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Improving Risk Decisions for Internationally Contracting Projects Based on Behavioral Decision Theory

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Abstract: Project risks have been proposed to be divided into four categories, namely, strategic risks, financial risks, operational risks and hazard risks for projects under the international competitive environment. Through systematical studies on internationally contracting project risk decisions based on Behavioral Decision Theory (BDT), key factors related to the behavior preferences of decision makers have been induced to expand and improve existing risk decision models, improving the efficiency and effectiveness of risk decision-making. Such systematical studies have resulted in some interesting findings which may be helpful for guiding the project management in strategic and operational planning. The first finding shows that, a reasonable guide has helped owners determine the appropriate contracting project management mode based on the specific context and requirements of the project in order to better improve the decision-making efficiency and effectiveness, and effectively control project risks by properly staffing the organizational behaviors. The second finding shows that, the risk quantification and proper financing decision making basis has been proposed on internationally contracting project costs estimate to meet the financing requirements of international banks, so as to help the contractor assist the owners for financing. The third finding shows that, the clearly defined methods for calculating the expected returns and risks on the risk decision on contracting project in properly packaging planning and procurement strategies have been systematically studied, so as to effectively instruct the contractors for the project subcontracting and its packaging planning and risk controlling.

Keywords: Project Management, Project Strategic Planning, Risk Decision, Behavioral Decision Theory

1. Introduction

Risk classification standard is not absolute, generally project risks are proposed to be classified into strategic risks, financial risks, operational risks and hazard risks. (1) Strategic risks refer to the impacts of uncertainty on the main contractor to achieve the strategic development goals and implementation of development programs, where the main contractor must comply with the requirements of the shareholders to select the appropriate project management modes by combining the market context and improving the contractor core competitive edge, seizing development opportunities to the aspects of market losses by avoiding the risk factors. (2) Financial risks are also called commercial risks or economic risks, which refer to the impacts on the contractor's cash flow caused by the uncertainties including changes in interest rates and exchange rates, as well as fluctuations of raw materials or product price, and policies for credit and financing, as well as the impacts on the contractor's financial goals caused by the financial management behaviors. (3) Operational risks refer to the impacts involved in company operational targets and its implementation process caused by the uncertain factors such as planning and supply chain management, as well as operations planning and rational allocation of resources, configuration and flow of key personnel, subcontracting strategies and legal compliance, supervision and inspections. (4) Disaster risks refer to the impacts on the achievement of the safety management objectives caused by the uncertainty factors including floods, fires, accidents, thefts, personal injuries etc. This paper discusses the risk decision on the above mentioned risks except the disaster risks.

In the practices of internationally contracting project management activities, complex risks have always been existing in the life cycle of projects in various stages and aspects, and the project risk decision has been playing a crucial role on the successful execution of the projects. In order to improve the efficiency and effectiveness of risk decisions, systematical study on internationally contracting project risk decisions based on behavioral decision theory, introducing the key factors related to the behavior preferences of decision makers might be helpful to improve risk decision efficiency and effectiveness, this study is of important practical significance. This paper focuses on risk decisions in the phase of project strategic planning, while the ones for operational execution phase such as bidding risk decisions were not discussed, but their lessons learned by Hetogh et al [1] were considered to risk decisions in the phase of project strategic planning.

2. Literature Review

2.1. Research and Applications of Behavioral Decision Theory

BDT research is on how the decision makers make their decisions, and what the psychological explanation is behind the decision behaviors in the actual decision-making process based on human rationality, which is bounded rationality between complete rationality and irrationality, where the actual decision behavior acts as a starting point from the perspective of cognitive psychology. Bounded rationality is an important foundation and prerequisite of BDT for Simon as a representative of the school on bounded rationality decision theory as a starting point, where assumptions were applied to advocating bounded rationality managers instead of completely rational decision makers. Simon [2] [3] thought that the decision makers were constrained by their own cognitive limitations and the limitations caused by the uncertainty and complexity of the decision-making environment, where its rationality is actually bounded rationality. Numerous studies showed that those bounded rationality decision makers seek satisfied standards rather than the optimal standards [4] [5] [6] [7]. In 1961, Edwards [8] published a review article, namely, Behavioral Decision Theory, based on the summary of experimental studies after 1954, which had significant impacts on the studies on BDT since then. Kahneman and Tversky jointly [9] presented Prospect Theory and Corrected Cumulative Prospect Theory [10], where the powerful additions and amendments were made to the expected utility theory theoretically, so that BDT has been widely recognized by the academic communities.

In economic and financial fields, Wong [11] proposed the optimal bank interest margins models based on the utility function of Regret Aversion Preference. The model regarding consumer behavioral decision regret was established by Bui et al [12] based on the existing literature on the Regret Theory, which was applied to assess how the regret impacts consumer satisfaction, as well as the degree of rumination and brand switching intention. Bromiley et al [13] proposed the project resource allocation model based on Prospect Theory under risk environment, including the positive and negative adjusted returns. Liu et al [14] proposed the program for optimal selection on sorting by establishing the prospect value function and interval probability weighting function of the uncertain language phrase property values based on solving the multi-attribute decision making problems, where prospect values of language phrase are uncertain and the probabilities are interval numbers. Most of the current BDT applications are in the fields such as finance, accounting etc, whilst the international project risk management activities are rarely involved. Internationally contracting project decision-makers by applying BDT still need to consider the internationally contracting project risk management features and explore the internal mechanism of project risk decision, building the appropriate risk management and decision-making system, so as to satisfy the actual needs.

2.2. Research on Risk Management for Internationally Contracting Projects

In the early 20th century, the concept of risk management was first proposed by a German management expert, and later, American scholars further improved risk management theory, and in the 1960s, risk management was formally introduced into business management, from then on, it opened a risk management chapter in modern management science. During 1980s, risk management was in the phase of rapid development, in 1983, the United States RIMS annual meeting was held, representatives of the world adopted the 101 risk management guidelines as general risk management guidelines for each country in the world. In 1992, the Risk Management Association promulgated the Project Risk Management Guide, where risk management methods and related terms were defined and standardized. After nearly a century of development, risk management study for the West has made a series of fruitful results [15], mainly in three aspects such as risk identification, risk assessment and risk control.

In the field of risk identification research, Maytorena et al [16] studied and analyzed the risk management activities of 51 projects, and the results showed that the experience levels of project managers and the levels of perfection of project information data had maximum effects on risk identification efficiency. Rubio et al [17] and Choudhry et al [18] thought that the project budget overruns, the complexity of construction context as well as the natural environment etc. would result in project risks. Thevendran et al [19] described the project perceived risk identification process and believed that the human risk was one of the important elements that must be considered in engineering project risk management.

In the field of risk assessment, Hsueh et al [20] proposed a multivariate risk assessment model that could be used to calculate the project expected utility value and risk value. Nieto-Morote et al [21] conducted risk assessment on construction projects in three aspects such as the risk impact levels, as well as the risk probability and risk recognizable degrees. Vanhoucke [22] applied the Monte Carlo model to measure and assess the effectiveness of the project coordination based on empirical and virtual data. Zeng et al [23] proposed the extended risk analysis method of fuzzy data and improved the Analytic Hierarchy Process (AHP) to assess the risk of the projects.

In the field of risk control, Fahad et al [24] proposed risk management framework for BOT projects based on the thinking of the entire life cycle project management. Melnic [25] put forward a series of measures to deal with project risks according to the cases once appeared in the project management processes. Vanhoucke [26] used tracing methods for project risks dynamic tracking, and predicted project dynamic risks to achieve effective management of risks according to the construction progress. Charrel et al [27] considered that it needed to develop a comprehensive risk prevention measures in the project planning stage, so as to validate the feasibility of preventive measures, ensuring its effective implementation and the effectiveness of risk management.

With the accelerating process of globalization, more and more construction companies began to participate in the overseas construction projects, where the high-yield internationally contracting projects not only attracted contractors to be engaged in the international market, but also brought higher risks to the cross-border projects by their particularities. Javernick-Will et al [28] believed that overseas project contractors needed to strengthen the understanding of the local policies and systems, so as to reduce the impacts of risk of social projects, and realize profitable for the overseas projects. Dikmen et al [29] constructed a CBR model, where the risks as well as opportunities and competitive situations of the internationally contracting project market were analyzed. Robert et al [30] thought that international EPC projects in execution phase were subject to constraints of political, economic, financial and social situations of the country where projects were located, while the situations in the country of the contractor also affected the projects.

In summary, systematic theories were lack for guiding the risk management activities of the internationally contracting projects. In addition, the existing risk management approaches were based on qualitative management experience mainly, whilst few quantitative analysis involved, but most internationally contracting projects emerged in large-scale, complex features, which need quantitative analysis as much as possible to ensure the reliability of risk management. Therefore, how to improve and enhance the internationally contracting project risk management capabilities is a big problem to be solved.

2.3. Research on Risk Decisions for Internationally Contracting Projects

Risk decision methods have been used for a long period of study, and great development have been gained. Risk decision methods are divided by nature into qualitative, quantitative, and a combination of both methods: some qualitative approaches are: the Analytic Hierarchy Process (AHP) and expert scoring (DELPHI), etc; and some quantitative methods are: Monte Carlo Simulation, as well as Graphic Evaluation and Review Technique (GERT), and risk assessment techniques etc.

In the field of project risk decision, scholars have proposed a series of methods that are suitable for contracting projects. Hashemi et al [31] proposed a comprehensive risk decision method based on bootstraps by applying the statistical principles to the project risk decision strategy. Sousa et al[32] used Bayesian network to conduct decision making to project risk control activities. Due to more types of risks and they have more dynamic lines of features under complex engineering environments, the use of Bayesian networks can integrate past historical data and information, which is helpful to conduct effective decision making to risk issues according to the principles of evidence. The project risks are also present in the project activities such as market strategy development, as well as project bidding, contractor selection, project investment, financial management, supply chain management, and contract management, project claims, so that carrying out these activities also needs to conduct risk decision activities. Mehmedali et al [33] used the evident-based reasoning model to build the framework for the bidding decision-making process issues to optimize the design for bidding decision making. Nieto-Morote et al [34] conducted decision making for solving the contractor pres-qualification tender issues, so as to guarantee the smooth progress of the bidding activities based on the fuzzy set theory. In the field of financial risk decision-making, Nikolić et al [35] summarized the risk characteristics of public works projects and conducted analysis and decision-making of financial risks by taking the hydro-power station construction project in Serbia as an example. In the field of supply chain risk analysis and decision-making, Botin et al [36] proposed a risk-based value chain management method, where project risks through each stage of the project cycle were evaluated, so as to achieve the objective of maximizing the value of the project to determine the optimal project risk management program. In the field of contract risk decision-making, Loosemore et al [37] explored the effects of the construction supply chain risk on contractual decisions, the authors believed that the contract risk-sharing consensus was the basis for contracting parties to effectively and efficiently communicate and reduce the contract risks.

For internationally contracting projects, since it was more complex and higher levels of risk decision than those of conventional projects, the risk decision activities of the international projects are more complex, thus increasing the decision-making difficulty. Khattab et al [38] and Holburn et al [39] proposed international political risk decision-making framework on the basis of summarizing on the international project political risks from a strategic point of view. The framework could be used as the theoretical basis for decision-making and operational guidelines to the political risk decision activities. Jia [40] combined the AHP with FMEA methods and used the combined method in the risk decision activities of internationally contracting projects. Use of the FMEA method would enable the contractor to identify the levels of project risks, use of the AHP method could measure the association of risk and harmful levels to determine the optimal risk response strategies.

For most of the existing risk decision methods, decision making was conducted by ignoring the impacts of psychological preferences and behavior modes of the decision makers were rarely considered on decision-making activities. But in the actual decision-making process, decision makers behaviors were mostly limited rational decisions, meaning that decision-making activities could be impacted by the factors such as their own behavioral deviance and personality characteristics etc. Therefore, during the project risk decision-making, study on the behavior of the decision-makers and identification of the subjective factors would be of great significance.

3. Data and Methodology

There are data for the research and the analysis, and the methodology for handling such data in the risk decision processes. The data are collected from the internationally contracting projects, and the procedures of risk decision are from the BDT.

3.1. Data Collecting Resources

The following research methods such as literature analysis, questionnaires, as well as modeling analysis have been adopted, and their data were collected through the extensive sources of questionnaires from experienced contractors, owners, project managers with extensive experience. The methodology of risk decision is described as below.

3.2. Procedures of Risk Decision

The procedures of risk decision are: (1) Identify and define the problems, which means describing the background of the issues, and indicate the existing issues and their scope. (2) Determine the target, which means describing the outcomes, and objectives to be achieved. (3) Develop the alternatives, which means pointing out the limited options, and noted their respective probabilities. (4) Choose the options, which means selecting the key factors in the risk decision and building the model, and making decisions to recommend the most appropriate solution based on the related indicators for the calculated target. (5) Implement risk analysis on the implementation program, which means describing the risk analysis after implementing the above recommended solutions. (6) Inspecting and evaluating the implementation program, which means describing the results of the assessment after implementing the above recommended program, and feed such evaluated results back to the step (2) determining the targets to minimize the risk and make more realistic goals for the projects.

4. Results and Discussion

The main contractors must be facing marketing strategic risks, financial risks for financing, as well as the operational strategic planning, and such comprehensive studies have been conducted on the project risk decisions, and their related findings have been discussed. In the 4.1 section, choice of proper project management mode is discussed, and in 4.2 section, the project cost estimate accuracy is discussed, in 4.3 section, the subcontract packaging strategy is discussed in detail, respectively.

4.1. Risk Decision for Project Management Modes Based on Marketing Strategic Risk Environment

One of the strategic challenges in the early project stages for the owners is the choice of proper project management mode, which is hard for the decision makers since there are over ten modes for project owners for choices, and their lack of knowledge in project management and experience would result in general confusion and disorder state in the beginning of the project strategic planning. Therefore, it is necessary to pick up three typical project management modes in the practical operability for detailed comparison, the purpose is to guide the decision-making and help improve the efficiency and effectiveness of the project strategic plans such as staffing plan, as well as effective team building and the effort estimate in the project early stages and the organizational behaviors.

The most typical project management modes are EPC, EPCM and IPMT. (1) EPC stands for Engineering, Procurement, Construction, this mode is also known as integrated design and construction mode. Features of EPC mode are that owners involved little in the project management, because the main contractor has assumed most of the risks of project management, and the owners focus on final acceptance. Owners can also assign a professional company as its representative to conduct a strict comprehensive supervision on the implementation. (2) EPCM stands for Engineering, Procurement as well as Construction and Management, this mode means that the main contractor is not only responsible for the execution of project engineering and procurement, and the management of the construction but also responsible for managing other aspects of the project, such as: the progress of the engineering, procurement and construction, and full communication with relevant stakeholders. (3) IPMT stands for Integrated Project Management Team, also means the integration of professional project management contractor (PMC for short) with the project owner. Integration means project objectives and values as well as organizational structure are integrated to implement the life-cycle turnkey project tasks in the integrated systems.

How the project owner makes a decision on selecting the project management modes depends on the factors such as the qualified talents required in the project organizational structure, the project management skill level, and the project scope definition stages, and the attitude towards the project risks proposed by Kerzner [41]. From the project management professional point of view, it has been proposed that the required conditions should be applied to corresponding project management modes as listed in Table1, where each mode probability is one-third.

It can be seen from Table 1 that the factors of the feeling and preferences of the decision makers were considered during the risk decision on the project management modes, such decision making models could be straightforward and the efficiency is high whilst the effectiveness is also good for the owner to choose the project management modes, which may be helpful for both the owners and potential bidders to prepare the proper project organizational staffing and intelligently predict the efforts that should be input in the early stage of the projects.

Table 1. *Recommendations for Project Management Mode with Required Conditions.*

Required Conditions for Owner and Main Contractor	EPC Mode	EPCM Mode	IPMT Mode
Project organizational structure for the owner	Simple	Complete	Basic
Project organizational structure for the main contractor	Complete	Complete	Complete
Project management skill level for the owner	Junior	Senior	Middle
Project management skill level for the main contractor	Senior	Senior	Senior
Project stage after definition completed	Basic engineering	Feasibility study	Conceptual Design
Attitude of the owner toward the project risks	Aversive	Aversive	Neutral
Attitude of the main contractor toward the project risks	Favorite	Neutral	Favorite

4.2. Risk Decision for Financing Cost Estimate Based on Financial Risk Environment

The project cost estimate accuracy is strongly depending on the factors such as site selection, as well as process data available, and the facilities design state, and the basis for capital cost estimating and operating cost determination. The acceptable financial risk levels for financing are the main factors that are considered for project financing. The comparisons among various types of cost estimate contingency for risk decision are shown in Table 2.

The lower the contingency value, the lower the potential systemic risk level would be in the project financing. The contingency value that is higher than 15% is not acceptable for the international commercial banks.

Table 2. *Project Financing Cost Estimate Contingency Comparisons.*

Financing Cost Estimate Contingency	20%-25% exclusive	15%-20% exclusive	15%	10%
Site				
Plant capacity	Assumed	Preliminary	Optimized	Finalized
Geographical location	Assumed	General	Approximate	Specific
Maps and surveys	None	If available	Available	Detailed
Soil and foundations tests	None	None	Preliminary	Final
Site visits by project team	Possibly	Recommended	Essential	Essential
Process				
Process flow sheets	Assumed	Preliminary	Optimized	Finalized
Bench-scale tests	If available	Recommended	Essential	Essential
Pilot plant tests	Not needed	Recommended	Recommended	Essential
Energy and material balances	Not essential	Preliminary	Optimized	Finalized
Facilities Design				
Nature of facilities	Conceptual	Possible	Probable	Actual
Equipment selection	Hypothetical	Preliminary	Optimized	Finalized
General arrangements, mechanical	None	Minimum	Preliminary	Complete
General arrangements, structural	None	Outline	Outline	Preliminary
General arrangements, other	None	Minimum	Outline	Preliminary
Piping drawings	None	None	One-line	Some detail
Electrical drawings	None	None	One-line	Some detail
Specifications	None	Performance	General	Detailed
Basis for Capital Cost Estimating				
Estimates prepared by	Project Engineer	Senior Estimators	Senior Estimators	Estimate Department
Vendor quotations	Previous	Single source	Multiple	Competitive
Civil work	Rough sketch	Drawing estimate	Drawing estimate	Take-offs
Mechanical work	% of machinery	% of machinery	Man-hours/ton	Man-hours/ton
Structural work	Rough sketch	Prelim drawings	Take-off/ton	Take-off/ton
Piping and instrumentation	% of machinery	% of machinery	Take-off	Take-off
Electrical	$ per hp	$ per hp	Take-off	Take-off
Indirect costs	% of total	% of total	Calculated	Calculated
Operating Cost Determination				
Labor rates	Assumed	Investigate	Get contracts	Get contracts
Labor burden	Assumed	Calculated	Calculated	Calculated
Power costs	Assumed	Actual	Actual	Contracts
Fuel costs	Assumed	Verbal quote	Letter quote	Contracts
Expendable supplies	Assumed	Verbal quote	Letter quote	Contracts
Reagents	Assumed	Verbal quote	Letter quote	Contracts
Parts	Assumed	Verbal quote	Letter quote	Letter quote
Economic Analysis D.C.F	Not meaningful	If requested	If requested	If requested
Use of Estimates	Comparison	Feasibility	Budget	Funding

It was clear for the commercial banks to make a decision on the application for project financing by knowing the range of the levels of risks or contingency levels from Table 2, where the data based on behaviors of the decision makers were fully considered. The risk decision efficiency is high since the required supporting data and information is clearly defined, and the risk decision effectiveness is also good and fair for both the international commercial banks and the loan applicants since the decision making basis is clearly depending on the available information and data from the project.

4.3. Risk Decision for Subcontracting Planning Based on Operational Risk Environment

The subcontract packaging strategy is based on the calculated risk and return for each package risk, as well as the total expected return and risk. The risk decisions will be made on the basis that the maximum expected return and the minimum expected risk for both each subcontract package and the whole project.

4.3.1. Calculation Model for Project and Package Expected Return of Contractors

The levels based on project work breakdown structure (WBS) method are divided into four hierarchy descending order as follows: the project level, as well as the contract package level, the activity level, and the task level, where the summary values of each level can be aggregated from the corresponding values of lower levels in such a way that: the value of upper level equals the sum value of the product value of the individual item value times its weight from next lower level. The calculation model and calculation principles of the expected return and expected risk of each activity for project contract package are as follows:

Each of the contract package is regarded as activity component of the portfolio held by the contractor, then the total contract package expected return K_t can be calculated as follows:

$$K_t = \sum_{i=1}^{n} \left(W_{ti} \times K_{ti} \right) \qquad (1)$$

Wherein, i = (1,... n). W_{ti} is the i-th event percentage of the estimated cost of the contract base price amount, and the sum of each W_{ti} equals 1;. K_{ti} is the expected return of the i-th event. The rate of expected return is the cost of equity capital for individual events, if using the capital asset pricing model: the expected return can be calculated as follows:

$$K_{ti} = \left(\frac{1}{n-1} \sum_{i=1}^{n} \beta_i \right) \left(M_t - F \right) + F \qquad (2)$$

Wherein, K_{ti} represents expected return of each subcontract package, F represents the rate of return on risk-free assets, β_i represents the corresponding contract beta, M_t represents the market rate of expected return, (M_t-F) represents the risk premium, such an internal rate of return assumes that the package or sub-project can be reinvested at the same rate of return at the time of evaluation. M_t can be taken from the average commercial bank financing rate over the past 12 months for the class of fixed assets investment projects or interim financing rate for the loan period of 1 to 5 years. Taking into account the risk-free situation, F can be the current annually bond yields minus the nationwide consumer price index (CPI) change year on year in labor and service price factors, then minus the industrial producer price index (PPI) change year on year of raw material prices factors. In the cases that the CPI change year on year increases, it presents positive, otherwise, it presents negative, and in the cases that the PPI change year on year increases, it presents positive, otherwise, it presents negative. β_i strongly depends on the subcontracting factors, which can be expressed in the form of the operational beta coefficient listed in Table 3.

Table 3. *Project Operational Beta Coefficients.*

Operational Beta Coefficient (β_i)	**>20% inclusive**	**15%-20% exclusive**	**<15% inclusive**
Subcontracting Complexity			
Total number of subcontracts	>160	80-160	<80
Number of turnkey subcontracts	>20	10-20	<10
Number of consulting subcontracts	>20	10-20	<10
Number of purchase orders	>80	40-80	<40
Number of routine buying	>20	10-20	<10
Site civil construction	>10	5-10	<5
Site erection and installation	>10	5-10	<5
Contingency after project stage completed			
Feasibility study	35%-45%	25%-35%	15%-25%
Conceptual design	20%-25%	15%-20%	10%-15%
Basic engineering	15%-20%	10%-15%	5%-10%
Potential capability level of subcontractor			
Technical	Low	Middle	Advanced
Commercial	Low	Middle	Advanced
Response	Low	Middle	Advanced
Localization	Low	Middle	Advanced

It can be clearly seen from Table 3 that the preferences and feeling of the risk decision makers have been considered for risk decision, where the factors of the preferred number of subcontracts, as well as the preferred contracting starting point after certain project stages, and the feeling and preferences on selecting the potential capability levels of subcontractor were helpful for the risk decision efficient and effectively. The expected return and expected risk computational model calculation principles of contracting various projects are as follows:

The project is deemed as a whole contract by the contractor of the project, where the subcontracts are divided into six sub-portfolio holdings, and the total expected return is K_p.

$$K_p = \sum_{i=1}^{n} \left(W_i \times K_i \right) \qquad (3)$$

Wherein i = (1,... n). W_i is the i-th sub-contract base price percentage of the total amountof the project, and the sum of W_i is 1. K_i is the i-th sub-contract expected return.

4.3.2. Calculation Model for the Project and Package Expected Risks of Contractors

There is no uniform definition of risk. The indicators for measuring the expected return uncertainty, where the expected standard deviation of returns can be used as measure of risk, in the cases that the value of standard deviation of the expected return is higher means the higher risk level. On the other hand, in the cases that the value of the standard deviation of the expected return is smaller means the lower risk level. Standard deviation of the expected return is the square root of the variance of the expected return. Variance is represented by V_p, and standard deviation is represented by S_p.

$$V_p = \left(\frac{1}{T-1} \sum_{i=1}^{n} K_i^2 \right) - K^2 \tag{4}$$

$$S_P = \sqrt{V_P} \tag{5}$$

Wherein, K_i means individual subcontract expected return, K represents the average rate of expected return of all the sub-contracts, T is the number of all sub-contracts. For individual subcontract activities risk calculations, the standard deviation of expected return, S_{tp} is the square root of the variance of the expected return V_{tp}.

$$V_{tp} = \left(\frac{1}{T_t - 1} \sum_{i=1}^{n} K_{ti}^2 \right) - K_t^2 \tag{6}$$

$$S_{tp} = \sqrt{V_{tp}} \tag{7}$$

Wherein, K_t represents sum of all the expected return of all the activities of the contract package, K_{ti} represents the average expected rate of return of all activities for the contract package in, T_t represents the number of all the activities of the contract package.

The expected return and risk are calculated and used for decision for optimizing the subcontracts based on the proper transfer and combine of WBS packages, which is helpful for the proper development of the Project Execution Plans (PEP), a guide for smooth project execution and delivery.

5. Conclusions

In order to win the projects, main contractors need to take proper measures such as selecting proper staffing structure according to the specific project management modes for controlling the strategic risks in the phase of project strategic planning under the internationally competitive environment. In order to successfully get project financing loan as required from international commercial banks, the financial risks need to be controlled based on cost estimate accuracy and contingency, which is based on the supporting data and information available for the projects. For the project operational risks, risk decisions on subcontracting and packaging are made based on the calculated maximum expected return and minimum risk levels for both of each subcontract package and the whole project.

Through systematical studies on internationally contracting project risk decisions based on behavioral decision theory, the behavior preferences and feelings of decision makers have been introduced into the existing decision-making models, which have improved the efficiency and effectiveness of risk decisions, so as to help the main contractors improve their project competitive advantages under the internationally competitive environment.

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Biography

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