

## ABSTRACT

Design change is the cause of the most dominant change in the implementation of construction projects. The changes affect the performance of the project, especially cost and time. Therefore, identification of factors causing design changes is essential. Manage properly the factors that cause design changes will be able to reduce the occurrence of design changes. To regulate the relationship the parties involved in a construction project requires a system called the project delivery system. Selection of project delivery system used will also have an impact on the design changes. The significance of this system has stimulated this study to develop a model of the impact of design changes on cost and time on the implementation of construction project, with use separate project delivery system between design and construction and integrated project delivery system.

This study used a survey method and case studies. In the survey method, data were collected through questionnaire that was distributed to contractors, consultants and the owners of construction projects. On the other hand, case studies were held in construction projects using both integrated and separated project delivery systems. Structural Equation Modeling Partial Least Squares (SEM-PLS) was then used to analyze the collected data. On the other hand, a dynamic system was used to simulate the model in the case studies.

Using SEM-PLS method, this study found that the main factor of design changes was the owners. The other factors were respectively design consultants, construction management consultants, political and economic matters, the natural environment, third parties and the advance of technologies. This study also found that DCCT model supported by SEM-PLS shows three significant relationships amongst variables. The relationships were (i) a design change that significantly influences the time, (ii) a change of time that significantly influences the cost and (iii) a design change that significantly influences the construction cost mediated by the change of time. The analysis also shows that a project delivery system was a moderator variable that caused the increase and reduction of a design change. Similar to SEM-PLS method, the DCCT simulation models, using empirical data, show that the factors, causing design changes, were respectively the owners, design consultants, construction management consultants and contractors. The simulation models also show that a construction project using a separated project delivery system tend to have more changes of design, time and cost than a project using integrated project delivery system.

Key words: design changes, cost, time, construction project, project delivery system, separated, and integrated.