

## **CHAPTER 5**

### **CONCLUSIONS AND RECOMMENDATION**

#### **5.1 Conclusion**

Several research studies have been published conducting on the topic of factors leading to cost overruns in both developed and developing countries because this phenomenon is well known as the global issues and challenges in the construction industry. Most of the literature identified the factors by using the analysis in regression method or mostly in important index analysis. The finding of cost overrun issues in ASEAN region have been studied since 1996 such as in Thailand, Indonesia, Vietnam, and Malaysia. The authors have explored the different significant factors regarded to the nature of construction situation in their country. Similarly, extending the finding of correlation for cost overrun factors, this study aimed to explore the relationship and correction between indicators, key factors which contribute to cost overruns in Cambodian construction industry.

The result of data analysis is based on the contractor and consultant's perspective who involved yearly in construction projects in Cambodia. A total of 95 datasets was collected during 3 months from the direct interview at the construction sites as well as the online survey via the google form. However, only data-sets of 87 respondents are the valid response as input for the final structural equation modeling via AMOS version 20.00 incorporated with program SPSS.

There are twenty-nine factors selected for the initial structural model. Yet, the final model is satisfied with only 25 factors being analyzed with the 87 sample data. After random structure, the result of final model indicates that the key factor contractor-related factors is supported by improper planning and scheduling, delay of material and equipment delivered by suppliers, lack of experienced contractor and sub-contractor, poor project controlling, poor in site arrangement, management and supervision, accident at the workplace, poor labor productivity, mistake and rework during construction, machinery and equipment breakdown. The owner-related factors are poor contract management between owner and contractor, design changes and changes in scope, additional works required from the owner, late progress payment by the owner for completed work, and delay of approval from owner. The bidding environment represents for insufficient of project's information, inadequate of tender documents, complexity condition of project type, bidding tender to the lowest price (suicide tendering), and inaccurate cost estimation. The last group is external influence refers to shortage and price fluctuation of material, unsettlement of forecast exchange rate, unpredictable/bad weather condition, local concerns and requirements, and political situation.

Addition to identifying factors, the structural equation model of cost overrun factors contains two principal components, the sub-structure represented by the concept of confirmatory model analysis (CFA), while the main structure is appeared in the structural model (causal model) with four latent constructs. In the final satisfied model, the endogenous variables getting an effect from the others are cost overruns, contractor-related factors, owner-related factor, and bidding

environment, except external influence being an exogenous variable which affects to the others.

Inclusion, the final structural equation model of cost overruns was derived following the satisfactory criteria on GOF measurement and hypothetical test, the research study resulted in that

1. Contractor-related factors were found, with a positive path loading coefficient, as the most significant factor leading to cost overruns in Cambodian construction projects. The factor caused by contractor is found to be due to mistake during construction which is the first significant factor, then poor labor productivity, poor in site arrangement, management and supervision, accident at workplace, poor project controlling, absence of managerial program in saving materials inside the site, lack of experience contractor and sub-contractor, machinery, and equipment breakdown, improper planning and scheduling, and delay of material-equipment deliver are respectively performed.

Secondly, the owner-related factors were found, with a negative path coefficient, as the most significant factor leading to cost overruns. According to contractor's perspective, this means that the additional cost required for any works suggested by owner is responded by the owner themselves (cost overruns on owner) since the contractors have to submit a variety order (VO) regarded with the changes of work scope or design. Thus, the contractors might face a lower probability of occurrence of cost overruns for their profits.

In summary, the owner's influence is found to be due to additional works required by owners, design change and changes in scope, late progress payment by

the owner for completed work and delay of approval from owner and contractual claims by poor contract management between owner and contractor.

2. In Cambodia, the contractor-related factors have an impact with a positive influence and the owner's influence have an impact on inversely affect to cost overruns regarded to the perspective of contractors. Traditionally, external influence in term of shortage and price fluctuation of material, unpredictable/bad weather condition, local concerns and requirement and political have been weighted for the construction delay and additional cost. However, the finding reveals that the external's influence does not directly affect to cost overruns. As results, it has a significant impact on bidding environment. The third key factors bidding environment also has a direct impact on owner-related factors and, it similarly found that the owner-related factors have a relation to contractor-related factors.

Cambodian construction industry is facing a challenge with cost overruns for decades. The top three of significant factors caused by the contractors are the mistake and rework during construction, poor labor productivity and poor site management, arrangement and supervision. The top three factors found are verified to the real situation. The mistake for construction is due to the contractors themselves and it will require spending an additional budget for rework in order to follow to the specification and owner's satisfaction. According to direct interview with respondents, they mentioned that the additional budget is the expense added for material and labor. Poor labor productivity happens when the unskilled or inexperienced workers working for the project without much professional. Due to Cambodia being considered as a developing country, it confirms that an amount of professional workers and laborers is required to support the rapid growth of

construction industry for the last few years. That is why the lack of human resource as well as workers is still one of the main challenges and that always makes a big loss for Construction Companies. The local human resource is still in limited and not supported for the assumption of industry, so that some companies especially the foreign contractors have to bring their staffs and skillful workers from their own country to work in the project, for an example the Chinese company in particular. The poor in site management, arrangement, and supervision is depended on the experience and ability of contractors. That is strongly focused on the quality of human resources such as team leaders, team workers and projects managers. Their implementation at the site is really related to the project cost performance. Besides the contractor-related factors, the significant cost overrun factors by the owner are additional works required by owner, design change and change in scope and late progress payment by the owner for completed work. The cost overruns from the additional works required by owners are verified with the finding since many contractors confirmed that the owners themselves are going to lose another budget due to their additional works as well as the frequency changes from the owners. Also, those factors affect contractor in Cambodia when the owner frequently change the scope of works. Late progress payment to the contractor for completed work always occurs from the owner. The contractors and consultants who joint the direct interview also complained about this issue because it notably affects them in losing some profits when they clarify the expense for labor and material after waiting for the payment from the owners.

## 5.2 Recommendation

The recommendation for this study is divided into 2 objectives, the first one recommends to the contractor, consultant, owner and other parties related to the construction industry in Cambodia, while the second one discusses on the sample size and characteristics of respondents.

Firstly, it may be concluded that the cost overruns can be improved by eliminating all risk factors from the contractors. The construction technology, human resource (skillful laborers) and financial support that addressed in this study were found as most critical challenges. Thus the practical implementation at the real site should focus more attention on how to make a better performance for the role and responsibility. Moreover, the result of owner's influence was indicated as the second important factor by a final structural equation model. Even it has a negative covariance to cost overruns, influence from the owner also has a positive effect on contractor's ability. Thus, the role of clients or owners should provide a clear requirement for working because this problem can affect for work scope and contract environment by adding more work which is not included in the bidding budget. Another option, they have to improve the system of payment process since those issues can affect to project by extending the schedule. The owner's financial difficulty might let the project required more budget for completing their work scope. Avoiding from additional cost issues, it will aim to bring overall positive outcome for the project.

Secondly, this research is still in a limitation. The sample size of data is small for covariance-based SEM analysis presented in this study since the valid response is only 87 data-sets. The recommendation is that amount of sample should be

carried out a larger data-set for more than 5 or 10 times of factors that we do investigation regard to the rule of thumb. Then, the characteristic of respondents is also very important for quantitative data collection since all of them should be people who work at the level of project cost management. We have to ensure that the selected respondents should have a sense very well for comprehending and understanding well on the cost performance, examples, such as construction company director, general manager, project director, technical manager, construction manager, project manager or quantity surveyor who might provide more accurate evaluation via the questionnaire survey.

### **5.3 Future research**

This study suggests for another research study in the future that

1. Extending to the finding of this study that focuses on contractor and consultant's view only, the future research should conduct and explore the issues with the owner's perspective based on the acknowledgment from this study.
2. According to the fast growth of construction industry in recent years, further research should study on project cost performance how to do cost planning and controlling without facing cost overrun issues, in order to avoid any failure business when the contractors and owners involving in the investment of construction projects.
3. Investigating cost overrun factors in Cambodian construction industry in the different perspective since the situation of cost overruns in small

construction projects (residential building) and large scale projects (high rise building) has some different conditions.



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