

Challenges negating virtual construction project team performance in the Middle East

Abstract

Purpose

Over the last couple of decades, many organisations are increasingly adopting virtual team concepts, and construction companies in the Middle East are no exception. Members of a virtual team are geographically scattered and represent diverse cultures. Thus, challenging issues emerge more frequently than in a traditional team. There are challenges associated with space and time as well as high client's demand. Therefore, this study aims to identify and probe the causes of the challenges in virtual project teams in the construction industry of the Middle East.

Design/methodology/approach

A list of challenges was derived through a comprehensive review of relevant literature. Questionnaire survey was conducted with professionals who are involved in construction virtual project teams. Further, the factor analysis technique was used to analyse the survey responses.

Findings

Results show that the challenges in virtual team arrangement in the Middle East construction industry can be grouped into seven categories, namely: organisational culture, conflict within the team, characteristics of the team members, trust within the team members diversity of the team, communication and training, and cohesion in the team. Understanding of these factors will drive the needed platform to support effective virtual project teams in the Middle East.

Originality/value

This study raises the prospect that organisations may establish an environment for team members to achieve higher levels of virtual cooperation by concentrating on these potentially crucial factors. This, in turn, will encourage further innovation and performance within construction organisations.

Keywords: Virtual team, construction industry, Middle East, organisational culture, team cohesion

1 Introduction

In today's globalised world, where crucial technological changes are occurring, organisations are experiencing unexpected possibilities and obstacles in achieving their goals. Such changes have compelled organisations to restructure and embrace new ways of working. Virtual team is one of the new ways of organising and achieving organisational goals (Lilian, 2014). Virtual teams are geographically and organizationally dispersed knowledge workers (such as Architect, Engineers, Project Managers and Quantity Surveyors) who work across time zones to achieve the goal of a specific project. Physical contact in virtual teams is limited or absent entirely due to such dispersion, implying that cooperation is supported through information technology (IT) solutions such as computer-based communication. This type of electronically enabled teamwork is recognised to present both opportunities and challenges to corporate organisations, of which construction is no exception. Many multinational organisations have diverse nationalities, vast geographical distances, and time zones. According to Oertig and Buergi (2006), academic scholarship has reported increasing geographically scattered project teams operating within matrix organisations, assuming that their job is highly challenging. The use of Information and Communication Technologies (ICTs) in the construction business has brought together diverse team members of a construction project from all over the world (Shaikh, 2018). As virtual teamwork is more complex than working face-to-face (Heimer and Vince, 1998), managing such a virtual team working in a construction project remains a challenging task (Shaikh, 2018).

The Middle East has become the destination for many multinational companies attracted by the massive development programme, especially in the construction sector. The construction industry in the Middle East has been expanding progressively and, at the same time, is facing some challenges. Throughout the project life cycle, the continuing market pressure to reduce costs, improve quality, and reduce time to market is becoming a threat to many construction companies. Most multinational companies operating in this region have their headquarters located outside the Middle East, hence collaborating

virtually with the client teams and other project participants. This is because globalisation and changing customer needs require many organisations to adopt virtual project teams for their business activities. There are various issues associated with virtual project teams, such as establishing, managing, and controlling virtual teams, maintaining trust among team members, information sharing, and communication. Although computer-supported collaborative work has increased, many distributed virtual teams are not benefiting from the tools and approaches used. This is because of the lack of efficient and empirically proven methods, which can judge a team's performance based on human factors and cultural differences. The Middle East is a multicultural region with people from various backgrounds and countries working on multiple projects; hence, managing virtual teams cannot be overemphasised. As remote work becomes more of a reality than a passing trend, virtual teams have become more significant, especially in this era of Covid-19 pandemic. Zuofa and Ochieng (2021) opined that remote working and virtual teams may still pose newer challenges for delivering projects. Construction project teams increasingly utilise virtual project teams to deliver projects (Kaur, 2017; Ramalingam et al., 2014). Due to the pressure from globalisation, it is becoming necessary for construction organisations to adopt virtual project teams to deal with the challenges of the contemporary business environment (Chen & Messner, 2010). The organisations have to predict and overcome virtual project teams' challenges by implementing effective managerial strategies to achieve desirable outcomes (Yen et al., 2002). Successful implementation of virtual project teams within the construction sector requires an in-depth understanding of the unique challenges quite different from the challenges encountered in face-to-face teams (Hosseini & Chileshe, 2013).

Against this backdrop, the lack of studies on virtual project teams in the construction literature has been questioned (Iorio & Taylor, 2015; Hosseini et al., 2018). Also, many previous studies on virtual teams have focused on various challenges faced by virtual teams (Zuofa & Ochieng, 2017). Moreover, the results of the studies from other industry sectors such as telecommunication, health care industry, agricultural industry, cannot be relied upon for the construction sector due to the obvious specific approach of the industry. For instance, multiculturalism has a negligible impact on virtuality in

construction project teams (Hosseini et al., 2016). In contrast, multiculturalism contributes to virtuality in non-construction contexts (Foster et al., 2015). This implies that knowledge of virtual project teams should be created within the natural context of the construction industry. As a result, the construction industry has remained in need of creating knowledge to supply the industry with essential information on the challenges faced in deploying virtual project teams on construction projects (Hosseini & Chileshe, 2013). There are challenges such as difficulty in setting up the virtual project teams and insufficient guidelines for managing virtual project teams in the construction sector of the Middle East (Kaur et al., 2015). Therefore, the companies fear implementing virtual project teams even though globalisation and changing customer needs require teams to increase the performance of the projects. Hence, the earlier we identify and address challenges associated with virtual teams, the better for achieving construction project goals. There was reluctance already for virtual project teams in the construction industry. However, with Covid-19, we have been forced into virtual interactions. Therefore, it is even more important to understand the issues or reluctance towards virtual teams to achieve greater effectiveness across a team that has been forced upon us due to the Covid-19 pandemic. There is a lack of empirically-based study of the perspectives of construction professionals on the greatest challenges virtual project teams have to manage, especially in the Middle East. To add knowledge on the field and fill the research gap, the study aims to identify and analyse the challenges faced by virtual team members in (both building and infrastructural) construction projects. This will underline the need for construction organisations to be conscious of these challenges and increase team awareness for improved performance.

2 Literature review

2.1 Virtual Teams Concept

In order to have an international presence in a global marketplace, more and more companies feel the need for creating virtual project teams. The organisations can assign the most qualified people to appropriate projects by dynamically allocating people to

projects based on expertise rather than location. This will reduce the expense and wasted productivity caused by extensive travel or frequent relocation (Goldman & Filliben, 2000). A global virtual team is defined as a temporary team formed on a need basis for a particular task duration and staffed by people from across the world (Jarvenpaa, Knoll, & Leidner, 1998). From the perspective of Lu (2015), virtual teams are groups of individuals collaborating in the execution of a specific project to achieve a common goal while geographically distributed, often away from their parent organisation. El-sheikh et al. (2014) stated that a multicultural virtual project team is a team whose members have different cultural backgrounds belonging to other countries.

Amongst the different definitions of a virtual team, the most widely accepted definition was given by Powell et al. (2004 p.7) as follows: “virtual teams as groups of geographically, organizationally and/or time dispersed workers brought together by information technologies to accomplish one or more organisation tasks”. For the construction industry, distributed teams could be defined as “groups of geographically, organisationally and/or time dispersed intelligent workers with different skills and in different positions of the hierarchy heavily relied on ICTs to accomplish engineering tasks which for all are held accountable” (Hosseini & Chileshe, 2013, p.1103). In this study, we defined virtual project teams as groups of professional individuals collaborating to execute a specific construction project while geographically and often temporally dispersed, working from different professional domains to achieve the project aim.

Virtual teams have become a norm with most corporate companies such as consulting firms, technology infrastructures and e-commerce because of globalisation due to improved telecommunications infrastructures (Zuofa & Ochieng, 2017). The virtual teams are also being increasingly examined in academic literature (Morrison-Smith & Ruiz, 2020), in open source software development (Ho & Richardson, 2013) and online communities (Lee et al., 2014). There is a strong need for virtual project teams in the construction sector, which would benefit organisations to achieve a global scope of work for these companies in the Middle East. Hosseini et al. (2018) revealed that many more

construction companies have instituted virtual workplaces and have reaped reduced real estate expense benefits, increased productivity, higher profit, and improved customer service, environmental benefits, and access to global markets.

2.2 Virtual teams in the context of the Middle East construction industry

The Middle East has become the destination for many multinational companies attracted by the massive development programme, especially that in the construction sector. Middle Eastern countries have outstanding national development goals to diversify their economies and reduce their dependency on oil and gas reserves and a desire to be recognised on the global arena. To achieve these plans, many construction and infrastructure projects will be needed and the construction industry will play a significant role in this. The Dubai World Expo 2020 and the Fifa World Cup 2022 in Qatar are two major planned projects. There is desire for faster completion of projects which necessitates multitasking and improved collaboration among project teams (El-sheikh et.al, 2014). The construction industry in the region has been expanding progressively and at the same time, is facing several challenges. The Middle East is a multicultural region with people from various backgrounds and different countries working on multiple kinds of projects. Hence, it's essential to understand the phenomenon of these virtual project teams who relate across multiple cultures. International organisations winning major construction contracts in the Middle East may find it difficult to effectively attract skilled professionals and unskilled labour on the scale required to complete projects on time (Harris, 2014). This gives rise to remote engagement of construction experts outside of the region. Hence, these needs and challenges required many organisations to adopt virtual project teams for their business activities.

2.3 Challenges of Virtual Project Teams

Even though virtual project teams have many advantages, new challenges also arise (Morrison-Smith & Ruiz, 2020). The distributed teams provide disappointing results if the challenges facing virtual project teams are overlooked. It is imperative to tackle the challenges to reap the same benefits of virtual project teams (Morrison-Smith & Ruiz,

2020; Mukherjee et al., 2012). Against this backdrop, very few studies have investigated distributed teams' challenges within the construction context, as Hosseini & Chileshe (2013) pointed out. Some of the problems that virtual project teams experience include the following: trusting the team members who are never seen, time delays in replies, lack of synergy among cross-cultural team members, communications breakdowns due to cultural variances, unresolved conflicts among culturally different members, different holidays (Vinaja, 2003). The key findings reported by Vakola and Wilson (2004) were the challenge of developing trust, leadership and managing virtual aspects of communication. Hosseini & Chileshe (2013) also mentioned that virtual teams face particular challenges involving trust, communication, deadlines, and team cohesiveness. Virtual teams are challenged because they are virtual; they exist through computer-mediated communication technology rather than face-to-face interactions (Hardin et al., 2007). Some of the challenges that occur in the literature are identified as shown in **Table 1**. Research into the challenges faced in virtual project teams has resulted in determining the factors associated with project success in virtual teams. Several challenges have been identified for traditional or colocated project teams in previous studies; however, it is not guaranteed that the findings from such findings directly translate to effective collaboration in the context of virtual teams. Other studies have looked at the factors that influence team work in general. Mattessich and Monsey (1992) identified 19 key factors required for effective teamwork, including the ability to compromise, mutual respect and trust, and flexibility.

Please insert Table 1 here

Similarly, Patel et al. (2012) produced a framework for collaborative engineering projects in the automotive, aerospace, and construction industries based on the classification of seven criteria related to collaboration. In a recent study, Morrison-Smith Ruiz (2020) conducted an extensive review of factors affecting virtual teams in general terms. While the findings from these studies are relevant, they apply to a broad range of contexts. Hence, it is difficult to determine how the factors reported in these research affect virtual

teams. This study differs because it focuses solely on virtual teams working within the context of the construction project.

3 Methodology

3.1 Prior literature and pre-testing

The first essential step in this study was to establish a comprehensive collection of variables from prior studies on virtual teams. The Web of Science (Core Collection) was searched to collect articles used for this study because the Web of Science core collection contains comprehensive literature databases with high quality and influential articles (Cui, Liu, & Mou, 2018). Suitable search terms include ‘barriers’, ‘challenges’, ‘obstacles,’ ‘virtual team’, ‘virtual project team’, and ‘construction virtual project team’. An initial search was made using the document type ‘article or review’ and the ‘title/abstract/keyword’ section of Web of Science, limited to papers published between 2000 and 2021. The initial search yielded 326 items. However, not all of the initially discovered publications included studies on the challenges of virtual project teams. Some just occurred to have some of the search terms in their title, abstract, or keywords. Therefore, a brief of the abstracts was undertaken, and in some cases, where the abstracts did not give enough information, the contents of the initial discovered publications were reviewed. Following the filtering, 149 articles were identified as relevant and valid for further investigation. It is important to note that this study is not a comprehensive evaluation of all literature on the subject. A total of 149 research articles were reviewed and methodically analysed to identify 40 indicators.

The set of 40 factors was then sent to seven participants from the construction sector for re-testing. Key professionals were identified and used as agents to reach other professionals (snowballing) for inclusion in the sample for the pilot study. These participants are professionals who have been involved or are currently involving in construction projects in the Middle East, although they are located in different regions including Oman, Dubai, Muscat, Sharjah, UK, the US, Holland, Qatar, and Saudi Arabia.

All the participants are graduates and have at least ten years of working experience, including a minimum of three years of such experience in the Middle East and they have all participated in virtual project teams before. The pilot study was used to assess the clarity, explicitness, meaning, and suitability of the questions provided in capturing the factors for virtual project teams in the construction industry of the Middle East. The pilot study helped modify the questionnaire and further refine the instructions' clarity. The 40 factors were compressed to 25 factors by the professionals. The pilot study validates the researcher's synthesis of the literature in the field by testing the adequacy of the research instruments and thereby assisting in developing the primary data collection instrument to be used in the actual data collection. The modified indicators affecting virtual teams extracted from the literature are shown in Table 1 with their sources. In building a virtual team, all of these issues must be at least implicitly addressed to have an effective virtual team (Morrison-Smith & Ruiz, 2020). The final questionnaire comprised two major sections: (1) general personal information of respondents; and (2) questions on the opinions of the professionals on challenging factors for virtual project teams in construction in the Middle East.

3.2 Questionnaire survey

A web questionnaire survey was created using Survey Monkey for this research. Questionnaire survey is one of the widely used methods in virtual team research to measure and evaluate practitioners' perceptions and opinions (Odubiyi & Oke, 2016; Moore & Abadi, 2005). The web-based questionnaire instrument was posted on Construction Network and LinkedIn groups. These postings were done only after taking formal approvals from the Webmaster and the leaders of these communities. Hence, in the case of such web surveys, the respondents were self-selected; however, they must have been involved in delivering construction projects in the Middle East for inclusion. Respondents were asked to rate their level of agreement with each of the 25 identified factors on a five-point Likert scale from 1 to 5, with '1' representing 'strongly disagree,' '3' representing 'neutral/no comment,' and '5' representing 'strongly agree' on the

statements with reference to a specific virtual team project in which they had participated. The respondents who answered the questionnaire formed a self-sampled population. They are graduates in their respective fields to understand the research study. Also, the mailing lists of some chosen virtual team project communities were obtained from the online directories of construction companies. The Emirates Oil and Gas directory, Middle East Building and Construction Directory, and The Blue Book Building were also referred to get the e-mail ids of the construction projects' team members and project managers. The questionnaire survey targeted only experienced and knowledgeable construction professionals such as Quantity Surveyors, Architects, Engineers, Builders and Construction Managers/Builders. These professionals must be working or have worked in various virtual project teams in the Middle East and were believed to provide valuable information needed for this research study. These respondents were sent a link to the online questionnaire instrument. A six-week period was given to the professionals, and after sending a series of reminders within the period, 403 responses were received. However, 80 responses found to be incomplete and unengaged were removed, leaving 323 valid responses for further analysis.

The respondents were asked to indicate the number of years they have been involved in virtual project teams in the Middle East. They had a great working experience in virtual project teams in the Middle East with an average of 6.9 years. Out of the 323 responses, 194 have Bachelor's Degree, 102 have a Master's degree, whereas only 27 reported having a diploma. This indicates that the respondents are graduates and can understand the research. The respondents obtained their experience from various countries in the Middle East, including Iraq, Kingdom of Saudi Arabia, Kuwait, Oman, Qatar and United Arab Emirates (UAE). The average size of virtual project teams in which respondents have worked comes out to be 9, with a minimum of 3 people and a maximum of 18 people in a team. This further validates that these teams are created on a need basis and are very specific to their job description. Average tenure of virtual project teams where the respondents have worked is only 3.05. Tenure refers to the average life of the team in years. This verifies the definition of virtual project teams, which says that virtual project teams are short-lived and are created only to fulfil specific projects in different

geographically dispersed locations (Hosseini & Chileshe, 2013; Jarvenpaa et al., 1998). Internal Consistency of Questionnaire Scale was computed using Cronbach's Alpha method. According to Nunnally (1978), a Cronbach's alpha score greater than 0.70 indicates that the data set has strong internal consistency and reliability. The Cronbach's Alpha (α) coefficient for the 25 scale-based questions achieves a high score of 0.799, indicating the study instrument's high level of consistency and dependability.

3.3 Analytical techniques

The Statistical Package for Social Sciences 21.0 was used to perform statistical tests, including reliability analysis (using Cronbach's alpha) and factor analysis. Reliability Analysis was used to determine the reliability of the data collected from the questionnaire survey. Reliability analysis was determined by the Cronbach's Alpha test, which is a measure of internal consistency and it checks how closely related a set of items are as a group (Santos, 1999). The factor analysis approach is frequently used to reduce a large number of interconnected variables to a small number of distinct groups (Brown, 2015). It is a multivariate statistical approach commonly used in construction management research to discover and understand non-correlated groups of components (Fang et al., 2004). Factor analysis helped to group various factors affecting virtual project teams of the construction sector in the Middle East.

4 Data analysis and Results

Exploratory Factor Analysis (EFA) was conducted to discover the measure's factor structure and examine its internal reliability. Principal components analysis was employed to uncover underlying grouped variables because of its simplicity and special feature of data-reduction capability for extraction. The total percentage of variation explained by each component was analysed to determine how many factors would be necessary to describe that set of data. Prior to running EFA, the researcher confirmed that all requirements were met. This study satisfied the variable to sample size ratio of 1:5 (Lingard and Rowlinson, 2006) with the variable to sample size ratio of 1:13. For the

extraction factors, the Kaiser–Meyer–Olkin (KMO) measure of sample adequacy and the Barlett’s test of sphericity can be employed. The KMO statistic has a value between 0 and 1. For a suitable EFA to proceed, the KMO value should be greater than the acceptable threshold of 0.5. (Norusis, 1993). KMO value is 0.828, which indicates a “good” degree of common variation and is considerably over the acceptable threshold of 0.50. Barlett’s test for sphericity is used to test the hypothesis that the correlation matrix is an identity matrix, indicating no relationship amongst the items (Pett et al., 2003). The value of the test statistic for Barlett’s sphericity is large (chi-square value = 2599.799), and the associated significance level is small (p -value = 0.000), implying that the population correlation matrix is not an identity matrix.

The Cronbach’s alpha reliability coefficient was used to assess internal consistency (reliability) between 0 and 1, based on the average inter-item correlation. The general guideline is that if the alpha value is more than 0.70, it may be inferred that the measuring scale used is trustworthy (Norusis, 1993). The total alpha value for the 25 factors was found to be 0.799 in this study, indicating a good internal consistency (reliability) in terms of the correlations among the 25 variables, and the measuring scale used is reliable. Oblique rotation technique was used because it is ideal for obtaining several theoretically significant variables (Hair et al., 1998), and the results are not complicated (Fabrigar et al., 1999). Promax is a popular oblique rotation approach that has been used by several researchers (Chan and Lee, 2009; Kärnä et al., 2009). As a result, the Promax rotation approach was eventually used in this study for further discussion.

The total variance explained (**Table 2**) is looked upon to determine the number of significant factors. It is important to note that only extracted and rotated values are meaningful for interpretation. The factors are arranged in ascending order based on the most explained variance. Seven main factors are significant. The extraction sum of squared loadings is identical to the Initial Eigenvalues, except for factors that have eigenvalues less than 1, which are not shown.

Please insert Table 2 here

The loadings of the factors determine the strength of the relationships. The largest loadings can identify factors, but it is also essential to examine the zero and low loadings to confirm their identification (Gorsuch, 1983). The reliability of the factor is determined by looking at the relationship between the individual rotated factor loading and the magnitude of the absolute sample size. The larger the sample size, the smaller loadings are allowed for a factor to be considered significant (Stevens, 2002). According to a rule of thumb, using an alpha level of .01 (two-tailed), a rotated factor loading for a sample size of at least 300 would need to be at least .32 to be considered statistically meaningful (Tabachnick & Fidell, 2007). The values represent the extent to which separate factors contribute to each underlying aggregated factor. The factor loadings and interpretation of the retrieved individual factors were found to be reasonably consistent. The pattern matrix (**Table 3**) shows the factor loadings of each variable on seven factors. This results from Promax rotation and suppressing small coefficients (less than 0.3), which helps in the interpretation. The factor loadings show that the factors are fairly desirable. The higher the absolute value of the loading, the more the factor contributes to the variable.

Please insert Table 3 here

The seven-factor groupings are labelled as shown in **Figure 1**. There are no rules for naming factors except to give names that best represent the variables within the factors. The reliability analysis test was performed for each group factor. The factor names were given by understanding the definitions of these variables. Again, Cronbach's Alpha (α) was used to test the reliability of each factor formed, as shown in **Figure 1**. It is believed that the seven-factor solution derived forms the underlying groupings for challenging factors for virtual team projects.

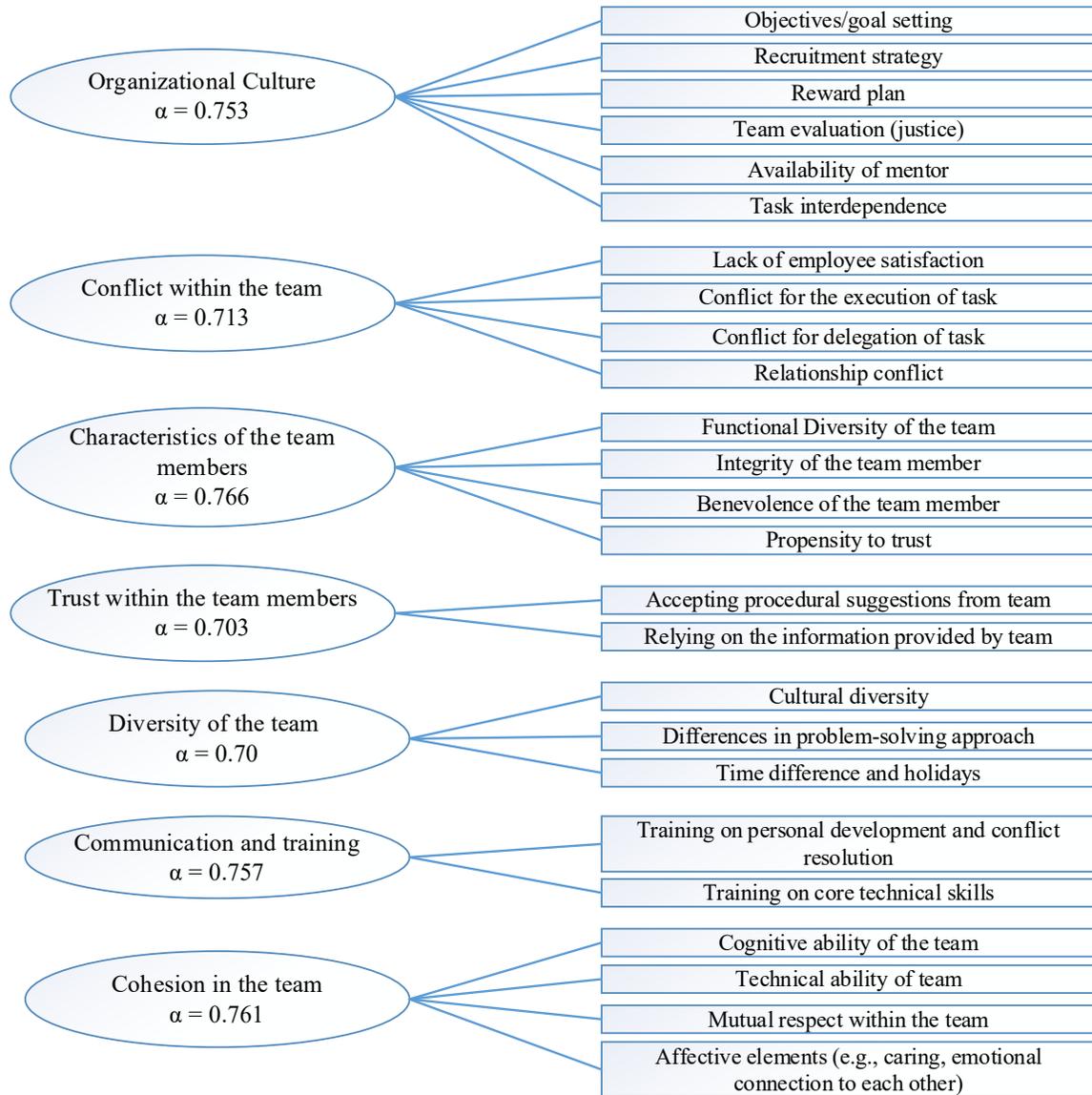


Figure 1: Group factors for challenges in virtual project teams

5 Discussion

This study identified factors that influence virtual teams in the construction sector. By applying factor analysis on the initial 25 items, the analysis produced seven major factors that could explain the challenges of virtual project teams in the construction sector of the Middle East. The factors are discussed further in the following details.

5.1 Organizational Culture

This factor consists of six sub-factors: objectives/goal setting, recruitment strategy, reward plan, team evaluation (justice), availability of mentor, and task interdependence. Organisational culture includes norms regarding the free flow of information, shared leadership, and cross-boundary collaboration. Organisations must provide the virtual project teams with appropriate physical, financial, and social support. These support systems should include evaluation and compensation systems, training development programmes, information systems that provide relevant, accurate and timely information for the group. The organisational culture becomes the motivational factor for the virtual project teams to develop confidence in the internal operational issues. This agrees with Katane and Dube, (2017), who emphasised the importance of organisational culture on the success of virtual project teams. Setting objectives or goals for effective virtual team management, having the highest loading of 0.833, is a challenging factor observed in construction organisations. Amah et al. (2013) found that goal setting improves performance by stretching the intensity and persistence of employee effort. The virtual team members channelise their behaviours' towards improved work performance when they have clearer role perceptions.

5.2 Conflict within the team

Four sub-factors, namely; conflict for the execution of task, conflict for delegation of task, relationship conflict, and lack of employee satisfaction that indicate a team conflict regarding virtual teams in the construction sector. These four sub-factors relate to task conflict and relationship conflict, aligning with Jehn (1997), who argued that intra-team conflict could be divided into two types: task conflict and relationship conflict. Disagreement in perspectives, thoughts about the substance and aim of the task, and attitudes on decision-making procedures are all examples of task conflict. Interpersonal friction and disagreement over personal concerns constitute relationship conflict. Members' tension, hostility, and irritability are all part of it. In this study, task conflict-related factors greatly influence virtual project teams in construction, having higher factor loadings of 0.760 (conflict for task execution) and 0.759 (conflict for delegation of task).

This agrees with Chidambaram and Jones (1993) who posited that virtual teams function more in task-oriented contexts and less in socially focused environments. The teams become more effective when they have well-defined tasks rather than unclear and ill-defined tasks (Amah et al., 2013).

5.3 Characteristics of the team members

The factor structure consists of four sub-factors that relate to the characteristics of the team members. The sub-factors include integrity of the team member, benevolence of the team member, propensity to trust, and functional diversity of the team. Among the sub-factors, integrity of the team member had the highest factor loading of 0.843. Integrity has always been a concern to various team members during virtual project teams. According to Mansor et al. (2012) and Morrison-Smith and Ruiz (2020), in a virtual team collaboration context, the team leader's integrity and zero tolerance for violations of commonly established ethical principles are critical in motivating other team members to accept responsibility for their decisions and actions and act in a trustworthy manner. The next highest factor loading is the benevolence of the team member with a value of 0.749.

5.4 Trust within the team members

This factor grouping consists of two sub-factors, namely, relying on the information provided by the team and accepting procedural suggestions from the team relating to trust within the team members. Among the two factors in this group, relying on the information provided by the team, recorded the highest factor loading of 0.876. Since most construction projects are unique and are usually one-off, it is difficult for team members to establish trust in virtual collaboration. This aligns with Garro-Abarca et al. (2021), who revealed that trust within the team is a major determinant of virtual team performance. Kuo & Thompson (2014) proposed that team members have little or no basis for judging the new teammate's trustworthiness because of a lack of past information about the individuals. Those team members who have this ability or willingness to trust are expected to engage in trusting behaviours because they are

especially inclined to trust teammates without knowing their trustworthiness and view new teammates as trustworthy based on limited information.

5.5 Diversity of the team

There are three sub-factors in this group, of which all factors relate to the diversity of teams within the virtual construction arrangements. The sub-factors include cultural diversity, differences in a problem-solving approach, and time differences and holidays. Diversity or group heterogeneity results in increased conflict among team members and affects the team's performance (Paul & McDaniel, 2004). Differences in the problem-solving approach recorded the highest factor loading of 0.721 in this factor grouping. Construction is a multi-stakeholder sector involving various professionals with diverse perspectives to solve problems. Hence, it becomes more difficult to get team members to agree especially when working virtually. The cultural diversity and communication barriers result in weakened team performance resulting in project complexity (Dube & Pare, 2001). Hosseini et al. (2016) claimed that diversity in culture and language have a negligible impact on virtuality in construction project teams because participants often speak technical language. Another important sub-factor is time difference and holidays. Gustavo et al. (2012) proved that when time zones are not overlapping between regions, it reduces communication between the teams.

5.6 Communication and training

This component emphasises the challenges associated with communication and training to managing virtual project teams in the construction industry. Training on personal development and conflict resolution and training on core technical skills are the two sub-factors in this grouping. Communication is key in virtual project team management. However, communication becomes a challenge in the virtual environment due to time delays in sending feedback, lack of a common frame of reference for all members, differences in salience and interpretation of a written text, and assurance of participation from remote team members (Amah et al., 2013). This challenge could be compounded by the lack of training needed by team members for effective communication. Training is

one of the requirements to work virtually in a collaborative fashion (Iorio & Taylor, 2015). Amah et al. (2013) suggested that the training makes employees good team players and helped them acquire skills and experiences. The training also could allow employees to experience the satisfaction that teamwork can provide. Cheng et al. (2021) revealed that computer training related to more advanced skills sets might help build virtual team efficacy in the case of collective computer efficacy.

5.7 Cohesion in the team

This factor consists of four sub-factors related to cohesion in the team, including cognitive ability of the team, technical ability of the team, mutual respect within the team, and affective elements (e.g., caring, emotional connection to each other). Cognitive and technical ability are related to task cohesion, while mutual respect and affective elements are socially related. Group cohesion is one of the determinants that can directly affect the virtual team's performance (Garro-Abarca et al., 2021). Hence, cohesion (both social and task) must be developed and strengthened for effective virtual teamwork (Lu, 2015). Given that construction projects are short-lived, it is difficult to develop bonding among team members for shorter projects as the deadline for the project does not give them enough time to bond. If the projects are for longer durations, initially, the virtual teams begin with lower cohesion, then they develop the bonding over a period of time. This is because they get enough time to exchange social information to create stronger cohesion. Therefore, time factor plays a great role in developing cohesion among the team members (Chidambaram, 1996).

5.8 Implication of findings

Organisations are increasingly leveraging advancement in communication technology to improve performance by forming virtual teams and construction organisations are not excepted. When experts and valued members of organisations are geographically located at distant, the formation of virtual teams allows organisations to access information, skills, and views that would not be available through traditional team formation. To meet the demands of today's hypercompetitive global economy and high rate of infrastructural development in the Middle East, virtual teams will enable construction companies to

aggregate the capabilities of their own personnel as well as those of trade partners and consultancy firms. Nonetheless, despite the availability of technology to support remote operations of experts, virtual teams frequently fail to achieve their full potential due to challenges some of which have been discussed in this study. Unlike traditional team, in virtual team arrangement, organisations structure their duties through networks of teams, which poses managerial issues that are distinct from those seen in traditional hierarchical relationships. Since team members work remotely from the construction site, their manager, and one another, typical social and cultural norms for influencing team members' attitudes and fostering cooperative conduct are unavailable. Moreover, in virtual teams, especially with construction projects, it is difficult to observe the progress made by team members directly. Establishing trust in virtual teams can be more difficult in construction project teams due to the one-off nature of most projects as members may have no past to draw on, no future to look forward to, and may never even meet face-to-face. To this end, an understanding of factors affecting virtual team's development will help construction managers, team leaders and members to facilitate and improve team success.

6 Conclusion

The vast majority of individuals participating in collaboration, equipped with knowledge of what makes virtual teams unique and the essential instruments for increasing virtual team performance, are expected to benefit greatly from virtuality. Because of globalisation, construction companies have realised the importance of virtual project teams and started implementing them. However, many of them have realised the challenges associated with virtual project teams and hence wanted to address this issue. Therefore, this study helped to understand the concept and challenges of the virtual project teams in the construction sector. The paper adopted a questionnaire survey on targeted professionals with virtual project team experience to evaluate 25 variables extracted from the literature review. The factor analysis technique (principal component analysis) was used to establish the factor structure for the set of 25 variables. The results indicate seven clusters of factors affecting virtual teams: organisational culture, conflict

within the team, characteristics of the team members, trust within the team members, diversity of the team, communication and training, and cohesion in the team.

This research has several implications for the Middle East construction companies. Most construction companies are involved in large infrastructural projects involving many professionals and stakeholders with different backgrounds and perspectives. Virtual teams must develop mechanisms for eliminating challenges to leverage experiences and insights critical for accomplishing project goals. Organisations embracing virtual teams must overcome coordination barriers of working across distance and time, engaging cross-cultural and team diversity, establishing trust and team cohesion as team members having minimal opportunities to identify common values, such as construction projects, and numerous other challenges associated with virtual work. This study would benefit construction professionals by educating them on the steps necessary for greater team cooperation in virtual teams. The factors will drive the needed platform to support effective virtual project teams in the Middle East. The study has some limitations that may affect its generalisability. First, based on experts' opinions, only 25 variables are taken from the list of forty factors extracted from the literature for the study. These variables can be extended. More experts can be invited and engaged in qualitative research to understand their challenges in different regions. Second, the overall analysis ignored the sensitivities of the challenging factors to different construction project types and territories in the Middle East; thus, bespoke studies may have to be conducted in different regions and tailored for specific projects. The study has several implications for research as it is the first to study the factors affecting virtual project teams in construction in the Middle East. Countries in the Middle East can contextualise the findings in the study, which provides a valuable reference for further contextual investigations in different regions. In this era of Covid-19, virtual environments are revolutionising the factors affecting team performance, and more research is needed to address this revolution.

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