and a complete procedure of changing the certification.

The communities surrounded are for the convenience of carrying out the project by alienating the temporal resources to the requirement of the project execution. Its benefit appeal is the environmental protection and the least influence on the production and people's life.

2. The interests requirements of the core interest groups

(1) The benefits requirement of the government(the project owner)

As the investor of the public program and the final manager of its implementation, the government (the project owner) is seen as the investment decision part on behalf of the public interest. Its benefits requirements can be summarized to two types: the first one covers three control requirements for the project management, i.e. the cost, the quality and the construction duration that meets its construction scheme. The second one is the requirement for the safety, containing a field management complying with our country's rules for the safe construction, a safe and orderly site, no catastrophic accidents, no severe environmental pollution on site as well as surrounded.

(2) The interests requirement of the professional institution

The technical stakeholders, the construction supervising and administrating / consulting department, the contractor and the supplier included, play a major role in providing the service of technology and product for the project, with its interest requirement within the range of its cost, quality and the construction duration.

4.2.1.3 The analysis of the stakeholders at the using stage of the project

1. The contribution and abilities of the stakeholders

Once completed, the project will be managed by its owner or be handed over to the administrative organization. The core stakeholders here are the project owner, the communities around and the public.

During the using stage of the project, the performance of the public program is mirrored as that of its result consisting of four performances under mutual influence: the valuation of the effect, the resource utilization, the influence and the social benefits.

At the stage of the project application, the project owner and its agent, on behalf of the administrative organization, are in charge of its maintenance and the support of the service is necessary to develop its service objective. The public shares the right of applying the project. Otherwise, the project sees no value. The surrounding community, as a supportive environment, lays a basis of society and environment for the service after the completion of the construction program. The social environment includes the conditions of the production and life, the climatic influence as well as human and culture.

2. The interest requirement of the stakeholders

(1) The interest requirement of the project owner

During the application of the project, its owner's requirement for interests is a steady source of the funding which can obtain a good social benefit by reaching to a fixed objective.

(2) The public's demand for interests

Under the current system of the ownership management, the public, as the user of the public project, takes part in the administration of the project maintenance by means of communities and the people's congress. At the stage of its application, there are two kinds of interest demands for this group: the first one is a convenient daily life with a basic requirement for a set of complete supporting service facilities, available services as well as convenient but safe traffic. Secondly, it can improve the quality of their life, such as the increase of their incomes that can improve the standards of consumption; an abundant cultural life; good medical and education conditions.

(3) The surrounding community's demand for interests

The demand of the surrounding community includes the appraisal of the impact and the resource utilization. As for the former one, it consists of the appraisal of the environment impact, the existing scenery under protection and the coordinating color of the construction style. The latter one covers the resource application of water supply, etc. as well as the climatic influence within a small range.

4.2.2 The appraisal system of the construction project performance based on the stakeholders.

Through the above analysis on the current state of the project performance index system and combining the feature of the project administration, an appraisal system of the index (see the following table) is constructed by applying the idea of multi-dimensional performance appraisal. The appraisal and analysis on the performance of the urban infrastructure is made based on nine aspects, including the satisfaction of owners, technical construction organizations and the public, the decision, administration stage of the project as well as its application period.

1. The target level. The indicators of the target level indicates that the performance of the project.
2. The standard level. The standard level is the extension of the target level, consisting of standards of the effect of the performance of the project deviation, the performance of the project administration, the performance of the project result.
3. The index level. It is made up by interest demands of stakeholders at various stages. It should be noted that it is inevitable to have different indexes for the performance valuation due to distinct construction duration and scale of various public projects. The system of the performance appraisal index put forward in this paper, based on the common features of the public projects, makes analysis of the indexes at the stage of the decision, the construction and administration as well as the result performance. As for different projects, their indexes can be selected on the basis of the standard level.

Table 4.1

| The index of the objective level | The index of the standard level | The index of the index level |
|---|---|---|
| The performance of the project | the performance of the project deviation | The construction objective |
| | | The approval complies with rules |
| | | The publicity of the decision information |
| | The performance of the project administration | Demand for safety |
| | | The operation of fund |
| | | the control of the transformation |
| | | The administration of quality |
| | | The control of its construction duration |
| | The performance of the project result | Steadily growth in economy |
| | | Social development |
| | | The effective development of the regional resources |
| | | Meeting the needs for improving the block |
| | | The convenience of daily life |

4.3 The performance appraisal of the means of processing data in the standard system

According to the above appraisal indexes, we can see that it is extremely difficult to make full preparation for the measurement during the operation of the project due to a very rich connotation and extension of indexes in every project. Therefore, the measurement is usually made by means of dynastic grading in reality. Based on it, the overall scores of indexes in every part are counted, which is multiplied by the weight given before, then the comprehensive score of every project in the performance management of the every project is obtained. As for the measurement standard of every part, in order to maintain its unity, the performance appraisal can be made after the scoring. It should be particularly noted that, provided nothing happens to the project measured, its standard score should be converted, based on certain ratio, to the standard score of ten-point before counting while scoring all grading form that are subdivided.

4.3.1 The weight assignment of the index

After the construction of the index architecture of the hierarchical level, corresponding weight assignment must be made to every index of the construction. During its assignment, taking into account personal preference and professional knowledge, it's necessary to decide the sort of index weight on the basis of the results provided by different appraisal personnel, with the view of thoroughly reflecting the preference of the appraisal group.

4.3.1.1 The construction of the judgment matrix

Provided A is the objective level and B is the standard level, then the judgment matrix of the former against the latter is AB.

$$AB = \begin{bmatrix} b_{11} & b_{12} & b_{13} \\ b_{21} & b_{22} & b_{23} \\ b_{31} & b_{32} & b_{33} \end{bmatrix} \quad (\text{Equation 4.1})$$

In the equation 5.1, b_{ij} is the importance grade of element i divided by element j . Then the index level is set to C . The judgment matrix, B_iC , is set by the index level B against the index level C . i is 1, 2, 3.

While reading the value of every element in the judgment matrix, it should be obtained based on the relative significance of two indexes of the equal level against their upper element by making comparison between every two according to the proportion scale as per Table 4-1.

4.3.1.2 Making model performance appraisal by means of level analysis (AHP Model)

Owing to its strong operation and convenience, the comprehensive scoring method is, to a large extent, applied in practice. Generally speaking, the weight used in every appraisal is decided ahead of time and is kept unchangeable in the actual operation. Considering features of various projects and different intentions among their leaders and that no adjustment could be made to the above variation by appraisal experts, it is of more practical significance to the adjustment made in this paper according to the weight of AHP model to indexes.

Table 4.2 The Scale table for every elements in the judgment matrix to value and judge

| b_{ij} | The analysis of the significance between element i and j |
|----------|--|
| 1 | Element i and j are of equal importance |
| 3 | Element i is slightly more important than element j . |
| 5 | Element i is obviously more important than element j . |
| 7 | Element i is strongly more important than element j . |
| 9 | Element i is extremely more important than element j . |
| 1/3 | Element j is slightly more important than element i . |
| 1/5 | Element j is obviously more important than element i . |
| 1/7 | Element j is strongly more important than element i . |
| 1/9 | Element j is extremely more important than element i . |

Provided the index of making comparison between every two under the same standard is raised by Q appraisal experts ($Q \geq 1$), there should be Q judgment matrix. In the light of the above rule, Abs is the judgment matrix of the performance appraisal given by the S expert while element of Abs is represented by AB_{ij} s. Since some experts are not in favor of comparison between every two indexes, there comes the incomplete judgment matrix which can be represented by A_s with "0" standing for the incomplete element. ξ_{ij} is the number of elements that don't equal to 0 in the column j and line i of K judgment matrixes. Elements in AB are represented by b_{ij} and the comprehensive judgment matrix obtained through the hierarchical analysis is AB . Then we can get the following equation:

$$Logb_{ij} = \frac{1}{\xi_{ij}} \sum_{\lambda=1}^{\xi_{ij}} \log b_{ij\lambda}$$

After obtaining the above synthetic judgment matrix, we can get the eigenvalue and the feature vector, based on which the consistency test is made to make comparison between λ , the maximum value, and CI , the coincident indicator. In case $CR=CI/RI < 0.10$, it indicates a satisfying consistency of the judgment matrix. Otherwise, certain adjustment should be made to the whole matrix. During the overall hierarchical ranking, CR should be calculated as well. In the case of $CR=CI/RI < 0.10$, it means a satisfying consistency for the result. At last, the consistency check of the feature vector should be seen as the set of weights of the corresponding hierarchy among the overall ranking. WAB is the set of weights in the standard level and WA_iC refers to the set of weights in the index level with $i = 1, 2, 3$.

The weighs and measurement scores for every performance appraisal index can be obtained through the above procedure. Meanwhile, its overall scores of the standard level in the measurement system can be calculated through the company 4.3 to 4.5. B_{i1} is the measurement value of other basic index and the total comprehensive value is Z_i with $i=1, 2, 3$. The equation is as follows:

$$B_{11} = W_{B1C} \times (C_{i1}, C_{i2})$$

$$B_{12} = W_{B1C} \times (C_{i3}, C_{i4}, C_{i5})$$

$$B_{13} = W_{B1C} \times (C_{i6}, C_{i7}, C_{i8}, C_{i9})$$

$$Z_i = B_{11} + B_{12} + B_{13}$$

After calculation, the scores of all projects are ranked by the order of big to small in the appraisal activities.

5. THE CASE ANALYSIS

On the basis of the above analysis on the appraisal index, methodology and standards, Kaina Business Center of Changzhou is chosen to make the trial performance appraisal.

5.1 The background introduction of the case

Guangxia Construction Group is a large private enterprise with the premium quality of the national construction contract. After over 30 years' striving and hardworking since 1980's, it has developed from a small construction team in Dongyang of Zhejiang Province to a group. As the general contract with the premium and a lot of first-grade quality, it owns many project manager departments in such area as Zhejiang, Jiangsu, Fujian and northwest China and three major professional branch companies and abroad, with a total construction capacity of over 10 billion.

Here the project department of Kaina Business Center of Changzhou in Guangxia Group is chosen as the research object. The project covers from the 5th to 21st floor with a construction area of 66,229 square meters and the engineering cost of 79.88 million yuan. Kaina Business Center, high up to 228 meters with 56 storeys and a construction size of 0.13 million square meters, is the highest building in Changzhou. The project, in the intersection of Xinxinqian and Wanfu Rd in Changzhou (the old center area and the new northern are), is planned to be constructed to a super high construction with the features of apartment, hotel, business and parking. Project u consists of three tall buildings, including a 56- storey apartment (an international well-modeled apartment according to the level of four stars, which is similar to a hotel) with a four-star hotel to its south and a parking building to its west. With its total construction area of 117,750 square meters, its investment of 0.5 billion yuan and the investor of the Rojana Industrial Park (Volkswagen) Co., Ltd. in Thailand, it is a major investment project for the government in Zhonglou area. Finishing its project proposal in September 15th, 2007 and its design task book in September 21st of the same year, the project was approved by the Construction Committee of Changzhou in November 30th, 2007 and its preliminary design was approved by the same committee in December 5th, 2007. The time to start: December of 2007. the completion time: September of 2010.

The whole construction of the Kaina Business Center of Changzhou project consists of the following:

1. The decision at the earlier stage of the project.

The approval standard of the project, the decision process and procedure, its performance appraisal and the main suggestion raised in the research report, etc.. The project, with its response to the appeal of the "Popular Projects" with a series of projects in Changzhou, has made up for the lack of business in the area of Xinqiao and Wanfu Rd. It provides inhabitants around with a place to entertain and, at the same time, improves the life quality of inhabitant nearby and beautifies the business scenery of the city.

2. The preparation for the project implementation and its measurement

The project of Kaina Business Center, made according to the plan of Rojana Industrial Park (Volkswagen) Co., Ltd. in Thailand in 2007, is a business project of the government in Zhonggu area. Finishing its project proposal in September 15th, 2007 and its design task book in September 21st of the same year, the project was approved by the Construction Committee of Changzhou in November 30th, 2007 and its preliminary design was approved by the same committee in December 5th, 2007. The examination of the project required in the material is finished by November 20th, 2007 and there was the report on the qualified detection. Laying a solid foundation for the start of the later construction,

By referring to the relevant materials about the project of Kaina Business Center, the permit of the construction engineering plan and that of the construction was not conducted before start the project, both of which were not submitted

until 2008. The earlier stage sees a proper control of its progress, accurate research data, a good design of the project, a standard organization forms for bidding and a timely, reasonable and accurate signing of the contract, which is conducive to the control during the construction.

(1) The inspection and design

The project of Kaina Business Center is under the inspection and design of China Railway Construction Engineering Design Institute of Beijing which has the first-class qualification to inspect and design. Designed by the Landscape Planning and Design Institute in Changzhou, with a later date of submit than the date required in the “Task of the Design for the Kaina Business Center” issued by Huantou company in Changzhou. The project was approved by the Construction Administration Committee in December 5th of 2007. Its final scheme complies with the principles of the cultural connotation and the innovation required, the behavior habit indicated in the turning and joining of the square; a reasonable size and form of the roads; indexes like the sceneries control should accord with the business project design specifications; the construction cost is within the estimated range.

(2) Making preparation before the start of the construction.

Due to an urgent preparation time of Kaina Business Centerm, many procedures are left undone, including the report on the site selection before construction, the permit of land use permit, of project use permit and the permit of construction, above which were resubmitted in 2008 but influenced the performance appraisal; the construction site has accomplished three supplies and one leveling (supply of water, electricity and road and leveled ground) for the demolition road; the construction organization design is written in detail; there is a huge gap between the planned construction duration and its actual one.

(3) The purchasing and bidding

The purchase of equipment and relevant material has been agreed in the construction contact under the control of the party.

(4) The requisition of land

The location of the project of Kaina Business Centerm was removed by the Network Company in the 2006, as part of the reconstruction of old city areas which relocation expenses was charged by Huantou company of Changzhou during the implementation of the project with more details stipulated in the Returning Agreement. According to the agreement, 9.3485 million yuan should be paid to the Network Company by Huantou. In addition to 1.8053 million yuan of interests between 2006 to 2008, the total amount is 11,1538 million yuan..

(5)The collection of the construction fund

The fund of the project construction is from a large amount of loan provided by the development bank, which was confirmed before the research and design. As a business project of the government, it can bring certain economic benefits in a short period.

3. The conclusion and measurement of the project construction

The project construction of Kaina Business Centerm mainly contains the apartment, the hotel, the business and parking, all of which were conducted by Changzhou Landscape Engineering Company. Started in December 16th of 2007 and completed in September 20th of 2010, it covers a total construction size of 117,750 square meters and the investment of 10 million yuan.

5.2 The system of the index of the project performance appraisal

The final system of the index of the performance appraisal is seen as below table.

Table 5.1 The architecture table of project indicators

| The index of the objective level | The index of the standard level | The index of the index level | Means of measure |
|----------------------------------|---|----------------------------------|------------------|
| The performance of the project | the performance of the project division | The construction objective | Documents |
| | | The approval complies with rules | Documents |

| | | | |
|--|---|---|--|
| | | The publicity of the decision information | questionnaire survey and interviewing |
| | The performance of the project administration | Demand for safety | Documents, opinions from experts |
| | | The operation of fund | Documents |
| | | the control of the transformation | Documents |
| | | The administration of quality | Documents |
| | | The control of its construction duration | Documents |
| | The performance of the project result | Steadily growth in economy | opinions from experts, questionnaire survey |
| | | Social development | opinions from experts, questionnaire survey |
| | | The effective development of the regional resources | opinions from experts, Statistical calculation |
| | | Meeting the needs for improving the block | questionnaire survey |
| | | The convenience of daily life | questionnaire survey, Statistical calculation |

Date source: the author

5.3 The collection of the performance appraisal and comments as well as the standard of its collection.

There are a set of comments of two levels based on the operating project. The comments of the standard level are:

U= { excellent, good, ordinary, bad, worse }

As for the reliability and validity of the qualitative index, both can be verified through quantization, and, meanwhile, it has been processed through dimensionless quantity method. After the quantization of the qualitative index, every appraisal indexes is offered to a value. However, there’s no basis for all types of indexes to blend due to various quantization units. The dimensionless quantity method, also called the standardization or specification of the data, will be transformed from the actual value of index indicated in different dimensions to the comment value of the dimensions through the mathematical transformation.

Based on the nature and various forms of expression in the system of the index of the project performance appraisal, it can be divided into two major types:

(1) The benefits type. The higher of the score and bigger of the benefits index is, the better for the project performance. Therefore, the more it required the better. For example, the approval in accordance with rules and the rational ratio of the fund operation.

(2) The cost type. The more the index of the cost type is, the worse the performance of the project will be. Therefore, the less required the better. For example, the rate of traffic accident and the environmental influence. The equation for both types is as follows:

X=1 when the measured value is higher than the highest one expected X_{max}

$$X = \frac{x - x_{max}}{x_{max} - x_{min}} \text{ 当 } X_{min} \leq X \leq X_{max}$$

$X=0$ when the measured value is lower than the highest one expected X_{min}

After the confirmation of the performance appraisal index and weigh, it is necessary to score every index by certain standards which include:

1. The national and local administrative standards of the urban construction: “The Urban Construction and Acceptance Specification”, “The Design Specifications for the Construction Project”, “The Design Specifications of the Urban Road Plan” and “The Construction and Acceptance Specification of the Construction Project”;
2. The task of the engineering design;
3. The proposal of the project;
4. The approval form of the project estimates and corresponding documents for approval.

Through the survey and interview for the owner organization, the community around and users, a performance appraisal standard about the project of Kaina Business Centerm is constructed which is seem as follows:

Table 5.2 The performance appraisal standard about the Kaina Business Centerm project

| Objective | weigh | index | Weigh | order of appraisal | | |
|---|-------|--------------------------------|-------|--|---|--|
| | | | | bad | medium | good |
| | | | | I | II | III |
| the decision performance of the project | W1 | Constructi on objective X11 | W11 | Impulsive decision-making; extremely ambiguous construction objectives; bad control objectives | Scientific decision-making process; Reasonable construction objectives | Scientific decision-making process; specific construction objectives |
| | | A proper approvalX 12 | W12 | Long appraisal process; incomplete appraisal materials | Moderate appraisal process; relatively complete appraisal materials | Proper appraisal process; complete appraisal materials |
| | | The informatio n publicity X13 | W13 | Conduct an investigation on information grasped by 30%+ users | Conduct an investigation on information grasped by 50%+ users | Conduct an investigation on information grasped by 60%+ users |
| The admini strative perfor mance of the project | W2 | Safety X21 | W21 | Critical construction security accidents; no safety precautions or indicating equipment | No critical construction security accidents; safety precautions, knowledge and equipments | No critical construction security accidents; complete safety precautions and clear indicating equipments |
| | | The fund operation X22 | W22 | Simple fund source and low rate of supply | Basically meet the demand of project. | Various capital source and low capital cost |
| | | The control of the change X23 | W23 | Delayed certification change; difficulties in | Timely certification change. Reasonable disputes solution. | Timely certification change; rapid disputes solution; raw contract defects |

| | | | | | | |
|---------------------------------------|----|-------------------------------------|-----|--|--|---|
| | | | | solving disputes; severe contract defects | Raw contract defects | |
| | | The quality managementX24 | W24 | Unreasonable quality management, no specialized quality management institution | Professional institutions for the quality management but incomplete quality management mechanism | Conclude quality guarantee, perfect management |
| | | The duration of the constructionX25 | W25 | More than 30% delay | Less than 30% delay | On schedule or completion before schedule |
| The result performance of the project | W3 | Economy X31 | W31 | Hinder economic development | Basically similar to economic growth | Improve economic development |
| | | societyX32 | W32 | Hinder social development | Basically similar to social growth | Improve Social development |
| | | resources X33 | W33 | Severe waste of urban resource | Basically no waste of urban resources | Exploitation of intensification of urban resource |
| | | trafficX34 | W34 | Hinder traffic development | Basically in line with traffic development | Improve the development of transportation course |
| | | Daily lifeX35 | W35 | Cannot satisfy demands in daily life | Basically meet demands in daily life | Can absolutely satisfy demands of surrounding residents |

5.4 The construction and analysis of the model

The methods of judging index weigh is to establish the hierarchical structure model, the constructing judgment matrix, the hierarchical ranking and the consistency test by means of hierarchical analysis.

(1) Establishing the hierarchical structure model.

The hierarchical structure is the key to simplify the complexity through the hierarchical analysis. The corresponding relation is established between all levels by disintegrating the objective of the whole performance appraisal s of the Kaina Business Centerm project.

(2) Constructing the judgment matrix

After the establishment of the hierarchical structure, the schemes can be compared in the group of two by adopting the methods of the relevant measurement with the hierarchical analysis. 1-9 scale is the most common standard quantitative method. Decision makers tend to choose the reciprocity1-9 scale judgment matrix as the judgment means. Reciprocity1-9 scale is seen below:

Table 5.3 The comparison among scale1-9 with the hierarchical analysis

| The scaling value of 1-9 | The corresponding language description |
|--------------------------|---|
| 1 | The former is of the same importance with the latter |
| 3 | The former is slightly more importance than the latter |
| 5 | The former is obviously more importance than the latter |
| 7 | The former is strongly more importance than the latter |
| 9 | The former is extremely more importance than the |

| | |
|-------------------|--|
| | latter |
| 2,4,6,8 | The result that is obtained by dividing the former by the latter is above the above scales |
| 1,1/2,, 1/9 | The relation between the former and latter is the opposite value of the above scales. |

The properties of the judgment matrix with 1-9 scales are as follows:

(a) When $i=j$, $a_{ij}=1$;

(b) When $i \neq j$, $a_{ij} = \frac{1}{a_{ji}}$;

(c) $a_{ij} > 1$.

(3)The hierarchical ranking and the consistency test

The aim of making the hierarchical ranking and scoring according to 1-9 scales is, as for certain objective of the last hierarchy, to make sure of the order of the importance among reactivity indexes of this hierarchy and the weigh value of the order. There are mainly two issues for the realization forms of the hierarchical ranking, including the feature solution and vector that are used to judge the knowledge of array. As for the fixed judgment matrix, its calculation should be met the feature solution and vector of the equation;

$$B = \lambda_{\max} L$$

λ_{\max} is the biggest feature solution in equation B. L is the normalized feature vector corresponding to the knowledge of array. The weight L_i of L is the weigh value corresponding to the elements of single order.

While making judgment that the matrix B is of completely consistency, $\lambda_{\max} = n$. In order to judge its consistency, it needs to calculate its consistency index.

$$CI = \frac{\lambda_{\max} - n}{n - 1}$$

In order to check whether the matrix is of satisfying consistency, a comparison should be made between CI calculated and RI- the average random consistency index. The value of RI can be seen in the following table.

Table 5.4 The Consistency Index of the Average Random

| Order number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|--------------|---|---|------|------|------|------|------|------|------|------|
| RI | 0 | 0 | 0.56 | 0.91 | 1.13 | 1.26 | 1.37 | 1.42 | 1.46 | 1.48 |

The weight of the index system constructed below will be calculated through analytic hierarchy process (AHP) mentioned above. Firstly, multiple comparisons will be conducted on project decision-making performance, project management performance and project application performance appraisal index in the criterion layer.

Table 5.5 Comparative Judgment Matrix of Index in Criterion Layer

| Appraisal Index Xi | Project Decision-making Performance X1 | Project Management Performance X2 | Project Application Performance X3 | Weight Value W |
|--|--|-----------------------------------|------------------------------------|----------------|
| Project Decision-making Performance X1 | 1 | 1/3 | 1/5 | 0.10926 |
| Project Management Performance X2 | 3 | 1 | 1/2 | 0.32067 |
| Project Application Performance X3 | 5 | 2 | 1 | 0.57007 |

See the calculation result through MATLAB7.0 below:

Characteristic Value $\lambda_{\max} = 3.0037$;

Characteristic Vector $w = [-0.1640, -0.4629, -0.8711]^T$.

The result of consistency check of the criterion layer is:

$$CI = \frac{\lambda_{\max} - n}{n - 1} = \frac{3.0037 - 3}{3 - 1} = 0.0019$$

Combined with RI Value: 0.58, the check value is

$$CR = \frac{CI}{RI} = \frac{0.0019}{0.58} = 0.0328$$

This check value is less than 0.01, the result of matrix and criterion layer index design is acceptable.

By using the same approach, characteristic value and vector of each judgment matrix can be achieved. See calculation result from the three tables below:

Table 5.6 Comparative Judgment Matrix of Project Decision-making Performance Index

| Project Decision-making Performance X1 | Construction Goals X11 | Appraisal Compliance X12 | Information Disclosure X13 | Weight Wi | Characteristic Matrix w | Consistency Check |
|--|------------------------|--------------------------|----------------------------|-----------|-------------------------|--|
| Construction Goals X11 | 1 | 4 | 7 | 0.7104 | -0.9592 | $\lambda_{\max} = 3.0020$ CI=0.0010 CR=0.017<0.1 |
| Appraisal Compliance X12 | 1/4 | 1 | 2 | 0.1924 | -0.2507 | |
| Information Disclosure X13 | 1/7 | 1/2 | 1 | 0.0973 | -0.1311 | |

Table 5.7 Comparative Judgment Matrix of Project Management Process Performance Index

| Project Management Performance X2 | Security X21 | Fund Operation X22 | Change Control X23 | Quality Management X24 | Construction Period Control X25 | Weight w2 | Characteristic Matrix w | Consistency Check |
|-----------------------------------|--------------|--------------------|--------------------|------------------------|---------------------------------|-----------|-------------------------|---|
| Security X21 | 1 | 1/5 | 1/3 | 1/5 | 2 | 0.0901 | 0.1535 | $\lambda_{\max} = 5.3467$ CI=0.08668 CR=0.078<0.1 |
| Fund Operation X22 | 5 | 1 | 1/2 | 2 | 3 | 0.2776 | 0.5183 | |
| Change Control X23 | 3 | 2 | 1 | 3 | 5 | 0.3379 | 0.7427 | |
| Quality Management X24 | 5 | 1/2 | 1/3 | 1 | 2 | 0.2373 | 0.3763 | |
| Construction Period Control X25 | 1/2 | 1/3 | 1/5 | 1/3 | 1 | 0.0571 | 0.1204 | |

Table 5.8 Comparative Judgment Matrix of Project Result Performance Index

| Project Result Performance X3 | Economy X31 | Society X32 | Resource X33 | Transportation X34 | Daily Life X35 | Weight W3 | Characteristic Matrix w | Consistency Check |
|-------------------------------|-------------|-------------|--------------|--------------------|----------------|-----------|-------------------------|--|
| Economy X31 | 1 | 1/2 | 2 | 2 | 3 | 0.2615 | -0.5236 | $\lambda_{\max}=5.2811$ $CI=0.0703$ $CR=0.063<0.1$ |
| Society X32 | 2 | 1 | 2 | 2 | 3 | 20.3077 | -0.6879 | |
| Resource X33 | 1/2 | 1/2 | 1 | 2 | 3 | 0.2154 | -0.3986 | |
| Transportation X34 | 1/2 | 1/3 | 1/2 | 1 | 1/2 | 0.0872 | -0.1894 | |
| Daily Life X35 | 1/3 | 1/2 | 1/3 | 2 | 1 | 0.1282 | -0.2406 | |

Combined with the above calculation process, see performance appraisal index system of KAINA Business Square as follows:

Table 5.9 Performance appraisal Index System of KAINA Business Square

| Criterion Layer Index | Index Layer Index | Index Layer Index | Total Weight |
|--|---------------------------------|-------------------|--------------|
| Project Decision-making Performance X1 | Construction Goals X11 | 0.7104 | 0.078 |
| | Appraisal Compliance X12 | 0.1924 | 0.021 |
| | Information Disclosure X13 | 0.0973 | 0.011 |
| Project Management Performance X2 | Security X21 | 0.0901 | 0.029 |
| | Fund Operation X22 | 0.2776 | 0.089 |
| | Change Control X23 | 0.3379 | 0.108 |
| | Quality Management X24 | 0.2373 | 0.076 |
| | Construction Period Control X25 | 0.0571 | 0.018 |
| Project Result Performance X3 | Economy X31 | 0.2615 | 0.149 |
| | Society X32 | 0.3077 | 0.175 |
| | Resource X33 | 0.2154 | 0.123 |
| | Transportation X34 | 0.0872 | 0.050 |
| | Daily Life X35 | 0.1282 | 0.073 |

5.5 Chapter Summary

This chapter mainly appraises construction project performance system from the angles of stakeholders through case analysis, and constructs performance appraisal index system. The main criterion, goal, index and appraisal scheme adopted are as follows:

- (1) Criterion: generally speaking, performance appraisal index system includes several layers, and each one of them contains several elements, which are also known as criterion. To be more understandable, criterion refers to standards or rules measuring the value of objects. In an index system, as criterion, elements in the same layer dominate certain elements in the next layer, and at the same time, they are dominated by elements in the previous layer, thus forming a hierarchical relationship.

(2) Goal: the top layer of hierarchical relationship is generally known as destination layer, in which, destination means a kind of anticipation value, which shows the final anticipated result of organizational hierarchy.

(3) Index: the bottom layer of performance appraisal index system is known as index layer, in which, index is generally regarded as the specific content and sub-item of appraisal, which is applied in measuring the realization degree of project goals. Index layer is dominated by the previous criterion layer.

(4) Appraisal Scheme: selectable approaches applied in evaluating specific sub-items of index system, and there are generally various alternative appraisal schemes for a specific index system.

In conclusion, the aggregate analyzing route of index system constructed in this chapter is: analyze and apply the interrelationship of three kinds of index-decision-making performance index, project management performance index, and result performance in evaluating the economical efficiency, efficiency, availability and fairness of public investment projects to finally appraise the performance of construction project. And then project performance appraisal, as well as interest requirements and influence of core stakeholders is applied to distinguish index weight.

6. OUTLOOK AND CONCLUSION

6.1 Research Conclusion

As a new system come into being in the process of our economic system transition, project performance appraisal has received increasingly attention. After going through reforms and opening up, our project shows new vitality, especially our economic macro-environment which has dramatically improved and developed under the influence of current market economic system. The management approach current traditions hold toward economy is no longer adaptive to requirements of social development, and socialist market economy system with Chinese characteristics has been established in China. We have no way but establish project performance appraisal system as soon as possible, and timely transform project operating management modes, because they are the objective demands and realistic requirements which are adaptive to current social and economic development in China.

During the process of studying construction project performance appraisal system, this dissertation analyzes from the angles of stakeholders, takes relevant national instruction files on performance appraisal as its guidance, and takes the initiative to make full use of key performance index, appraisal process theory, goal management theory and tendency management theory to apply in unified appraisal standards, dynamic and static index of initiative application in project performance appraisal index system, as well as appraisal standards and multiple layer index system according to features of project obtained through analysis. On such foundation, this dissertation applies AHP in the process of assigning and calculating index system and appraisal result.

This project has different construction goals from private projects, which makes it impossible to acquire satisfactory conclusions from project financial appraisal. This dissertation studies performance connotation, stakeholders, and interrelationship, interest requirements of stakeholders, together with index system through performance appraisal theory and stakeholder theory. Research conclusions in this dissertation are mainly as follows:

Firstly, construction project performance refers to, in essence, optimal efficiency of overall project construction on the basis of satisfaction of core stakeholders. In order to satisfy requirements of the public, construction goals have multiple features. Public project is accomplished by continuous contributions and satisfaction of requirements of core stakeholders, in which, the essence of performance is optimal efficiency of overall construction on the basis of satisfaction of core stakeholders.

Secondly, stakeholders of construction project changes dynamically according to the process of project construction. Core stakeholders projects are more complicated than private ones, that's why different construction stages are made up of different core stakeholders. Dynamic core stakeholders of public projects are defined according to scores given by experts: decision-making stage includes government and social public; construction stage includes project proprietors and professional institutions (contractor and consultancy); application stage includes government, social public and surrounding residents.

Thirdly, there are multiple goals of construction project performance appraisal. The overall objective is to inspect the following capabilities of projects: supply, satisfying public demands; maintaining social fairness; improving social

economic development environment and living standard. Each group holds different goals toward performance appraisal, which are consistent as a whole though.

Fourthly, overall construction project performance is a reflection of performance in three aspects: decision-making, management and result. The final conclusion of performance appraisal is in the form of report, which is finding out questions existed in construction process through performance appraisal, thus offering experience and reference for improving construction efficiency of similar projects.

Fifthly, performance appraisal index system of construction project based on analysis of stakeholders is established. Through specific analysis of decision-making, construction and management, as well as interest requirements of core stakeholders in the application stage, index framework is constructed, and three approaches of confirming index weight are analyzed. Finally, performance appraisal of KAINA Business Square project is selected for case analysis.

6.2 Research Suggestion

On the basis of stakeholder theory, AHP is actively applied in project performance appraisal, which offers the possibility of conducting an objective appraisal of project performance from a horizontal and vertical angle. Conducting project performance appraisal through approaches combined with AHP can not only work as an objective reflection of current performance level of construction project, but also make a objective identification of effective subjective endeavors in operation management under different objective conditions visually. Therefore, the popularization and application of this approach can play a favorable role in improving the level of operation management, and dramatically enhance the level of project performance. Although in this dissertation, all appraisals of project performance and relative performance are based on construction projects, various projects have common traits, and, consequently, this approach can also be popularized to be applied in overall and relative performance appraisal of construction projects with different properties or regional differences.

6.3 Research Outlook

In China, study and application of performance appraisal of construction project is still in the initial stage, which has objective existence of many theoretical and practical questions when comparing with other successful countries. The construction of project performance appraisal system in this dissertation also relies on continuous perfection in practice.

Firstly, keep in mind anytime that in the process of setting index system, system adjustment according to objective and actual situation of project is required in due time, especially after getting to know the objective and actual situation of construction project, scoring standard, description and settings of scores should be adjusted according to practical demands.

Secondly, accomplish data statistics of appraisal index in this dissertation through calculating result and appraisal scores of comparative analysis when developing computer software according to internal LAN equipped with project.

Thirdly, be established in eternal performance improvement; in the practice process, further study on human resource management system of project department, relevant questions of construction department, as well as motivation system and staff performance appraisal system of project department should be conducted when constructing performance appraisal system of construction project.

Fourthly, provide conditions of the implementation of performance appraisal of construction project in the initial stage to government, and improve to be geared on social demands gradually according to market environment. With the gradual improvement of our socialist market economy, as well as appraisal system, which has been gradually standardized, especially the establishment of increasingly diversified project investment structure, just like those social audit and assets appraisal, project performance appraisal must ascend from being manipulated by government departments to being entrusted to appraise by government departments or being implemented by social intermediary organs in carrying out appraisal step by step.

Fifthly, move toward internationalization and institutionalization step by step. Because our project performance appraisal system is a new approach created by supervising project under current market economic conditions, we should take the initiative to learn and reference new appraisal experience in the world in practical process. With the increase of exchanges between our economy and various countries in the world, our project performance appraisal system will also move toward internationalization and institutionalization gradually.

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APPENDIX - 1

Expert Score Sheet of Screening Construction Project Stakeholders

Dear distinguished experts:

We are doing an investigation on an academic topic, which aims at understanding the current situation and questions existed in the relations between construction project and stakeholders.

This investigation is anonymous, and there's no right or wrong answer. Please spare some of your valuable time and offer us real information. We will keep your answers confidential, and will not reveal enterprise or personal information in any case. We also guarantee that these data materials will only be used for academic research. Please be relieved in filling your answers.

Your support and cooperation will be highly appreciated.

INTRODUCTION

1. "Construction project" refers to constructional engineering project in the field of investment construction, namely, conducting investment construction which contains certain constructional or constructional installation engineering related projects for specific goals. For example: constructing a residence community in a certain scale; constructing a workshop or factory with certain production capacity; constructing an expressway in certain grade; constructing a hospital, cultural and recreational facility in a certain scale.
2. "Construction project stakeholder" refers to individuals or organizations, who have invested certain exclusive assets in construction project, can influence construction process, and whose interests are under the influence of project. Stakeholders, in the broad sense, mainly include proprietors, contractors, investors (shareholders), sub-contractors, suppliers of equipments and materials, supervision companies, design companies, management personnel, staff, competitors, financial institutions (for example, bank), domestic governmental institutions, overseas government, public, social groups (environmental protection organization and consumers' association), media (television, newspaper, network), communities, creditors and exterior cooperators (scientific research institution, consulting company) involved in project.
3. This questionnaire takes stakeholders of constructional engineering project as the main targets for investigation.
4. Please mark "√" after the stakeholders that you think have greater influence on construction project, and the number of "√" is not limited.

Table A-1

| Stakeholders | Check | Stakeholders | Check |
|--------------------------------------|-------|---------------------|-------|
| Staff | | Overseas Government | |
| Project Management Team | | Contractor | |
| Educational Institution | | Social Public | |
| Supplier of Equipments and Materials | | Natural Environment | |
| Supervision Company | | Media | |
| Government | | Competitor | |

| | | | |
|---------------------|--|------------------------|--|
| Social Group | | Community | |
| Project Proprietor | | Sub-contractor | |
| Exterior Cooperator | | Religious Organization | |
| Investor | | Financial Institution | |

APPENDIX - 2

Questionnaire of Interests Requirements of Project Stakeholders

In the three stages of project-decision-making, implementation management and application, which interests requirements of the three core stakeholders below do you think are the most important? Please mark “1” for the least important, “9” for the most important, and “1 to 9” correspondingly for between. (Other investigation reports are similar, and omitted due to the length limitation)

Table A-2

| Project Stage | Interests Requirements of Project Proprietor | Importance (1...9) | Forms of Realization | Importance (1...9) |
|-----------------------------|--|--|---|--------------------|
| Decision-making | Social Demands Transition Effect | | Comprehensive Information Gathering on Social Demands | |
| | | | Scientific Approaches of Information Analysis on Social Demands | |
| | | | Scientific Conclusion of Information Analysis on Social Demands | |
| | Specific Construction Goals | | Approved by Appropriate Approval Authority | |
| | | | Construction Goals in Line with Regional Economic Development Program | |
| | | | Construction Goals in Line with Public Social Demands | |
| | Requirements of Appraisal Compliance | | Complete Approval Procedures | |
| | | | Proper Execution of Approval Procedures | |
| | | | Authentic and Valid Approval Result | |
| Project Management | Security Requirements | | In Line with National Regulations on Safety Manufacture | |
| | | | Safe and Ordered Site Operation | |
| | | | No Critical Safety Accident | |
| | Environmental Protection Requirements | | No Critical Site Environment Pollution Accident | |
| | | No Critical Surrounding Environmental Pollution Accident | | |
| Appraisal after Application | Drive Economic Development | | Rapid Growth of National Economy | |
| | | | Optimization and Upgrade of Industrial Structure | |
| | | | Rapid Development of Regional Economy | |
| | Drive Social Development | | Enhance in the Capability of Resisting Natural Calamities | |
| | | | Social Stability and Unity | |
| | | | Fair Income Distribution | |

| | | | | |
|--|--|--|---|--|
| | | | Employment Increase | |
| | Realization of Effective Exploitation and Utilization of Regional Resource | | Technological Progress | |
| | | | Enhance of Residence Living Standard and Life Quality | |
| | | | Increase of Regional Infrastructure and Social Service Capacity | |
| | Satisfaction of Urban Requirements of Transportation Development | | Rapid Urban Development | |
| | | | Harmony with Urban Development | |
| | | | Enhance of Transportation Efficiency | |
| | Drive Opening to the Outside World | | Increase of Foreign Investment | |
| | | | Increase of International Exchange and Cooperation | |

APPENDIX - 3

Score Sheet of Performance appraisal of KAINA Business Square Project.

In the form below, please score according to the circumstance you know well, mark “9” for excellent (or satisfactory), “1” for worst (or least satisfactory), and “1-9” correspondingly for between.

TableA-3

| Project Stage | Realization | Appraisal Index | Appraisal Grade | | Score (1...9) |
|--|-------------------------------------|----------------------------|--|---|------------------|
| | | | Worst (or Least Satisfactory) | Excellent (or Satisfactory) | |
| Project Performance appraisal of KAINA Business Square | Project Decision-making Performance | Construction Goal X11 | Impulsive decision-making; extremely ambiguous construction goals; bad control goals | Scientific decision-making process; specific construction goals | |
| | | Appraisal Compliance X12 | Long appraisal process; incomplete appraisal materials | Proper appraisal process; complete appraisal materials | |
| | | Information Disclosure X13 | Conduct an investigation on information grasped by 30%+ users | Conduct an investigation on information grasped by 60%+ users | |
| | Project Management | Security X21 | Critical construction security accidents; no safety precautions or | No critical construction security accidents; complete safety | |

| | | | | | |
|--|----------------------------|-------------------------|---|--|--|
| | Performance | | indicating equipment | precautions and clear indicating equipments | |
| | | Fund Operation X22 | Simple fund source and low rate of supply | Various capital source and low capital cost | |
| | | Change Control X23 | Delayed certification change; difficulties in solving disputes; severe contract defects | Timely certification change; rapid disputes solution; raw contract defects | |
| | | Quality Management X24 | Unreasonable quality management, no specialized quality management institution | Conclude quality guarantee, perfect management | |
| | | Construction Period X25 | More than 30% delay | On schedule or completion before schedule | |
| | Project Result Performance | Economy X31 | Hinder economic development | Improve economic development | |
| | | Society X32 | Hinder social development | Improve Social development | |
| | | Resources X33 | Severe waste of urban resource | Exploitation of intensification of urban resource | |
| | | Traffic X34 | Hinder traffic development | Improve the development of transportation course | |
| | | Daily Life X35 | Cannot satisfy demands in daily life | Can absolutely satisfy demands of surrounding residents | |