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## CIVIL & ENVIRONMENTAL ENGINEERING | RESEARCH ARTICLE

# Causes of delay in residential construction projects in Cambodia

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**Abstract:** Construction industry is one of the significant contributors to the economic growth and development of Cambodia. Two major challenges are limiting the performance of the construction industry in Cambodia, which are poor cost and schedule performance of the construction projects. Therefore, the aim of this study is to fill an important knowledge gap by identifying the various attributes for construction project delay, using the residential building projects as a starting point. Feedback from a survey administered to the contractors and consultants was analysed using Relative Importance Index (RII). Results showed that shortage of materials on site; unrealistic project scheduling; late delivery of material; shortage of skilled labour; complexity of project; labour absenteeism; late payment by the owner for the completed work; poor site management; delay by subcontractor; accidents due to poor site safety are ranked by the contractors and consultants as the main causes of project delays in Cambodia. Construction frontline players are recommended to put their efforts on the identified key factors in relation to their magnitudes of influence. By doing so, the causes of project delays in the Cambodia's construction and real estate sector could be significantly reduced or controlled, which will ultimately lead to the on time project completion.

### ABOUT THE AUTHORS

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### PUBLIC INTEREST STATEMENT

Construction industry is one of the important contributors to economy and development of any country. It plays a significant role in providing the required infrastructure to improve the quality of life. Despite its proven significance, most of the construction projects (both in developing and developed countries) faced schedule delays, which makes it a chronic problem in global manner. Similarly, due to the poor schedule performance management, the construction projects in Cambodia are also experiencing project delays, which have to be controlled, as it will lead to a poor quality of work due to hurry. Therefore, identification of the causes of construction project delay is significant; this way, the construction industry players can focus their efforts and resources to addressing the most affective causes for optimum and time-effective results.

**Subjects: Construction Management; Building Project Management; Construction Business Management**

**Keywords: project delays; construction; Cambodia; residential projects; scheduling**

## 1. Introduction

Construction industry is one of the significant contributors to the economic growth and development of Cambodia (Council for the Development of Cambodia [CDC], 2015). Due to its forward and backward linkages with other industries (Durdyev & Ismail, 2012), construction industry plays a very important role in providing the required infrastructure to improve the quality of life. Sustainable development of construction industry is therefore important (Enshassi & Ayyash, 2014), which has a multiplier impact on the wider economy (Durdyev & Ismail, 2016). Construction industry contributes approximately 30.1% to the GDP of Cambodia, and moreover has been generating about one fourth of an employment since 2007 (Durdyev, Omarov, & Ismail, 2016). However, strong evidence shows the performance inconsistency of Cambodian construction projects and the trend is growing rapidly. Two major challenges are limiting the performance of the construction industry in Cambodia, which are poor cost and schedule performance of the construction projects (CDC, 2015).

Along with cost and quality, project schedule is considered to be the most significant aspect of the construction management life cycle and as one of the main drivers of the project success. Notwithstanding its proven significance, most of the construction projects (both in developing and developed countries) faced schedule delays, which makes it a chronic problem in global manner (Doloi, Sawhney, Iyer, & Rentala, 2012; Kaliba, Muya, & Mumba, 2009). Similarly, due to the poor schedule performance management, the construction projects in Cambodia are also experiencing project delays, which have to be controlled, as it will lead to a poor quality of work due to hurry (Kikwasi, 2012).

Delay is defined as a time overrun beyond the project completion date agreed by the parties (Assaf & Al-Hejji, 2006). Delay may also be defined as act or event, which extends required time to deliver work of the contract, manifests itself as additional days of work (Zack, 2003).

Construction project delay has been a research topic for decades and several studies have investigated causes of delays in other countries (Assaf & Al-Hejji, 2006; Doloi et al., 2012; Haseeb, Xinhai-Lu, Bibi, Maloof-ud-Dyian, & Rabbani, 2011; Ogunlana, Promkuntong, & Jearkijrm, 1996). However, most of those studies are area specific. Therefore, applicability of such research in the construction context of Cambodia still remains unexplored, which limits the resources of the industry operators to addressing the myriads of causes of delays presented in the literature. The identification of the fewest number of causes of project delays is of importance; this way, the frontline players can focus their efforts and available resources to addressing the most affective causes for optimum and time-effective results. The aim of this study is to fill an important knowledge gap by identifying the various attributes for construction project delay and it will be limited to residential building projects in Cambodia. The remainder of this research paper is structured as follows. The paper starts with the review of the previous studies that have been undertaken in other countries, continues with the methodology adopted in this research, presents the research findings after application of statistical methods and consequently offers some conclusions and recommendations geared toward controlling and reducing the delays in residential projects in Cambodia.

## 2. Literature review

Delay in construction projects has been attracting attention of the researchers for decades. There are two types of researches conducted in this area. The first one relates to factors that cause construction project delays, while the second one consists of analysis of reported project delays. However, in their studies conducted for the specific locations, Iyer and Jha (2005), Sambasivan and Soon (2007) and Abd El-Razek, Bassioni, and Mobarak (2008) reported the complexity of the delay analysis. Therefore, literature focusing upon project delay factors found to be relevant to this research is reviewed below.

**Table 1. Project delay causes**

No	Causes of delay	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Unrealistic project scheduling	*	*								*	*				
2	Frequent breakdowns of construction plant and equipment		*	*	*						*	*	*			*
3	Late payment by the owner for the completed work				*	*			*	*		*	*			
4	Poor site management	*	*		*	*			*	*	*	*	*			
5	Delay by subcontractor	*			*											
6	Conflicts in subcontractors schedule	*														
7	Rain effect on construction activities		*	*									*			
8	Price fluctuations			*			*				*		*			
9	Imported materials										*					
10	Shortage of skilled labour	*	*	*	*	*	*	*	*	*	*	*	*			
11	Legal disputes		*					*				*				
12	Bad weather conditions	*	*	*				*				*		*		*
13	Rework due to the construction errors	*	*	*	*	*	*	*	*	*	*	*	*			
14	Poor labour productivity	*	*	*	*	*	*	*	*	*	*	*	*			
15	Shortage of materials on site	*	*	*	*	*	*	*	*	*	*	*	*			*
16	Unskilled equipment operators										*	*	*			
17	Accidents due to poor site safety						*	*			*	*	*	*	*	*
18	Project size													*	*	*
19	Poor communication and coordination	*	*	*	*	*	*	*	*	*	*	*	*			
20	Unavailability or delay of utilities in site	*			*	*	*	*	*	*	*	*	*			
21	Poor ground conditions	*	*	*	*	*	*	*	*	*	*	*	*			
22	Complexity of project													*	*	*
23	Delays in obtaining permit from municipality						*	*						*	*	*
24	Lack of labour supervision						*	*								
25	Construction method		*	*	*	*	*	*	*	*	*	*	*	*	*	*
26	Labour absenteeism				*	*	*	*	*	*	*	*	*	*	*	*
27	Lack of high-technology mechanical equipment		*	*	*	*	*	*	*	*	*	*	*	*	*	*
28	Late delivery of material	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
29	Effect of social and cultural factors	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
30	Design changes	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
31	Personal conflicts among labours	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

Notes: (1) Assaf and Al-Hejji (2006); (2) Odeh and Battaineh (2002); (3) Owolabi et al. (2014); (4) Sambasivan and Soon (2007); (5) Haseeb et al. (2011); (6) Aziz (2013); (7) Fugar and Agyakwah-Baah (2010); (8) Orangi, Palaneeswaran, and Wilson (2011); (9) Kazaz, Ulubeyli, and Tuncbilekli (2012); (10) Oguntana et al. (1996); (11) Sunjka and Jacob (2013); (12) Santoso and Soeng (2016); (13) Abd El-Razek et al. (2008); (14) Songer and Molenaar (1997); (15) Odeyinka and Yusuf (1997).

Sambasivan and Soon (2007) identify and evaluate the most significant causes of project delay in Malaysian construction industry, which are improper planning, poor site management, inadequate experience of the contractor, inadequate finance of the client and payments for completed work, problems related to subcontractors, material shortage, labour supply, availability and failure of equipment, lack of communication between parties and mistakes during the construction stage.

Al-Kharashi and Skitmore (2009) identify leading causes of construction project delay in Saudi Arabia by conducting a questionnaire survey administered to contractors, consultants and clients. They conclude that the most two significant causes of project delay are lack of finance to complete the work by the client and delay in progress payments by the owner.

Haseeb et al. (2011) conduct a research on the causes of delay in large construction projects in Pakistan, where the following factors are reported to be the most influential: natural disaster; financial and payment problems; improper planning; poor site management; insufficient experience; shortage of materials and equipment.

Doloi et al. (2012) report the factors affecting project delays in Indian construction projects by surveying construction professionals in India. After the factor analysis the most influential factors of project delay were identified as follows: lack of commitment; inefficient site management; poor site coordination; improper planning; lack of clarity in project scope; lack of communication; and sub-standard contract.

Based on the 5,424 scheduled activities, Lindhard and Wandahl (2014) investigate the principal causes of project delay in Denmark construction projects through the Last Planner System theory. The most frequent causes of project delay are found to be connecting work, change in work plans, workforce, external conditions, material and construction design.

Santoso and Soeng (2016) have conducted a research on the causes and effects of delay in road construction projects in Cambodia. Based on the importance index of the factors rated by the contractors, consultants and clients, the top ten factors found to be related to the contractor and project. In addition, rain and flood factors were also found to be significantly influencing on the main objectives of construction projects, which are time, cost and quality. Thus, a literature review as depicted in Table 1 has been carried out as the basis for the efforts to identify the main causes of delay in construction projects.

Based on the review of relevant literature, it can be seen that several studies have identified and evaluated causes of project delay in other countries (Doloi et al., 2012; Haseeb et al., 2011; Lindhard & Wandahl, 2014; Sambasivan & Soon, 2007). The only study (Santoso & Soeng, 2016) has identified causes of project delay in Cambodia, which has analysed the delay factors in road construction projects. However, the research findings in other countries and in different project types may not be completely applicable to the nature and scope of this research, as the socio-cultural, regulatory, legislative environment and project specific issues may vary from country to country and from project to project (Mbachu, 2011). Therefore, this study aims to fill an important knowledge gap by identifying and evaluating the causes of delay in residential projects in Cambodia, this way, the frontline construction players can focus their efforts to addressing the most affective factors for optimum and time-effective results.

### 3. Research methodology

This study adopts a questionnaire survey technique to investigate the main causes of project delay in construction industry of Cambodia. There are historically proven two main reasons that are make this method difficult: being highly labour intensive on the part of respondents and particularly on the part of the researcher and being difficult to design, which requires many amendments before an acceptable questionnaire is produced (Fellows & Liu, 2008). However, even there are some consequences (such as low response rate), this method is selected as an appropriate one because it helps to gather

more information for relatively cheap cost administration by post or email/web to respondents. The mode of administration of the questionnaire to the respondents is very crucial to avoid low response rate, notably for postal questionnaires, which can expect a 25–35% useable response rate. Therefore, this study administered questionnaire surveys using web domain (Survey Monkey), which allows large number of participants in a wider geography or organization coverage (Durdyev & Mbachu, 2011).

Prior to the distribution of questionnaire, a small group of respondents in the pilot survey is questioned before the actual questionnaire is administered. A pilot survey was conducted with a convenience sample of two contractors and two project managers that were willing to devote quality time for in-depth interviews. This helped to improve the quality of the questionnaire design and its appeal for optimized response rate. The open-ended sections of the questionnaire served to explore further constructs which were not included in the subsets of variables for rating.

However, even the pilot survey determines the data reliability or relevancy to the industry, it is mandatory to analyse the reliability of the data using the Cronbach's alpha method based on internal consistency (Tavakol & Dennick, 2011). The following equation helps to calculate the Cronbach's alpha:

$$\alpha = \frac{k}{k-1} \left( 1 - \frac{\sum V_i^2}{V_x^2} \right) \quad (1)$$

where  $k$  is the number of items;  $V_i$  is the variance of scores on each item;  $V_x$  is the variance of the observed total test scores.

Statistical Package for the Social Sciences (SPSS V20) was used to compute the Cronbach's alpha, where the reliability coefficient was calculated as 0.910, which shows the internal consistency of the data (George & Mallery, 2003).

As part of its aim, this study analyses the impact level of the causes of project delay in Cambodian construction industry. To achieve this aim, a Relative Importance Index (RII) is chosen as an appropriate analytical method (Doloi et al., 2012). It analyses the ratings received through the questionnaires and establishes a mean rating point, which represents rating for each group participants. As it is shown in the following equation, in every computation, the responses for every single cause are used to calculate the percentages of respondents associating a particular rating point to each cause (Tam, Zeng, & Deng, 2004).

$$RII = \frac{\sum W}{A \times N} \quad (2)$$

where  $W$ , represents the rating given to each factor by the respondent, where 1 is for very low impact, 2 is for low impact, 3 is for medium impact, 4 is for high impact and 5 is for very high impact.  $A$  is the highest weight (5 for this study) and  $N$  represents the total number of samples.

## 4. Results

### 4.1. Survey results

Invitations to participate in the survey were extended to the 75 contractors and consultants registered with the Cambodia Constructors Association. By the cut-off date set for the survey, 48 usable responses were received; this represented approximately 64% usable response rate, which is perceived as adequate for analysis and reporting the findings of this research (Miller, 1991). In the questionnaire survey method, background of the respondents signifies the data reliability. Thus, detailed analysis of the demographic profiles of the respondents showed that the majority (i.e. 65%) occupied high-ranking positions as project managers, directors or associate directors with approximately 10 years of work experience in the construction industry of Cambodia. The highly experienced profile of the respondents added to the quality of the feedback and the findings of the study.

#### 4.2. Causes of delay in Cambodian residential projects

There are a variety of possible causes for the delays in the Cambodian residential projects. Therefore, there is a need to focus on evaluating key problems within the construction industry and opportunities for reducing or taking a control on the project delays.

As part of the aim of this study, causes of project delay in Cambodian construction industry are identified, evaluated and categorized under five major groups (material and equipment, management, workforce, project and external). These identification and evaluation are carried out through the primary and secondary data collection methods as well as validated via statistical techniques. On the basis of ranking of the causes it was possible to evaluate the most important ones that influenced project time. To this end, the RII of the 31 factors causing delay in the residential projects of Cambodia are determined and presented (refer to Table 2), and in order to validate the results, they are compared to the findings of the relevant researches conducted in other countries.

**Table 2. Rank of all the causes of project delays**

Causes of delay	RII	Rank	Category
Shortage of materials on site	0.88	1	Material and equipment
Unrealistic project scheduling	0.88	2	Management
Late delivery of material	0.83	3	Material and equipment
Shortage of skilled labour	0.81	4	Workforce
Complexity of project	0.81	5	Project
Labour absenteeism	0.81	6	Workforce
Rain effect on construction activities	0.80	7	External
Design changes	0.79	8	Project
Delay by subcontractor	0.77	9	Management
Accidents due to poor site safety	0.76	10	External
Poor communication and coordination	0.75	11	Management
Project size	0.74	12	Project
Conflicts in subcontractors schedule	0.73	13	Management
Late payment by the owner for the completed work	0.73	14	Management
Price fluctuations	0.73	15	External
Poor site management	0.73	16	Management
Imported materials	0.72	17	Material and equipment
Frequent breakdowns of construction plant and equipment	0.72	18	External
Delays in obtaining permit from municipality	0.72	19	External
Legal disputes	0.71	20	External
Bad weather conditions	0.71	21	External
Rework due to the construction errors	0.71	22	Management
Poor labour productivity	0.70	23	Workforce
Unskilled equipment operators	0.70	24	Workforce
Unavailability or delay of utilities in site	0.70	25	External
Poor ground conditions	0.69	26	External
Lack of labour supervision	0.68	27	Management
Construction method	0.66	28	Management
Lack of high-technology mechanical equipment	0.62	29	Workforce
Effect of social and cultural factors	0.59	30	External
Personal conflicts among labours	0.56	31	Workforce

The result shows that several significant factors causing project delay in residential construction projects in Cambodia. The most ten influential factors agreed by the contractors and consultants as the main causes of project delays are: shortage of materials on site; unrealistic project scheduling; late delivery of material; shortage of skilled labour; complexity of project; labour absenteeism; rain effect on construction activities; design changes; delay by subcontractor; accidents due to poor site safety.

Respondents ranked the shortage of materials on site and late delivery of material as the first and third of the most influential cause responsible for project delay among the thirty-one factors, respectively. This outcome substantiates the findings of Fugar and Agyakwah-Baah (2010), who ranked the aforementioned factors as one of the most influencing causes of construction project delay in Ghana. This is not surprising because Cambodian construction industry is dependent on the export materials (i.e. cement, reinforcement) mainly from Thailand, Malaysia and Vietnam, which occasionally may cause material shortage on market and ultimately the availability of materials on site. In addition, in order to supply construction material on time, providence of material plays a significant role.

The second most significant factor responsible for project delays in residential projects is an unrealistic project scheduling. Unrealistic scheduling arises from the acceleration in the project schedule due to the delays in the construction activities and may increase the expectations on labour performance and may cause frequent disruptions in site management due to the delays in tools, equipment and material supply. High expectation on labour performance, which can be referred to working overtime, can cause the following problems: labour's physical fatigue, which ultimately will demotivate due to poor mental attitude of the workforce. Eventually, all of this will not only be affecting labour performance level, but also quality level of output due to the poor workmanship, which is therefore rework, project time and cost overruns. This result agrees with the findings of several researches conducted in different countries to evaluate the most significant causes of project delays (Frimpong, Oluwoye, & Crawford, 2003; Ren, Atout, & Jones, 2008).

Shortage of skilled labour ranked as the fourth most significant cause of project delay in the Cambodian residential projects. Although construction industry employing advanced technology, it continues to be a labour-intensive industry, where labour skill beyond any doubt is the key player of the project success. Improvement in the labour quality and therefore efficiency will certainly reflect to the construction project success. Most of the workers in the Cambodian construction projects are from the rural areas of the country and the majority of them are unskilled. On the other hand, the majority of the quality workforce (engineers, project managers, quantity surveyors) is from South Korea, China, Singapore and Thailand. Dependence on temporary foreign workers does not improve the quality of the local workers and this causes shortage of labour pool in the construction industry.

Respondents ranked complexity of project factor as the fifth most significant cause of project delay in the residential projects in Cambodia. This result agrees with the findings of Miterev and Nedelcu (2011) that complexity of project in a holistic sense represents a necessary condition for project delay. Project complexity can be defined in terms of its size or design specifications. Construction projects with degree of complexity usually have complex plans and schedule. This has to be vigorously done or it could lead to change orders, which is ultimately could lead to project delay. To reduce or eliminate the effect of project delay due to project complexity, careful planning considering every significant aspect of the project scope (i.e. milestones, delivery time, method) has to be carried out, which obviously needs experience and expertise.

Labour absenteeism ranked as the sixth most influential cause of project delay in the Cambodian residential projects. This result is justified, as the absence of the labour will cause delays in on-site activities and cause low performance of a labour, which will consequently affect total project duration. Due to the following reasons labour absenteeism does frequently happen in Cambodian construction projects: socio-cultural life style; low labour profile employed in the construction projects; living far away from the construction site; lack of labour commitment toward the project he or she is working for; and weather conditions (particularly during the rainy season).

Rain effect on construction activities ranked as the seventh most significant cause of project delay. Although residential building projects do not involve open-space construction activities as much as road construction works do, due to the heavy rains, construction projects cannot be executed at their full performance from May to October. Flood occurs almost after every heavy rain in the country, which leads to the failure of infrastructure and ultimately disturbs the transportation of materials and equipment on site. Therefore, it is justified that rain effect was ranked in the top-10 causes of project delay in residential construction projects in Cambodia. During the planning and execution stages of the residential project, construction forefront players are recommended to consider the impact of heavy rain seriously. Moreover, in order to avoid project execution during the rainy season, the development stage of a project has to be well planned or at least schedule those construction activities will be minimally affected by the rain.

Design change is defined as a change in the project design after award of a contract and it is found to be a very common problem in the construction projects, which is ultimately lead to excessive disputes and delays in project schedule (Mahamid, Bruland, Dmaidi, 2012). Design changes during the execution of any construction project may be originated due to the various reasons. The main reasons of design change identified by researchers are extra task by client (Austin, Baldwin, & Steele, 2002), poor communication between parties, conflicts (Love, Holt, Shen, Li, & Irani, 2002) and the financial aspect (Ssegawa, Mfolwe, Makuke, & Kutua, 2003), which ultimately affect the on-time completion of construction project. There are several projects in Cambodia, which unfortunately has not been reported, faced delays in their project schedules due to the one of the aforementioned reasons of design change while execution. Hence, it is reasonable that contractors and consultants have assessed design changes factor as one of the top-10 causes of project delay in residential building projects in Cambodia.

Factor named “delay by subcontractor” ranked as the ninth most significant cause of delay in the residential projects in Cambodia. This result agrees with the findings of Haseeb et al. (2011) that any delay caused by any subcontractor, depends on its size, may affect subsequent construction activity or may lead to a short-term stoppage of other project activities. Subcontractors play a significant part in the success of any construction project and typically clients view them as an extension of the main contractor. Therefore, any delay originated from any of the appointed subcontractor can adversely affect contractor’s on-time project completion. Unfortunately some main contractors in Cambodia do not really manage subcontractors. Instead, they step aside and leave them to carry on their job as best they can. However, before the show up of subcontractors to the construction site, they have to be briefed about the scope of their work, which shows the significance of communication between the parties. Even if it will cost more, it is recommended to choose subcontractor with better qualification and experience, as the cheapest subcontractor may actually end up delaying and costing the project more.

Major causes of construction site accidents are due to the industry’s unique nature (i.e. difficult site conditions, lack of attention to site safety and poor safety management), which therefore makes it one of the most hazardous industries (Farooqui, Farrukh, & Rafeequi, 2008). Accidents due to poor site safety can reduce the work rate and efficiency, which will lead to work disruption and ultimately to project schedule delay. This is because construction site accident causes loss of labour productivity and morale until the normal site working rhythm got at. The Cambodian workforce in general characterized by low levels of education and skills (Noun & Serrano, 2010). As a result, most of the labours are working in poor conditions with a challenging safety and health environment. The number of reported construction accidents in Cambodia is still limited in spite of the hazardous nature of the construction industry (Bronh, Cawdu, & Choeung, 2012). Most of the cases are closed after the compensation of the labour, and there are no further reports from such cases. Hence, the ranking of this factor as one of the top-10 significant causes of project delay is justified.

**Table 3. Spearman’s rank correlation between the respondents**

	Consultants (%)	Contractors (%)	Overall (%)
Overall	91	93	100
Contractors	82	100	-
Consultants	100	-	-

#### 4.3. Spearman’s rank correlation

The Spearman’s rank correlation (Fellows & Liu, 2008) indicates the level of agreement on the ranking among groups of respondents participating in the study. It can be calculated using Equation (3):

$$\rho = 1 - \frac{6 \times \sum d^2}{n(n^2 - 1)} \tag{3}$$

where  $\rho$  = level of consensus between each pair of groups ( $0 \leq \rho \leq 1$ );  $d$  = difference in the ranking of a cause; and  $n$  = number of ranking places (in this case 31).

Table 3 presents the calculated correlation among the various groups of respondents.

The highest correlation (93%) was found between the contractors and the overall respondents. This indicates that contractors really understand the overall situation on the construction site, and that they alone can possibly provide fairly accurate initial results in future pilot studies, saving time, efforts, and resources otherwise required for a full-scale study.

The second highest correlation (91%) was found between the consultants group and the overall respondents.

The lowest correlation (81%) was found between the contractors and consultants, who have different views and different approaches.

#### 5. Conclusion

This study has investigated the key causes of delays, which are specific to the operational and socio-cultural context of the Cambodia’s residential building sector. Feedback from a survey administered to the contractors and consultants was analysed using a RII. Results showed that the most ten influential factors agreed by the contractors and consultants as the main causes of project delays are: shortage of materials on site; unrealistic project scheduling; late delivery of material; shortage of skilled labour; complexity of project; labour absenteeism; rain effect on construction activities; design changes; delay by subcontractor; accidents due to poor site safety, which were extracted from 31 identified causing variables.

Demographic background of the respondents and previous studies within the similar scope justifies the reliability and validity of the design and the findings of this research, respectively. Internal consistency of the causes of project delays was also tested and validated via Crobbach’s alpha. Results of the tests confirmed the reliability and validity of the research design and the findings.

In accordance with the research findings, the following ways of reducing project delays are recommended:

- Ensure timely delivery of materials on construction site
- Detailed and realistic work schedule for site supervisors to be able to follow and coordinate the activities

- Improvement of workforce resource through various educations and trainings
- Development of human resource capabilities and capacities in the construction industry
- While increasing the local workforce capacity, the use of foreign labour is necessary
- Selection of the appropriate workforce to control certain activities
- Usage of electronic technologies to monitor workforce present, as well as their performance
- Creating an activity based plan and schedule those activities which are suitable to be carried out outside during the rainy season period
- More complete job of defining scope, objectives and long-term plan. Concretely defined plans and goals will limit design changes
- Choose the subcontractor with a better qualification and experience
- Subcontractors have to be briefed about the scope of their work and properly managed by the contractor
- Site conditions have to be improved in order to reduce the number of construction accidents
- The workforce has to be trained with construction site health and safety regulations

In addition to the aforementioned recommendations, contractors, project managers and clients are recommended to put their efforts on the identified key factors in relation to their magnitudes of influence. By doing so, the causes of project delays in the Cambodia's construction and real estate sector could be significantly reduced or controlled, which will ultimately lead to the on time project completion. However, effects of delays on project cost and quality should also be considered as part of the whole process to successfully complete the construction project. Hence, this will enhance the sector's performance and consequently contribution to the nation's economy.

Finally, the major contribution of this study to the global construction management community is identification and ranking of the causes of project delay in construction pertaining to any local circumstances. A major part of the problem related to project delays could be prevented by identifying the vital few root causes and minimizing them.

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