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Disputes in Construction Industry: Owners and Contractors' Views on Causes and Remedies

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Abstract: The construction industry is prone to conflicts and disputes due to complexity, competitive environment, and complicated project documents. In this complex environment, members from various professions, each has their goals and desires to secure the most of his own benefits, work together to build a structure. The objectives of this study were to investigate the frequency, causes, and remedies of disputes in the Central Province of Saudi Arabia. The required data were collected, through a questionnaire survey, from 130 contractors and 54 owners located in the Central Province. This study reveals that disputes in the Saudi construction industry are inevitable with a frequency of occurrence exceeds two disputes per month. Project documents, owners, and contractors to some extent are the sources for such disputes. Project documents are poorly prepared with inaccurate specifications, ambiguity in contract wording, contradictions between project documents, unrealistic project duration, the inaccurate bell of quantities (BOQ), and weakness in contract language. Owners cause great disputes through sizable variation orders exceeding allowable limits, changing item descriptions and quantities in BOQ, interfering in the execution of the contract, and delaying responses to requested information/approvals. Contractors cause disputes through poor contract administration. Contractors follow a combined strategy (mitigating disputes and holding only the disputed work area only) and owners either mitigate disputes or hold disputed scopes. Government owners mostly mitigating disputes and, conversely, private owners hold the disputed scope and continue with the rest of the project. This study is believed to contribute to the current body of knowledge in disputes and contractors and owners by providing effective mitigation techniques that will assist them in minimizing the negative impacts of disputes.

Keywords: Causes, construction, disputes, practices, resolve, Saudi Arabia.

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1. Instruction

The construction industry is prone to conflicts and disputes due to complexity, competitive environment, and complicated project documents (drawings, specifications, conditions of the contract, etc.). In this complex environment, members from various professions, each has his goals and desires to secure the most of his own benefits, work together to build a structure. Furthermore, each member organization has its own culture, education, and objectives that may conflict with other organizations.

According to Fisk and Reynolds (2014), project documents are subject to broader principles of interpretation than most contracts. Although the written contract documents the conditions agreed by the parties it reflects the understanding that each party had with concerning the wording of the document. Furthermore, it is almost inevitable that the written documents do not adequately address every single matter.

Conflicts and disputes are used interchangeably and mean different things to different people. Conflict, according to Fenn et al. (1997), is "any divergence of interest, objectives or priorities between individual, groups or organizations". On the other hand, the Institution of Civil Engineers (ICE) states that dispute occurs when one of the parties raises a claim and the other rejects it, and the rejection is opposed with no consent by the party that submitted the claim (Zaneldin, 2006). Diekmann and Girard (1995) defined dispute as "any contract question or controversy that must be settled beyond the job site management."

Table 1. Global dispute values and the time needed to solve them

Region	Dispute Values (US$ Millions)						Length of Dispute (Months)					
	2010	2011	2012	2013	2014	2015	2010	2011	2012	2013	2014	2015
Middle East	56.3	112.5	65	40.9	76.7	82	8.3	9	14.6	13.9	15.1	15.2
Asia	64.5	53.1	39.7	41.9	85.6	67	11.4	12.4	14.3	14	12	19.5
North America	64.5	10.5	9	34.3	29.6	25	11.4	14.4	11.9	14	12	19.5
UK	7.5	10.2	27	27.9	27	25	6.8	8.7	12.9	13.7	16.2	13.5
Continental Europe	33.3	35.1	25	27.5	38.3	25	10	11.7	6	6.5	18	18.5
Global Average	35.1	32.2	31.7	32.1	51	46	9.1	10.6	12.8	11.8	13.2	15.5

Source: ARCADIS (2016)

Construction disputes are very expensive especially if they are not resolved promptly. Disputes costs are classified into direct costs including attorney expenses, expert opinion and alternative dispute resolution costs, and indirect costs including ruining business relationships, company resources that are assigned to resolve the disputes and loss of opportunities. Experts estimated the litigation costs in the United States to mount to $5 billion annually (Pétursson, 2015). ARCADIS (2016) considers the disputes in the construction industry costly and time-consuming; contractors consider disputes tedious, costly, and causal of losing new projects opportunities and realizing profits; and the average values of disputes and their durations are increasing as shown in Table 1. The construction industries in the Middle East, including Saudi Arabia, does not vary very much in the size and duration of disputes from the global trend.

The construction industry in Saudi Arabia is probably the largest among those in the Middle East. The Saudi construction industry has markedly evolved and reached the level where it contributes to a total gross outcome around 6.35 percent during the period (2011-2015) and expected to rise to 7.05 percentage in 2020, jumping from a value of US$105.6 billion in 2015 to US$148.5 billion in 2020 (PRNewswire, 2016). The construction industry in Saudi Arabia recruits around four million personnel from all specialty spectrums, interacting together in different projects to introduce project deliverables, which make the industry full of variables to be controlled properly toward the final products (Domínguez and Alfonso, 2007).

A considerable amount of knowledge has been accumulated on dispute causation but, unfortunately, disputes continue to prevail and disturb construction processes with substantial costs. Besides, few researchers have addressed disputes in Saudi Arabia and only from the perspective of the contractors. This study is an attempt to present a comprehensive investigation of disputes in the Construction Industry in the Kingdom of Saudi Arabia and from the perspectives of the owners and the contractors. It is expected that identification of the causes of disputes from the point views of owners and contractors will, hopefully, enable their prevention. The following research questions were raised:

What is the frequency of disputes in the Saudi construction industry? What are the causes of disputes? What are the reactions of the contractors and owners to disputes?

Construction disputes occur in every construction industry in the world and, hence, are considered universal issues. Therefore, studying disputes issues in any construction industry is believed to contribute positively to the book of knowledge and the mitigation or elimination of their adverse effects globally. This study attempts to answer the above questions through a dedicated investigation of the Saudi construction industry which is accessible to the researchers with a hope that owners and contractors in other world construction industries benefit from this study research outcomes.

The objectives of this study are to determine the extent of disputes in the construction industry in Saudi Arabia; to reveal the causes of such disputes; to determine the sources of these disputes, and to investigate the owners' and contractors' reactions to disputes.

2. Literature Review

There has been considerable research undertaken to understand the underlying causes of disputes in the construction industry. It is evident from the size of literature in disputes that there is enormous interest in construction disputes but, unfortunately, it tends to focus on dispute resolution techniques rather than how to avoid them. Furthermore, most of the undertaken studies have been either based upon a questionnaire survey, law cases, or analysis of causes of disputed reported in the literature. Although researches have concentrated on various causes of disputes, there is a certain level of commonality in the causes of disputes and mostly related to project documents (designated as unclear, not mentioned, incomplete, contradicting), owner related (variations, delay in response and progress payments) and contractor related (poor project management, poor performance). Global Construction Disputes Report that was prepared by ARCADIS (2016) indicates that for the sixth year in a row, the failure in administering the contract is the main construction dispute factor between the construction parties including the contractor and the owner. Acharya et al. (2006) reported that 'change of site condition', 'people interruptions', 'change order evaluation', and 'defective design' were major factors responsible for dispute occurrence and that the owner is the most dispute creating party among the several other factors and then comes consultant. Chan and Suen (2005) related construction disputes to contractual problems, cultural problems, and legal matters. Cakmak and Cakmak (2014) identified that contract-related factors play a key role in disputes occurrence. Mitkus and Mitkus (2014) indicated that the major reasons for conflicts and disputes in construction projects are the ineffectual transfer

of view or thoughts between parties and poor attitude of the construction participants and psychological defense mechanisms. Jaffar et al. (2011) reported that "behavioural problems", "contractual problems" and "technical problems" are the main reasons which tend to disputes occurrence. Soni et al. (2017) reported that most disputes are related to owners, contractors, consultants, third party and human behavior, and designs and contracts. Dangochiya et al. identified scope changes, poor contract documentation, restricted access, unforeseen ground conditions, and contractual ambiguities as attributes to disputes in the Indian construction industry. Waldron (2006) identified variations to scope, contract interpretation, site conditions, late information, site access, design quality, etc. as attributes to disputes in the Australian construction industry. Kumaraswamy (1997) identified five common categories of disputes (variations due to site conditions, client changes, design errors, unforeseen ground conditions, and ambiguities in contract documents) and five common causes of disputes (inaccurate design information, inadequate design information, slow client response to decisions, poor communication, and unrealistic time targets). Mishmish and El-Sayegh (2018) found that the most frequent causes of disputes in road construction projects in the United Arab Emirates (UAE) are variations, delays caused by contractors, and measurement-related issues. Yildizel et al. (2016) indicated that poor quality of performed works, delays in progress payments, inefficient site management, poorly written contracts, and design mistakes are the major causes of disputes in the Turkish construction industry. Cakmak and Cakmak (2014) revealed through literature review and analytical network process (ANP) that contractor related disputes and their sub-dispute categories are the most common ones in the construction industry. Barman and Charoenngam (2017) studied law cases thoroughly and found that delay, defect, payment, termination, negligence, and performance were the causes of disputes in the UK. Furthermore, they attributed disputes to decision uncertainty. Assaf et al. (2019) reported that change orders, variations in quantities, delays caused by contractor, design errors or omissions, and inconsistencies in the drawings and specifications are the most significant contributors to disputes in Saudi Arabia. Mahamid (2016) identified many causes which he classifies into micro and macro, disputes in residential buildings in Saudi Arabia. The top micro causes of disputes are delays in the progress of payments, change orders, unrealistic duration of construction projects, labor inefficiency, and poor quality of completed construction work and the top macro disputes are mistakes in design, qualifications of subcontractors, inspection delays, and violation of contract conditions. Shash and Habash, (2020) found that contract conversions were practiced in reality resulting in achieving project objectives under a more harmonious work environment and with almost no disputes. Therefore, it was concluded that contract conversion is a great means for eliminating disputes.

The analysis of the documented causes of disputes shows common underlying factors. However, most of the studies focus on identifying factors mostly from the perspective of contractors and neglect how contractors solve disputes.

This study attempts to close the gap in the dispute subject by providing a comprehensive investigation on the causes and remedies of disputes from the perspectives of owners (government and private) and contractors (different sizes).

3. Research Methodology

This study is part of large research work that was conducted to study disputes in the Saudi construction industry and the construction contract conversion concept. The objectives of the study mandated an intensive review of relevant literature and the collection of data related to disputes and contract conversion from contractors and owners. The required data were collected during the fourth quarter of 2017 from 130 contractors and 54 owners through a structured questionnaire consists of questions seeking information about the respondent; the organization; frequency and sources, of disputes; and reaction and remedies to disputes. The questionnaire was sent to the entire contractor and owner populations (175 contractors and 79 owners). The information providers are construction and project managers, architects, cost engineers, general managers, and directors with college degrees and extensive experience in the construction industry earned from the participation in the construction of many projects. It is evident that the information providers are well informed in the construction environment. Therefore, obtaining the required data from such calibre sources increases the reliability and validity of the results of the study. This paper presents the findings on the disputes only. The contract conversion concept, as part of the larger study, was investigated to determine its applicability as a means for resolving disputes. The study of contract conversion was published earlier with a detailed description of the research methodology and the characteristics of the participants. This paper shares the research methodology and the sources of the collected data with the paper on contract conversion. Therefore, interested researchers in more details of the research method and the characteristics of the participants are referred to Shash and Habash (2020) published paper.

4. Results Analysis and Discussions

The extent of disputes, the causes of disputes, the root causes of disputes, and reactions of contractors and owners to disputes are presented in the following sections.

4.1. Extent of Disputes

The results indicated that, in general, contractors and owners encounter disputes very frequently as shown in Table 2. The majority (60%) of the contractors, regardless of their grades, and the majority (60%) of the private owners experience two disputes every month. However, the majority (55.89%) of the government owners encounter one dispute every month. It seems that because a government owner awards, as per government policy, a contract to a single general contractor and, therefore, has fewer participants in developing the project and, hence, fewer disputes than the other participants do. Contractors contract also with subcontractors, which exposes them to more conflict and disputes. Private owners may break projects into packages and award each package to a prime contractor, which exposes the private owners to more conflicts and disputes. The results indicated that a good number of Grade 2 contractors encounter 3 and more disputes every month. This means that the causes of disputes in the construction environment of Grade 2 contractors are significantly operative. This alarming frequency could be attributed to poor project documents and poor project management practices.

Table 2. The dispute occurrence frequency

Frequency of dispute occurrence	Contractors						Owners					
	Grade 1		Grade 2		All		Government		Private		All	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
One time a month	12	19.35	5	7.35	17	13.08	19	55.89	3	15.00	22	40.75
Two times a month	41	66.13	37	54.41	78	60.00	12	35.29	12	60.00	24	44.44
Three times and more a month	9	14.52	26	38.24	35	26.92	3	8.82	5	25.00	8	14.81
Total	62	100	68	100	130	100	34	100	20	100	54	100

Notes: Freq.: Frequency; %: Percent

The dispute frequency in the Saudi construction industry is considered higher than the other similar industries in other countries. The national construction contracts and law survey concluded that the dispute frequency occurrence during the last year was at least once a month in 30% of the respondents. With this significant and frequent dispute frequency, it could be easily said that most of the efforts are expended on resolving such disputes rather than directing such efforts toward project objectives and preventing disputes in the first place.

4.2. Causes of Disputes

The quantitative data collected from the questionnaire were analysed first with Cronbach's coefficient alpha to measure the reliability of the potential causes of disputes between contractors and the owners (common construction contractual disputes scale). Cronbach's alpha is a measure of internal consistency, that is, how strictly a set of things are related as a cluster. A high value of Cronbach's coefficient alpha (close to +1.0) reflects a high degree of internal consistency (Wikipedia, 2018). Cronbach's alpha coefficient was calculated for the 28 causes of disputes. The calculated coefficient is (0.883), which is considered high and very close to the perfect value of unity (+1.0). Thus, the scale is highly reliable (Cheung et al, 2002).

The quantitative data, then, were analysed with the Kolmogorov-Smirnov test to assess whether the potential causes of disputes follow the normal distribution. The variable is said to follow the normal distribution and is statistically significant when the P-value is less than 0.05 ($P<0.05$). The results indicated that all causes of disputes passed the test. Hence, it was decided to use Kruskal-Wallis test (non-parametric test) instead of one way- ANOVA to compare four types of contractors or independent groups (Grade 1/ Grade 2/ National / International) and two types of independent groups of owners (private and government) to identify which factors had the greatest frequency in causing disputes in Saudi Arabia construction industry. The following hypotheses were tested for all the causes of disputes in the six categories:

H_o: μ is ≤ 3

H_1: μ is > 3

The number 3 was chosen because it was the mean score in the 5-point Likert Scale and represented "Somewhat high frequency". Therefore, if a cause of a dispute had a significance level (P-value) of less than 0.05 and a positive Z-value, the null hypothesis (H_o) was rejected and the alternative hypothesis (H_1) was accepted. This means simply indicated that the frequency was at least ranging between somewhat high and very high. Conversely, the result did not meet the aforementioned criteria, the null hypothesis was accepted and the factor frequency was concluded to be low or very low.

The results indicated that all the factors cause disputes but with different frequencies of occurrence. These factors are grouped into five categories (project documents (D), contractors (C), owners (O), contractors and owners (CO), and others (X)) and discussed in the following sections. Appendix A presents the calculated means of frequency rating (MFR), standard deviation, and the Kruskal-Wallis test output for each dispute cause according to contractor and owner organization types. Based on the results from the Kruskal-Wallis test, of the thirty disputes causes investigated, contractors perceived 12 factors as significant (i.e. a positive z-value and a p-value less than .05): D1, D3, D4, D5, D10, C4, D11, O1, O3, O5, O6, and O8 in causing high dispute frequency. Similarly, owners perceived 10 factors as significant (i.e. a positive z-value and a p-value less than .05): D1, D3, D9, D11, C4, O1, O2, O3, O4, and O5 in causing high dispute frequency. The owners and contractors coincide in 7 significant causes of high-frequency disputes including D1, D3, D11, C4, O1, O3, and O5. The remaining factors did not pass the hypothesis testing and were perceived as less frequent or not significant.

The following paragraphs focus on the causes of disputes that had significant statistical results.

4.2.1. Project documents

The results indicated that owners and contractors considered 4 and 6 significant causes of high-frequency disputes related to project documents, respectively, of which 3 are commonly considered significant included D1, D3, and D11. Either the contractors or the owners considered the other four variables significant in causing high frequent disputes.

Weakness in contract language and instruments (D1)

In general, contractors and the owners perceived the weakness in contract language and instruments as significant (Contractor MFR = 3.29 and Owner MFR = 4.2) to frequently cause disputes. It seems that contractors and owners encounter significant frequency of disputes due to weakness in contract language and instruments, which could be attributed to negligence, exclusion of essential or necessary elements, abusive wording, and inaccurate choice of wording. The concurrence of all the participating parties emphasizes the significance of this factor in causing disputes. Grade 2 contractors and private owners perceived

the weakness in contract language and instruments as not significant despite the values of the calculated MFRs (Grade 2 Contractors MFR = 3.29) and (Private Owners MFR = 3.43) to frequently cause disputes. It seems that Grade 2 contractors and Private owners encounter frequent disputes due to weakness in contract language and instruments but less than Grade 1 contractors and government owners, respectively.

Inaccurate specification of items (D3)

The contractors and owners perceived the inaccurate specifications of items as significant (Contractor MFR = 3.7, Private Owner MFR = 4.04, Government MFR = 4.2) to high frequently cause disputes. The Specification is the reference for the project's quality. Material and equipment in the construction are major components in construction, therefore any ambiguous specification of material quality and description will be reflected in the total cost of the project, despite the contractor's qualification or capabilities. An item specification presents a general description, performance, and function of the item sub-clauses. It seems that specifications writers use the cut-and-paste technique in preparing projects specification to reduce inconsistency of item specifications in the project by frequently recycle from one project to another without any consideration to the uniqueness of the project systems and the integration between them. Furthermore, it seems that owners add wording such as "contractor is the sole responsible for the means and methods of the construction" to specifications which add ambiguity to the specifications and, hence, cause high frequent disputes. Such statements are very wide and ambiguous leading to disputes between owners and contractors. It is widely known in the industry that the project requirements are the responsibility of the contractor, dictated by the owner, and if any problem occurs related to specifications then it would be argued to be taken care of by the owner in terms of cost and time (Wirsching, 1992)

Inaccurate specification may lead to unsatisfactory products, difficulties in constructing products according to specified methods, inaccurate terminology and referencing, and referring to items that are not included in contracts.

Ambiguities in the contract documents (D4)

The contractors, regardless of their grades and nationalities, perceived ambiguities in the contract documents as significant (MFR = 3.7) in causing high frequent disputes. Conversely, owners consider the above factor as not significant (Private owner MFR = 3.29 and Government owners MFR = 2.12). Contract documents collectively form the reference to parties' responsibilities, desired project quality, time, cost, and setpoint for any tangible or intangible component of the project. Accordingly, any miss-interpretation in these documents is a genuine reason for a dispute. It affects directly the aforementioned factor in the project cycle.

Contradictions between the project documents (D5)

The contractors regardless of their grades and nationalities perceived the contradiction between the project documents as significant (MFR = 4.09) in causing high-frequency disputes. It seems that contractors, whenever there is a contradiction between project documents, tend to select the easiest and the cheapest option, which may go against the designer perceptions of the project, and the owner desire and vision for the project, creating a source of dispute between the contract parties to go for which reference. Based on the results, the owners regardless of their class considered this factor as not significant in causing high frequent disputes in the industry.

Lack of setting a reference for the disputes between the owner and the contractor (D9)

The government owners are the only group that indicated that lack of setting a reference for the disputes between the owner and the contractor is significant (MFR = 1.84) in causing a high frequency of disputes. It seems that government owners' contracts do not describe dispute resolution clearly. The private owners perceived this variable as not significant despite its calculated MFR (3.09) exceeding the cut-off point (3). It could be that private owners encounter high disputes due to this factor more than government owners do.

Un-realistic schedule of the project (D10)

The contractors and the private owners indicated that the un-realistic schedule of the project is significant (Contractor's MFR = 3.76 and Private Owner's MFR = 4.0) in causing the high frequency of disputes. The government owner, on the other hand, perceived this cause is not significant (Government Owner's MFR = 1.84) in causing the high frequency of disputes. Government owners impose a penalty clause for delays up to 10% of the contract price. It seems that contractors eliminate this risk by including equal amounts in the contract prices and, hence, no disputes occur for delays. It seems that private owners force contractors to squeeze and crash schedules to un-achievable duration. Consequences of the un-achievable schedule of the project affect both contracting parties; the owner by cutting corners and lowering the quality of the project, and the contractor over-run the cost because of the re-work and spending more cost to crash the critical and non-critical tasks.

Inaccurate BOQ in Unit-Price contracts (D11)

The contractors and the owners indicated that inaccurate BOQ in the Unit-price contracts is significant (Contractor's MFR = 3.86 and Private Owner's MFR = 4.09 Government Owner's MFR = 4.44) in causing the high frequency of disputes. It is clear that estimated quantities in BOQ are inaccurate causing disputes whenever actual quantities are excessively more or less than the allowed ranges especially if contract terms do not address such situations. When actual quantities are more than the estimated owners may request contractors to reduce unit prices. Conversely, when actual quantities are less than the estimated quantities contractors demand higher unit prices. In both situations, the disputes are related to the redistribution of the indirect costs. It seems that government owners suffer greatly from such inaccuracies as shown in its MFR. The government restricts projects' budgets to plus or minus 10% of the contracts' prices. When project prices exceed the allowable budget variance government owners either request supplement to budgets which takes a long time to be approved or reduce the project scopes. In both situations, disputes occur.

Its evidence from the empirical data that contracts include various terms, which use ambiguous terms and double meaning terms leading to the occurrence of conflicts and disputes in the construction industry. It is evidence also that designs, drawings, and specifications contain errors causing delays in projects, which lead to conflicts and disputes. Lack of knowledge of consultants and wrong

estimates of work quantities in BOQ are the causes of such faults.

4.2.2. Contractors

Based on the empirical results, the owners and contractors considered Low quality in administration processes as the only significant causes of high-frequency disputes related to contractors. They considered the other contractors' related factors including "sizable subcontracting and outsourcing" (Contractor MFR = 2.83, Private owner MFR = 3.37 and government owner MFR = 2.13); "unskilled workers" (Contractor MFR = 2.75, Private owner MFR = 3.50 and government owner MFR = 2.56); "lack of quality" (Contractor MFR = 2.66, Private owner MFR = 3.32 and government owner MFR = 2.17); and "errors in developing bidding documents such bid price" (Contractor MFR = 2.63, Private owner MFR = 2.87 and government owner MFR = 3.92) as not significant in causing high frequency of disputes in the construction industry.

Low quality in administration processes (C5)

All the contractors, regardless of their grades and nationalities, and owners indicated that low quality in administration process as significant (Contractor MFR = 3.29 and Government owners MFR=3.89) in causing the high frequency of disputes. It seems that contractors have major difficulties in recruiting qualified project managers and, lately, in losing many qualified engineers and personnel who had left Saudi Arabia after imposing new labor and tax policies. The annual ARCADIS Global Construction Disputes Survey (ARCADIS, 2016) found that contract administration was the main cause of disputes on construction projects for 6 years in a raw.

Indeed, a contractor plays a huge role in the success or the failure of any construction project. If the management and administrative process of the contractor is effective and sound then, there will be a minimal chance of disputes and conflicts in construction projects. However, the results indicated contractors have weak processes in administrating construction projects leading to conflicts and disputes. This conforms with what has been highlighted by many prestigious research organizations and management consultations like ARCADIS (2016) on contractors' weaknesses in contract administration causing conflicts and disputes.

4.2.3. Owners

The results indicated that owners and contractors considered 4 and 6 significant causes of high-frequency disputes related to project documents, respectively, of which 3 are commonly considered significant including O1, O3, and O5. Either contractors or owners consider the other two variables significant in causing high frequent disputes.

Change in the item description and quantities in the BOQ (O1)

The contractors, regardless of their grades and nationality, and the government owners considered changing the items description and quantities in the BOQ as significant (Contractor MFR = 3.60, and government owner MFR = 4.40), cause of high disputes frequency. The private owners perceived this factor as a not significant cause of high disputes frequency despite its calculated MFR (3.69). Government owners seem to award projects to contractors based on project documents that were prepared years back. Government owners sometimes wait for a long period after preparing project documents until project budgets are approved by designated authorities. During these waiting periods, the original items may have become obsolete and/or new materials with better functionality become available causing owners to change the descriptions and quantities the items during construction.

Changing the project specifications after materials approval (O2)

Grade 2 and international contractors and government owners considered changing the project specification after materials approval as significant (Grade 2 contractors MFR = 3.19, international contractors MFR = 3.18, and government owner MFR = 4.24) in causing high dispute frequency. The national and private owners perceived this factor as not significant in causing high dispute frequency despite their calculated MFRs (National contractors MFR = 3.12 and private owner MFR = 3.36). It seems that government owners change specifications after materials approved in projects which are built by Grade 2 and international contractors.

Sizable variation orders that exceed the maximum allowed percentage in the standard contract (O3)

The contractors, regardless of their grades and nationalities, and government owners considered sizable variation orders that exceed the maximum allowed percentages in the standard contract as significant (Contractor MFR = 3.27, and government owner MFR = 4.25) in causing high dispute frequency. The private owners are the only group that perceived this factor as not significant in causing high dispute frequency despite their high MFR (Private owners MFR = 3.58).

Legally, the variation order is the agreement to alter the scope of a contract within the contract frame and boundary, but in construction, it might be defined as the alteration of the scope of work in the form of addition, omission or substitution from the original scope of work. Variation may include alteration of design, quantities, quality, working conditions, the sequence of work, and alteration of the project schedule by the owner. One of the common main factors of disputes among Grades 1 and 2 contractors is this factor. Variation provision in contracts is usually provided in articles, with citations for the price referencing of any additional items. Dispute happens between the contractor and the owner when the variations in one project occur more frequently, and the evaluation of these variations exceeds the usual agreed-upon percentages form the total project value. Unsuitable quality of design, with missing of recorded information, delays the project and lead to sizable variations ending up with tedious work progress to all the stakeholders.

Delays in handing over the project site (O4)

The government owners are the only participants which perceived delays in handing over the project site as significant (MFR = 4.08) in causing a high frequency of disputes. It seems, due to bureaucracy in government processes, government owners experience great delays in handing over projects sites to contractors causing frequent disputes. A contractor after signing a contract assigns resources to the project and any delay to start the construction activities costs him considerable money which the owner does not conceive leading to frequent disputes.

Owner Interference in the contract execution (O5)

The contractors, regardless of their grades and nationality, and the government owners perceived owners' interferences in the contract execution in extreme situations as significant (Contractor MFR = 3.39 and government owner MFR = 4.32) in causing high dispute frequency. Owners have three main obligations toward the construction of projects. The first is a moral obligation by keeping a safe, friendly work construction environment with all the interaction between all the departments and contractors. The second is a legal obligation toward the governmental authorities to assist in keeping the contractor's rights, securing the required licenses, and proactively alert the unforeseen hazards. The third is potential saving by seizing any opportunity to save on the contractor and the owner any extra costs and adopt an alternative saving method of construction.

In interfering in a contract there are ups and downs, limited to the nature of interfering whether it is positive and pushes the project toward the completion within the scope and budget of the project, or negative and only picks the observation and highlights the flaws of the contractor. Again, one of the common dispute factors among the first and second-Grade contractors is when the owner interfering in the project. Owner participation in the project is not always un-preferred; on the contrary, it might be beneficial and needed. What makes the difference is the behaviour of the owner. First and second-Grade contractors observed that the owner's participation in project execution is usually in a bad manner, which negatively affects the project.

Delay of response to the requested decisions by the owner (O6)

All the contractors, regardless of their grades and nationalities, indicated that owners' delays in response requested actions as significant (Contractor MFR = 3.38) in causing a high frequency of disputes. The owners considered this factor as not significant (Private MFR =3.34 and government owner MFR = 2.44) in causing high dispute frequency. Project owners are responsible for securing required licenses, providing necessary information, making decisions, and clarifying the disputed scope of the project to the contractor directly or through his agents. Construction of a project is dynamic, continuously moving forward, and to manage such a project it is a must to work in an organized timely manner. Delays in responses and decisions that are needed from the owner do not support the dynamic nature of such processes and cause disputes. Indeed, contractors consider delays as the main factor for causing disputes.

The long period of project hold (O8)

The government owners are the only group that perceived these delays in the long period of project holding as significant (MIR = 4.08) in causing a high frequency of disputes. It seems that government owners when hold projects they take a long period due to bureaucracy to restart projects.

It is evident that owners have unrealistic expectations, unjustified interferences in construction processes, and delays in responding to information, approvals, and payments, which are considered the basic factors responsible for disputes occurrences in any construction project. Several researchers concluded that delay of payments is one of the foremost causes of conflicts and disputes.

4.2.4. Contractors and owners

The participants considered all causes in this category (CO1, CO2, CO3, CO4, and CO5) are not significant to cause frequently high disputes. These results indicate that contractors and owners are fully aware of the governing government, commercial, and project regulations and, hence, causing no disputes between the parties.

4.2.5. Other factors

The participants perceived the causes in this category (X1 and X2) are not significant in causing high disputes frequency.

4.3. Root Causes of Disputes

The participants were requested to indicate the root causes of disputes. The participants cited finance, contract, management, and construction as the root causes of disputes. The majority of contractors (71.54%) especially Grade 2 and the majority of owners (48.14%) reported that disputes are mostly related to combined root causes rather than a single root. Moreover, based on the analysis, contractors and owners equally considered "financial and contract" and "management and contract" as the major root causes of disputes. Furthermore, a good portion (19.35%) of Grade 1 contractors related disputes to contracts as a single source. The participants emphasized the contract as a major source for disputes concur with their assessments on the significance of the items in the project documents in causing high disputes frequency. This assessment coincides with their assertion on the quality of the project documents, which are considered as a high frequent cause of disputes. The contractors ranked the financial issues of a dispute as to the second single main source of disputes between owners and contractors because the management of a contract includes the management of finance. This nature of the dispute has a great impact on another construction triangle (workforce, material, and engineering). The above-mentioned findings support ARCADIS's (2016) ranking of finance as the second root cause of disputes in the construction industry.

4.4. Participants' Reactions to Disputes

Based on the results, participating contractors and owners react differently when a dispute occurs. The results indicated that the majority (68.46%) of contractors deal with disputes with several combined approaches. On the other hand, the majority (75.93%) of owners react to disputes with a single and different approach. The majority (55.88%) of government owners mitigate disputes and, conversely, the majority (55%) of the private owners hold the disputed scope and continue with the rest of the project. Owners may choose to mitigate disputes or to hold disputed scopes for simplicity, quickness, and prevention of their entities' confidentialities from exposure to a third party. Furthermore, the results indicated that about 25% of the contractors mitigate disputes as a single strategy to solve disputes. In a mitigation process, the disputing parties go into multiple rounds of negotiation to narrow their expectations and reach a meeting of minds. Interestingly, two contractors indicated that they disregard disputing issues and sacrifice benefits to keep projects active. It seems that some contractors use the last two single approaches in resolving disputes to maintain a good relationship with owners, especially repetitive builders, by keeping signs of progress of projects, eliminate disputes associated costs,

and prevent the exposure of their internal information to a third party.

The contractors react with a combined approach probably for securing a negotiation position in disputes. The results indicated that only five owners use combined approaches toward disputes including "mitigating disputes and holding disputed work area" and "mitigating disputes and sacrificing benefits".

The results indicated that the majority (42.67) of the contractors usually react to disputes by mitigating disputes and holding only the disputed work area only. Mitigation is the simplest and easiest solution to disputes, which maintains good relationships with the owner and does not reveal the commercial secrets of the two disputed parties. Holding the disputed work area does not affect the entire project progress severely and does not hurt the losing party of the dispute.

The second top reaction by the contractors is mitigating the dispute and sacrificing the benefits to continue the project. This combined reaction is responded by 14.61% from contractors. This reaction keeps the dispute internal and initiates the compromising process to proceed with good intention.

Holding the disputed scope and referral to the legal department is the last combined reaction taken by the contractors to overcome the dispute. Such a reaction does not give a chance for the mitigation or mediation, and faster solution, but it goes directly to legal judgment, which loses the relationship with the owner, and smudges the contractor and the owner's reputation.

The results indicated that the participants follow certain practices in solving disputes. The participants agreed on several practices toward disputes as follows:

Re-negotiate the terms of the disputed work (Mean: 4.16, Standard Deviation: 1.09)

Change the contract terms (Mean: 3.82, Standard Deviation: 1.18)

Hold the work in the disputed scope (Mean: 3.48, Standard Deviation 1.06)

De-scope the disputed work (Mean: 3.39, Standard Deviation: ±1.15)

Consult with an arbitrator (Mean: 3.16, Standard Deviation: ±1.23)

Sacrifice the benefit of the disputed work to complete the work (Mean: 3.00, Standard Deviation: ±1.13)

The participants reported their disagreements to the following practices:

Changing the contract with the manpower supplier to overcome the limited cost of skilled manpower (Mean: 2.56, Standard Deviation: ±1.15)

Pursue a case in the court (Mean: 2.45, Standard Deviation: ±1.31)

Hold the work in the whole project (Mean: 2.04, Standard Deviation: ±1.19)

It is evident that parties to a contract follow certain practices in their efforts to solve a dispute. They negotiate the terms of the disputed work and, if necessary, change the contract terms, hold the work of the disputed area, or de-scope the disputed work. In case they do not reach an agreement, they either consult with an arbitrator or sacrifice their benefits and move forward with the project. The parties do not prefer to resort to courts and to hold the entire project as a solution to disputes. The reactions of the contractors and owners to disputes confirm with the five disputes resolutions which Rauzana (2016) defined for resolving disputes. These techniques are Avoid, Accommodate, Compromise, Direct, and Collaborate.

5. Conclusion

Disputes in the Saudi construction industry originate more or less from sources that are similar to what other researchers have identified in other construction industries. The disputes in Saudi Arabia are inevitable with a frequency of occurrence exceeds two disputes per month. Project documents, owners, and contractors to some extent are the sources for such disputes. Project documents are poorly prepared with inaccurate specifications, ambiguity in contract wording, contradictions between project documents, unrealistic project duration, inaccurate BOQ, and weakness in contract language. Owners cause great disputes through sizable variation orders exceeding allowable limits, changing item descriptions and quantities in BOQ, interfering in the execution of the contract, and delaying responses to requested information/approvals. Contractors cause disputes through poor contract administration. The above disputes are generally financial and contract related. Contractors and owners react to disputes differently. Contractors follow a combined strategy (mitigating disputes and holding only the disputed work area only) and owners either mitigate disputes or hold disputed scopes. Government owners mostly mitigating disputes and, conversely, private owners hold the disputed scope and continue with the rest of the project. There is a lack of understanding of the basic types of construction contracts, and the selection of each type according to the type of project.

Owners and contractors follow certain practices in solving disputes where they go through a systematic procedure that starts with renegotiating the terms of the disputed work, changing the contract terms, holding the work in the disputed scope, de-scoping the disputed work, and consulting with an arbitrator.

Although this study is limited to the Central Province in Saudi Arabia, the findings could be generalized to other provinces in Saudi Arabia as they operate under the same regulations and environment. Also, the findings could be generalized to the other construction industries in the world as disputes are common in construction projects.

The most effective approach to eliminate or at least reducing disputes is to eradicate their causes. Owners are strongly advised to select qualified consulting offices based on a robust qualification based system (QBS) to prepare project documents and to procure the services of a Construction manager agency to supplement their teams to monitor and control the quality and completeness of such documents. Owners are also advised to limit their interference in contractors' work and to expedite the processes in responding to inquiries, approvals, and progress payments.

Contractors are recommended to improve their management teams either by hiring qualified personnel and providing training.

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Appendix A. Causes of dispute

Category	Description	All Contractors				Grade 1 Contractors				Grade 2 Contractors			
		Level of Severity	Standard deviation	P value (Z test)	Significant?	Level of Severity	Standard deviation	P value (Z test)	Significant?	Level of Severity	Standard deviation	P value (Z test)	Significant?
Project Documents	D1. Weakness in contract language and instrument	3.29	1.02	0.00	Yes	3.66	1.10	0.00	Yes	3.29	1.02	0.75	No
	D2. Imposing un-fair contract conditions on other contract party by the high-power authority's (like the public work)	2.55	1.00	1.0	No	2.36	1.07	1.00	No	2.55	1.00	1.00	No
	D3. Inaccurate specification of items	3.70	1.23	0.00	Yes	3.74	1.20	0.00	Yes	3.70	1.24	0.00	Yes
	D4. Ambiguities in the contract documents	3.88	1.24	0.00	Yes	3.90	1.12	0.00	Yes	3.88	1.24	0.00	Yes
	D5. Contradiction between the project documents.	4.09	1.20	0.00	Yes	3.99	1.19	0.00	Yes	4.09	1.20	0.00	Yes
	D6. Mixing the lump-sum item and the unit-price items in the same contract	2.31	0.94	1.00	No	2.27	1.01	1.00	No	2.31	0.94	1.00	No
	D7. Ambiguity in the project boundaries	2.73	0.95	1.00	No	2.77	1.00	1.00	No	2.73	0.95	1.00	No
	D8. Ambiguity in project responsibilities between the contractor and the owner	2.59	0.96	1.00	No	2.52	1.00	0.93	No	2.59	0.96	1.00	No
	D9. Lack of Setting a reference for the disputes between the owner and the contractor	2.57	0.88	1.00	No	2.53	0.96	1.00	No	2.57	0.88	1.00	No
	D10. Un-realistic time schedule of the project	3.76	1.17	0.00	Yes	3.82	1.11	0.00	Yes	3.76	1.17	0.00	Yes
	D11. Inaccurate BOQ in the lump-sum contract	3.86	1.12	0.00	Yes	3.90	0.08	0.00	Yes	3.86	1.12	0.00	Yes
Contractor	C1. Sizable sub-contractors and out-sourcing	2.83	1.03	0.99	No	2.88	1.10	0.90	No	2.83	1.03	0.99	No
	C2. Un-skilled contractor workers	2.75	1.07	1.00	No	2.88	1.14	0.89	No	2.75	1.07	1.00	No
	C3. Lack of quality	2.66	1.00	1.00	No	2.62	1.68	0.97	No	2.66	1.00	1.00	No
	C4. Low quality in administration processes	3.29	1.09	0.00	Yes	3.36	1.07	0.00	Yes	3.29	1.09	0.00	Yes
	C5. Error in developing the bidding such as estimation	2.63	0.94	1.00	No	2.63	0.93	1.00	No	2.63	0.94	1.00	No

Appendix A. Causes of dispute (continued)

Category	Description	All Contractors				Grade 1 Contractors				Grade 2 Contractors			
		Level of Severity	Standard deviation	P value (Z test)	Significant?	Level of Severity	Standard deviation	P value (Z test)	Significant?	Level of Severity	Standard deviation	P value (Z test)	Significant?
Owner	O1. Change in the item description and quantities in the BOQ	3.60	1.25	0.00	Yes	3.49	1.08	0.00	Yes	3.60	1.25	0.00	Yes
	O2. Changing the project specification after the material approval	3.12	1.042	0.06	No	3.19	1.08	0.02	Yes	3.12	1.04	0.06	No
	O3. Sizable variation orders that exceeds the maximum allowable percentage	3.27	1.03	0.00	Yes	3.62	1.08	0.00	Yes	3.27	1.03	0.00	Yes
	O4. Delays in handing over the site to the contractor	2.66	0.87	1.00	No	2.63	0.96	1.00	No	2.66	0.87	1.00	No
	O5. Interfering in the contract execution of the contract by the Owner in severe affecting way	3.39	1.20	0.00	Yes	3.98	1.22	0.00	Yes	3.39	1.20	0.00	Yes
	O6. Delay of response to the requested decisions by the Owner	3.38	1.09	0.00	Yes	3.84	1.07	0.00	Yes	3.38	1.09	0.00	Yes
	O7. Long period of project hold	2.43	1.05	1.00	No	2.24	1.12	0.48	No	2.434	1.05	1.00	No
Contractors & Owners	CO1. Un-awareness of the governing rules in the appendixes	2.42	0.90	1.00	No	2.52	0.98	1.00	No	2.42	0.90	1.00	No
	CO2. Un-awareness of the governing rules that regulate the work in the country	2.41	0.92	1.00	No	2.43	0.98	0.67	No	2.41	0.92	1.00	No
	CO3. Un-awareness of the governing of the commercial regulations	2.59	0.99	1.00	No	2.78	1.05	0.46	No	2.59	0.99	1.00	No
	CO4. Un-awareness of the project milestones	2.68	0.93	1.00	No	2.72	0.98	0.98	No	2.68	0.93	1.00	No
	CO5. Un-awareness of the stated construction method	2.84	0.95	0.99	No	2.78	1.01	0.60	No	2.84	0.95	0.99	No
Others	X1. Shortage of skilled workers in the labor market	2.78	1.06	1.00	No	2.87	1.14	0.91	No	2.78	1.06	1.00	No
	X2. Fault negotiation procedure between the parties	2.36	0.83	1.00	No	2.19	0.87	1.00	No	2.36	0.83	1.00	No

Appendix A. Causes of dispute (continued)

Category	Description	International				National			
		Level of Severity	Standard deviation	P value (Z test)	Significant?	Level of Severity	Standard deviation	P value (Z test)	Significant?
Project Documents	D1. Weakness in contract language and instrument	3.38	1.10	0.00	Yes	3.28	1.01	0.00	Yes
	D2. Imposing un-fair contract conditions on other contract party by the high power authority's (like the public work)	2.65	1.07	1.00	No	2.55	1.00	1.00	No
	D3. Inaccurate specification of items	3.73	1.22	0.00	Yes	3.70	1.23	0.00	Yes
	D4. Ambiguities in the contract documents	3.87	1.22	0.00	Yes	3.88	1.24	0	Yes
	D5. Contradiction between the project documents.	3.97	1.20	0.00	Yes	4.09	1.20	0	Yes
	D6. Mixing the lump-sum item and the unit-price items in the same contract	2.26	1.01	1.00	No	2.31	0.94	1	No
	D7. Ambiguity in the project boundaries	2.66	1.01	1.00	No	2.73	0.95	1.00	No
	D8. Ambiguity in project responsibilities between the contractor and the owner	2.53	1.02	1.00	No	2.59	0.96	1.00	No
	D9. Lack of Setting a reference for the disputes between the owner and the contractor	2.52	0.97	1.00	No	2.57	0.88	1.00	No
	D10. Un-realistic time schedule of the project	3.79	1.13	0.00	Yes	3.76	1.17	0.00	Yes
	D11. Inaccurate BOQ in the lump-sum contract	3.78	1.11	0.00	Yes	3.86	1.12	0.00	Yes
Contractor	C1. Sizable sub-contractors and out-sourcing	2.87	1.10	0.91	No	2.83	1.03	0.99	No
	C2. Un-skilled contractor workers	2.89	1.13	0.91	No	2.75	1.07	1.00	No
	C3. Lack of quality	2.82	1.06	0.98	No	2.66	1.00	1.00	No
	C4. Low quality in administration processes	3.35	1.07	0.00	Yes	3.29	1.09	0.00	Yes
	C5. Error in developing the bidding such as estimation	2.62	0.93	1.00	No	2.63	0.94	1.00	No

Appendix A. Causes of dispute (continued)

Category	Description	International				National			
		Level of Severity	Standard deviation	P value (Z test)	Significant?	Level of Severity	Standard deviation	P value (Z test)	Significant?
Owner	O1. Change in the item description and quantities in the BOQ	3.48	1.21	0.00	Yes	3.60	1.25	0.00	Yes
	O2. Changing the project specification after the material approval	3.18	1.10	0.03	Yes	3.12	1.04	0.06	No
	O3. Sizable variation orders that exceeds the maximum allowable percentage in the standard contract	3.4	1.09	0.00	Yes	3.27	1.03	0.00	Yes
	O4. Delays in handing over the site to the contractor	2.62	0.97	1.00	No	2.66	0.87	1.00	No
	O5. Interfering in the contract execution of the contract by the Owner in severe affecting way	3.38	1.23	0.00	Yes	3.39	1.20	0.00	Yes
	O6. Delay of response to the requested decisions by the Owner	3.32	1.07	0.00	Yes	3.38	1.09	0.00	Yes
	O7. Long period of project hold	2.48	1.12	1.00	No	2.43	1.05	1.00	No
Contractors & Owners	CO1. Un-awareness of the governing rules in the appendixes	2.50	0.94	1.00	No	2.42	0.90	1.00	No
	CO2. Un-awareness of the governing rules that regulate the work in the country	2.52	0.98	1.00	No	2.41	0.92	1.00	No
	CO3. Un-awareness of the governing of the commercial regulations	2.75	1.05	1.00	No	2.59	0.99	1.00	No
	CO4. Un-awareness of the project milestones	2.81	0.98	0.99	No	2.68	0.93	1.00	No
	CO5. Un-awareness of the stated construction method	2.96	1.01	0.67	No	2.84	0.96	0.99	No
Others	X1. Shortage of skilled workers in the labor market	2.86	1.133	0.92	No	2.78	1.06	1.00	No
	X2. Fault negotiation procedure between the parties	2.39	0.88	1.00	No	2.36	0.83	1.00	No

Appendix A. Causes of dispute (continued)

Category	Description	Private Owners				Government Owners			
		Level of Severity	Standard deviation	P value (Z test)	Significant?	Level of Severity	Standard deviation	P value (Z test)	Significant?
Project Documents	D1. Weakness in contract language and instrument	3.43	0.89	0.75	No	4.2	1.14	0.00	Yes
	D2. Imposing un-fair contract conditions on other contract party by the high power authority's (like the public work)	3.13	0.98	0.93	No	1.56	0.94	1.00	No
	D3. Inaccurate specification of items	4.04	1.059	0.00	Yes	4.2	1.179	0.01	Yes
	D4. Ambiguities in the contract documents	3.29	1.12	0.95	No	2.12	1.47	1.00	No
	D5. Contradiction between the project documents.	2.83	1.14	1.00	No	1.92	1.72	1.00	No
	D6. Mixing the lump-sum item and the unit-price items in the same contract	2.13	0.98	1.00	No	2.28	1.00	1.00	No
	D7. Ambiguity in the project boundaries	2.66	1.01	1.00	No	2.73	0.95	1.00	No
	D8. Ambiguity in project responsibilities between the contractor and the owner	2.53	1.02	1.00	No	2.59	0.96	1.00	No
	D9. Lack of Setting a reference for the disputes between the owner and the contractor	3.09	1.05	1.00	No	1.84	1.37	0.00	Yes
	D10. Un-realistic time schedule of the project	4.00	0.99	0.00	Yes	2.24	1.15	1.00	No
	D11. Inaccurate BOQ in the lump-sum contract	4.09	1.08	0.00	Yes	4.44	1.117	0.00	Yes
Contractor	C1. Sizable sub-contractors and out-sourcing	3.37	1.10	0.75	No	2.13	1.62	1.00	No
	C2. Un-skilled contractor workers	3.50	0.74	0.42	No	2.56	1.69	0.99	No
	C3. Lack of quality	3.32	0.96	0.87	No	2.17	1.57	1.00	No
	C4. Low quality in administration processes	3.63	1.07	0.059	No	3.89	1.23	0.00	Yes
	C5. Error in developing the bidding such as estimation	2.87	0.91	1.00	No	3.92	1.37	0.12	No

Appendix A. Causes of dispute (continued)

Category	Description	Private				Government			
		Level of Severity	Standard deviation	P value (Z test)	Significant?	Level of Severity	Standard deviation	P value (Z test)	Significant?
Owner	O1. Change in the item description and quantities	3.69	1.07	0.19	No	4.4	1.03	0.00	Yes
	O2. Changing the project specification after the	3.26	0.91	0.96	No	4.24	1.23	0.00	Yes
	O3. Sizable variation orders that exceeds the	3.58	0.86	0.30	No	4.25	1.09	0.00	Yes
	O4. Delays in handing over the site to the	2.87	0.90	1.00	No	4.08	1.31	0.03	Yes
	O5. Interfering in the contract execution of the contract by the Owner in severe affecting way	3.56	1.09	0.29	No	4.32	1.18	0.00	Yes
	O6. Delay of response to the requested decisions by the Owner	3.34	0.94	0.83	No	2.44	1.8	0.99	No
	O7. Long period of project hold	3.04	1.02	1.00	No	1.76	1.19	1.00	No
Contractors & Owners	CO1. Un-awareness of the governing rules in the appendixes	3.22	0.95	0.99	No	2.08	1.23	1.00	No
	CO2. Un-awareness of the governing rules that regulate the work in the country	3.00	1.058	1.00	No	2.92	1.31	0.98	No
	CO3. Un-awareness of the governing of the	3.21	0.95	0.99	No	3.92	1.30	0.11	No
	CO4. Un-awareness of the project milestones	3.15	0.89	0.99	No	3.48	1.50	0.47	No
	CO5. Un-awareness of the stated construction	3.26	0.87	0.98	No	3.4	1.34	0.34	No
Others	X1. Shortage of skilled workers in the labor	3.46	0.88	0.56	No	2.4	1.53	1.00	No
	X2. Fault negotiation procedure between the	2.59	0.94	1.00	No	3.46	1.39	0.52	No

5 Points Likert scale: Very High= 5, High=4, Somewhat high =3, Low =2, Very Low=1