

Development of a Bid Decision Making Model for Road Construction Projects in Bangladesh

Civil and Environmental Engineering

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An undergraduate thesis submitted to the Department of Civil & Environmental Engineering
of Islamic University of Technology, Board Bazar, Gazipur in partial fulfillment of the
requirements for the degree

OF

**BACHELOR OF SCIENCE IN CIVIL AND ENVIRONMENTAL
ENGINEERING**

NOVEMBER, 2014

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DECLARATION

We hereby declare that the undergraduate project work reported in this thesis has been performed by us and this work has not been submitted elsewhere for any purpose (except for publication).

November, 2014

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Dedicated
to
our beloved
parents

ACKNOWLEDGEMENT

All praises belongs to the almighty Allah for giving us the strength and courage to successfully complete our B.Sc. thesis.

We would like to express our sincere appreciation to our supervisor Dr. Md. Aslam Hossain, Assistant Professor of the Department of Civil and Environmental Engineering, Islamic University of Technology (IUT), for his generous guidance, advice and encouragement in supervising us. Our gratitude also goes to all the faculty members for their thoughtful recommendations during our study.

We would like to express our special thanks to Mr. Habibur Rahman, Sr. Assistant Engineer of Local Government Engineering Department (LGED) who helped us to select a case project for our study and helped us in collecting the relevant data.

Finally, we would like to thank our beloved parents, for their never ending support.

ABSTRACT

Two critical decisions faced by bidders in competitive bidding include, firstly, whether or not to submit a bid, and secondly (if the answer to the first is 'yes') what markup value should be used on the submitted bid. In the construction industry, government agencies and private sector clients typically adopt competitive bidding to determine contract awards. There are many variables that affect contractor decisions regarding whether to bid and the markup scale, which complicate the bidding decision process. Not bidding for a project could result in losing a good opportunity to make substantial profit, improve the contractor's strength in the industry, gain relationship with the client, and more. However, bidding for inappropriate projects may result in large losses or the consumption of time and resources that could be invested in more profitable projects, ultimately even financial failure of the contractor. This dilemma expresses the importance of the bid / no bid decision. The high complex process is a major characteristic of the bidding decision, which involves a large quantity of objectives and reflection of several internal and external factors. Smart contractors realize the importance of doing initial research and project evaluation before committing themselves to a construction project.

In Bangladesh, recently government has identified construction sector as an industry. Here is an attempt is being made to identify the construction industry of Bangladesh through different parameters. Proper identification of problems and information about the industry will enrich the contributions to the national economy. This paper reports on-going research aims to develop a framework that can be used as a decision aid for project evaluations at the initial project selection decision phase. The results from a review of the literature concerning the bid / no bid decision are presented, and a conceptual model is developed.

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CHAPTER 1

INTRODUCTION

1.1 Background

In the construction industry contractors typically earn construction contracts through either direct negotiation or competitive bidding. Government agencies and private sector clients most often employ competitive bidding, which commonly use the lowest bid price as the main award criterion. Usually the bid price includes cost of construction and a markup, the scale of which is typically determined using a percentage of construction costs. Size of markup impacts upon the profit, which serves as the primary motivator for a contractor to win and execute a contract. Research in the area of competitive bidding strategy models has been conducted since the 1950s (Friedman, 1956). Numerous models have been developed, some of which were designed specifically for the construction industry. Despite the number of competitive bidding strategy models that have been developed, few of these are used in practice, largely as they do not address the practical needs of construction contractors. Therefore, there is a perceived need for models designed in line with actual construction contractor practices. In the bid process, once a determination is made to bid, the next step is to select an appropriate markup.

A successful contractor is the one that selects the most optimal bid markup that secures both the contract and contract profitability (Shash et al. 1992). Bid markup decisions currently follow no accepted standards or formal procedures, but rather consider contractor experience, intuition, and personal preferences, which are not conducive elements for building an effective approach for achieving the optimal bid markup (Chua et al. 2000).

1.2 Problem Identification

There are 25000 registered construction companies in Bangladesh. One fourth of these companies work as irregular company. They lose their inspiration in this sector

as well as they face great amount of financial crisis. Lack of experience, experts, skilled manpower is the main reason behind this situation. Most challenging object for this company is bid /no bid decision. Among a large number of contracts which is considered as the best and suitable for the company is most challenging objects. In case of undertaking proper decision may lead to failure in business and losing in competition market. In Mymensingh zone, there are almost 250 construction companies. Among them only 70 companies can survive in competition market. Rest are now converted in different sectors. Every year around 200-500 contracts are signed up with this 70 companies. So the competition in bidding is less. In our study we work with these 180 irregular companies to find out their faults and make a model which will help to select a best suitable and profitable contract among a large number of contracts.

1.3 Objectives

The objectives of this study are to identify the common challenging parameters in decision making among various contracts in order to maximize the profit in bidding for road construction projects in Bangladesh. The specific objectives are as follows:-

- To identify the bidding decision parameters.
- To make a model using the parameters.

1.4 Scope of the study

A systematic model can help to choose a contract among various contracts. It helps newly registered companies to making bid /no bid decision. As a result, competitions among all the companies will increase. So employment facilities will increases and contribution in GDP in national economy will increases.

1.5 Thesis Organization

This thesis has been organized into five chapters. The contents of the following chapters are described below –

Chapter 2 includes literature review of bid/no bid decision modeling for construction projects in other countries and in Bangladesh

Chapter 3 covers the methodology adopted for this study

Chapter 4 presents detailed description of decision making problems in construction sites in Bangladesh

Chapter 5 includes conclusion and recommendation .The effectiveness of this study has been discussed in this chapter. Recommendations for further studies have also been presented.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Companies need to win tenders to survive in the construction industry. Companies must be able to deal with various bidding situations successfully in today's highly competitive construction market. The first step that the companies need to consider is whether to bid or not to bid before they decide on a competitive tender strategy to win the tender. To make the bid/no bid decision, the company's human resources, time and costs need to be considered.

2.2 Competitive bidding

2.2.1 Varying Procurement Strategy

A successful project means that projects are delivered on time, has a standard quality and within an appropriate cost. (Barclay, 1994). Client selection of a suitable procurement is very important to achieve successful project. (Love, Skitmore and Earl, 1998). Love, Skitmore and Earl (1998) says procurement system means an organizational system which responsibilities of different job roles are arranged to achieve a target project. Procurement methods are categorized by Love, Skitmore and Earl (1998) as traditional method, design and construct methods and management method.

2.2.2 Competition in the construction industry

Competition never slows down in the construction industry. The competitive strategies are various. The lowest bid price is the prime requirement to win traditional tenders, but that is also one of the major causes of project failure. (Walraven& De Vries, 2009) Client's expectations changed in late 1980s, when clients started to consider more non-price criteria. The contractor's performance was becoming more important.

2.2.3 Price VS Performance

Several authors agree that clients traditionally more prefer to use the lowest bid price as the criterion to select the contractor. Contractor selection needs to consider more than just cost. The contractor's capacities affect the project cost, duration and project performance. (Walraven & De Vries, 2009).

Waara and Bröchner (2006) analyze how Swedish clients used multiple criteria to select a contractor and how the non-price criteria were applied in the model. The multiple criteria include: quality, bid price, function, Technical design; environmental management system, operation costs, maintenance costs, life-cycle costs, Service, Project duration, Contractors capabilities, skills, training, references, past experience and performance, construction methods, financial capacity, health and safety and conformity with bidding documents

2.3 The bid/no bid decision making process

2.3.1 Definition

The decision is made not only on the probability of winning the tender, but also on the need to consider the possibility that the company can finish the project successfully following the contract agreement. The contractors bid or not bid decision is affected by various factors. The decision is highly related to the specific project and macro environment. It is hard to make the decision in a limited time by the management team. The decision is based upon the experience, intuition and guesses.

In competitive bidding process, a client selects a numbers of contractors to bid for the proposed project. The selected contractors must make the decision whether to bid or not bid. The contractors need to submit an estimated price if they intend to bid. The client would select the contractor who submitted the preferred price. Therefore there are two stages involved in the bidding process, first the decision to bid/ no bid; and the markup level decision.

2.3.2 Importance of bid/no bid decision

According to respondents feedbacks there are 20% to 100% of works are obtained through a bidding procedure. There are 97.5 % respondents use intuitions as their primary tool to make the bid/ no bid decision. (Egemen and Mohamed, 2007). Shash (1993) mentions similar data that 34 out of 85 responding contractors obtain 50-100% of their jobs through competitive bidding. Lowe and Parvar (2004) identify that 1% of the contract sum was used on the decision to bid making process

2.3.3 Decision making difficulty

Shash (1993) explains that the decision to bid making is complex and hard to make, because if the company decide not to bid, they just lose an opportunity. On the other hand if the company decides to bid, the direct cost will be borne immediately and the value of decision outcome would not be defined in short period. An incorrect decision would lead to contractor losses their operating capacity, reputation and capital. Egemen and Mohamed (2007) agree that bid/ no bid decision making is affected by the specific project characteristics and complex external situations. The bidding decision making is very complex and it is required to consider a large number of relevant factors to achieve the decision.

2.3.4 The bid/ no bid decision making processes used in industry

The small number of contractors has used some kind of systematic model to assist with decision to bid making. Egemen and Mohamed (2007) identify that 92.5% of responding contractors have never used any systematic model to make bid/ no bid decision. Lowe and Parvar (2004) and Egemen and Mohamed (2007) agree that a systematic model would be able to helps the contractor to achieve the business objectives, increase productivity and improve the quality of the decision making. Egemen and Mohamed (2007) also identify that systematic consideration is more important for larger sized companies. Shash (1993) finds similar data that only 17.6% of the responding contractors used some kinds of systematic model to make the bid/ no bid decision.

However Wanous and Boussabaine (2000) and Shash (1993) argue that the systematic model is only useful for academia, it would not help for real industry practices. Wanous and Boussabaine (2000) also state that the complicated mathematical model reduces the potential users and the model ignored the contractors other objectives rather than maximizing the profit. Also Shash(1993) provides the reasons for systematic model failure:

1. The assumptions are made for the models are too simple compare to the complex industry situation.
2. Historical data were used for research may not fit the modern situation.

Wanous and Boussabaine (2000) identifies 38 factors from interviews with 6 experienced contractors and a formal questionnaire in Syria. A parametric solution for the bid / no bid decision is created afterwards in this research. The proposed model includes 162 different bidding situations. The model achieved 85% of accuracy rate by tested using 20 real projects

2.4 Summary

This chapter has identified a large number of information relatives to the contractor bid/ no bid decision making. This chapter discovered the competitions in the construction industry and the bidding strategies and finally the factors affect the bid/ not bid decision making are presented.

Factors identified in the literatures are highly inter-related. For example the project has a low rate of return may decrease the company's desire to bid, but the project has a high rate of return may increase the requirements to the contractors such as the cash requirement for the project, the experience required and amount of company's resources required. Another example, the project conditions may very suitable to a contractor, but the project may also suitable to some strong competitors as well. So the bid for the right project is hard to decide and it is kind of opportunity cost. The company managers are required to consider various factors from different aspects.

CHAPTER 3

METHODOLOGY

3.1 General

This chapter outlines the research methodology will be used to carry out the research. The chapter will describe the research methodology, the research method, data collection method, data analysis method and research ethics in detail which will be used to ensure the research is reliable and valid.

3.2 Research design

3.2.1 Research methodologies

The similar studies done in the literature demonstrate that both quantitative and qualitative methodologies have been used to identify the factors affect bid/ no bid decision making. There are two main types of research method used to implement the research which are questionnaire survey and multi-case study.

There is one typical research done by Shash (1993) which collects quantitative data through mailed questionnaire surveys from 300 top UK contractors. The questionnaire is based on the study carried out at the University of Cincinnati by Ahmad and Minkarah (1988, as cited in Shash, 1993). Then Shash (1993) modifies the questionnaire to suit the UK construction industry environment in 1990 which identified 55 potential factors that influence bidding decision making. The 300 top contractors were identified randomly from Independent Community Consultants (Hampton) ICC publications Search Utility (version 2.00, June 1990) database. The questionnaire has three main parts, firstly, the company type, capacity and relevant information. Secondly, it asks contractors to rate the 55 factors by using 1 -7 categories. "1" means the lowest effect, "7" means highest effect. The last part is asking the company's rules of bidding decision. A total of 85 surveys were received which was a 28.3% response rate.

3.2.2 Chosen research design

Qualitative research is generally understood as explore people's perception and opinions. According to the study question "what are the key factors affecting the bid/ no bid decision", the objective of the study is to discover construction contractors opinion on "the factors affecting the bid/ no bid decision". Also qualitative research can explore the general perception of the entire population such as small to medium sized contractors in Bangladesh for this study by selecting a representative sampling. So, qualitative research methodology seems to be the most suitable approach to carry out the research. Also this methodology confirmed by Egemen and Mohamed (2007) as the qualitative methodology is the option has been used. The main finding of literature is 50 highest ranking factors are extracted from Egemen and Mohamed (2007) would potentially affect the bid no bid decision which will be used to form the basis of the questionnaire; the reason for selecting those factors which is good for directly comparison with the similar studies.

3.3 Data collection

The methods of data collection can be categorized as: one-way communication and two-way communication. One-way communication means the gathered information can either be accepted or rejected. The researcher has less opportunity by asking supplement questions. One way communication includes:

- Postal questionnaires
- Completely structured interview
- Diaries
- Scrutiny of archives

Two-way method permits feedback and gathering of further data investigation through asking supplement questions. The typical two-way methods include Semi-structured interview.

Data was collected for this study is employing a face to face structured interview format, incorporating a questionnaire. The face to face interview forms the basis of the data collection and questionnaire is the way of that most questions are asked.

The reason for using an interview is according to the feedback of past similar studies showed that questionnaire is a good way to execute survey, but questionnaire has very low response rate which normally just 30% around. But, interview has a high response rate comparatively. Also interview can obtain detailed information by asking more subsequent questions about personal perceptions.

3.3.1 Questionnaire

Questionnaires include two types of questions: open and closed questions. All the questionnaires need to be piloted to ensure the questions are clearly stated. Open questions allows respondents answer those questions in whatever forms, provides opportunities to respondents to answer in full. The feature of open question is easy to ask, but hard to answer, also the answer may hard to analyze. Open questions are more preferable to use for interview. Closed questions have provided the potential answers which may limit the responses, so, it is important to give opportunities to respondents to states their answers. Closed questions can be administrated by e-mail and post.

3.3.2 Interview

Interview can be used for collecting simple factual data, but it is more preferable to use for explore the more complex problems such as gain insights into other person's behaviors in detail and depth. It is important to present the information fairly. The study seeks to investigate other people's world in detail; it more seems to discover the people's feeling in the social world. Interview has three different types:

- Structured interview
- Un-structured interview
- Semi-structured interview

The difference between those three interviews is the limitations on both sides of participants. In structured interview, the interview involves a questionnaire; interviewer has fewer opportunities to ask supplement questions. In unstructured interview, interviewer brief the study topics, and then respondents answer the questions in a widely boundary. Semi-structured interview between those two extremes, normally semi-structured interview based on a simple questionnaire, and then more detail questions are asked based on the questionnaire.

3.4 Data collection procedure

There are 50 highest ranking factors are identified by which are extracted to form the basis of questionnaire. The questionnaire includes two parts. First part, demographic information is asked which to identify the identity of respondents. Second part, the 50 factors are rated by using 0,1 and -1 points scale which “0” means not important at all and “+1” means the most important. Also the subsequent questions such as why they give the points to the particular factors. Also give respondents opportunities to add any factors they think important. The rating of the factors should be based on the company’s tendering policy.

3.5 Data analysis procedure

There are three steps in data analysis:

- To rank the rated factors
- To compare data between participants
- To compare data with literature

To rank the rated factors, firstly we aim to calculate the mean rate for each factor, so for each single factor, add all the scores given by participants, and then divided by number of participants. Finally, calculate the importance weight by using mean rate of each factor divided by 6. The highest importance weight would be the most important factors as respondent’s view.

3.6 Conclusion

According to the research question “what are the key factors that affect the bid or no bid decision making process of small to medium sized contractors in Bangladesh?” This research is designed as a qualitative research. The research method for this study is survey which is going to explore the factual data as “the factors affect bid/ no bid decision”. The data collection method is employing a face to face structured interview incorporating a questionnaire. The sampling for data collection is convenience sampling which focus on the small to medium sized contractors.

CHAPTER 4

MODEL DEVELOPMENT AND DATA ANALYSIS

4.1 General

This chapter discusses how the model has been developed in detail. Analysis of different parameters in decision making model will result in obtaining the best value contract.

4.2 Selection of Companies

We have worked with thirty two companies. Among them six companies are identified as top ranked companies in competitive market and rest twenty six companies are medium ranked. Name of the top six selected companies are given below:

- M/S Saiful Islam
- M/A Mahbub Enterprise
- Samiran Chowdhury
- M/A Nippon Engg. & Construction
- M/S Tanvir Traders
- Vowel construction

Among several factors, ninety four factors have considered as most important in competitive bidding for any international construction project. But most of these factors have no effect on developing countries construction project. So a questionnaire survey was done to identify the most important factors among the ninety four factors for thirty two companies. At first, twenty six companies selected twenty five parameter among which thirteen parameter is selected by the top six ranked companies. The selected thirteen parameters are given below:

Table 4.1: Bidding Decision Parameter

Bidding Decision Parameter
1.Size of contract
2.Local climate
3.Site accessibility (Political influence on the contract)
4.Payment habit of the client
5.Availability of required cash
6.Strength of the company
7.Familiarity with the condition
8.Firms previous experience & profit in similar job
9.Prequalification
10.Biding Method
11.Availability of labor
12.No of Participants
13.Future Projects

After selecting the parameters, every company was asked to give score for every individual parameter which indicates the importance of that individual parameter in construction phase of any contract. They provided the score on the basis of their previous work experience. These scores are known as relative importance & the score ranges from 1 to 10. The more positive score indicates the suitability of the parameter for the construction of a project.

4.3 Relative Importance Value

Every company gave a score for each individual parameter according to the importance of that parameter for the company. An average value of all the scores for every parameter is the relative importance value. All of this scoring process is done with the top six companies. A table showing the calculation of relative importance value is given below:

Table 4.2: Relative Importance Value

Bidding Decision Parameter	M/S SAIFUL	M/S MAHBUB	S.CHOW DHURY	M/S NIPPON	M/S TANVIR	VOWAL CON.	AVG. VALUE
Size of contract	2	3	1	4	3	3	2.67
Local climate	1	1	1	2	1	1	1.17
Site accessibility	10	10	10	10	10	10	10
Payment habit of the client	5	6	5	6	5	5	5.33
Availability of required cash	6	7	5	6	5	7	6
Strength of the company	7	6	7	8	7	6	6.83
Familiarity with the condition	1	3	1	2	1	2	1.67
Firms previous experience	8	7	8	5	6	7	6.83
Prequalification	10	10	10	10	10	10	10
Biding Method	8	9	8	8	7	9	8.17
Availability of labor	7	5	6	8	5	7	6.33
No of Participants	10	10	10	10	10	10	10
Future Projects	5	6	5	4	5	2	4.5

4.4 Degree of Impact (DOI)

The main purpose of providing degree of impact is to show how any project is affected by the parameters. If the parameter has negative impact for a particular project then the impact value is expressed as “-1”. On the other hand if the parameter has positive impact then it will be scored with “+1”. The parameter having no impact on the project is scored with 0. Degree of impact varies with different ranges project. It fully depends on the company’s judgment. Experienced and professional contractors will very careful while scoring of degree of impact.

Table 4.3: Value of Degree of Impact

condition	Value of degree of impact
Parameter have negative impact	-1
Parameter have no impact	0
Parameter have positive impact	+1

4.5 Bidding Impact value

It is the multiplication of relative importance and degree of impact. The summation of all the bidding impact value is considered as the output of the model. For different project, the total bidding impact value will vary according their importance to the construction company. In general, more positive value indicates benefit for the project as well as more negative value indicates the adverse effect of the parameter on the project. By considering all of factors, a best and suitable decision will come from this model for different companies.

4.6 Model analysis & Result

The developed model is applied for two different contracts which were published in national newspaper on 2 October, 2014. The decision making model worked efficiently for different characteristics of both contract. The contracts detail is given below:

Table 4.4: Characteristics of Contracts

Subject	Contract 1	Contract 2
Contract Name	Periodic maintenance of Madhupur – Dewanganj GC road from ch .(2000-6902) m under Nandail UP..	Periodic maintenance of Ishwarganj –Anadaganj road ch. (00-2900) m under Ishwarganj UP.
Bidding Method	Open tendering method	Open tendering method
Proposal Security	1,50,000 BDT	2,00,000 BDT
Similar Work Experience	30 lac overturn last five year	50 lac overturn last five year
Company Liquid Asset	20 lac	25 lac
Annual Average Turnover	5 crores	6 crores
Location	Nandail	Ishwarganj

The decision making model evaluate the bidding impact value for each contract. The contract which obtains more positive value will be beneficial for the company. Therefore the selected companies will submit bid for the contract which has positive value. On the other hand if both the contact has negative value then we have to choose the less negative value contract and will submit bid for the contract. So the decision

model for submitting bid will be more positive or less negative bidding impact value. The result of decision making model for the two contracts are given below :

Table 4.5: Assessment of Decision Making Model

Bidding Decision Parameter	Relative Importance	DOI	DOI	Bidding Impact Value	Bidding Impact Value
		Contract1	Contract2	Contract1	Contract2
Size of the contract	2.67	0	0	0	0
Local Climate	1.17	0	0	0	0
Site accessibility	10	-1	-1	10	10
Payment habit of the client	5.33	+1	+1	5.33	5.33
Availability of required cash	6	+1	+1	6	6
Strength of the company	6.33	-1	-1	-6.33	-6.33
Familiarity with the condition	1.67	+1	-1	1.67	-1.67
Firms previous experience	6.83	+1	+1	6.83	6.83
Prequalification	10	+1	+10	10	10
Bidding Method	8.17	+1	+8.17	8.17	8.17
Availability of labor	6.33	+1	+1	6.33	6.33
No of Participants	10	-1	-1	-10	-10
Future Projects	4.5	-1	-1	-4.5	-4.5
Total				9.86	8.19

From the assessment, it shows that the contract 1 has more positive value. The difference between the bidding impact values is only for the familiarity with the condition parameter. The condition of project differs from each other that's way the scoring value also differs. Since the contract 1 is more positive therefore the bidders should go for the profitable contract.

4.7 Summary

The decision making model will effectively find out the suitable bidding contract for any company. It will help the construction company for choosing the best contract for bidding. The relative importance of parameter & degree of impact are the key function in decision making model .Multiplication of these factors cause the difference in bidding impact value which is the criteria for choosing any contract. Therefore the bidder must have knowledge on the bidding impact value. However difference in the project size and volume has also impact on bidding.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 General

Companies must be able to deal with various bidding situations successfully in today's highly competitive construction market. There are few more relevant researches have done in the past. But there isn't any research done in Bangladesh context. So, the research question is proposed that what are the factors affecting bid/no bid decision making in Bangladesh?

5.2 Effectiveness of the study

The response rate was 67% which were 6 participants involved in this research. Those 6 participants are Bangladesh based construction contractors which include 4 participants are small sized contractors and remaining participants are medium size d contractors.

Most contractors have less than 50 percent jobs obtained through competitive bidding. Importance weights given to specified factors are very different by different sized contractors. Research revealed the medium sized contractors give more considerations to those listed factors. Small sized contractors sign higher importance weight to those specified factors. The most important factors for small sized contractors are "experience and familiarity of your firm with this specific type of work", "current financial situation of the company", "current financial capability of the client" and "history of client's payments in the past projects". The most important factors for medium sized contractors are very different to small sized contractors which are "having qualified subcontractors", "profits made in similar projects in the past" and "possible contribution in building long-term relationship with other key parties".

Furthermore, the small sized contractors provide very similar responses which the factors affecting the small sized contractors bid/ no bid decision making are much

unified. By contrast, every medium size contractor has every different individual opinion about those specified factors. It is seen that medium sized contractors have stronger individual business strategy. Both small and medium sized contractors think factors are important under categories such as “strength of firm”; “need for work”; “client and consultant of the project” and “project considering long term gains and losses”. It is seen that both of them concern about their capability, workload and client characteristics.

Differences between two sized contractors are factors relative to job uncertainty are very important to small size contractors. It is seen that small contractors are more difficult to deal with project uncertain risks. Factors under categories like “project conditions contributing to profitability of the project”; “risk creating job” and “foreseeable future market conditions” are signed very important rate by medium sized contractors. It is seen that medium size contractors are more concern about profit they can make from purposed projects, and risks involved in projects and especially, they take more business strategy consideration.

5.3 Limitations

This research is based on Egemen and Mohamed (2007). For this current research, the sizes of contractors decided according to the number of full time employees in the company. Companies have less than 5 employees are treated as small size d contractors. Companies have more than 5 employees are treated as medium size d contractors. Referring to Egemen and Mohamed (2007), the sizes of contractors are defined according to firm’s annual turnover. So, the definition of sizes of contractors may different, this would limit the directly comparison with Egemen and Mohamed (2007).

5.4 Recommendations for future studies

As we mentioned in research limitations, this research involves very limited participants who are not generalizable to all small/medium contractors .Therefore, there are two areas are suggested for future studies:

- Increase sample size. .
- Involve large sized contractors.

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