

# Impacts of multi-layer chain subcontracting on project management performance

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## Abstract

This paper investigates the impacts of applying the multi-layer chain subcontracting system on project management performance with reference to Hong Kong construction industry. Multi-layer chain subcontracting system is widely used within construction industry as it is considered advantageous in many aspects such as better efficiency of subcontractors' operation due to their unique skills. However, the fact of poor quality products in construction practice raises the doubt about the effectiveness of the chain system. Accordingly, the reasons why the applications of the system contribute to poor project performance are examined. A survey conducted in the Hong Kong construction industry demonstrates that the multi-layer chain subcontracting system, while widely adopted, is largely flawed. Based on the survey results, application of multi-layer chain subcontracting system contributes largely to the poor performance across the all major aspects including quality and time management, cost control, and communication and coordination performance. The association exists between poor project management performance and the increase of the number of layers in the chain of the subcontracting arrangement. The long communication chain because of the increasing layers of subcontractors results in various problems such as communication errors, poor supervision on the bottom-layer contractors. Consequently overruns in cost and time, and abortive and remedial works are common. Recommendations for improving the practice are suggested and explored, including change the practice of the "lowest bid" to an approach which incorporate both price and technical performance, limit the number of subcontracting layers, restrain the use of "supply-and-fix" subcontracting arrangement, and enforce the implementation of government regulations. The findings of this study provide useful references in examining the practice of subcontracting system in other construction industries and identifying the areas where the improvements can be made for gaining the benefits of using the system.

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## 1. Introduction

The subcontracting system is usually described as the contractual process in which a main contractor subcontracts parts of the job to another contractor, who may also subcontract to another firm or further subcontract (Chiang, 2009). For example, a contractor can subcontract work to a concreter, a steelworker, a mechanic and an electronic installation firm, or a plumber. The concrete subcontractor or the steelworker further subcontracts to a third

party and this party can also further subcontract work. This multi-layer supply chain arrangement can graphically be presented in Fig. 1.

A single main contractor cannot possibly handle all related project tasks. The delivery of a construction project involves different skills at different construction stages and these skills are usually managed in different organizations (Construction Industry Review Committee, 2001). Coupled with the fluctuating amounts of construction work in the Hong Kong construction industry, in particular over last decade, using the multi-tier supply chain subcontracting system is considered as an effective approach for avoiding a changeable demand on the main contractor's own in-

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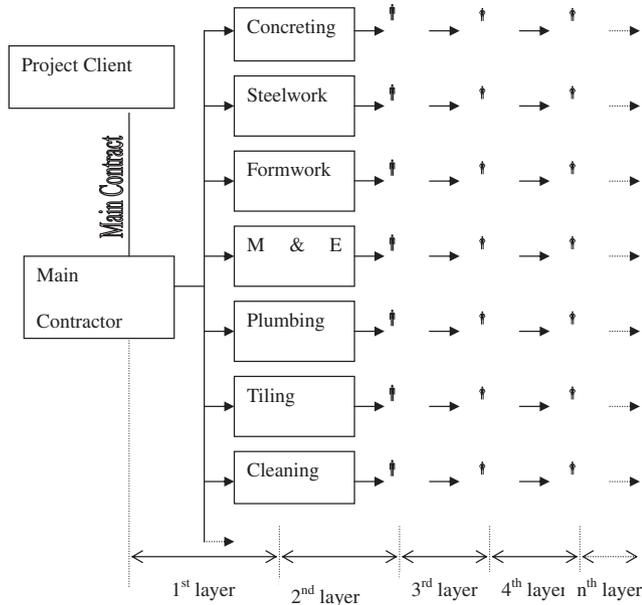


Fig. 1. A multi-layer supply chain subcontracting system in implementing a construction project.

house resources (Ng et al., 2009). Subcontractors could bring unique skills and talents for specialized work such as steel work, installation and other sophisticated facility systems (Hinze and Tracey, 1994). It had also shown benefits in using information systems for supply chain management practices (Bayraktar et al., 2009; Soroor et al., 2009). Under multi-layer supply chain subcontracting arrangement, a main contractor will rarely need to invest on training programs or sponsor training to site workers whom they do not directly employ (Ofori and Debrah, 1998). It is said that the risk for main contractors to pay overtime is also reduced as subcontractors are often contracted for individual tasks and not based on a period of time. In the United Kingdom, subcontractors are used to relieve main contractors from providing training, pension rights, redundancy payments and sick leave. This can significantly reduce main contractors expense to the project. Main contractors can thus reduce general expenses and yet, still accept and complete the same amount of work (Wong and Chan, 1997). Subcontracting in construction business is applied worldwide, and generally larger projects will involve more layers in the subcontracting arrangement. If the use of the system is properly monitored and all subcontractors are adequately instructed, a project team can effectively and efficiently work towards common goals (Elazouni and Metwally, 2000).

Multi-layer chain subcontracting practice is widely used in the Hong Kong construction industry. The system is a long established practice and will continue to function in the local construction market (Construction Industry Review Committee, 2001). The subcontracting practice dramatically developed in the local industry during the

construction boom in mid-1990s when construction firms could not manage too many work offered in the industry. During this boom period, contractors at various levels had to subcontract work to fulfill market demand. However, there are criticisms that in the practice, the benefits of using the subcontracting system have not effectively been gained. It is reported that there are notable flaws in the application of the system in Hong Kong (Construction Industry Review Committee, 2001). Construction quality in the local construction industry suffers in the absence of adequate control and supervision by main contractors over subcontractors' work. The "cutting corner" practice in subcontractors' work is common. The responsibility is diffused along the hierarchy of subcontractors, and construction quality accordingly deteriorates (Tam et al., 2000). It is often difficult to identify who does what and who is responsible for the quality of the work in multi-layer chains. Furthermore, the bottom-layer subcontractors are often contracted for unreasonably low bids. In order to make a profit, these bottom tiers have to use cheap or deteriorated materials, employ unskilled workers and engage poor workmanship, thus deliver inferior products (Kam and Tang, 1998; Low and Sua, 2000). This normally results in inevitable sacrifices of quality, as bottom-layers have to survive on cutting corners by applying poor quality resources and ignoring construction regulations such as safety, labor ordinances, insurance policies and environmental issues (Elazouni and Metwally, 2000; Yik and Lai, 2008). Poor site management and supervision are also one of the major common causes of delay (Chan and Kumaraswamy, 1997).

There is a growing consensus that connection exists between the multi-layer supply chain subcontracting practice and poor project management performance in the Hong Kong construction. Through examining the effects of using the subcontracting system on the key aspects of project management, this paper examines the reasons why the application of the subcontracting system contributes to the poor project performance. The data used for analysis is from a survey to the local construction industry. Following the analysis on the factors contributing to the poor management performance from using multi-layer subcontracting system, recommendations to improve the existing practice are suggested and explored.

## 2. Research methodologies

This study is focused to investigate reasons why the application of the multi-layer supply chain subcontracting contributes to poor project management performance in the Hong Kong construction. Data used for analysis is from a questionnaire survey in the Hong Kong construction industry.

Twenty-one factors contributing to the ineffectiveness of multi-layer chain subcontracting are identified based on the review of the existing studies (see Table 1). The ineffectiveness is evidenced by poor quality performance, poor time

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