

Identification and Assessment of Risks out of Contractors' Control in the Saudi Construction Industry

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Several studies have identified ownership of parties who cause risks and lead to low performance in the Saudi construction industry. These studies identified that contractors are not the main party that cause risks as owners, consultants, and other parties have the major share of causing risks in the industry. This study is conducted to investigate the risks that are out of contractors' control (caused by other parties) in the context of the Saudi construction industry and reports an up-to-date ranked list of risks that are out of contractors' control according to contractors' viewpoint through a questionnaire survey. The questionnaire survey was sent to contractors who work in public construction projects in Saudi Arabia. Thirty six risk factors that are out of contractors' control were identified through literature review and a pilot study. The study concluded that the top risks that are out of contractors' control in public construction projects in Saudi Arabia are: delay in progress payments by owner, owners' practice of assigning contracts to lowest bidder, slow decision making by the owner, change orders by owner during construction, excessive bureaucracy in the owner's administration, delay in approving major changes in the scope of work by consultant, and external work due to public agencies (roads, utilities and public services). The study recommends contractors to identify the risks that are out of their control before projects starts and identify how to mitigate these risks with the project parties during execution phase.

Key Words: Risk analysis, Project Parties, Saudi Arabia, Public projects.

Introduction

Construction projects are unique and carry different sources of risks. Several parties are involved in projects such as owner, consultant, contractor, designer, suppliers, and other stakeholders and all of these parties inevitably carry certain risks (Peckiene, et al., 2013). In the context of the Saudi construction industry (SCI), several researchers identified risk factors in the industry and categorized those risks considering the responsible parties. Assaf and Al-Hejji (2006) identified and assessed 73 causes of delay in the SCI using a field survey for owners, contractors and consultants. The results showed that the most common cause of delay identified by the three parties is change orders by owners during construction. The final combination of results showed that construction delays are mostly originated by owners, and then followed by contractors, designers, labors and consultants.

Alghonamy (2015) conducted a survey to assess 34 causes of cost overruns in the SCI. The study concluded that the top causes of cost overruns are owners' use of bid award for lowest price system, frequent changes in design, improper planning and owners' delay of progress payments. In addition, Albogamy (2012) conducted a survey to evaluate the relative importance of causes of delay in the SCI. The top risks factors were identified and ranked for different categories. Out of 17 owners' related factors, low performance of the selected contractors in the Saudi government tendering system was ranked first followed by delay in progress payments by the owner. For the consultant party, 11 risk factors were assessed and found that delay in approval of shop drawings and design changes were the highest ranking. Out of 12 external factors, non-utilization of professional construction contractual management and rise in the prices of materials were the highest ranking.

A recent study assessed the significance of 54 risks inherent in the aviation construction projects in Saudi Arabia (Baghdadi and Kishk, 2017). The study found that designer related risks are the most important group of risks affecting the aviation projects in Saudi. Client related risks group was ranked second followed by consultant related risks and then contractor related risks. Another recent research identified the ownership percentages of the parties

causing risks in the SCI (Elawi, et al., 2016). This research studied the causes of time overruns for 49 public projects and identified that 53% of the risks were caused by owners. Contractors were responsible for 27%, and other parties responsible for 20%. Additionally, this research applied a quantitative analysis of the literature that studied the causes of time overruns in the SCI and concluded with a similar ownership indication as owners were responsible for 49.2%, contractors for 36%, and other parties for 14.8%.

Contractors are playing an essential role in pushing the growth of any construction industry through successful delivering of projects. Failure to deliver projects successfully will impact the growth rate of the construction industry. Consequently, it is important to identify and assess the risks that impede contractors from delivering projects on specified time, cost and quality objectives (Assaf, et al., 2015). In addition, risk is defined as what the contractor has no control over, or areas where the contractor has insufficient information to clearly see into the future (Kashiwagi, et al., 2013). To minimize effects of project risks, according to Algahtany et al (2016), contractors should identify risks out of their control (caused by other parties) and plan in advance how to reduce the effects of these risks.

Objective of the study

The literature discussed above showed that contractors are not the only party causing risks that lead to low performance in the industry as owners and other parties have the major share. The main aim of the study is to identify and assess the risks that are out of contractors control in the SCI. Literature review and a pilot study will be utilized to identify the risks that are out of contractors control in the SCI. Identified risks will be assessed based on contractors' views on risks' importance and occurrence. The study will report an up-to-date ranked list of risks that are out of contractors' control in the SCI.

Methodology

The methodology of the study will include the following steps:

1. Identifying the categories of risks out of contractors control through reviewing 8 studies that identified responsibilities of the risk factors in the SCI.
2. Identifying the risks out of contractors control in the SCI through reviewing 24 studies that studied risks in the context of the SCI.
3. Identifying additional and recent risks out of contractors control through asking experts in the SCI.
4. Surveying contractors based on the risks' importance and occurrence in the SCI.

Literature Analysis of Risks out of Contractor's Control in the SCI

To identify the risks out of contractors control in the SCI, a literature review has been conducted to identify and review publications that studied risks in the SCI. 24 publications have been identified which are classified as follows: 12 studies investigated causes of delays (Al-Khalil and Al-Ghafly, 1999; Assaf and Al-Hejji, 2006; Assaf, et al., 1995; Albogamy, et al., 2012; Mahamid, 2013; Al-Kharashi and Skitmore, 2009; Al-Tami, 2015; Mahamid, 2011; Al-Emad and Nagapan, 2015; Elawi, et al., 2016; Alzara, et al., 2016; Mahamid, et al., 2015;), 6 studies were about general risk factors' identification (Baghdadi and Kishk, 2015; Albogamy, et al., 2013; Al-Hammad, 2000; Mahamid, 2014; Ikediashi, et al., 2014; Alhammadi, 2011), 4 publication studied causes of costs overruns (Alhomidan, 2010; Alghonamy, 2015; Bubshait and Al-Juwairah, 2002; Allahaim and Liu, 2015), and 2 publications studied risk factors in projects' initial stages (Mohamad, et al., 2012; Arain, et al., 2006). To specify the risks out of contractors' control, studies that identified the ownership or responsibility of risks in the context of Saudi Arabian construction industry were utilized. 8 studies out of the 24 publications classified risks based on different categories which show the ownership or responsibility of risks. However, those researchers adopted several approaches in classifying risks. Assaf and Al-Hejji (2006) classified construction risk factors into eight groups including project,

owner, contractor, design, materials, equipment, labors, and external. Albogamy et al (2013) assigned risk factors into seven groups including material, project, contractor, owner, consultant, design, and external. Baghdadi and Kishk (2015), however, further expanded the classification of risks into three main categories and 11 subcategories as follows:

- Internal risks including: client-specific risks, designer-specific risks, contractor-specific risks, subcontractor specific risks, consultants-specific risks.
- External risks including: political risks, social risks, financial risks, natural.
- Force Majeure risks including: natural phenomena, weather issues.

However, an agreement in main classification categories among the researchers in the 8 studies has been noticed which include the four main pillar in most of public projects in SA (owner, contractor, consultant, and designer) as can be seen in table 1. These four categories can represent most of risk factors through relating the risks to their sources. Other risks such as risks related to other stakeholders, market factors, or to unforeseen conditions can be categorized as external. These main categories will be used in categorizing risks out of contractors' control. Table 2, lists the most frequent risks out of contractors' control from the 24 identified studies and their classification categories.

Table 1

The most used classification categories for risks in the Saudi construction industry

Classification Category/ No. of Study	1	2	3	4	5	6	7	8	Freq
Owner (client)	*	*	*	*	*	*	*	*	8
Contractor	*	*	*	*	*	*	*	*	8
Consultant		*	*	*	*	*	*	*	7
External	*			*	*		*	*	5
Designer				*	*	*		*	4

1. (Assaf and Al-Hejji, 2006) 2. (Albogamy, et al., 2012) 3. (Al-Kharashi and Skitmore, 2009) 4. (Baghdadi and Kishk, 2015) 5. (Albogamy, et al., 2013) 6. (Mohamad, et al., 2012) 7. (Elawi, et al., 2016) 8. (Alzara, et al., 2016)

Table 2

The most frequent risks out of contractors' control and their classification categories

No.	Risk factor	Frequency in 24 studies	Classification Category
1	Mistakes in design	20	Design
2	Delay in progress payments by owner	19	Owner
3	Changes in specifications during construction	18	Owner
4	Additional work or changes in the scope of the project	17	Owner
5	Adverse weather conditions	17	External
6	Cost fluctuation of labor and material during construction	16	External
7	Design changes	16	Design
8	Changes in government regulations and laws	16	External
9	Owners' practice of assigning contracts to lowest bidder	14	Owner
10	Unrealistic contract duration	14	Owner
11	Availability of construction material	14	External

12	Slow decision making by the owner	14	Owner
13	Owner's team lack of experience including consultants	13	Owner/Consultant
14	Owner's poor coordination with the construction parties	12	Owner
15	Difficulties in obtaining work permits	10	Owner
16	Change orders by owner during construction	10	Owner
17	Delay in approving shop drawings and sample materials	10	Owner
18	Delay in performing inspection and testing by consultant	10	Consultant
19	Shortage of equipment required	10	External
20	Excessive bureaucracy in the owner's administration	9	Owner
21	Shortage of manpower	8	External
22	Effects of subsurface conditions (e.g., soil, high water table, etc.)	8	External
23	Poor communication and coordination by consultant engineer	8	Consultant
24	Unclear and inadequate drawings and specifications	8	Design
25	Delays in producing design documents	8	Design
26	Interference by owner in the construction operations	6	Owner
27	Poor site conditions	6	Owner
28	Delay to furnish and deliver the site to the contractor by the owner	6	Owner
29	Delay in reviewing and approving design documents by consultant	6	Consultant
30	Delay in approving major changes in the scope of work by consultant	4	Consultant
31	External work due to public agencies (roads, utilities and public services)	3	External
32	Contract breaching by owner	3	Owner

The researchers presented in a pilot study the list of risks factors to three experts whom have more than 25 years of experience in the SCI to provide feedback on the questionnaire for the risks assessment and to add any other important or recent risks not listed in the questionnaire. Three risks factors were added to the list which are: the duration of the consultant contract does not match the duration of the project, wars in region and delays in disputes resolutions.

Data Analysis and Results

The targeted population in this study is contractors who work in public projects in Saudi Arabia. Ninety four contractors responded to the survey. The sent questionnaire was composed of three sections. The first section was an introduction about the purpose of the questioner and its goals. The second section was related to general information about the respondents and the company they work in. The respondents were asked about their working positions at the company, their years of experience in public projects, their academic qualifications, and the classification grade of the company. The third section includes a list of risks which are classified into three groups including owner's related risks, consultant and designer related risks, and external risks. The survey was formed in English and then translated into Arabic and distributed through online survey.

Of the 94 respondents, 12 contractors are classified in grade 1 in the contractors' classification system in Saudi Arabia. 17 contractors are classified in grade 2. Most of the participated contractors are classified in grades 3 and 4 with 26 contractors in each grade, 10 contractors in grade 5, and 3 non- classified contractors. The contractors' classification system is used by public organizations in Saudi as the basis for prequalifying contractors and awarding projects to ensure contractors' capabilities and performance (Bubshait & Al-Gobali, 1996). The Saudi contractors' classification system functions within 5 grades and 29 fields and the grades levels determine the financial values of projects budgets that contractors can bid for within their fields of classification (MOMRA, 2017). A total of 47 respondents (50%) have more than 15 years of experience in the construction industry. 19% of the respondents were in the group of 10-15 years of experience, 26% have from 5 to 10 years of experience, and 5% have less than 5 years of experience. Considering the participants' academic qualifications, 79% of the participants have bachelor's degree as their minimum level of education, with 14% holding master's degree, and 3% holds PhD degrees. Considering

the participants' working position at the company, the majority of the participants were the companies' owners (58%), 18% are projects managers, 7% are field engineers, 10% are administration managers, and 7% choose the final choice (others).

The participants were asked to rate each risk factor according to its frequency of occurrence in public projects and its degree of impact (severity) on public projects' cost and time. A 5 point scale was used for the evaluation of risks for both severity and frequency of occurrence. Degree of severity was categorized as follows: Extremely sever, sever, Moderate, Low, and None (on a 5 to 1 point scale). Similarly, frequency of occurrence was categorized as follows: Always, Often, Sometimes, Rarely, and Never (on a 5 to 1 point scale).

Importance Index was used to analyze the collected data from the questioner including both Severity Index and Frequency Index. This formula was used by Assaf and Haji (2006) and Albogamy et al (2012) to analyze and rank risks in the SCI.

$$\text{Importance Index (II)} = (\text{F.I} \times \text{S.I}) / 100$$

The frequency index formula is used to rank risks according to risks' frequency of occurrence in projects based on the participants' point of view.

$$\text{Frequency Index (FI)} = \sum \left[a \cdot \left(\frac{n}{N} \right) \right] \times 100/5$$

The severity index formula is used to rank risks based on the risks' degree of impact on projects' cost and time based on the participants' point of view.

$$\text{Severity Index (SI)} = \sum \left[a \cdot \left(\frac{n}{N} \right) \right] \times 100/5$$

Where a is the constant of weighting given to each response which ranges from 1 for none for severity and never for frequency of occurrence to 5 for extremely sever for severity and always for frequency of occurrence, n is the responses frequency, and N is the sum of responses. The results of the survey are shown in the table 3.

Table 3

The overall importance of risks out of contractors' control in the Saudi construction industry

Risk Factor	FI	Rank	SI	Rank	II	Rank
1- Owner's related risks						
Delay in progress payments by owner	90.740	2	96.559	1	87.618	1
Owners' practice of assigning contracts to lowest bidder	91.111	1	86.956	3	79.227	2
Slow decision making by the owner	79.629	5	82.888	6	66.004	3
Change orders by owner during construction	81.481	3	79.354	18	64.659	4
Excessive bureaucracy in the owner's administration	81.481	3	79.318	19	64.629	5
Delay in approving shop drawings and sample materials	77.037	7	82.173	7	63.304	8
Owner's team lack of experience	77.037	7	79.775	15	61.456	10
Owner's poor coordination with the construction parties and government authorities	75.555	10	80	12	60.444	11

Changes in specifications during construction	71.851	16	80	12	57.481	14
Unrealistic contract duration	72.222	13	79.565	16	57.463	15
Interference by owner in the construction operations	75.849	9	73.333	30	55.622	18
Additional work due to changes in the scope of the project	71.111	18	76	27	54.044	21
Difficulties in obtaining work permits	69.629	22	76.179	25	53.043	24
Poor site conditions	67.924	25	76.091	26	51.685	28
Delay to furnish and deliver the site to the contractor by the owner	63.703	30	71.685	33	45.666	31
Contract breaching by client	57.037	34	75.955	28	43.322	32
2- Consultant and designer related risks						
Delay in approving major changes in the scope of work by consultant	77.974	6	81.842	8	63.816	6
Consultant's lack of experience	72.183	14	87.073	2	62.852	9
Design changes	71.034	19	82.926	5	58.906	12
Delay in performing inspection and testing by consultant	72.183	14	81.219	9	58.627	13
Delay in reviewing and approving design documents by consultant	73.25	12	78.4	20	57.428	16
Poor communication and coordination by consultant engineer	71.494	17	76.829	23	54.928	19
Mistakes in design	69.767	21	78.292	21	54.622	20
Unclear and inadequate drawings and specifications	69.069	23	77.590	22	53.591	23
Delays in producing design documents by designer	68.25	24	76.8	24	52.416	25
The duration of the consultant contract does not match the duration of the project	63.218	31	72.439	32	45.794	30
3- External risks						
External work due to public agencies (roads, utilities and public services)	74.942	11	85.121	4	63.792	7
Cost fluctuation of labor and material during construction	70.352	20	80.952	10	56.952	17
Shortage of manpower	67.529	26	80	12	54.023	22
Availability of construction material	64.470	28	80.952	10	52.190	26
Delays in disputes resolution	65.287	27	79.512	17	51.911	27
Changes in government regulations and laws	63.720	29	75.662	29	48.212	29
Effects of subsurface conditions (e.g., soil, high water table, etc.)	57.209	33	73.012	31	41.769	33
Shortage of equipment required	58.372	32	68.536	35	40.006	34
Adverse weather conditions	56.551	35	64.146	36	36.275	35
Wars in region	41.162	36	70.487	34	29.014	36

It is evident from the table above that the most important five risks that are out of contractors' control are categorized as owner related risks. Moreover, seven of the top ten ranked risks that are out of contractors' control

are owner related risks. Two risks of the top ten important risks are related to consultant and designer and one risk is categorized as external. The study finding makes it clear that owner related risks are extremely important in terms of their frequency of occurrence and their severity on public projects in Saudi Arabia.

Conclusion

This study investigated the risks that are out of contractors' control (risks caused by other parties) in the context of the Saudi construction industry and reported an up-to-date ranked list of risks that are out of contractors' control. Thirty six risk factors that are out of contractors' control were identified through literature review and a pilot study. The study identified that the top risks that are out of contractors control in public construction projects in Saudi Arabia are: delay in progress payments by owner, owners' practice of assigning contracts to lowest bidder, slow decision making by the owner, change orders by owner during construction, excessive bureaucracy in the owner's administration, delay in approving major changes in the scope of work by consultant, and external work due to public agencies (roads, utilities and public services).

The study results provide a general idea about what are the risks out of contractors control and what is their importance. The study results are based only on the perceptions of contractors who work in public projects as risks' importance could be different if other parties of projects were included in the sample. It is recommended for contractors to identify and assess all risks out of their control before starting projects to include them in projects plans. This will help in knowing how to reduce the effects of these risks and to measure responsibility for any adverse results. Further research can be performed to investigate the risks out of contractors control in specific types of projects with evaluating the level of effect of all parties on projects. Furthermore, risk management approaches should be developed to minimize risks out of contractors' control. Contractors in their risk management practices should shift their focus from only the activities and risks under their control to the activities and risks of other parties involved in the projects. Highly experienced project manager within the contractor will be essential in this paradigm shift to identify, evaluate, and mitigate risks out of contractor control with measuring risks impacts on time and cost.

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