THE NATURE AND FREQUENCY OF OCCURRENCE OF VARIATION ORDERS FOR EDUCATIONAL BUILDING PROJECTS IN SINGAPORE

Faisal Manzoor ARAIN ¹ and Sui Pheng LOW ²

¹ Department of Building, School of Design and Environment, National University of Singapore, 4 Architecture Drive, Singapore 117566. faisal.arain@nus.edu.sg
² School of Design and Environment, National University of Singapore, 4 Architecture Drive, Singapore 117566. sdelowsp@nus.edu.sg

Abstract
The study identifies the nature and frequency of occurrence of variations orders for educational building projects in Singapore. To achieve the study objectives, an in-depth study of source documents of seventy-nine educational building projects was carried out for data collection. In-depth interviews with 28 professionals from the developer organisation (a governmental agency), were analyzed. The results indicate that the total number of variations in upgrading projects was almost twice, in absolute terms, the total number of variations in new projects. Though, in the relative terms, the average number of variations in upgrading projects was almost 21% more than in new projects. Furthermore, in the new projects, architectural variations were 65.29% of the total numbers of variations, 20.37% were mechanical and electrical variations, and civil and structural variations were 11.83%. In the upgrading projects, architectural variations were 59.20% of the total numbers of variations, 25.19% were mechanical and electrical variations, and civil and structural variations were 11.75%. The professionals with the developer organisation strongly agreed that the nature and frequency of occurrence of variations vary between upgrading projects and new projects. Nevertheless, the results suggest that there are more variations in educational upgrading projects, whereas new projects had fewer variations. Recommendations are made for the most likely areas on which to focus to reduce the variations in future educational projects.

Keywords
variations, new, upgrading, developers, educational buildings, Singapore.

INTRODUCTION
Developments in the education sector and the new modes of teaching and learning fostered the need for renovation or extension of existing academic institutions in Singapore. Changes of space usage in academic institutions are required to cater for the new technology used. The construction of an educational building also poses risks as in the construction of any other large projects. Variations during the design and construction processes are to be expected. Variations are inevitable in any construction project. The needs of the owner may change in the course of design or construction, market conditions may impose changes to the parameters of the project, and technological developments may alter the design and the choice of the engineer. The engineer’s review of the design may bring about changes to improve or optimize the design and hence the operations of the project. Furthermore, errors and omissions in engineering or construction may force a change (Arain, et al., 2004). All these factors and many others necessitate variations that are costly and generally not welcomed by all parties.