

Risk Management in Turnkey Projects in Malaysia

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Abstract: - Fragmentation and adversarial working relationship have always been the issues in Malaysian construction industry. The philosophy of turnkey procurement system adopts a single responsibility in design, construction, commissioning and handing over of the project life cycle. It would be one of effective project delivery approaches in addressing the fragmentation and adversarial working practices. This paper aim to identify the level of awareness in risk management among the relevant participants in turnkey projects in Malaysian; with the intention of promoting and streamlining the turnkey projects through managing or avoiding the risks involved. Questionnaire surveys were carried out and analysed. The results show internal risk factors are more critical than external risk factors. Besides, the factor 'disagreements on some conditions of contract between clients and main Contractor' is ranked the most critical risk factor. Nevertheless, the respondents have unanimously agreed to all of risk management solutions for turnkey projects. It is hope that both parties should make clear their terms and conditions of the turkey system at the outset of the project and should refer to the risk management solutions as highlighted in the findings.

Keywords: - Risk Management, Turnkey Projects, Malaysia

1 Introduction

Turnkey projects are on the increase with many clients perceiving them as providing better value for money and consequently, giving rise to fewer disputes than other procurement methods. The value of contracts using the turnkey form has doubled since 1995 and exceeds the total value of works procured under all other standard forms [1]. One key advantage of using turnkey is the opportunity to integrate the design and construction components. The integration of design and construction offers better performance in time and cost and results in lesser defects [2]. Similarly, the majority of clients regarded turnkey projects as the optimum route to obtain value for money [3]. The popularity of turnkey procurement arises from its perceived ability to bring design and construction processes closer together culturally [4], while it was argued that turnkey projects offer a high degree of cost certainty encourages economic solutions and enables value to be considered as well as price [5].

For the past three decades, although some confusion still exists among inexperienced clients, the term turnkey project procurement has essentially been unanimously interpreted and defined as an arrangement where one contracting organization takes sole responsibility, normally on a lump sum fixed price basis, for the bespoke design and construction of a client's project. It was argued that this definition contains three elements that are fundamental characteristics of the system [6]. Over the years, several different configurations of turnkey procurement have evolved. There is evidence to suggest that these developments have caused some confusion amongst clients and pose as a drawback to the adaptation of turnkey project procurement [7].

The turnkey project [8] are complex products and systems (CoPS) which are produced on a project basis in small batches, or as one-offs for business users, operators, service providers and/or government agents. Thus, there is a very high degree of similarity between the concept of CoPS and the concept of 'turnkey project' which was already significant in the 1980s. The first widely

reported turnkey deliveries can be considered to have taken place in the form of large BOOT (build-own-operate-transfer) and BOT (build-operate-transfer) deliveries [8] where a key consideration of the often, governmental buyer, was to increase the commitment of the contractors by forcing them to think of themselves as owners of the project.

This is easy to understand as in the construction industry for example, the low commitment of the main contractor towards projects was (and to some extent still is), considered a significant problem hindering the quality and effectiveness of the industry's deliveries [9]. Since the 1980's, the procurement of Turnkey projects has become increasingly common in many industries such as construction and shipbuilding [10]. A commonly noted advantage of turnkey projects is that when the supplier is responsible for the process as a whole, the dilution of responsibilities over various parties can be reduced [11].

2 Literature on turnkey projects

Under the turnkey arrangement, a contractor is commissioned to undertake the full responsibility for everything necessary for the construction, completion, commissioning and handing over of the project. The word "turnkey" means that, upon completion, the client is given the key and he can then enter the finished project by "turning the key". The contractor will have to do everything from preparing the project brief, getting approval, designing, financing, construction, furnishing and decorating to commissioning and handing over completed, cleaned and ready for use projects.

Turnkey projects can also be defined as a project-delivery system in which a single organization prepares the design and undertakes construction of a project. This kind of project can substantially shorten project times, primarily by overlapping the design and construction phases so that concurrent activity is possible, with construction starting and ending sooner. Yet, if the schedule is not being managed properly, delay is very common in this procurement system [12]. The overall project schedule is construction-driven, with construction sequencing driving the production of engineering information packages that support construction activities. An additional benefit of the turnkey approach is single-source responsibility for design and construction, which

can result in consolidated risk management, fewer change orders and reduced litigation.

The turnkey project may involve a comprehensive arrangement of certain legal methods whereby one party undertakes to hand over to his client – the technology recipient – an entire industrial plant that is capable of operating in accordance with agreed performance standards. More usually, the turnkey project involves an undertaking by one party to supply the design for the industrial plant and the technical information on its operation to the client.

The turnkey project is an alternative to the traditional design and built system as this kind of project may take place when the owner requires external expertise and then allows the entity to turn over the keys at project completion.

Turnkey projects can be described in four stages. In the first stage, the project concept is defined, financing is envisioned and negotiations are begun between the project financiers who comprise the future client, the main contractor and other relevant parties. What follows next is the implementation stage which includes estimation of the project costs, layout of the financial plan, conclusion of negotiations, and commencement of engineering and disbursements. Construction of the project will then take place. Once construction is completed, the project assets and its operation will be transferred back to the client.

The key difference distinguishing turnkey projects is the use of works of fiction and innovative ways of combining products and services to address the unique needs of individual customers [8]. The contractor is often highly involved in formulating the scope of the project and may also provide maintenance or lifecycle services after the handover of the project to the customer. As the contractor becomes highly involved in the early phases of the turnkey project delivery [13], the importance of a close inter-organizational relationship between the transacting organizations is emphasized. The presence or absence of trust between organizations parties also affects the selection of contractors for forthcoming projects [14].

Turnkey projects involve a major shift of responsibility from the customer to the contractor [13]. This responsibility may involve the conclusion of the component, responsibility for developing innovative and productive practices, and responsibility for ensuring that the project is not just successfully delivered to the client according to the time, cost, and scope objectives set, but that it also fits the customer's own

processes and ultimately, creates value for the customer.

Turnkey projects involve delivery of a complete system and the construction organization is typically involved in the early specification phase of the project, project negotiations, setting up the project, building strong financial and relational positions within the business milieu, and handing the finished system over to the buyer [13].

In addition, turnkey projects often include a combination of the following elements [8]:

- Financing
- Design
- Construction
- Manufacturing
- Installation
- Operation of the finished system
- Training of the buyer's personnel to operate the system
- Warranty period
- Guarantee of the whole system

Technology Transfer Issues of Turnkey Projects

There are clearly many difficulties in transferring technologies through the turnkey project. Aside of the socio-economic environment, difficulties include the innovation content of the project, the continuity of the parties in the project, the alignment of goals among parties involved, the role of the government in the project and finally, measurement of the technology transfer.

Technology transfer typically refers to the donation of the manufacturing industry, in which the commitment period of the parties is prolonged and there is a continuing need for innovation to stay ahead of competition in the market. However, the technology component inherent in Turnkey projects, whether power plants, water systems, or toll roads, is mostly applicable to utilities or civil works which have much more limited market potential and therefore, do not have the same need for continuous innovation.

Furthermore, due to the revenue risk in turnkey projects, engineering companies will be discouraged from entertaining unproven technologies. The operational stage of a project typically spans 15 or 20 years [15]. While this time span would seem to suggest prolonged engagement of foreign companies with more advanced technologies, it may easily be interrupted by transfer of full or partial ownership and corporate reorganization. Unless the project agreements are

somehow structured to transfer the role of the technology provider to the new entity along with project ownership, the process of technology transfer that may have been initiated under the original operator company will have been discontinued.

Managing risks is one of the most important tasks for the construction industry as it affects the project outcomes [16]. To avoid the occurrence of possible events that may jeopardize the project, it is important to manage the risk properly. It is achievable through risk management procedures. In addition, risk management is essential in ensuring that the project can be completed successfully. A project is considered successful when it is completed within budget, ahead of schedule, and meets or beats the objectives set out by the owner. And achieving those goals usually means that the project team was able to counteract, minimize, or eliminate risk [17]

According to [18], risk management refers to the methods and processes used by organizations to manage risks (or seize opportunities) related to the achievement of their objectives. A risk management framework typically involves a few processes. Firstly, there is the careful identification, measurement, and assessment of risk types and contingencies that a company might face. Secondly, it involves the formulation of a response model or strategic action to tackle the risks (both threats and opportunities). This includes determining capacity for bearing risk, risk reduction or mitigation procedures and other strategies to benefit from the impact of the potential risk. Finally, it requires the monitoring and checking of the implementation of all the actions planned as proposed by the response model [19]. By identifying and proactively addressing risks and opportunities, the company protects and creates value for their stakeholders, including owners, employees, customers, regulators, and society overall [18]. In general, risk management techniques can be classified into three different stages which include risk identification, risk analysis and risk response [21]

AIM of This Research

The aim of the research is to identify the level of awareness in risk management among the relevant participants in turnkey projects in the Malaysian construction industry.

3 Methodology and analysis

Questionnaire surveys were sent to the 100 Grade G7 contractors registered under the Construction Development Board Malaysia (CIDB). However, only 20 copies were properly answered and returned. This was well below par but the low response rate could be attributed to four main reasons;

- the construction people were busy with the election process;
- respondents were not interested or bothered to answer the sets of questionnaires;
- risk management is not widely practiced in the construction industry;
- success or failure of turnkey projects kept in confidence between the parties involved and respondents are unwilling to share their experience with others especially students.

Questionnaires were analysed using a Likert scale of 1-5. The respondents were required to point out the criticality of each risk factor. Generally, this part includes common information of the respondents, the characteristics of the turnkey project they participated in and focuses on the risk factors that contributed to the construction of turnkey projects and is further categorised into three sub-headings;

1) Internal Risk Factor

The exclusiveness of the turnkey project is that the contractor must take sole responsibility if internal risks occur during the design and construction period.

The internal risks include [20]:

- over-interference by clients;
- disagreement on allocation of works,
- incompetence of design team appointed by the contractor;
- disagreement on the total cost of the whole project;
- financial problems faced by the main contractor's company during the design and construction period.

2) Specific Risk Factors in Turnkey Projects

The list below constitutes the specific risk factors that usually occur in turnkey projects if they are not given due attention during the construction period [20]:

- incompetence of nominated sub-contractors;
- excessive demands and variation by clients after the work is completed;
- insolvency of the client after the handover of the projects;
- poor project relationship between parties involved;
- disagreement over certain conditions of the contract between the future client and the main contractor;
- pressure to perform due to short construction period.

3) External Risk Factors

The list below contains additional risk factors during the construction period that result in time, quality and cost overruns once the projects are completed [20]:

- security problems;
- communication barriers among the parties involved;
- pollution;
- inconsistency in policies, the law and regulations;
- economy fluctuations;
- force majeure and social disorder;
- inflation;
- restriction on fund repatriation;
- import restrictions.

Part C of this section lists several recommendations to reduce the mentioned risk factors. The risk management suggested is based on several sub-divisions which are agreement, clients/main contractor selection, employment, good relationship, control [21] and others.

Implementation of Turnkey Projects by Respondents

The questionnaire firstly looked at the respondent's designation in the turnkey projects. Thirty eight percent (38%) were contractors and (31%) were engineers. The questionnaire also enquired whether they had participated in turnkey projects and all respondents stated that they had some experience of it. The turnkey project provided them with a different experience from the traditional procurement project.

It shows that thirty eight percent (38%) of the respondents stated that the main contractor had the right to initiate this concept while another 62% claimed that the client had the major responsibility

in initiating the concept. Thirty eight percent (38%) of respondents agreed that there was no charter in the turnkey project while another sixty two percent (62%) stated that the charter was included in order to achieve the project objectives. The charter in the turnkey project provides guidelines for the contractors and is a pre-requisite before the start of the project. From the contractor’s view, the charter rests on the decision of the team in the project. If the majority agrees to have it, then only will the charter be included.

Most respondents agreed that the turnkey project charter should comprise between two to five guidelines. The charter provides guidelines about the client’s expectations and is provided so that the main contractor may fulfil the client’s requirements.

Thirty eight percent (38%) of the respondents stated that they must own the charter while sixty two percent (62%) stated that clients should be the owners of the charter. In their view, whoever owns the project must own the charter as well. Seventy seven percent (77%) of respondents claimed that the objectives of turnkey projects were successfully achieved. According to them, integration between the parties involved was the main factor that influences whether the project objectives are achieved. The respondents were asked as to which project type was suitable for turnkey procurement and all of them (100%) agreed that the method was appropriate for projects valued at more than thirty million (RM 30M).

According to the respondents, several projects were unsuitable for this method of procurement. Projects which are valued at less than five million (RM 5M) and other small project amounts, short term projects or projects of less than a one year duration are deemed unsuitable. If this type of procurement is used for such small projects, only losses and no profit will be gotten. Twenty three percent (23%) of the respondents claimed that there was no need for a different contract because all parties understood their duties. However, seventy seven percent (77%) of the respondents stated that this kind of project required a different form of contract. The contract clearly states the tasks and the responsibilities of the various parties involved in the project.

Common Risk Factors During Construction of Turnkey Projects

Respondents need to respond on the frequency, which they had problems during the period of construction of turnkey projects. Each of this factor

risk had concluded in the ranking system. The principle of average index was use in order to analysis the data collected.

Average Index

The Average Index was chosen in order to calculate each factor of risk group and this average Index was calculated based on the formula from Al-Hammadet (1996) which is:

$$\text{Average index} = \frac{\text{Total } a_i x_i}{\text{Total no. of sample}}$$

Where;

- a = constant the symbol of weight
- xi = changer the symbol of respondents frequency
- i = 0,1,2,3,4,5; the illustration as below:
 - x¹= frequency answer for not critical/ not effective
 - x²= frequency for fairly critical/ less effectiveness
 - x³= frequency for average
 - x⁴= frequency for very critical/ very effectiveness
 - x⁵= frequency for extremely critical/extreme effectiveness

Respondents were asked to indicate the frequency with which they encountered problems during the duration of the turnkey project. Each of the risk factor was consequently ranked. The principle of average index was use in order to analyse the data collected.

No	Risk Factor	Average Index	Ranking
1	Disagreements on total amount of the whole Turnkey Project	3.46	1
2	Main Contractor company in financial problems	3.31	2
3	Disagreement on allocation of the works	3.08	3
4	Incompetence of Design Team point by Contractor	2.69	4
5	Over-interference by clients	2.69	5

Disagreement on the total amount of the whole project showed a greater average index of 3.46 than the other risk factors. The respondents claimed that this risk factor was common in Turnkey projects and may worsen if those involved in the project do not address it accordingly.

In order to reduce this risk, the responsible party should conduct detailed discussions on the price value before any works begin. Financial problems (average index = 3.31) showed the second highest average index. Turnkey projects usually have longer durations compared to traditional projects. In order to reduce or avoid this risk factor during the construction period, the responsible party, specifically the client, must check the main contractor's financial background before any agreements are concluded.

The third highest average index of 3.08 was obtained for disagreement on allocation of works, a risk factor that often arises when the main contractor has submitted their works to the client. In order to avoid this type of risk, each party must clearly state their requirements in the contract documents. Over-interference by clients and incompetence of the design team appointed by the contractor received the same average index of (2.69).

Table 2 Specific Risk Factors

No	Risk Factor	Average Index	Ranking
1	Disagreements on some conditions of contract between clients and Main Contractor	3.54	1
2	Pressure to perform	3.31	2
3	Poor project relationship	3.15	3
4	Incompetence of sub-contractors	3.08	4
5	Excessive demands and variation by clients after the works have been done	2.69	5
6	Insolvency of the clients after the hand-over of the projects	2.69	6

The highest average index for specific risk factors was obtained for disagreements over certain conditions of the contract between clients and the main contractor (Average Index = 3.54). This is a very critical average and this risk always materialises in turnkey projects. To avoid any losses for both parties, they must communicate their needs before the start of construction.

The second highest average index claimed by the contractor was the pressure to perform (Average Index = 3.31). In turnkey projects, the contractor has 100% responsibility to fulfil the client's needs. So, in order to do this, contractors need to push themselves to the limits, ensure that the project fulfils all the client's requirements and also finish on time to avoid any losses.

Poor project relationship received an average index of 3.15. The main contractor observed that in order to make the turnkey project successful, the owner of the project and the construction party must enjoy a good relationship. If there are problems in their relationship, it is hard for the contractor to perform well in the project and to fulfil the owner's requirements.

The fourth highest average index obtained was for incompetence of sub-contractors (3.08). In order to avoid or reduce this risk factor, the main contractor needs to carefully choose the parties that will be involved in the turnkey project. If the owner of the project chooses the right people to conduct the project, the right product will be obtained at the end of the project.

Excessive demands and variation by clients after the works are completed received an average index of 2.69 followed by the insolvency of the clients after the hand-over of the projects. In order to avoid or reduce these two risk factors, the parties involved must ensure that their requirements are clearly stated in the contract before they sign the contract. Thus, no party can easily change their requirements without consent from the other party.

Table 3 External Risk Factors

No	Risk Factor	Average Index	Ranking
1	Economy fluctuations	3.38	1
2	Restriction on fund preparation	3.08	2
3	Inflation	2.92	3
4	Security problems	2.85	4
5	Pollution	2.85	5
6	Import restriction	2.85	6
7	Inconsistency policies, laws and regulations	2.80	7
8	Economy fluctuations	2.78	8

With regard to external risk factors, economic fluctuations received the highest average index of 3.38 and restriction on fund reparation was the second highest with an average index of 3.08, compared to others. Sometimes, the construction

party may need to impose extra fees on the amount stated in the contract due to adverse economic conditions during the construction process. This kind of risk cannot be predicted because the country's economic conditions are beyond the contractor's control.

The third highest risk factor was inflation, with an average index of 2.92. For this risk factor, the contractor has no means to predict if inflation will set in during the construction project period since the turnkey project usually spans a long duration. In order to reduce this risk, each party must be aware that this kind of risk cannot be avoided. Security problems, pollution and import restrictions received the same average index of 2.85.

Part C: Effective Risk Management Solutions for Turnkey

No	Risk Factor	Average Index	Ranking
1	Define transfer scope clearly before setting up the works	3.46	1
2	Ensure clear terms and conditions in Turnkey Project	3.46	2
3	Define clearly authority and responsibility in Turnkey Project agreement	3.38	3
4	Stated clearly parties involve especially Client and Main Contractor	3.31	4

Part C comprises six main groups which are agreement, clients or main contractor selection, employment, good relationship, controls and others. The details for each group will be presented in the next section.

The most effective solution to avoid or reduce risks in the agreement was to clearly define the transfer scope before setting up the works and ensuring that clear terms and conditions are stated in turnkey projects. Both these risk factors received an average index of 3.46. The owner of the project must ensure that the construction party knows their specific requirements. Clearly defining the transfer scope and responsibilities received an average index of 3.38. It is hoped that by doing this, each party is aware of their responsibilities in the project.

Clients and main contractors should also clearly state their conditions to avoid any third party or outsiders interfering in the project. This risk factor solution received an average index of 3.31 while effective solution on one accounting standard received an average index of 3.15. This is an appropriate solution for the risk which involves the cost of the total project.

Solutions concerning the main contractor or clients are difficult as each party has its own mission in the turnkey project. Based on the above data, the criteria that need to be considered was having a good reputation in projects that they were involved in. It was shown that parties with good reputation received the highest average index of 3.54.

According to analysis, it was more secure to have experienced staff because they were aware of their tasks and roles in the project compared to the staff that did not have any experience in turnkey projects. Inexperienced staff may be unaware of the processes in turnkey projects and the roles they need to play and this will indirectly delay the construction of the project.

The second highest effective solution was defining the scope of works for each staff which received an average index of 3.46. The staff must have detailed explanations about the client's requirements and the contractor is responsible to ensure that the works fulfil these requirements. The lowest effective solution was to carefully select staff for turnkey projects with an average index of 3.38.

Good communication among the parties involved was deemed necessary, without which problems will occur. According to the respondents, the most effective solution was maintaining a good relationship with local authorities, which received an average index of 3.85. It is useful as from time to time, the involvement of the local authority is required in the construction process. The least effective solution was to maintain a good contract to ensure that few problems will occur during the construction period. This factor received an average index of 2.92.

From the analysis, the five criteria mentioned above constitute the most effective solutions in order to reduce or to avoid risks in Turnkey projects. The various processes, from controlling the turnkey charter to finishing the projects within the agreed period, must be controlled by the main contractor in order to achieve the objectives. The main contractor must be responsible for staff performance and the overall project.

Turnkey projects must adopt the process of insuring all force majeure risks and conduct detailed feasibility studies before commencing the project. Parties involved must have alternatives or actions that must be taken in order to reduce risks. As proper risk avoidance will have a better control to the overall outcome of the project [22]

4 Conclusion

The advantages of turnkey projects will have effects on time, cost and quality when compared to the traditional method. This procurement method has its own peculiarities in terms of the pre-tender and post-tender activities and processes, division of risks between clients and contractors and the effectiveness of project monitoring and control. Turnkey procurement had a positive effect on the quality of the finished product. There are several risk factors that the responsible party must be aware of such as the relationships of the parties involved, financial factors and prevailing economic conditions. Fundamentally, the main contractor must maintain the turnkey project charter from the beginning of the construction. A clear and comprehensive agreement must also be drawn up for the parties involved before the construction starts. The right parties or employer need to be carefully selected in order to avoid any misunderstanding during the period of construction.

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