INVESTIGATING THE EFFECT OF APPLYING RISK MANAGEMENT TECHNIQUES ON IMPROVING CONTRACTOR'S PERFORMANCE IN EGYPT

A.A.E. Othman [1] and R.N. Fathy [2]
[1] Architectural Engineering Department, [2] Civil Engineering Department,
Faculty of Engineering, The British University in Egypt (BUE), Cairo, Egypt,
E-mail: ayman.othman@bue.edu.eg [1] and ramy_fat7i@hotmail.com [2]

ABSTRACT

Today, contractors have no choice but to develop their business to compete domestically and globally. Competing globally means facing challenges of diverse nature, various customers' cultures, different governmental regulations and laws, different business environment and practices in addition to the impact of the state of the country whether it is a developing or a developed one. All these factors lead to the increase of risks associated with contractors business which eventually needs to be well managed. This paper aim to investigate the risks and challenges encountered by contractors as well as the possible means of risk management that can be applied in order to ensure high contractors performance and competitiveness with particular emphasis on the Egyptian market.In order to achieve the abovementioned aim a research methodology is designed to accomplish a set of objectives. Firstly, literature review is conducted to build a comprehensive background of the research topic including risk management and performance management. Secondly, a field study carried out in selected five major construction companies in Egypt in order to investigate the perception and application of risk management tools and techniques as well as identify the required resources and the effect of the risk management on contractors' performance in Egypt. Thirdly, developing a set of strategies to help improving the performance of contractors in the Egyptian market and finally summarising research conclusion and recommendations useful for construction professionals and further research. Generally, the main broad areas of risks facing contractors in Egypt are: technical, design and management errors, shortage of human or financial resources, bad work environment, in addition to customers, suppliers, subcontractors and governmental organizations risks. There is a wide gap between risk management theory and the practical application by contractors in Egypt. Unfortunately, the majority of contractors rely on the managers' experiences to identify, analyze and manage risks associated with their projects. They rarely use scientific methods, which eventually results in delivering poor quality, over budgeted and delayed projects. This research emphasizes the role of risk management in improving contractor's performance through managing risks associated with their projects. It adds a valuable contribution to the built environment body of knowledge by bridging the gap between the theoretical risk management approaches and the real management of risks in the construction industry in Egypt. In addition, improving risk management will lead into better results in terms of profitability and provided service which is of interest of all stakeholders. Pre-Identification of risks that might face the contractor is crucial to be considered in taking the decision of entering projects and later on in preparing tenders. Developing the suitable reactive risk identification techniques to ensure the continuous identification of new risks that may arise through the project life cycle is essential. Developing the necessary risk analysis and mitigation plans to deal with each risk individually as well as combined will minimize its/their negative impact on the successful completion of the project and affect contractor's performance. This research is focused only on major construction companies in the Egyptian market.

Keywords: Risk Management Techniques, Improving Contractor's Performance, Egypt

Introduction

No operation or decision is free of risk and threats to its success. Risk is the combination of probability targeted benefit while the other is an event occurrence and its results. It is the potential that a chosen action or activity will lead to loss or undesirable outcome (ISO/IEC Guide 73, 2002). Risk is associated with any activity or decision. As the volume of business or industry increases, the associated risk and uncertainty also increases. The construction industry is characterized by its huge amounts of invested capitals, the involvement of many stakeholders, the special nature of its activities being closely dependent and strongly related to each other as well as the environmental concerns represented by the social and environmental hazards. As a result, many and diverse risks face contractors when they take decisions or decide to get into business regardless of its nature, size or complexity. Ye and Tiong (2003) consider construction among the industries that face the most severe and challenging risks. Risk management is an integrated part of strategic management process as it addresses the risks associated with the organization activities during the implementation of different strategies to achieve the desired goals. Risk management is also a live process that takes its input parameters from the current and future situations and business objectives at both short and long terms (IRM, 2002). The construction industry business include many risk parameters ranging from technical challenges (i.e. design & modelling requirements and errors) to typical management challenges (i.e. human and financial resources management including work environment management, labour disputes, financial controls, training and qualification of employees, performance appraisal, motivation and empowerment of labour force, in addition to the relationship challenges with customers, suppliers, subcontractors and governmental organizations). Risk management includes prediction of potential problems or inconvenient events and even disasters that threat human life and business practices. Today, assessment of risk is a basic step in negotiating and developing construction contracts especially under the conditions of the open market and globalization standards and the increasing dependence on third party and subcontractors in international and domestic construction projects. Construction contracts in both developing and developed markets vary according to project type and size, the required human and financial resources, the required materials and equipments, in addition to the political, social and economic conditions. Failing in addressing these issues can lead to the failure of the project (Alwan, 2006).

Research Aim and Objectives

This research aims to investigate the perception and application of risk management as an approach for improving the performance of contractors with particular emphasis on the Egyptian construction industry. To achieve this aim, the following objectives have to be accomplished.

1. Building a comprehensive background about the research topic including: risk management in terms of risk definition, types of risks, tools and techniques used to identify, analyse and manage risks associated with construction projects. In addition, literature review is used to cover the area of performance management through defining performance management, reviewing framework of successful performance management, steps, areas and methods of performance measurement.
2. Investigating the perception and application of risk management in the Egyptian construction industry.
3. Developing a set of strategies that help improving the performance of contractors in the Egyptian market.
4. Outlining research conclusion and recommendations for construction professionals and further research.

Research Methodology

The methodology used to achieve the above mentioned aim and objectives is based on literature review and field study. Literature review depended on textbooks, dissertations, academic and professional journals and related websites. In depth literature review showed that there is a gap and lack of information and research about risk management and its application in Egyptian construction firms. A field study consisted of a structured interview conducted with managers of five major construction companies in Egypt is designed to define the methods adopted for risk identification, analysis, response and how these methods affected organizations performance. Copy of the questionnaire could be collected from the authors.

Literature Review

Risk Management

Definition of Risk

Risk is always a subject of concern and point of interest in many business fields. Many definitions were developed for risk. Walewski and Gibson (2004) defined risk as any exposure to undesired circumstances such as injury, loss, disadvantages or even destruction. Afify (2000) stated that risk is the existence of high level of uncertainty about achievement of the required project performance and goals. In other words, risk is the factor or reason that can influence diversely the performance and execution of the project commitments and terms.

Types of Risks in Construction Projects

Risks in construction projects could be classified under many categories.

(1) Alwan (2006) classified risks into inherited risk, economical risks, commercial risks, technological risks and Implementation risks. For example; economical risks include the lack or shortage in financial resources while commercial risks include competition, power of suppliers and customer satisfaction. On the other hand, technological risks are related to the know-how and the technical aspects and procedure to deliver the required product or service, as detailed in the contract or in accordance to the agreed terms.

(2) According to the events outcome risk could be classified to (a) upside risk when the outcome of the event or activity is better than the original forecast and (b) downside risk when the outcome of the event or activity is worse than the
original forecast.

(2) According to the possibility of occurrence there are two kinds of risks: (a) pure risk, normally arises from the possibility of accident or technical failure and (b) speculative risk, possibility of loss and gain, which may be financial, or physical.

(3) According to the possibility of reduction there are two kinds of risk: (a) diversifiable risk, if it is possible to reduce risk through pooling or risk-sharing agreement, and (b) non-diversifiable risk, if pooling agreement are ineffective in reducing risk for the participants in the pool (Williams et al., 1995).

(4) Flanagan and Norman (1993) classified construction risks to political, economic, technical, external relations, management, design, environmental, legal, operational.

(5) Perry and Hayes (1985 cited Shen, 1999) classified risks in construction projects as: physical, construction, design, political, financial, legal-contractual, and environmental.

(6) Santoso et al. (2003) classified risk as: physical risks, personal risks, technical risks, safety-accident risks, construction design causes risk, political and regulation risk, financial risk, contractual risk, and environmental regulations cause risk.

Risk Management Process

Risk management process comprises identification, analysis and response strategy to all significant project risks with the aim of reducing the opportunity for and consequence of loss. The process of Risk Management can be broken down into three essential components, they are risk identification, risk analysis, and risk responses.

Risk Identification

This involves identification and classification of the potential risk. Risk identification is the first step in risk management process. The accurate identification of a risk is the right start for a successful risk management process that provides better control and management process. Risk identification is not an easy process as it requires deep analysis and understanding of the project from different aspects. This necessitate using experienced and well qualified staff to have the right views of the required activities and their associated risks (Alwan, 2006). Different methods are used in risk identification. They are brainstorming, historical data, checklist, tree diagram, and influence diagrams (Hamilton, 1997; Shen, 1999, Smith, 1999).

Risk Analysis

Risk analysis is used to evaluate risks, and to ascertain the importance of each risk to the project, based on an assessment of the probability of occurrence (Likelihood) and the possible consequence of its occurrence (Severity).

Risk = Likelihood X Severity Loss/Gain (Balfour Beatty, 2000).

Risk analysis is important because it gives an understanding and awareness of the impact of risks on the project, providing the team with an understanding of how risks are generated through the completion of the project and thus, helps in achieving objectives. Therefore, the team becomes aware of solutions that would help to manage risks

without affecting the value achieved from the project. Risks could be analysed quantitatively and qualitatively.

Quantitative risk analysis requires input of numerical data and carrying out of some calculations work. It provides some numerical results, which will allow more informed decision-making by the team. On the other hand qualitative risk analysis involves subjective assessment based on experiences and intuition of the team, which may be used to determine risk impact. Lack of information and lack of demand for more detailed approach, and absence of numerical data related to identifying the risk are two main reasons that force the risk analyst to use the qualitative technique. This does not mean that the quantitative risk techniques are not used. Both techniques are used according to the importance of the project and the availability of information. There are many techniques used for risk analysis. They are: sensitivity analysis, probability analysis, simulation techniques, risk premium, expected monetary value (EMV), expected net present value (ENPV), EMV using a Delphi peer group, risk-adjusted discount rate (RADR), detailed analysis and simulation, and stochastic dominance (Raftery, 1994; Shen, 1999; Smith, 1999). There is no "best" single technique, as every project will almost certainly have individual characteristics, which make it unique (Amos and Dent, 1997).

Risk Response and Mitigation

Risk response and mitigation is the action that is required to reduce, eradicate or avoid the potential impact of risks on a project. The main aim of any response and mitigation strategy is to initiate and implement the appropriate action to prevent risks from occurring or, at minimum, limit the potential damage they may cause. This should ensure that the overall project objectives of time, cost and quality are not jeopardized. The information gained from the identification and analysis stages of the risk management process gives an understanding of their likely impact on the project if they are realized. This, in turn, enables an appropriate response to be developed. The general guiding principle of risk response is that the parties of the project should seek a collaborative and mutually beneficial distribution of risk. Furthermore, risks need to be allocated to those parties best placed to influence both the likelihood of the risk occurring and its potential impact should it occur. The methods used for risk response and mitigation are risk avoidance, risk transfer, risk reduction and residual retention, risk retention, combination of two or more of these responses to risk

Performance Measurement

Definitions

Performance measurement system is simply defined as an information system that present an integrated part of the whole performance management process. The effectiveness and accurate performance management depends to a great extent on the accuracy and quality of measurement process (Bititci et al., 1997). Amaratunga et al. (2000) defined performance measurement as a quantifying or expressing each action effectiveness and efficiency in terms of quantified amounts or numbers. In other words, performance measurement indicates the level of success or failure of the company or the organization in achieving its objectives and strategies (Evangelidizs, 1992)

Framework of Successful Performance Measurement

Traditional performance measurement was mainly based on financial measures. However, the modern trends in performance measurement are focusing on the customer satisfaction and feedback because customers are the main and final destination of business strategies. In general, selecting the appropriate performance measure is the key for the success of the performance measurement process. Those measures should be defined, identified and clearly understood. They should be managed by the assigned staff in the organization. They should be based on consistent, reliable and accurate data, and linked to the organization goals and mission.

Steps of Performance Management

There are four key steps for performance management framework. Firstly, organization strategic objectives are transformed into required performance standards. Secondly, performance matrices are developed to compare between the desired and actual achieved standards. Thirdly, gaps have to be identified and finally corrective actions to align both standards have to be initiated, see figure (1). This process has to be carried out on periodic time basis to ensure aligning the origination performance and strategies towards the desired goals (DTI, 2011).

Figure 1 Steps of Performance Measurement (DTI,2011)

Areas for performance measurements

Three main areas are considered in performance measurement: the effectiveness, the efficiency and the productivity as shown in the following equations (DTI, 2011).

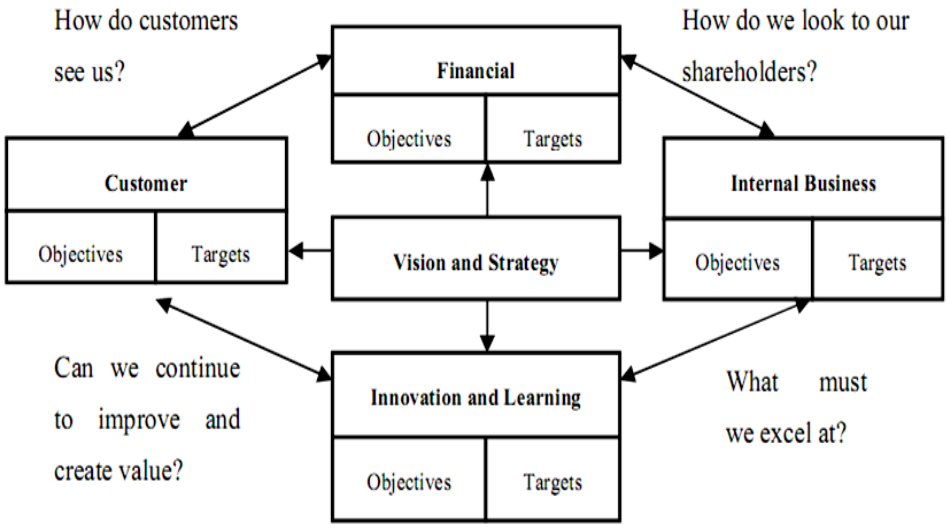
$$\text{Effectiveness} = \frac{\text{Actual Output}}{\text{Expected Output}} \times 100\ \%$$

$$\text{Efficiency} = \frac{\text{Resources Actually used}}{\text{Resources Planned to be used}} \times 100\ \%$$

$$\text{Productivity} = \frac{\text{Outputs}}{\text{Inputs}} \times 100\ \%$$

Methods for Performance Measurement

The balanced scorecard



The Balanced Scorecard (BSC) is a group of selected assessment measures for basement company or organization strategy success. BSC links organization long-term strategies with its objectives and desired goals. BSC enables the management to evaluate the company performance in terms of four perspectives: customer knowledge, financial performance, internal business processes and growth and learning (Pearce and Robinson, 2003). Figure (2) shows an example of BSC and its main components.

Figure 2 The Balanced Score Card (Pearce and Robinson, 2003)

The performance pyramid

The second known method for performance measurement is the analysis and reporting technique (SMART) system or the so-called the performance pyramid. This method was developed to extend the scope of performance measurement to include more components in addition to the effectiveness, productivity, efficiency and other financial variances (Cross and Lynch, 1988). As shown in figure (3), performance pyramid is a customer-oriented model which is completely linked to the company's overall strategy, with financial figures supplemented by several other key ratios of a non-financial nature (Olve et al., 1999; Ross and Lynch, 1988).

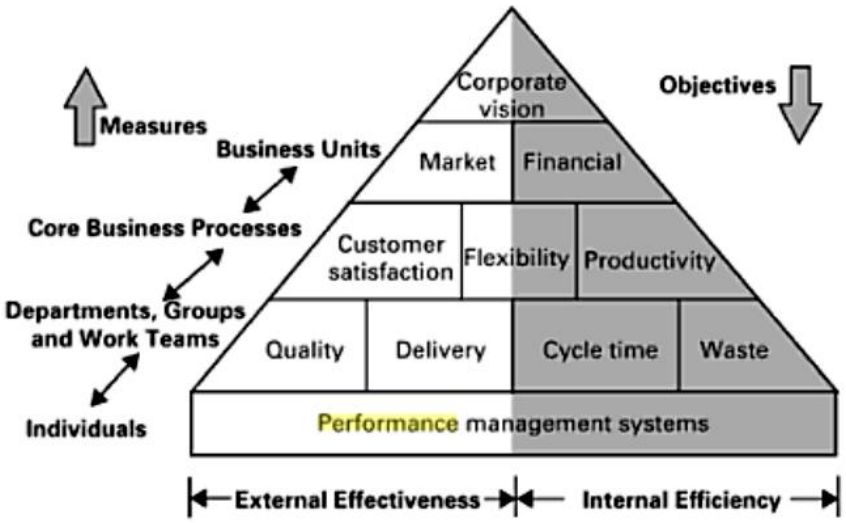


Figure 3 Performance Pyramid (Ross and Lynch, 1988)

At strategic level, the company management assigns a corporate portfolio against corresponding business unit with the required resources to support them. At the 2nd level, each business unit objective are defined in terms of financial and market terms. The 3rd level in the pyramid is the higher priorities and tangible objectives per each business operating system in terms of productivity, flexibility and customer satisfaction. The 4th level in the pyramid is the department level. At department level , customer satisfaction, flexibility and productivity are represented by specific operational criteria in terms of cost, delivery, process time and quality.

The Relationship between Risk Management and Performance Improvement in Construction

Factors that influence contractor performance in adverse way are considered risks. Those risks can arise from many sources such as management mistakes, subcontractors delays or violation of provided material quality or delivery schedule, work environment hazards, climate change, suppliers delays, client demand changes or delays in signing required documents related to the project contract, general economic conditions, political environment , transportation for instance. So, mitigating these kinds of risks through applying suitable risk management process and practices can be an added value that maintain or enhance the contractor performance in general.

Data Analysis

Results of the interviews identified eleven risks that are considered as the main concerns of the contractors in Egypt. These risks are:

- Political instability.
- Subcontractor breaches and violations.
- Corruption and bureaucracy.
- Improper design.
- High Inflation.
- Fluctuation of currency exchange rates.
- Work Site hazards.
- Government license permits and Approvals.
- Client inability to finance the project.
- Change of Clients demands.
- Lack of required equipment or material risks.

Analysis of collected data revealed that the most influential risk according to the manager's opinions are: political instability, Subcontractor breaches and violations and Corruption and bureaucracy. Table (1) and Figure (4) rank risks according to their impacts on the organization performance sorted from the highest to the lowest using the average mean.

Table (1) Ranking of Risks Associated with Projects in the Egyptian Construction Market

Rank	Risk	Probability 1-5	Severity 1-5	Impact P*S
1	Political instability	3.80	4.30	16.34
2	Fluctuation of currency exchange rates	4.20	3.40	14.28
3	High inflation rate	3.00	3.60	10.8
4	Design errors	2.80	3.80	10.64
5	Subcontractor breaches and violations	2.20	3.90	8.58
6	Corruption and bureaucracy	2.20	3.90	8.58
7	Client inability to finance the project	2.60	2.80	7.28
8	Work site hazards	2.40	3.00	7.2
9	Change in clients specifications	2.60	2.50	6.5
10	Government license permits and approval	2.90	2.20	6.38
11	Lack of required equipment or material	2.10	3	6.3

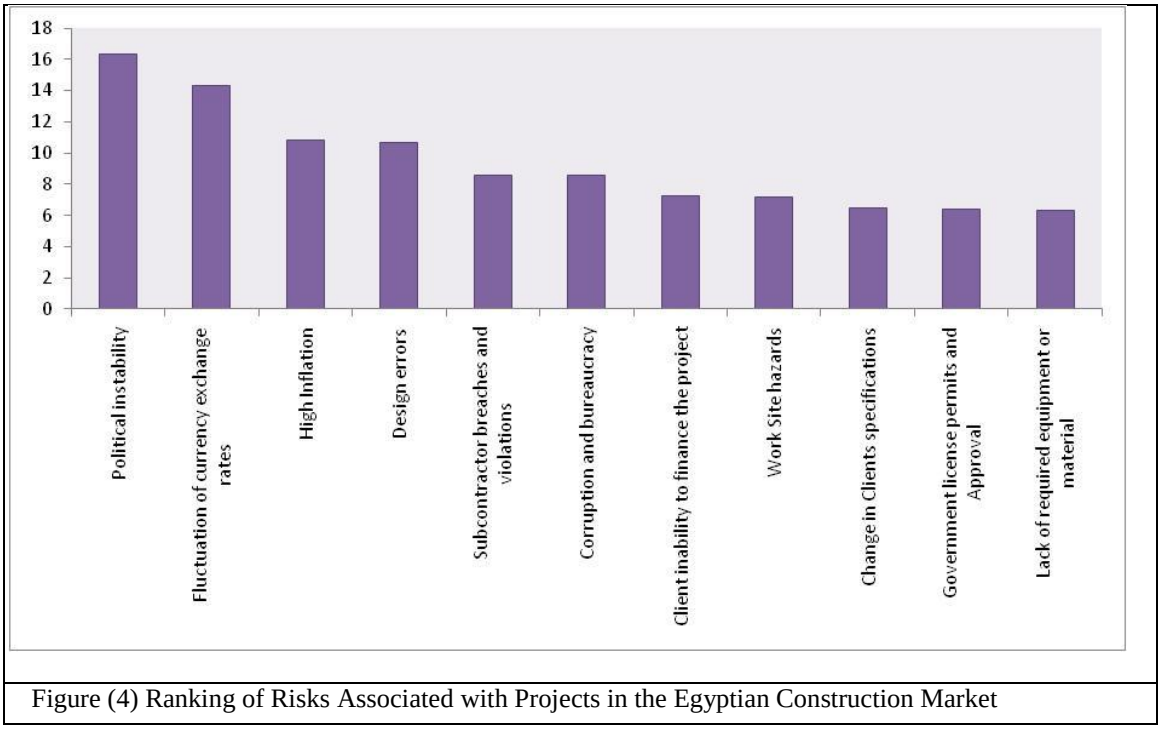


Figure (4) Ranking of Risks Associated with Projects in the Egyptian Construction Market

Political instability risks

Although this type of risk was at its minimum in Egypt before the 25th of January 2011 revolution, yet this has changed into a situation where Political Instability risk is heavily experienced in Egypt. This risk has a probability of (3.8 out of 5) and a severity of (4.3 out of 5). These results would have been completely different if this research was conducted before revolution, which can adversely impact the contractor performance in terms of delays or leaving the entire project under the force majeure conditions. The preventive actions for political instability risk may include: firstly, carrying out all the possible analysis about the country where the project will be constructed using different strategic analysis techniques such as Strengths, Weaknesses, Opportunities, and Threats (SWOT) and Political, Economic, Social, and Technological analysis (PEST analysis). This analysis should take into consideration similar countries case studies. Secondly, seeking the consultancy and advice of specialist and experts in risk analysis and management field when studying this risk. Thirdly, studying the worst scenario case about political instability and identify the corresponding solutions or actions in a comprehensive contingency plan. Creating joint ventures and maintaining good relationships with politically high governmental bodies.

Fluctuation of currency exchange rates risks

With a probability of 4.2 out of 5 and a severity of 3.4 out 5, the fluctuation of currency exchange rates risk is considered the second highest influential risk. Interviewees mentioned that this risk is almost certain in Egypt and it has sever direct impact on project's costs as many of the resources used in projects are imported from foreign countries. This can adversely impact contractor performance in terms of delays due to unavailability of certain materials or items because of price changes. mitigation of this risk includes: developing suitable contract terms to cover the problem of currency rate fluctuations in the form of a defined amount of compensation to the affected party (owner or contractor), including payment terms that state to pay part of the payment in local currency and the other part in US dollars.

The effect of high inflation rate

Interviewees mentioned that the risk of high inflation rate represents a chronic disease in the Egyptian economy that has increased in the last five years due to the global economic crisis and the Egyptian revolution in 2011. The probability of this risk is 3 out of 5 and the severity if 3.6 out of 5. It has a big influence on the contractor performance as it makes them reluctant to take any business adventure under risky economic conditions. Mitigation of this risk could be achieved through provision of contingency funds, including clauses in the contract that determine certain amount of compensation in case of high inflation rates, setting up and agreeing fixed price contracts and material supply, managing the operation costs such that they are kept to the minimum as much as possible.

Design Errors

Table (1) and figure (4) show that design error represents the 4th highest risk with probability of 2.8 out of 5 and severity of 3.8 out of 5. The probability of this risk to occur is small because each of interviewed companies has professional, qualified and experienced designers as well professional site engineers who conduct in-depth revision of designs before execution and report any errors or mistakes to the design team. However, the severity of design errors on the contractor performance varies depending on the type, location and time at which the error is discovered. The worst of which are fatal errors and mistakes discovered at project completion requiring reworking which imposes a lot of cost on the contractor, jeopardizing his project net profit and affecting his reputation in the market. Moreover, delays and long discussions with the site engineers or project manager result in an unhealthy work environment. Mitigation

Of this risk could be achieved through:

- Spending adequate time for studying and planning of the project as well as appointing professionals who helps avoid any design mistakes, especially in the early stages of the project.
- Conducting interval meetings with the client consultants to investigate and monitor the design progress and receive any feedback.
- Identifying the consultants' responsibility towards missing data or details and request for changes at the allocated time before execution is done. Mentioning this condition in the contract is essential for ensuring and making reviews in each phase of the construction work.

Subcontractor breaches and violations Risks

The probability of this risk is 2.2 out of 5 and a severity of 3.9 out 5. The probability of this risk is not too high to occur because experienced companies carefully select their suppliers who are known to have good reputation with their compliance to rules and regulations regardless that their prices may be higher than the average known prices in the market. This emphasizes the importance of adhering to the quality and timing of the contract in order to avoid big loses. Mitigation of this risk could be accomplished through:

- Dealing with trustworthy and qualified subcontractors
- Including appropriate contract terms for compensation and penalty in case of violation of contract terms.

Corruption and bureaucracy risk

This risk is associated with corruption which unfortunately dramatically influences the Egyptian market. The probability of occurrence is 2.2 out of 5 and the severity is 3.9 out of 5. This risk adversely impacts contractor performance as he targets saving costs on the account of quality, violating standards such as using inferior materials making use of the cover of general corruption. However, bureaucracy affects contractor performance ea it delays approvals and discourage innovative solutions and constructive criticism. Mitigation of this risk could be accomplished through:

- Setting up joint ventures with domestic partners experienced in the local business environment.
- Developing the right contractual terms in order to avoid those type of risks
- Increasing the awareness and experience of the working staff and employees to deal with those types of corruption.
- Creating strong relationships and agreements with power political figures to facilitate permissions and approvals.

Client Inability to Finance the Project

With a probability of 2.6 out 5 and severity of 2.8 out of 5, this represents the 7th highest risk that affects contractor performance. This risk is generated from the client's inability to avail the required funds for the project. This could be attributed to delays in advance payment at the begging of the project which may prevent the project from starting, where as too long delays in paying due invoices, may lead to inability to continue activities as per contract and hence terminating the contract. This risk could be managed through the Selection of a trustworthy client or partners which is a critical factor for the project success. However, contract terms and conditions should guarantee the commitment of the client to fulfil his/ her financial obligations at the required time.

The work site Hazards

The probability of occurrence of this type of risks is relatively high in general in Egypt. This is a result of the ignorance of the basic safety measures and precautions in addition to the cultural aspect of the tendency of not abiding by the safety and security regulations and procedures. Work site hazards with a probability of 2.4 out of 5 and a severity of 3 out of 5 adversely impacts contractor performance as it may result in accidents and/or mistakes in certain operations. Mitigation of this risk could be achieved through:

- Increasing the awareness about work site safety regulations and precautions in order to reduce the probability of accident occurrence.
- Conducting periodic short training courses, interviews, meeting about safety regulations including using equipment, construction tools, vehicles, etc. in the correct way.
- Promoting using and following of safety rules as well as applying strict rules in case of any violations and rewards in case of compliance.
- Periodic inspection on wearing safety clothes, shoes, etc. to ensure that every one is using safety tools and is committed to safety regulations.

Changes in clients' specifications

This risk is caused by the client making changes to the pre-agreed specification. As illustrated in table (1) and figure (4) the results show that the probability of this risk to occur and its severity are not so high. However, it adversely impact contractors' performance as they will expect continuous changes due to the changes in client's needs and requirements. This can result in delays, re-work and an inefficient operation as it is considered a subject of future changes. This risk could be mitigated through:

- Establishing variation order procedures to be followed if the client requires any changes in the specifications agreed upon in the contract, stating clearly that any over required specifications will be executed by the contractor at the client cost.
- Choosing a committed client from the begging is the most ideal solution to avoid any future problems in the project satisfactory completion.

Government license permits and approval

This risk addresses the Government's refusal or delay to grant license or approvals. As shown in table (1) and figure (4), the probability of this risk is 2.9 out of 5 and a severity of 2.2 out of 5 causing a negative impact on the contractor performance as it may affect the project start up or cause delays in the project schedule. This risk could be mitigated through consulting specialised law firm in the construction industry to provide contractors with the procedures to get government permits and approvals and assure the legality of the submitted documents.

Lack of required equipment or material risk

The probability of the shortage in acquiring the required equipment or machineries to take place in the construction industry in Egypt is illustrated in table (1) and Figure (4). This risk is unlikely to happen in Egyptian market in view of the fact that there are many sources for the Egyptian companies to use to face this problem. However this risk might have a significant impact in large complex construction projects with long durations and unusual construction techniques used requiring the availability of large quantities of materials, special materials and different equipments for the different functions. This risk could be mitigated by contractors through having plans that include all possible options of renting equipment, or buying new ones, or importing them. This in addition to making use of engineering experience and reverse engineering techniques to modify or change the design to be compatible with the existing technology.

Conclusions and Recommendations

Having reviewed literature review pertaining risk management and performance management in construction and keeping in mind the results of the field study, the research may come to the following conclusions and recommendations:

- The construction industry is subject to more risk than any other industry. These risks affect contractor performance; hence it is crucial for any construction company to manage these risks to enhance its performance.
- The main broad areas of risks facing contractors in Egypt are: technical, design and management errors, shortage of human or financial resources, bad work environment, as well as customers, suppliers, subcontractors and governmental organizations risks.
- The practical application of risk management in Egypt is different from theory. The majority of contractors depend on the managers' experiences to identify, analyze and manage risks associated with their projects. They rarely use scientific methods, which at the end results in delivering poor quality, over budgeted and delayed projects.

  A number of strategies are recommended to be adopted to manage risks associated with construction projects including:

  - Selection of the right client or partners and stating suitable contractual terms & conditions will reduce the risk of the client inability to finance the project.
  - Using appropriate strategies including the allocation of an additional Contingency fund and minimizing the operation costs as much as possible can reduce the inflation risk.
  - Risks related to change of clients' demands can be mitigated or avoided through the proper selection of the right client and establishing a proper change management system.
  - For Government license permits and approval risks, it is preferred to transfer the responsibility of obtaining the required licenses, permission or work permits to the project owners and use joint ventures as a business strategy.
  - Subcontractor risks can be avoided through the selection of a trustworthy and qualified subcontractors, making appropriate contract terms for compensation and penalty in case of violation of contract terms. Entering partnership with another domestic company is much better than using subcontractors.
  - Design errors and mistakes are not a common hazard. However this risk can be avoided by the carful studying and planning of the project, spending the adequate fund and time in order to avoid any design mistakes. Use of auditing and highly experienced engineers / consultant especially before mega projects or projects that are new to the company's experience. Site investigation is also recommended and developing appropriate contractual terms
  - Bureaucracy Risks can be also be avoided by entering joint ventures with strong partners and developing the right terms for contracts.
  - Prevention of Political Instability Risks is impossible but it can be reduced through using different strategic analysis techniques such as SWOT and PEST analysis; Using services of specialist or experts in risk analysis and management; Study the worst scenario case about political instability and identify the corresponding solutions or actions in a comprehensive Contingency Plan
  - Fluctuation of currency exchange rates is also a major risk. It can be mitigated through arranging that part of the payment would be made in local currency and the other part in US dollars. This can reduce the impact of this risk
  - Work Site hazards risks can be reduced to a great extent if awareness about work site safety regulations and precautions is made in order to reduce the probability of accident occurrence. This in addition to conducing periodic inspection on wearing safety clothes to ensure everyone is using safety tools and is committed to safety regulation

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