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Risk Assessment in Turnkey Contracts and Its Impacts on Construction Project in Egypt

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ABSTRACT: The risk is significantly reduced for the owner when working on turnkey contracts. The most important of these risks, for example, is the shortening of the delivery time of the project. However, these contracts are also exposed to many risks that must be taken into consideration during the various stages of construction of projects starting from the feasibility study, design stage, tender stage and to the stage of construction up to the operation. The structure of this research is based on a literature review and making questionnaire, with the aim of identifying the risks inherent in this type of contract and the risks assigned to Egyptian contractors according to its level of importance. It concluded that out of 34 specific risks allocated in turnkey contracts, most of these risks which constitutes the majority of the risks are faced the contractor. According to the survey, it has been concluded that it is from those risks relating to the design and tender stages is compliance with the requirements of the client and with the tender submitted by the contractor. The list of risks includes modifications that can occur during work, deletion or addition. The survey also showed that there are some risks associated with prevailing economic conditions during the survey period in Egypt.

KEYWORDS: Risk – Turnkey – Contracts – Construction.

I. INTRODUCTION

In this type of contract the owner has entered into a single agreement with the contractor under which the design process is carried out. In some cases, if the contractor has the financial potential and the owner is willing, the contractor will be responsible for land tenure, financing the project, leasing the final structure, this form of contracting becomes a "turnkey contract."

Through this comprehensive framework of contracting, the contractor's goal is to achieve the wishes of the owner in the limits that do not conflict with the objectives of the contractor profitability and therefore is often not bound by the designs and drawings of other specialists. So the contractors are responsible for all the arrangements of all stages, which is a reason to bring a lot of risks. Such as design deficiencies and construction errors that may lead to poor manufacturing.

Although the use of these types of contracts, Turnkey contracts is not common in the construction industry in Egypt, because it brings a lot of risks, although the owners prefer this type of contracts to reduce the proportion of expected risks.

Turnkey contracts require a contractor with prior experience in the same type of project in order to deal with this type of contract because the contract price is often determined based on the design idea without completing the detailed design of the project.

II. THE PROBLEM OF THE RESEARCH

The contractor is directly responsible in the Turnkey contracts for the risks of the construction stages starting from the design stage, through the specifications and the origins of the industry to the operational stage, which will lead to insert the budget of many items and therefore to the uncertainty that the construction budget is sufficient.

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Therefore, the Contractor will identify and assess all uncertainty risks for consideration, depending on their level of impact on project objectives (cost, time and quality). Qualitative and quantitative risk analysis is very important and very useful for contractors in this type of contract.

III. THE OBJECTIVES OF THE RESEARCH

The main objectives of this research are:

- Qualitative analysis to the risk by classifying risks according to its severity, probability and importance
- Develop a methodology to measure the risks of the contractor before and after the occurrence - in accordance with the recurrence of the specific risk.
- Reducing risk through the implementation of the necessary procedures which known as "risk response"
- Determine a checklist of contractors' risks and its level of importance in order to develop a design / construction contract to access the minimum risk to the contractor by avoiding disputes related to tender documents, B.O.Q and specifications.

IV. THE METHODOLOGY OF THE RESEARCH

The methodology of the research was based on providing an initial information base on research elements, explaining the research problem, determining the purpose and importance of the research, analyzing the responses of the proposed questionnaire to know the influencing axes which contractor uses it to manage their contracts, and know the common risks which faces contractors . This is followed by a risk and circumstances analysis to prioritize its impact on project objectives. And then propose a methodology to describe the risk measurement method, "Measure the potential and impact of risks and assess their impact on project objectives".

V. TURNKEY CONTRACTS, DEFINITION AND FEATURES

Definition of Turnkey Contracts.^[1]

The contractor in the Turnkey contract shall be responsible for the design work and execute it after determining the price and the specific date of the construction process between him and the owner, while the role of the owner shall be limited to conducting the tender and supervising the contractor.

Other synonyms, terms and expressions of this contract may be used, such as "package contract", "design and construction" or "design and build". This type of contract is also known as engineering, procurement and construction contract.

Features of a Turnkey Contract.^[1]

In a turnkey contract, the contractor may be required to make the design. Some aspects of the design may already be specified in the contract. There are cases where the contract is only for construction, but the contractor usually has to prepare the detailed design.

In the more detailed definition of the Turnkey contract, the contractor is required to complete the construction to be ready-to-operate facility. Construction supplies are a part of the contractor's obligations, and sometimes the owner requires the contractor to retain a specific subcontractor. Owners may wish to ascertain the quality of some components or negotiate directly on price of some subcontractors.²

Advantages of Turnkey Contract^[3]

The Contractor shall be individually liable for defects in design, execution and operation. The owner can recover his money directly from the contractor for deficiencies in the design or construction of the project. So, the owner does not need to identify initially the defect if it was from design or execution.

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One of the most important features of this system which is in the interest of the owner is summarized in:

- First: The Contractor shall bear any additional costs that may be incurred as a result of improper or inappropriate use or not match with designs and specifications prepared by the Engineer. The Owner shall attach all designs and documents required in the model construction contract.
- Second: - In a turnkey contract, the contractor is responsible for the design as well as the execution, if the plans are not adequately designed; the contractor will not be able to wait the owner for additional compensation.
- Third: - This type of contract allows the implementation of the project is to be in a shorter period of time, where construction can begin before the completion of the drawings and specifications as a whole. The contractor can begin work in the initial phase of the project while the design stages, and this result saving in time instead of design the project in stages at first and followed by implementation stage. And other than the conventional tripartite contracting form (intended as a consultant, contractor and owner) because the contractor often cannot even begin to work, until the design is completed professional plans.
- Fourth: - Increase the contractor's control over the Turnkey contract may lead to lower total costs. Since in turnkey projects the project can be designed and executed in stages, allowing the contractor to request material for later stages at a reduced cost. In addition, its control over the design details allows the contractor to use the familiar and practical construction methods to build the structure more efficiently and thus it benefits the project and therefore the owner .

However, owners are convinced that professional control will be significantly reduced under this type of contract due to the poor quality control by the owner. This is a danger to the construction process and the follow-up because the contractor will seek to complete the work quickly and cheaply and therefore less control over the quality and quantity Work in turnkey contracts.

VI. RISKS OF TURNKEY CONTRACTS

Risk Definition

It is a relationship between the probability, or the rate of perceived risk, and the total consequences of its emergence. Risks can be divided into qualitative and quantitative. The quality of risk is intended when there is a risk source, and there is no warranty against it, there is the possibility of loss or injury. The high level of warranty means the lower level of the risk. Quantitative risk includes an estimate of the degree or probability of loss^[4]

Disadvantages of Turnkey Contracts

Contracts are divided into two main categories, traditional contracts and integrated contracts. Traditional contracts include Lump Sum, Unit Price, Ceiling, Cost Plus and Fees contracts. While the integrated contracts include Construction management, Management contract, Design & Bid & Building, Prime contracting, Design & Build, and Turnkey contracts^[5].

The amount of risks which faces contractors, owners and sponsors in different projects are different. The risks amount which faces the contractor in turnkey contracts is greater than others, so a segment of owners prefer a turnkey contract. Figure 1 shows the amount of risk faced by contractors, owners and sponsors in integrated contracts.^[6]

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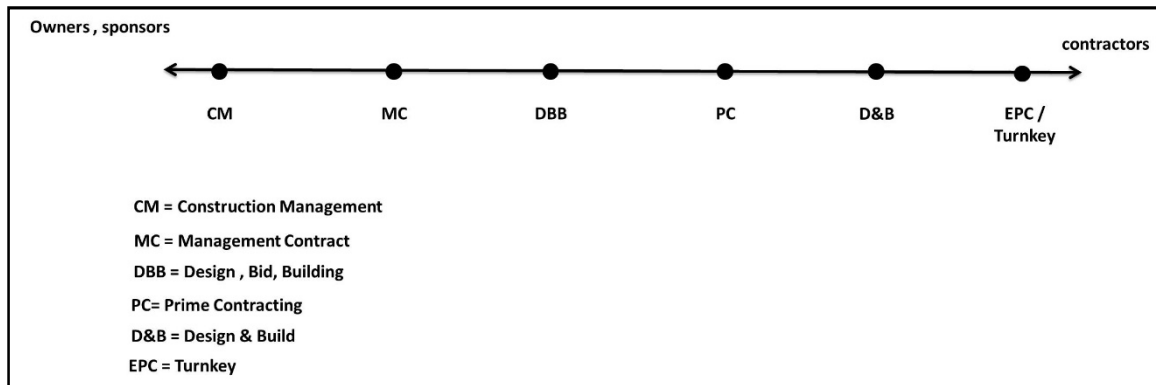


Fig.1: Amount of risks which faces owners, sponsors over all non-traditional contracts

One of the main drawbacks of Turnkey contracts from the owner's point of view is that it is often difficult to effectively compare various initial design proposals submitted by contractors and therefore the owner's intervention in modifying the detailed design of the structure will be limited because the contractor rather than the owner is responsible for following up and modifying the design work. So the design comes not as the owner thinks or wishes and this can lead to conflicts later on. Therefore, the owner may have to a specialized entity that carries out the design process as he wishes to reduce the points of dispute with the contractor and the turnkey contract is limited to the execution work.

In the Turnkey contracts, owner may not get the least cost for the project because the turnkey contract is usually entered by negotiation rather than competitive bidding.

The contractor is often exposed to the risk of not paying the owner the initial design cost if the owner does not accept these designs, so the prior agreement on these payments before design is one of the solutions to get out of this expected conflict.

This type of contract does not allow any real evaluation or comparison between prices between contractors where their designs vary and if this is attempted, for example, by placing the project on a tender with the requirements of owner, the result is inevitably competition in a lower price design, with Considerations of long-term efficiency in terms of cost, quality and simplicity of maintenance.

There are no satisfactory standard forms for Turnkey contracts in many courts of law, with the rare existence of substantive provisions for a conventional construction contract which is quite different from turnkey contracts since the changes need to be very precision formulation. The contractor wants to have the guarantees that help him change the drawings and specifications from his point of view to achieve continuous work and better, as well as wants to have the right to object to changes in the drawings and specifications from the point of view of the owner, so the installments payable at specific stages is in fact the only satisfactory solution to the parties.

Long-term contractual protection is often provided with respect to suitability and design in the case of turnkey contracts, and the interdependence or insurance of such a commitment is likely to be either non-negotiable or expensive. It will be important for the owner of one of these projects to understand the extent of coverage provided by the liability insurance for the rest of the design, like contractor insurance and design insurance. Even if the owner is able to demonstrate that the shortage in the product is due to a defect in the design or implementation, the owner may be unable to recover anything if the contractor's assets or insurance coverage is insufficient to compensate the owner.

The contractor is responsible for both design and implementation in a turnkey contract, so most contractors bear overall commercial responsibility and all the risks of "construction insurance" to cover claims and damage caused by their work. One of the important considerations of the owner is that with almost all contractors "insurance policies. The liability does not cover damage to property resulting from faulty designs and specifications prepared by design professionals, and on the other hand, most if not all professional liability policies covering turnkey engineers do not cover damage caused by a defect or shortage of labor, or equipment that the Contractor has included in its work during construction.

The contractor's guarantee, currently in these arrangements is a guarantee for a limited period on the basis of the concept of professional negligence. However, given the fact that a turnkey contractor is subject to commercial and

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Vol. 7, Issue 9, September 2018

financial pressures as much as possible, and the subsequent failure of the building is most likely the most likely, and with this limited warranty is likely to produce litigation that will be In the case whether the design economy exceeded the limits of professional responsibility at the time. It is often a controversial issue indeed. What most owners look for in this situation is ensuring that the building is fit for its known purpose, regardless of the error. It is likely that this obligation is either not commercially viable or expensive

From the above, a number of risks to projects in Egypt can be derived if turnkey contracts are used. The risks to which the project is exposed can be grouped and classified into two categories as shown in the table (1).

Table1, Risks in turnkey contract

Category	Risk
Risks associated with tender and design stages	Functional inappropriateness
	Inappropriate appearance
	Durability
	Compliance with owner's requirements
	Compliance with contractor's tender offer
	Lack of accuracy
	Constructability
	Coordination
	Applicability of Contract
	Financing Provision after contract signature (Redesign if over budget)
	Financing Provision during tender stage (Redesign if over budget)
	Error calculating quantities
	Description of the elements
	Coordination between elements
	Delay of payments by the owner
	Owner/Sponsors financial standing
	Ability of contractor's management team
	Scope of work responsibility

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Vol. 7, Issue 9, September 2018

Risks associated with construction and operation stages	Differing site condition
	Adverse weather condition
	Accidents/Safety
	War threats
	Fees & Taxes
	Inflation
	Delay of payments by owner
	Ability of the owner to hand over the site in time
	Labor, Material and Equipment availability
	Productivity of labor and equipment
	Changes in work during construction
	Defective materials
	Quality of work
	Lower level of maintenance
	Ability of contractor's management team
	Labor strike
	Scope of work responsibility

Definition of Risk Management

According to the Project Management Knowledge Institute (PMBOOK), risk management is the process of determining how risk management activities are carried out in the project. The essence of this process is to ensure that the degree of risk management, type and clarity is commensurate with the risks and importance of the project. The risk management plan is vital to communicating with all stakeholders and obtaining approval and support to ensure effective management and implementation throughout the project life cycle. Appropriate risk management will not only reduce probability of occurrence but also reduce its impact.

A questionnaire was submitted to a number of project managers and project management staff in Egypt to identify the primary stakeholders affected by the above risks and to determine the probability of occurrence of these risks and their impact to identify the priority risks in dealing with the management of those risks. Fig.2, showing the primary stakeholders allocated with the above risks.

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Vol. 7, Issue 9, September 2018

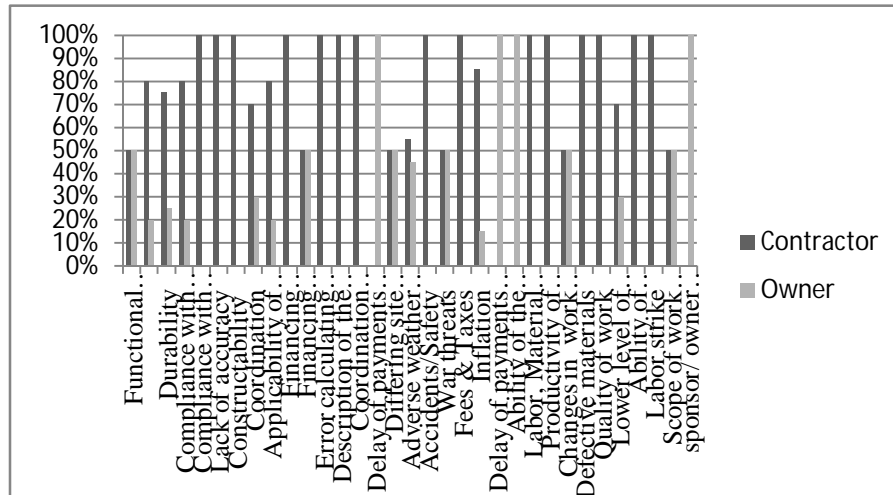


Fig. 2, The primary stakeholders allocated with the risks.

In the previous chart and from the respondents' answers, it can be concluded that contractors are the most exposed to the risks of construction projects in Egypt when turnkey contracts are used. They face twenty four risks out of thirty three risks in turnkey contracts, while owner face just four risks, and both of them sharing five risks, Figure 3 showing a sample respondent about the probability of occurrence of risks associated with turnkey contracts in Egyptian projects.

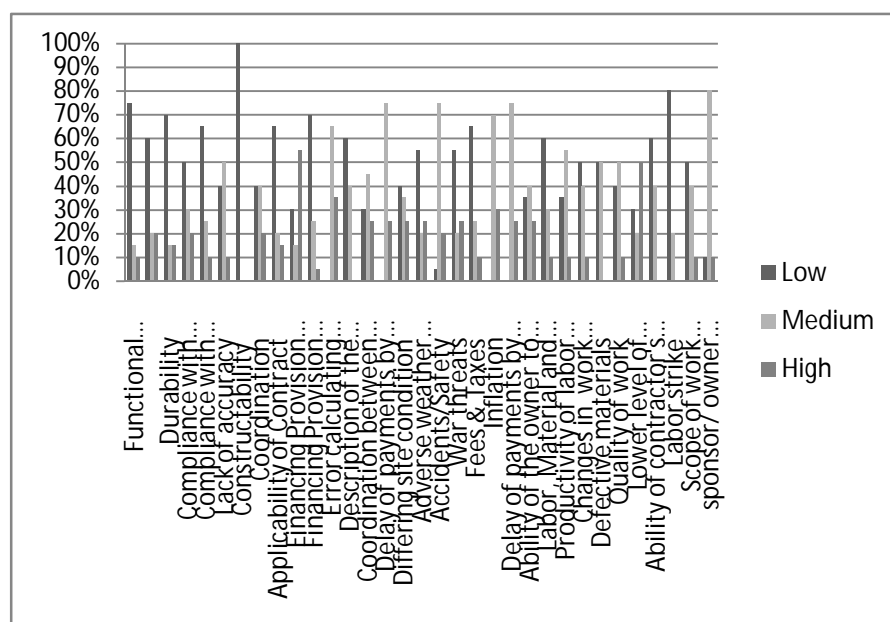


Fig.3, Probability of the risk of turnkey contracts in Egyptian projects.

International Journal of Innovative Research in Science, Engineering and Technology

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Visit: www.ijirset.com

Vol. 7, Issue 9, September 2018

In the previous chart and from the respondents' answers, it can be concluded that projects in Egypt where turnkey contracts are used, the probability of occurrence of most risks in the tender and design stages are low, which represent 11 of the 18 risks that are the total risk at these stages, and the number of risks which have a medium probability of occurrence are 6 risks, finally the Financing Provision after contract signature (Redesign if over budget) is the only risk which have a high probability of occurrence in these stages.

On the other side and in the stages of implementation and operation, from the respondents' answers, it can be concluded that the probability of occurrence of most risks in the tender and implementation and operation, which represent 9 of the 16 risks that are the total risk at these stages, and the number of risks which have a medium probability of occurrence are 7 risks, finally there is no risk have a high probability of occurrence in these stages, figure 4 showing a sample respondent about the impact of risks associated with turnkey contracts in Egyptian projects.

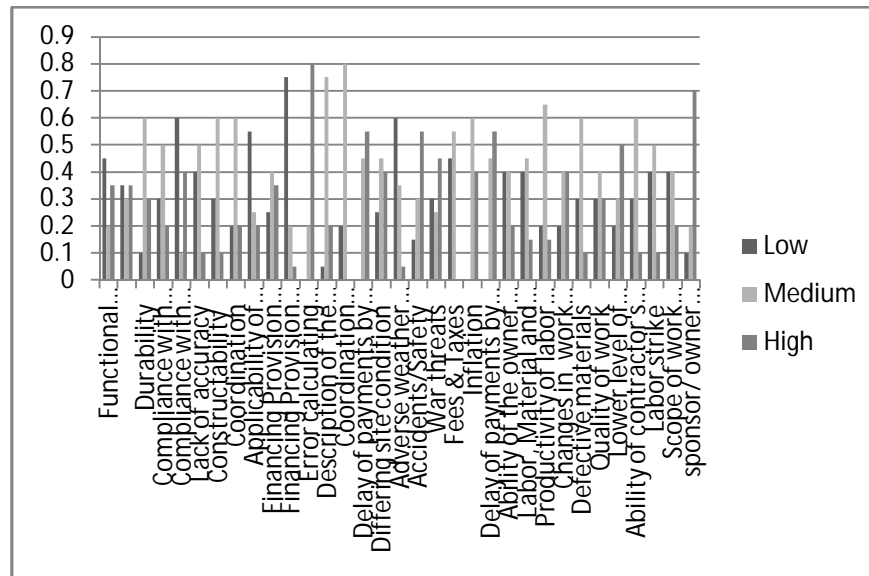


Fig.4, impact of the risk of turnkey contracts in Egyptian projects.

In the previous chart and from the respondents' answers, it can be concluded that projects in Egypt where turnkey contracts are used, the impact of most risks in the tender and design stages are medium, which represent 11 of the 18 risks that are the total risk at these stages, and the number of risks which have a high impact are 5 risks, finally there are two risks which have a high impact in these stages.

On the other side and in the stages of implementation and operation, from the respondents' answers, it can be concluded that the impact of the most risks in the implementation and operation stages are medium, which represent 11 of the 16 risks that are the total risk at these stages, and the number of risks which have a high probability of occurrence are 4 risks, finally the adverse weather condition have a low impact on the projects in these stages.

VII. RESULTS

- It was concluded that out of 24 numbers of risks allocated in turnkey contract there are 34 risks allocated to the contractor In the previous chart and
- It was concluded that projects in Egypt where turnkey contracts are used, the probability of occurrence of most risks in the tender and design stages are low, which represent 11 of the 18 risks, while in the stages of

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Vol. 7, Issue 9, September 2018

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- It was concluded that projects in Egypt where turnkey contracts are used, the impact of most risks in the tender and design stages are medium, which represent 11 of the 18 risks that are the total risk at these stages, while the impact of the most risks in the implementation and operation stages are medium, which represent 11 of the 17 risks that are the total risk at these stages.

VIII. RECOMMENDATIONS

- Priority risk is defined by the probability of risk ratio multiplied by the impact of that risk, so based on Results the priority risks will be classified into five classes as follows:

Class A includes:

- Financing Provision after contract signature (Redesign if over budget).
- Error calculating quantities. - Delay of payments by the owner. - Accidents/Safety.
- Delay of payments by owner. - Lower level of maintenance.
- sponsor/ owner financial standing

Class B includes:

- Lack of accuracy. - Coordination. - Inflation.
- Coordination between elements. - Ability of the owner to hand over the site in time.
- Productivity of labor and equipment. - Quality of work.

Class C includes:

- War threats. - Changes in work during construction.

Class D includes:

- Durability - Compliance with owner's requirements
- Constructability - Description of the elements
- Differing site condition - Fees & Taxes
- Labor, Material and Equipment availability
- Defective materials - Ability of contractor's management team
- Labor strike - Scope of work responsibility

Class E includes:

- Functional inappropriateness - Inappropriate appearance
- Compliance with contractor's tender offer - Applicability of Contract
- Financing Provision during tender stage (Redesign if over budget)
- Adverse weather condition

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