AN ANALYSIS OF THE DISTRIBUTION OF TIME VARIANCE FOR BUILDING PROJECTS

J. Y. WANG 1, N. FISHER 2, C. S. SUN 3 and D. H. WU 4

1 Faculty of Architecture and Civil Engineering, Shenzhen University
   E-mail: wangjy@szu.edu.cn
2 Department of Construction Management and Engineering, Reading University
3 Department of Construction Management, Institute of Technology
4 Department of Building and Real Estate, The Hong Kong Polytechnic University

Abstract
Construction time is a major factor that affects the interests of all parties involved in a building project. The variance of construction time, in particular, only the delay in construction can have significant impacts for both client and contractor. Various methods are well established for controlling construction time in the process of implementing a building project. Nevertheless, overrun in construction time is still a typical problem in construction practice. This paper presents a distribution of time variance ($T_v$) between the scheduled contract time and the completion time in undertaking building projects according to data collected from major public sector construction organisations in Hong Kong and Shenzhen. The Gaussian distribution has been adopted to describe the general distribution of time variance. The study analyses the major causes contributing to such distribution and proposes a $T_v$ control chart for monitoring the degree of time variance during the construction process. Using the control chart, the project manager can identify whether the time variance is due to abnormal causes or common management related factors. Methods are also suggested for controlling and mitigating the time variance.

Keywords
Time Variance, Building Project, Construction Time Management, Inverse Gaussian Distribution

INTRODUCTION

It is considered that construction activity is particularly subject to more uncertainties than other business activities because of its complexity, thus time and cost overruns are common. There is evidence showing that the majority of the building projects usually cannot be completed within the stated contract period (Shen et al. 2001). A construction project often involves a multitude of people with different skills and interests and the co-ordination of a wide range of disparate, yet interrelated, activities. Such complexity is further compounded by the unique features of a project, a dominant “design to order” culture and many other external uncertainties. The variation of construction time from the planned schedule can affect the interests of all parties involved in a building project. Previous studies suggest that delay in the completion of construction projects could be the greatest cause for extra cost, and loss in financial return and other benefits from a project (Shen 1997). Both project client and contractor usually contribute significant amounts of efforts in estimating the construction time for committing to a project before its commencement. Based on the estimation, the two parties will agree a contract time to be included as a major contractual term in the contract. The value of construction time has been recognised and there is a growing tendency for project clients to apply liquidated damage rates to a delayed project completion (Shen et al. 1999). Yet, theories have been well developed for planning and analysing construction time, and typical methods include the Bar Chart,