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Compressing construction durations: lessons learned from Hong Kong building projects

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Abstract

This paper explores explanations for possible causative patterns and suggestions for strategies to compress the construction durations of various types of building projects, on the basis of the lessons learned from recent Hong Kong-based surveys and research findings. A review of the literature from different countries is first provided — on the factors affecting construction durations, reasons for project delays and existing statistical models for duration forecasts. This is followed by the presentation of a regression-based model — developed from Hong Kong public housing construction project data — for predicting the durations of the primary work packages in the building process and the overall completion period. Finally, the principal survey results of three parallel investigations which sought out the critical contributors to faster construction in Hong Kong within each of three different building sub-sectors — public housing, public non-residential buildings and private sector buildings — are presented and discussed. Both similarities and differences are noted among the many perceived important contributory factors and factor categories, across the various types of industry practitioners, i.e. clients, consultants and contractors. Based on the factors identified as significant from the above recent research findings, specific technological and managerial strategies for reducing construction periods (increasing construction speed) in particular building sub-sectors are formulated in order to improve the construction time performance of local building projects. The research methodology developed for the reported investigations can well be extended to similar studies in other sub-sectors in Hong Kong, as well as in other countries for international comparisons — so as to expand our existing body of knowledge of the critical success factors in compressing the building construction process.

Keywords: Construction durations; Project delays; Prediction models; Faster construction; Hong Kong

1. Introduction

It is almost axiomatic of construction management that a project may be regarded as 'successful' if the building is completed on time, within budget, without any accidents, to the specified quality standards and overall client satisfaction. Realistic 'construction time' is now increasingly important because it often serves as a crucial benchmark for assessing the performance of a project and the efficiency of the project organization.

A review of the literature has established that poor performance of projects in terms of time overruns over the last three decades is commonplace in the construction industry. For example, there was an announced 50–80% delays on 1627 World Bank sponsored projects between 1974 and 1988, together with an average of 23.2% time overrun on UK Government construction projects from 1993 to 1994 [1], while average time overruns on samples of public building projects, private building projects and civil engineering works, which were studied in 1994 in Hong Kong, were found to be 9, 17 and 14%, respectively [2] 'Construction time performance' may be argued to be critical in most Hong Kong projects, also given that Hong Kong has itself acquired a reputation for remarkable speeds of construction [3].

Project delays can lead to cost overruns as well, for example through additional overheads and potential claims between client and contractor. But many national construction industries or representative organizations have set themselves targets for the purposes of measuring and improving the current levels of construction time performance on different categories of projects. This would assist particularly in reducing durations for construction on a realistic basis, that also does not adversely impact on other priorities. For instance, the US Construction Industry Institute established goals

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to improve project costs and schedules by 20% between 1990 and 2000 [4]; while Sidwell's investigations reported the targeted potential time savings of 25–40% in Australia by reducing non-value-added activities in the building process [5].

With the intention of enhancing construction time performance of projects, it is important to identify the significant factors that affect construction durations and contribute to delays. It was decided at the outset to shift the focus from exploring the negative scenarios (factors responsible for delays) to extracting the more positive aspects from the faster projects, i.e. factors facilitating faster construction, and hence to formulating some possible strategies for reducing construction periods for various types of buildings. The positive factors and consequential recommended strategies were then sought through a PhD research programme, three BEng final year projects completed in June 1998 and a university funded research project in Hong Kong. The outcomes from these research studies are found to be useful in measuring and suggesting improvements to the present levels of 'construction time performance' in building projects, with particular attention to practical measures for shortening the completion time of public housing blocks, so as to meet the accelerated programme to produce an average annual output of 85,000 new units in the next few years up to 2001 [6]. A strong potential is noted for extending the reported research strategy and methodological approach to other categories of construction projects in Hong Kong, as well as in other countries.

2. Literature review of construction time performance

Studies in various countries appear to have contributed significantly to the body of knowledge relating to construction time performance and delays in construction projects over the past three decades.

3. Factors that affect construction durations

The mid-1990s in Hong Kong has seen another construction boom due to the accelerated residential demand from both public and private sectors, and the ten New Airport Core Programme (ACP) projects including the new modernized airport construction at Chek Lap Kok and the related infrastructure developments. It is widely accepted that construction time performance has been regarded as one of three critical success factors (together with cost and quality) for a construction project [7,8].

A review of the literature suggests that the construction duration of a project is affected by a vast number of factors and to varying extents. Nkado found an absence of consensus in the literature on the identification of factors which influence planned or actual construction times [7]. However, it was proposed in a recent PhD research exercise [9] that these time-influencing factors in Hong Kong can be classified into the following four major factor categories, as for example also identified in other countries [10,11]:

a. Project-scope;
b. Project complexity;
c. Project environment; and
d. Management-related attributes.

The above four factor categories were explored in association with their constituent causal factors, to gain a sound understanding of their significance with regard to project construction times [9]. Fig. 1 has been developed to show the four categories and their principal associated factors that could influence construction project durations.

4. Factors causing delays in construction projects

Factors responsible for project delays can be regarded as adverse manifestations of general factors that affect construction durations. Conversely, a study of the delay factors could help identify many of the significant factors influencing project durations as well. Table 1 is developed to present a consolidated comparison of the findings from the present literature review — on the reasons for delays in construction projects across different countries. It provides an interesting overview of commonly recurring factors that may be explored further.

5. Previous statistical models for duration estimates

There is an increasing need for more reliable front-end predictions of construction durations at the planning and even the tender preparation stages, for example, for incorporating a realistic duration in the tender package. Such duration estimates are needed even before designs are complete and/or before detailed programmes can be prepared.

A number of statistical models were previously developed for predicting the duration of a construction project: for instance in Australia [10,23]; in UK [24,25]; as well as in Hong Kong [26,27]. While all of these models were based on the use of project-scope factors as the primary variable(s), for example measured in terms of construction cost, gross floor area and/or project complexity levels, some models also incorporated management attributes, e.g. effectiveness of communications and speed of decision-making among contracting parties. Table 2 is developed to provide a consolidated summary