

## **Factors Influencing Saudi Construction Design Management**

Michael Gbolagade Oladokun<sup>1</sup>, Waleed Alshaikh<sup>2</sup>

<sup>1</sup>Department of Building, Faculty of Environmental Studies, University of Uyo, Nigeria

<sup>2</sup>School of Science and Engineering, Teesside University, United Kingdom

\*Correspondent E-mail: michael.g.oladokun@uniuyo.edu.ng

Received 2 April 2016; Revised 21 December 2017; Accepted 2 February 2018

DOI: <https://10.30880/ijscet.2018.09.01.002>

---

### **Abstract**

This study evaluates factors influencing Saudi construction design management. Through the use of literature review, questionnaire and interview surveys, the study identified and assessed the factors influencing design management in Saudi Arabia and suggested ways of improving the Saudi construction design management. The sample for the study was carefully selected with the use of purposive sampling technique. A total of one hundred and fifty questionnaires were administered online and of this number, fifty three respondents returned completed questionnaires. In addition, nine carefully sampled seasoned professionals were interviewed. Through the use of mean item score and content analysis for the interviews, the identified factors were assessed. The results obtained from descriptive analysis indicate that respondents ranked 'effectiveness of communication channels and methods' as the most important factor influencing design management in the study area. This was closely followed by 'cultural differences' and 'deficient project documentations'. On ways to improve the Saudi construction design management, the respondents gave divergent views on the issue. Among the views expressed is that the government should ensure that the local consultants are well trained. The study recommends that the government should provide support for small and medium sized Saudi-based companies to integrate and collaborate with large foreign ones in order to work round the problem accruing from only foreign ones. This would further increase new innovative collaborative working.

**Keywords:** *Design Management, Construction, Saudi*

### **1. Introduction**

Construction projects by its nature involve the sharing of information between the project participants. However, by the distinct and temporary nature of each construction projects the communication channels formed in the course of a project are dissolved upon its completion, and others formed as new projects arise [1]. Tam [2] posited that heavy information sharing is one of the characteristics of the construction industry. Information in construction project is communicated by the design team. Construction contractors are provided drawings and specifications to transform the design concepts and ideas into physical product by the designers. The quality of these design documents greatly affects the efficiency of the construction phase. Once issue of design management like project documentation quality has caused delays, disruption and increased costs to all parties in the construction process [3]. If the design is deficient, documentations arising as a result of this will provide the contractor with incomplete, conflicting, or erroneous information.

Accurate design documentation is of vital importance to project success. Barret and Barret [4] in their research state that incomplete project documentation allows construction projects to have both schedule and cost overrun which is seen as one of the results of deficient design management. Clearly, the established consequences of this are quality failures and rework [5]. It is therefore, evident that most contractors do not receive complete project documents from the designers' void of errors without any need to still have reasons to clarify issues from the project designers. Deficient or incomplete project documentation leads to reduction in construction process efficiency, design changes, variations and reworks. This correspondingly results in time and cost overruns to be borne by the client.

Saudi Arabia is a rich developing country with an economy that is largely dependent on oil revenues, which constitutes 70 % of the Kingdom's total revenues. Because of this, the Kingdom of Saudi then needs to invest heavily on infrastructural development which made its construction sector of the economy to open up to both local and international construction contracting and design companies. According to Darwish [3], about 30% to 40% of the nonoil contribution to the Gross Domestic Product (GDP) between 1980 and 2000 is attributed to the construction industry. Arain and Assaf [6] pointed out that one major problem plaguing public sector construction projects in Saudi Arabia is schedule overrun which is very incessant. A number of factors have been identified to be responsible for this menace. Among the prominent ones is Design management. It is accepted that a successful construction project is the one well designed, finished to schedule, without cost overrun, in accordance with specifications and to stakeholders' satisfaction. Unfortunately, successful construction projects are not easy to come by even in the developed economy, talk less of developing economy. This construction sector in often time, used to be criticized for having poor performance. So many other problems which has been claimed to be characteristics of the industry, for example clients not being happy with the end product which may then leads to litigation [7]. Wang [8] opined that litigations as a result of conflicts among different parties involved in the construction projects which are incessant are associated significantly with poor design management. A qualified management can reduce conflicts in the design phase which is the first communication between the project parties. Conflicts can be reduced by management skills and behaviours. Arian [9] argued that the interface problems between the client, designer and contractors may be a source of problem to the management of both the design and construction. There is then the need to conduct a cross examination into factors influencing design management in the construction industry of the Kingdom of Saudi as this has led to many projects not being successfully completed, thereby resulting in financial loss and many other losses. It is on this basis that the research now seeks to answer the following questions:

1. What are the factors influencing the Saudi construction design management?
2. How can one improve design management in Saudi Arabia construction industry?

## **2. Review of Related Literature**

According to Tone *et al.* [10] and Tai *et al.* [11], communication issues contribute significantly to design management problems within construction projects. Poor communication is shown to have a knock on effect which in turn slows down the project. Latham [7] concluded that ineffective or non-existent communication, together with low levels of workmanship, were the main two factors which had the greatest negative impact on the successful outcome of a project.

By eliminating this communication gap at the offset a substantial number of ensuing problems would automatically be resolved as a result or removed from the equation. Improving communication therefore is seen as the first and most important solution [7]. This communication gap between design team and contractors is further exacerbated in the construction industry in Saudi Arabia when the parties involved do not speak the same language and often come from culturally different parts of the world [12]. Arabic, the native language of Saudi, is not commonly spoken among the professionals who make up the contract and design teams so difficulties arise when trying to communicate ideas and points of view, which in turn may be further hindered by cultural differences [6]. According Mendelsohn [13], this is a peak time for construction in Saudi Arabia due to a favourable economy based on increased oil production. As a result, many multinational global construction companies are now operating in Saudi Arabia, attracted by the economic boom. The contract and design teams are from all over the world and added to language differences, the cultural differences bring different values and beliefs [6]. Despite these differences, these groups of people are required to work together. Problems ensue when cultural differences influence the way projects are carried out, on occasion even ignoring the requirements stipulated by the client [14].

Interface problems among the main parties such as the contract and design teams create instant barriers, hindering smooth progression of the work [6, 15, 16]. Arain and Assaf [6] highlighted the architectural issues faced by the construction industry in Saudi. The time delays resulting from dealing with and resolving impractical ideas impacts the client, design team and other involved stakeholders [17]. Senthilkumar *et al.* [18] pointed out issues relating deficient project documentations. Arain and Assaf [6] are of the opinion that where designs are overly complicated, contractors have difficulty following them leading to conflict and again additional delays. The conceptual way of thinking of intangibles of a designer is in stark contrast to the more concrete, practical mind of a contractor who deals with tangibles on a daily basis [17]. A further complication pointed out by Senthilkumar *et al.* [18] is that any errors that exist in the execution of design drawings can often only be identified by the architect himself. If too many alterations are made to the bidding (tender) design, the contractor should respond to and act on these changes. Bakti *et al.* [19] argued that constructability and maintainability issues are part of the factors influencing design management. Analysis of those issues may cause time delays and problems in situations where the contractor is not prepared to or able to respond to or act upon the changes arising [14]. Furthermore, Senthilkumar *et al.* [18] pointed out that project participants' willingness to work together on future projects has implication on influencing design management. Hwang *et al.* [20] argued that design changes and rework has implications in affecting design management. This may lead to erroneous calculations and specifications of drawings in the design team. Other factors identified from the review of literature are given in Table 1.

**Table 1:** Summary of factors influencing design management in construction projects

<b>The following items are considered factors influencing design management</b>	<b>References</b>
1. Cultural differences	[21]
2. Deficient projects documentations	[18, 22]
3. Interface issues among different project teams	[6, 15, 18]
4. Constructability and maintainability issues	[19]

5. Project participants willingness to work together on future projects	[18]
6. Design changes issues	[20, 23]
7. Effectiveness of communication channels and methods	[2, 12, 15, 24]
8. Rework required to correct errors	[5]
9. Level of litigation and claims arising	[3]
10. User satisfaction with the product of the project	[3, 23]

---

### **3. Research Methods**

In order to provide answers to the questions raised in this study, it is necessary to use appropriate method to investigate the research problem. After a careful review of the research problem, the scientific method of inquiry seems most appropriate for the study. As such, the study made use of the survey research design. This is adjudged to be appropriate because the research is exploratory and descriptive in nature. For this research, data were collected using structured questionnaire and semi-structured interview. This is because some salient points that questionnaire survey alone cannot dissociate had to be followed by telephone or face-to-face interview. Data were captured from the design team professionals and contractors in the Saudi construction industry. The professionals who took part in the questionnaire survey and interview were selected using purposive sampling method. As such, a total of one hundred and fifty (150) questionnaires were administered online to the sampled respondents. 53 duly completed questionnaires were returned. This represents a response rate of 35.33%. In addition, nine seasoned construction professionals were interviewed. Data analysis involved the use of analytical technique to facilitate ease of communicating the research results. The study used descriptive statistics to analyse the demographic background of respondents. In addition, Mean Item Score (MIS) method was used to evaluate each of the factors influencing construction design management in order to know the importance attached to them individually. The analysis was implemented using the Statistical Package for Social Sciences (SPSS). Furthermore, data from the structured interview were analysed using content analysis approach.

### **4. Data Analysis and Discussion of Results**

Data captured from the respondents are analysed and discussed in this section thus:

#### **4.1 Respondents' Background/General Questions**

This section involves analysis and discussion of information obtained from Section A of the questionnaire and has to do with the respondents' background and general questions pertaining to the respondents' firms. Table 2 illustrates the results obtained. Question was asked to know the nature of respondents' firms' role in the construction industry. The result shows that 58.5% of the respondents are designers while the remaining 41.5% work in the contracting firm (Table 2).

**Table 2: General Questions about the Respondents Background**

<b>Respondents firms' role in the construction industry</b>	<b>Frequency</b>	<b>Percentage</b>
Contractor	22	41.5
Designer	31	58.5
Total	53	100.0

  

<b>Positions</b>	<b>Frequency</b>	<b>Percentage</b>
Director	8	15.1
Senior Management	11	20.8
Manager	20	37.7
Supervisor	13	24.5
Others	1	1.9
Total	53	100.0

  

<b>Professional Employees</b>	<b>Frequency</b>	<b>Percentage</b>
<10	2	3.8
10-20	34	64.2
21-30	11	20.8
30-50	6	11.3
Total	53	100.0

  

<b>Years of experience</b>	<b>Frequency</b>	<b>Percentage</b>
<10	14	26.4
10-20	26	49.1
21-30	12	22.6
>30	1	1.9
Total	53	100.0

  

<b>Professions</b>	<b>Frequency</b>	<b>Percentage</b>
Architect	17	32.1
Civil Engineer	11	20.8
Mechanical Engineer	7	13.2
Electrical Engineer	6	11.3
Builder	5	9.4
Quantity Surveyor	7	13.2
Total	53	100.0

Respondents were asked to indicate their positions in their respective firms; the results (Table 2) show that 39 respondents out of 53 representing 73.6% indicated that they are managers and above (Senior Management and Director). The implication of this is that majority of the respondents that took part in the survey are well knowledgeable about the subject matter based on their positions in their respective companies while at the same time this result means that all the respondents participated in the study are holding managerial and/or technical positions in their respective firms.

Respondents were asked of the number of professional employees in their companies. Table 2, also, reveals the result. 96.2% of the respondents answered that they have above 10 professional employees in their companies. The implication of this is that quite majority of the respondents firms engage professionals which means that the quality of the information that is received from these firms is accurate for this survey.

Furthermore, Table 2 shows the years of experience of the respondents in the construction industry. The results indicate that more 70% of the respondents have more than 10 years of cognate experience in the construction industry. The implication of this result is that the respondents participated in the study are well knowledgeable about the subject matter because of their wealth of experience in the construction industry. Table 2, also, indicates the professional affiliations of the respondents. The results show that majority of the respondents are Architects (32.1%) and followed by the Civil Engineers (20.8%) (Table 2).

## **4.2 Analysis of Factors Influencing Design Management**

Analysis of factors influencing design management was done in two separate ways. The first being the analysis of data captured based on the questionnaire administered as shown in Section 4.2.1. Also, data from the interview conducted are also analysed based on content analysis as show in Section 4.2.2.

### ***4.2.1 Ranking of Factors Influencing Design Management Based on Questionnaire Survey***

Table 3 shows the summary of the ranking of factors influencing Saudi construction design management by the respondents. MIS was calculated for each of the factors. The results obtained indicate that respondents ranked ‘effectiveness of communication channels and methods’ as the most factor influencing design management in the study area with MIS of 0.924. This was closely followed by ‘cultural differences’ with an MIS of 0.920 and ‘Deficient projects documentations’ with MIS of 0.898 each. Others are as shown in the Table 3. It is worthy to say that all the identified factors have MIS greater than 0.5 which shows that all the factors are the ones actually influencing design management in the Saudi Arabia construction industry. It is worthy of note also to say that ‘effectiveness of communication channels and methods’, and ‘cultural differences’ worth further exploitation in other to throw more light to these factors as the reasons why this is so.

**Table 3: Summary of Ranking of factors influencing Saudi construction design management**

Factors influencing design management	5	4	3	2	1	<u>Total</u>	<u>MIS</u>	<u>Overall Ranking</u>
Effectiveness of communication channels and methods	33	20	0	0	0	53	0.924	1
Cultural differences	34	17	2	0	0	53	0.920	2
Deficient projects documentations	30	19	4	0	0	53	0.898	3
Design changes issues	27	19	7	0	0	53	0.876	4
Rework required to correct errors	14	28	11	0	0	53	0.812	5
Interface issues among different project teams	18	17	17	1	0	53	0.796	6
Level of litigation and claims arising Project participants	13	22	18	0	0	53	0.782	7
willingness to work together on future projects	12	24	16	1	0	53	0.778	8
Constructability and maintainability issues	15	17	20	1	0	53	0.774	9
User satisfaction with the product of the project	0	25	24	4	0	53	0.680	10

#### ***4.2.2 Factors Influencing Design Management Based on Interview Conducted***

Analysis was done for the interviews conducted based on the results of the questionnaire survey analysed. The interview was conducted mainly because of the need to get more insight into the pertinent questions emanated from the results gotten from the questionnaire survey. This afforded the authors to fully answer the research questions for the study.

It needs to state that nine individuals with cognate experience in the construction industry were interviewed. Information about these individuals was captured in Table 4. All the professionals interviewed further corroborate the outcome of the questionnaire surveys and this outcome is now discussed as follows:

**Table 4:** Details of the Individuals Interviewed

S/N	Interviewee's position	Interviewee's company	Interviewee's occupation	Duration of interview	The interview method	Years of experience
Interviewee 1	Director of Engineering Projects	Alfares Commercial Contracting	Contractor	22min	Face to face	9
Interviewee 2	Project Manager	Project Management at Altaif University	Client	19min	Face to face	11
Interviewee 3	Senior Engineer	Abdullah Mohammed Alrajhi, Engineering Consulting	Consultant	17min	Phone	19
Interviewee 4	Project Manager	Saudi Ministry of Interior	Client	23min	Face to face	18
Interviewee 5	Supervision	Al-Imam Muhammed bin Saud Islamic University	Client	21min	Phone	7
Interviewee 6	General Manager	Nafitet Al-Jazzira Constructing EST.	Contractor	19min	Phone	20
Interviewee 7	General Manager	KametAlbayan Constructing EST.	Contractor	22min	Phone	6
Interviewee 8	Head of Department	Saudi Aramco Company	Client	14min	Phone	18
Interviewee 9	General Manager	Al-Marakez Al-Enshaeyah Contracting and Maintenance	Contractor	22min	Phone	15

The first question is for them to shed more light regarding the factors they think are influencing Saudi construction design management and the second one is for them to throw more light based on the outcome of the questionnaire results.

Based on the first part of the interview, problems such as poor communication and different cultural backgrounds are among the most important factors influencing design management. This opinion was supported by most of the interviewees (1, 2, 3, 4, 6, 8 and 9).

*“Projects located outside the Kingdom have problems due to poor communication and the length of time and different culture, for example, building in Indonesia Institute of Arabic and Islamic influenced by the previous factors have been resolved in part to contract with a consulting firm in the same country. And travel abroad if necessary”.* Interviewee 1

*“Some non-local contractors lead to a difficulty to communicate with them, leads to problems”.* Interviewee 2

*“Lack in communication among owners, designers and contractors, the cultural differentiations among owners, designers and contractors and the differences in the designers’ background and techniques lead to the conflict as they work in one project are among those factors affecting project design. Saudi construction has its own specifications so that Saudi designing is affected by some different backgrounds and skills for example: some tile setters or ceiling board fixers are used to putting or installing things based on their own background not on Saudi construction’s methods”.* Interviewee 9

*“Cultural differences influence the project as follows: different specifications which the contractors may not have implemented previously, designer and contractor might be of different countries where different procedures of works are being followed”.* Interviewee 8

*“Both contractors and designers can read the drawing from their point of view or perspective, contractor sometimes can ignore some minor details whereas designers focus on details more than the main figure. This problem might lead to a conflict and delay and cost overrun accordingly”* Interviewee 9

Also, project documentation plays a vital role in design management. Deficient and bad project documentation such as unclear design drawings, inaccurate registered information, unfinished designs and weekly reports and undefined project specifications cause unwanted time delays and cost overruns. This was identified by the interviewees (1, 2, 8, 9).

*“Inaccuracy in recording information, inefficient design or shortage in illustrations and drawing with incomprehensive information, then therefore , contractors are asked to complete these designs or drawing and shortage in specifications and standardisation descriptions are among those factors. Project documentation and weekly reporting are very essential and sometimes are not done properly”.* Interview 9

In addition, design change is considered an important factor which affects time, cost and the quality of the project. This factor was supported by interviewees (1, 3, 8 and 9).

*“Engineer and owner modifications under the supervision of the owner, the owner corrects and changes the design depending on his culture which causes time delay and money lose” Interviewee 3*

*“yes, in my opinion the factors affecting the design management are communication of all parties involved in the project, change of design during the execution of project”. Interviewee 8*

*“Delay in project handover due to some changes in drawings or design will lead to increase the project cost” Interviewee 9*

Furthermore, the interviewees determined other factors that might affect design management. However, those factors were supported individually and there was not a consensus about their importance. Those factors are “define goal of the design”, “determine the need” (interviewee 5), “weak designer” (interviewee 2), “leadership planning problems as well as experience” (interviewee 4). Well understanding and managing of clients’ ideas by the designer and contractor was another factor (interviewee 7). While interviewee 9 added, in addition to cultural differences, bad communication, deficit documentations and design change, four factors summarised in the following sentences.

*“Some decisions are not assigned to a specific stakeholder, which leads to the conflict or even ignorance, some of these decisions are very important and crucial, the ambiguity in decision-making and absent in dividing roles or delay in decision making between owners and designers in construction phase, shortage in specifications and standardisation descriptions and the differences in the designers’ background and techniques lead to the conflict as they work in one project”*

As a result, several factors affecting design management in Saudi construction were determined and emphasised by the interviewees. However, bad communication, differences in culture, deficit documentations and design change are considered the most serious from the results of the interviews among other factors as can be seen in Table 5.

**Table 5: Factors Affecting Saudi Construction Design Management Based on Interviews**

Factors	Interviewees
Effectiveness of communication methods	1, 2, 3, 4, 6, 8, and 9
Cultural differences	1, 2, 3, 4, 5, 6, 8, and 9
Deficient projects documentations	1, 2, 8 and 9
Design changes issues	3, 8 and 9

The results of these questions, in fact, support the outcomes of literature review and the questionnaire conducted. The results obtained from the questionnaire indicate that respondents ranked ‘effectiveness of communication channels and methods’ as the most important factor

influencing design management in the study area with MIS of 0.924. This was closely followed by 'cultural differences' with an MIS of 0.920 and 'Deficient projects documentations' with MIS of 0.898 each (Table 3). These are also supported by other studies such as Darwich [3] who indicated that delays, disruption and increased costs are the main results of bad project documentation. Barret and Barret [4] stated that incomplete or deficit project documentation causes cost overruns and time delays. In addition, Assaf and Al-Hammad *et al.* [12] pointed out that faulty design management can be avoided by good, clear communication which was supported as well by Tam [2], Wikforss & Lofgren [24] and Chen *et al.* [15]. Furthermore, design changes were one of the factors supported by interviews and questionnaire results and stated by researchers such as Chang *et al.* [23], Hwang *et al.* [20] and Love *et al.* [22]. Hwang *et al.* [20] stated that design changes continue to affect both cost and schedule performance throughout the construction process. Finally, Arain and Assaf [6] declared that if cultural differences affect the way projects are carried out this might even cause the client requirements to be ignored and bad design management will follow. This is supported by Arditi *et al.* [17] and Ochieng and Price [21].

Moreover, on the second part of this question asking for the views of the interviewees regarding the outcome of the questionnaire survey on the factors influencing Saudi construction design management, where ineffective communication and cultural differences are ranked as most two influencing factors, all of the interviewees are in support of this outcome. In conclusion, although many other factors were mentioned, all the interviewees acknowledged "cultural differences" and "ineffective communication" as two major factors influencing Saudi construction design management.

#### **4.3 Suggestions for Improving Saudi Construction Design Management**

Here respondents were asked to suggest ways by which Saudi construction design management could be improved upon. Based on the questionnaire and interviews surveys that were carried out the respondents gave divergent views on the issue at hand. While some of the opinions that government should make sure that the local consultants are qualified enough in order to get licensed by supporting these local consultants and make sure they are well trained. This would help reduce dependency on the foreign expatriates. Also, these local consultants need given full authority and man right positions in the Saudi construction industry which they believe will further enhance full confidence of these consultants to perform their tasks without any form hindrances. Some are of the opinions that there should be a Standard form of Contracts in Saudi Arabia. They claim that adoption of different forms of contract especially from the UK, China and the US has created a form of problem in Saudi construction industry and hence, the problem of design management. These are to make known to all the parties to the contracts. Another suggestion is that government should provide support for small and medium sized Saudi-based companies to integrate and collaborate with large foreign ones in order to work round the problem accruing from only foreign ones. This, they say, would further increase new innovative collaborative working. A comprehensive list of the suggestions is as follows:

- The main contractor of the project should be able to implement the project otherwise it should be handed over to another well qualified contractor.

- There is a need for advanced project management programmes in order to develop design management.
- There should be a schedule to monitor the progress of the project to ensure completion of the project.
- Local workers and professionals should be hired.
- Local contractors should be used.
- Using and implementing design standards of the country the project is implemented in.
- Developing of consulting companies.
- The designer or the consultant must monitor the project site to oversee the project contractor.
- Providing training for engineers and workers.
- Choosing a well-qualified team of engineers.
- Good preparation for the project.
- Renewal the technique departments.
- Implementing a clear action plan from the beginning to the end. Identifying clear objectives for the project team. Reviewing the design stages at 30%, 40%, and 60% and using of value engineering.
- There is a need to train the Saudi engineers.
- Developing engineering graduates to enhance design management.
- Establishing association for engineers.
- Establishing external relations with developed countries and learning/benefiting from their experience.
- Coordination between all parties (designer, contractor, project owner).
- Implementing quality assurance / quality contractors in design and implementation stages.
- Carrying out weekly meetings among all parties involved in the project.
- Clear and effective communication can solve many problems caused by cultural differences and design changes.
- Designers should have sufficient knowledge on Saudi construction methods.

#### **4.4 Discussion of Results**

The discussion here is based on both the questionnaire and interview survey results. As revealed from the questionnaire and interview surveys, the results obtained from the analysis indicate that the respondents are of the opinion that ‘effectiveness of communication channels and methods’ is the biggest factor influencing design management in the study area. This was closely followed by ‘cultural differences’ and ‘deficient projects documentations’. Relating the outcome of this study to what is obtainable in the literature, Arain and Assaf [6] was of the opinion that a major problem discovered happening between the designer and the contractors is that of the communication gap. As argued above, this research corroborates this assertion by coming to the conclusion that effective communication channels and methods is the most influencing factors affecting design management in Saudi Arabia. These results are not in any way different from the assertion of Tone *et al.* [10] and Tai *et al.* [11]. This may then leads to further problems that may hinder the project. Based on the interviews conducted, many attribute the problem to insufficient and inadequate communication. Most problems appear to

stem from poor communication between the contractor and design team as opined by Latham [7]. It is argued that once this gap in communication is eliminated, many of the resulting problems resolve themselves so should be considered the first solution. As advocated by the professionals interviewed, this communication problem is the most prevalent factor influencing design management in the Saudi construction industry today.

Communication is very important factor in construction field and this was confirmed by interviews conducted. The contractors sometimes ignore some design details as they think that these details causing project delay. This usually occurs due to the lack of communication with the designer especially if they experienced dispute before. This was motioned by interviewees 4 & 9. Poor communication between the local Saudi owner, and foreign contractor and designer arises especially if the project is outside the kingdom. This will cause difficulty in supervision and monitoring the project and solving the problems. This was mentioned by interviewee 1.

Therefore, to overcome these problems there needs to be effective communication mediums. The most effective way of communication is direct communication. The designer should be present the project site most of the times during the implementation of the project. This was mentioned by interviewee 3.

Another important factor that was discovered is the cultural difference among the project participants and the effect of this on projects. Construction is considered to be at its peak in Saudi Arabia because of the oil boom which consequently necessitates an influx of foreign firms to develop the infrastructural base of the country [6]. As a result, many multinational global construction companies are now operating in Saudi Arabia, attracted by this economic boom. The contract and design teams are from all over the world and as well as language differences, the cultural differences bring different values and beliefs [6]. Despite these differences, these groups of people are required to work together. Problems ensue when cultural differences influence the way projects are carried out, on occasion even ignoring the requirements stipulated by the client [14].

The kingdom of Saudi Arabia is an advanced country in the field of construction. The kingdom hosts many international companies in all different fields including design management and construction. Many workers and professionals come from outside the country and represent different cultures, some of the problems arising from these differences are summarised as follows:

- Differences in educational levels among the construction team (management level and employees' level) (interviewee 9). This causes problems between the project team. In addition, some of the contractors and workers do not pay enough attention to the culture of the country.
- Differences in experience (interviewee 5) and in dealing with construction materials and specifications (interviewees 8 & 9). Contractors and workers do not use proper construction materials nor do they follow the country's construction specifications. Hence, there is a need to use local contractors (mentioned by interviewee 2) to overcome these issues.

- There is lack of communication experience, due to culture differences, between designers, contractors and owners. This leads to conflicts when defining each party's responsibilities and duties (interviewee 6). This will have an impact on the implementation of the project causing unnecessary delay.
- Because of the general culture of the Saudi kingdom, the owner, designer and contractor pay attention to architectural and constructional drawings only. However, they do not pay attention to other parts of the project such as electrical and mechanical drawing (as mentioned by interviewees 3 & 6).

Documentation is another important factor that prevents conflict between different parties involved in the project. If design drawings were incomplete or not stamped by the authorities, this will cause problems during the implementation of the project as mentioned by interviewee 1 & 9. This requires major changes leading to disputes between the different parties involved in the project. If the documents (drawings and specifications) are not clear due to cultural difference (as mentioned by interviewee 8) or due to shortcomings in details or detailed drawings (as mentioned by interviewees 2 & 9), this will require time complete documentation therefore causing delay in the project as mentioned by interviewee 9

Disagreements between the main parties such as the contract and design teams create instant barriers, hindering smooth progression of the work [17]. Arain and Assaf [6] highlighted the architectural issues faced by the construction industry in Saudi. Although not restricted to Saudi Arabia, major design flaws or durability of the project are examples of problems within architecture and can be linked to the plan of the entire project [6]. Another factor to take into consideration is the chosen method of procurement. A traditional contract differs from one where the contractor is responsible for the design as well. Instructions from architects in the form of designs and ideas are not always practical and can cause problems [16]. The time delays resulting from dealing with and resolving impractical ideas impacts the client, design team and other involved stakeholders [17]. Arain and Assaf [6] mentioned where designs are overly complicated, contractors have difficulty following them leading to conflict and again additional delays. The conceptual way of thinking of intangibles of a designer is in stark contrast to the more concrete, practical mind of a contractor who deals with tangibles on a daily basis [17].

A further complication pointed out by Scriptheadler [16] is that any errors that exist in the execution of design drawings can often only be identified by the architect himself. If too many alterations are made to the bidding (tender) design, the contractor should respond to and act on these changes. This causes time delays and problems as does the situation where the contractor is not prepared to or able to respond to or act upon these changes [14]. Issues are not solely restricted to communication problems between different teams. Mistakes also occur within a single discipline. For example erroneous calculations and specifications of drawings in the design team account for 8% of the total errors made in construction documentation in Saudi Arabia. Studies offer a range of solutions to reduce this communication gap. Assaf and AlHammad [12] suggested regular meetings throughout the duration of the project to ensure everyone involved understands their responsibilities and what is required of them at each stage of the project. A further suggestion was to appoint an effective leader to liaise between the various teams. Mohammad [14] focused on training to improve workmanship and cooperation.

## **5. Conclusions and Research Implications**

This study identified ten factors adjudged to influence design management in the literature review conducted. The findings of the study indicate that respondents ranked ‘effectiveness of communication channels and methods’ as the most factor influencing design management in the study area. This was closely followed by ‘cultural differences’ and ‘deficient projects documentations’. All the identified factors have MIS greater than 0.5 which shows that all the factors are the ones actually influencing design management in Saudi Arabia as corroborated by the findings from the interviews conducted. Additionally, the findings of the study suggest the respondents gave divergent views regarding the ways on how to improve Saudi construction design management. While some are of the opinions that government should make sure that the local consultants are qualified enough in order to get licensed by supporting these local consultants and make sure they are well trained. This would help reduce dependency on the foreign expatriates. Others are of the view that local consultants need to be given full authority and man right positions in the Saudi construction industry. They believe it will further enhance full confidence of these consultants to perform their tasks without any form hindrances. The study concludes that Saudi government has major role to play by enacting relevant laws on local contents. It is therefore recommended that the government should provide support for all small and medium sized Saudi-based companies to integrate and collaborate with large foreign ones in order to work around the problem accruing from contracting only foreign ones.

The study has a number of implications for practice and research. The research sheds new light on the design management in the construction industry of the Kingdom of Saudi Arabia, which provides platform for other Kingdoms in the region to draw lessons on. The research, also, has the capability of advancing theory in the subject area by adding to the pool of existing literature and spur research activities in the research domain. One of the areas that researchers need to give proper attention is in the area of providing frameworks for managing design management in Saudi Arabia. This needs to be generic and as well as specific to different procurement routes for different projects. Further, a wider study with focus to similarities and differences in the impact of deficient design management in Saudi Arabia construction industry needs to be further investigated in order to fully understand and identify contextual issues.

## **References**

- [1] Leng, K. C. (2005). Principles of knowledge transfer in cost estimating conceptual model. Unpublished Master in Science (Construction Management) Thesis in Department of Civil Engineering of the University of Technology, Malaysia.
- [2] Tam, C.M. (1999). Use of the internet to Enhance Construction Communication: Total information Transfer System. *International Journal of Project Management* 17(2), 107 – 111.
- [3] Darwish, M.I. (2005). Factors Affecting Design Documentation Quality in Construction Industry. Construction Engineering and Management Department, King Fahd University of Petroleum and Minerals, Dhahran 31261, Saudi Arabia. Retrieved from

[http://faculty.kfupm.edu.sa/CEM/assaf/Students\\_Reports/Factors-Affecting-Design-andDocum.pdf](http://faculty.kfupm.edu.sa/CEM/assaf/Students_Reports/Factors-Affecting-Design-andDocum.pdf)

- [4] Barret P., and Barret L. (2004). Revaluing Construction. *Final Synthesis Report on Workshops*. University of Salford.
- [5] Love, P.E.D. and Sohal, A.S. (2003). Capturing Rework Cost in Projects. *Managerial Auditing Journal*, 18(4), 329-339.
- [6] Arain, F.M. and Assaf, S.A. (2007). Consultant's Prospects of the Sources of design and construction interface problems in large building projects in Saudi Arabia JKAU: *Envi. Design Sci.*, 5(2), 15-37.
- [7] Latham, S. M. (1994). *Constructing the team*, London: Her Majesty Stationary Office.
- [8] Wang, Y, 2000, Coordination issues in Chinese large building projects, *Journal of Management in Engineering*, 16(6), 54-61.
- [9] Arain, F. M. (2002). *Design-Construction Interface Dissonances*, unpublished MS Thesis, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia.
- [10] Tone, K., Skitmore, M., Wong, J. K W. (2009). An investigation of the impact of cross-cultural communication on the management of construction projects in Samoa, *Construction Management & Economics*, 27 (4), 343-361.
- [11] Tai, S., Wang, Y., Anumba, C. J (2009). A survey in communications in large-scale construction projects in China, *Engineering, Construction and Architectural Management*, 16(2), 136-149.
- [12] Assaf S.A. and Al-Hammad A.M. (1988). The effect of economic changes on construction cost, *American association of Cost Engineers Transactions, AACE Morgantown, West Virginia*. 63- 67.
- [13] Mendelsohn, R. (1997). The constructability review process: A constructor perspective. *Journal of Management in Engineering*, 13(3), 17-19.
- [14] Mohammed, R. E. (2007). An Exploratory System Dynamics Model To Investigate The Relationships Between Errors That Occur In Construction Documents In Saudi Arabia and Their Possible Causes, PhD Thesis, School of the Built Environment, Herriot-Watt University.
- [15] Chen, Q., Reichard, G., and Yvan Beliveau, P.E. (2008). Multiperspective approach to exploring comprehensive cause factors for interface issues, *Journal of Construction Engineering and Management*, 134(6), 432-441.
- [16] Scripthandler (2010). Saudi Arabia: opportunities and barriers to inbound construction. Available online at: <http://bdo.scripthandler.com/g20/pdfs/SaudiArabia.pdf> [Accessed 30 March 2012].
- [17] Arditi *et al.* (2002). Constructability Information Classification Scheme. *Journal of Construction Engineering and Management*, 121(4), 337-345.
- [18] Senthilkumar, V., Varghese, K., and Chandran, A. (2010). A web-based system for design interface management of construction projects, *Automation in Construction*, 19, 197-212.
- [19] Bakti, E.S., Abdul Majid, M.Z., Zin, R.M., and Trigunaryyah, B. (2011). Constructability improvement in seawater intake structure, *Engineering, Construction and Architectural Management*, 18(6), 595-608.
- [20] Hwang, B.G, Thomas, S.R., Haas, C.T.; Caldas, C.H., (2009). Measuring the impact of rework on construction cost performance, *Journal of Construction Engineering & Management*. 135 (3), 187-198.

- [21] Ochieng, E.G. and Price, A.D.F. (2010). Managing cross-cultural communication in multicultural construction project teams: The case of Kenya and UK, *International Journal of Project Management*, 28, 449-460.
- [22] Love, P. E. D., Edwards, D. J., Smith, J., & Walker, D. H. T. (2009). Divergence or congruence? A path model of rework for building and civil engineering projects. *Journal of performance of constructed facilities*, 23(6), 480-488.
- [23] Chang, A.S.T., Shih, J.S., and Choo, Y.S. (2011). Reasons and costs for design change during production, *Journal of Engineering Design*, 22(4), 275-289.
- [24] Wikforss, O. and Lofgren, A. (2007). Rethinking Communication in Construction. *ITcon*, 12, 337-345.