

SUSTAINABLE ADVANTAGES AND CORPORATE STRATEGIES – THE CASE OF PREFABRICATION IN HONG KONG

Chiang Yat-Hung¹ and Lok Ka-Leung Lawrence

Department of Building and Real Estate, Hong Kong Polytechnic University, China Hong Kong

The Hong Kong Government through its Housing Authority (HA) has typically provided more than half of the total new residential units per annum. Being a major client of housing construction, the HA has influential roles to play in driving innovations. Our earlier research has identified a few leading contractors who have been repeatedly gaining major market shares in the public housing construction sector. It suggests that some contractors have responded to the client's demand on prefabrication better than the others. This paper will examine how the leading contractors and the others in the public sector have responded to the mandatory requirement of prefabrication. In particular, we shall investigate (i) whether prefabrication by itself is a sustainable source of competitive advantage, and if not, what could be the sources? (ii) how the leading contractors have formulated and implemented their competitive strategies, and (iii) the constraints or difficulties that other "non-leading" contractors have had in securing works. The findings of this study will contribute to further understanding of the clients' roles in driving innovations in the construction industry, and the strategic management of contractors in search of their sustainable advantages.

Keywords: Hong Kong, innovation, prefabrication, strategy, sustainable advantage

INTRODUCTION

The study examines how contractors have responded to client's technology demand pull in the case of the public housing construction in Hong Kong. The Hong Kong Government through the Housing Authority has typically provided more than half of the total new residential units per annum. Ever since the mid-eighties, the HA has required prefabrication in the construction of their public housing estates. Being a major client, the HA has influential roles to play in driving technological and managerial innovations in the building industry. Yet, for a long time, the HA had remained the only client who constantly required their contractors to adopt prefabrication, which had been conspicuous by its absence in the private sector where traditional and labour-intensive in-situ concreting was the norm.

It was not until a couple of years ago when the Hong Kong Government started giving incentives to private developers to adopt prefabrication to reduce construction wastes. Developers would be allowed more Gross Floor Area to build if they adopt prefabrication. Ever since the introduction of the incentives, private residential and hotel buildings have started to be constructed with prefabrication.

¹ bschiang@inet.polyu.edu.hk

Our earlier research (*Chiang et al.*, 2006) identified a handful of contractors who had been consistently gaining major market shares in the public housing construction sector. It suggests that a few contractors were able to respond to the clients' demand on prefabrication better than the majority. It also raises the question of why there were only a few contractors who had managed to secure the lion's share of the market. Has prefabrication posed a formidable technology barrier of entry for the majority, particularly in view of the conspicuous absence of prefabrication in the private sector for such a long time?

This paper will attempt to answer the questions. It will examine how the leading contractors and the others in the public sector have responded to mandatory requirement of prefabrication. In particular, we shall investigate (i) whether prefabrication by itself is a sustainable source of competitive advantage, and if not, what the sources could be, (ii) how the leading contractors have formulated and implemented their competitive strategies, and finally (iii) the constraints or difficulties that other "non-leading" contractors have had in securing works. A questionnaire survey forms the main vehicle to collect the empirical data for this study.

QUESTIONNAIRE SURVEY

A questionnaire survey was conducted between January and March of 2006. Altogether 116 questionnaires were sent out to contractors registered with the Hong Kong Housing Authority for public housing and/or the Environment, Transport and Works Bureau for institutional building. Included in this sample were all public housing contractors listed in the New Works category. They were categorized into two groups: NW1 contractors were eligible to tender for contracts with a value of up to \$270 million [or £18.62 million based on a conversion of HK\$14.5 to £1 in June of 2006], and NW2 contractors could tender for contracts of unlimited value. Also included in the sample were all public building contractors except the smallest Group A ones: Group B contractors were eligible to tender for public institutional building for contracts up to a value of HK\$50 million [or £3.45 million], and Group C contractors could tender for contracts of any values exceeding HK\$50 million or £3.45 million. Probationary contractors in any group were confined to tender for a certain number of contracts at any one time.

The managing directors of the construction firms, or their delegates, were invited to answer the 4-page questionnaire. After a reminder letter was sent out in March, a total of 34 contractors completed and returned the questionnaire. The response rate was 29%. The following is a breakdown of their main business.

Q.1: Main business

In the last 3 years, the company has undertaken mostly [in terms of contract value]:	Number of respondents	% of total
Public housing construction	4	12%
Public building construction	11	32%
Building and housing construction in the private sector	14	41%
Civil engineering and/or other business	3	9%
Public housing construction <i>and</i> building and housing construction in the private sector	1	3%
Public building construction <i>and</i> building and housing construction in the private sector	1	3%
Total	34	100%

In the past 3 years, all but three of our respondents have had their main undertakings in building or housing construction. Of these 31 building contractors, 15 considered that their main sources of works were from the public sector and another 14 the private sector. There was almost an equal split of “public” and “private” contractors. Their size could be inferred from the value of building or housing contracts they are eligible to tender, as shown in the following table:

Q.2: Listing

The company is listed in:	Number of respondents	% of total
Building (New Works) Group NW1 in the Hong Kong Housing Authority List of Building Contractors	1	3%
Building (New Works) Group NW2 in the Hong Kong Housing Authority List of Building Contractors	0	0%
Group B or BP [confirmed or probationary] in the Building Category of the List of Approved Contractors for Public Works	10	29%
Group C or CP [confirmed or probationary] in the Building Category of the List of Approved Contractors for Public Works	7	21%
NW1 and B or BP	2	6%
NW1 and C or CP	5	15%
NW2 and B or BP	0	0%
NW2 and C or CP	9	26%
Total	34	100%

Out of the 34 respondents, 21 [or 62% of the total] could be considered “large” contractors because they were eligible to tender for contracts of unlimited value in the public housing and/or public building sectors. Further, many of them have identified themselves in the questionnaires returned. For confidentiality reasons, they have to be kept anonymous. It suffices, however, to say that they were among the largest, if not the largest, in the public housing and building construction sector. Though there were

only 34 contractors who returned their questionnaires, those who did were the leading contractors. Thus, their opinions, both individually and collectively, are representative enough and are worth being analyzed carefully. The interpretation of the data will be discussed in the following three sections to answer the three questions set in the Introduction earlier.

IS PREFABRICATION A SUSTAINABLE SOURCE OF COMPETITIVE ADVANTAGE?

The first question is whether prefabrication by itself is a sustainable source of competitive advantage, and if not, what the sources could be. The questions were set based on the resource-based view of Barney (1991 and 1997), which maintained that a company resource has to satisfy the following 4 requirements to be a sustainable source of competitive advantage: (1) it is valuable to the clients, (2) it is rare, (3) it is costly to imitate [or what Barney called “imperfectly imitable”], and (4) it is non-substitutable. The following are the descriptive statistics of the respondents’ perception on prefabrication technology as a potential source of competitive advantage. For each of the opinion questions, the respondents were asked to indicate how they agreed or not with the statement on 5-point Likert scale. The following table shows the means of their response to each statement. A mean value of 1 indicates that everyone “strongly agrees”, 2 “agrees”, 3 “disagrees” and 4 “strongly disagrees”. A blank mean value suggests that no one has any opinion [“don’t know” is treated as a missing value here]. The smaller the mean, the more the respondents collectively tend to agree with the statement.

Q.3 Prefabrication Technology

Prefabrication technology:	Mean	Standard Deviation
Provides value to clients.	1.9	0.5
Is rare.	2.9	0.7
Is imperfectly imitable.	2.5	0.6
Is non-substitutable.	3.0	0.5
Is a sustainable competitive advantage to a firm.	2.2	0.6

The results suggest that whilst the respondents agreed that prefabrication technology is valuable to their clients, it is not rare, imperfectly imitable and non-substitutable. Though it does not seem to have passed “Barney’s test”, they did however regard it a sustainable competitive advantage to a firm. After all, of the 33 respondents who answered the question “if your firm is to catch up with the market leader in prefabrication technology in Hong Kong, how many years would it take?”, 18 [or 55%] of them said that it would take “more than 3 years”. Of the 31 respondents who answered the follow-up question “what would you require the most for you to catch up with the market leader in prefabrication technology?”, 12 and 10 [or 39% and 32%] answered “market share” and “know-how” respectively. Only 6 [or 19%] of them regarded “finance” as what they would need the most. The remaining 3 [or 10%] of them would need “nothing really” at all. The Pearson Correlation between the answers to the two questions is 0.2 only: there is little correlation between the

specific needs to catch up and the time to catch up with the market leader in prefabrication.

Who are the market leaders? A total of 14 companies were mentioned 40 times by 18 respondents as market leaders in prefabrication technology in Hong Kong. Gammon and Yau Lee received the most “votes”: 9 times each. They were followed by Dragages [4], China State and Hip Hing [3 each], Paul Y, Redland and Shui On [2 each], and finally 6 others [1 each]. This answer probably highlights the strategic roles of prefabrication on competitive advantage and competition. There appears to be some correlation, or even a causal relationship, between the acquisition of prefabrication technology and success in the public construction sector. There are two pieces of evidence: (1) The perceived market leaders in prefabrication had been very active in public housing and building construction. The first 6 companies except Redland, which, unlike the others, is specialized in the production and sale of precast concrete products rather than the provision of general construction services, were among the top three contractors [in terms of market shares] in public housing and/or building sectors in one time or another between 1988 and 2002 (Chiang, *et al.*, 2006). Further, Yau Lee, China State and Shui On were the top three public housing contractors (Chiang, *et al.*, 2006). (2) Most of the respondents considered “market share” as what would be the most needed to catch up with the market leader in prefabrication.

The conclusion we could draw so far is that whilst prefabrication technology is not a sustainable competitive advantage as defined by Barney, the acquisition of such technology is still a prerequisite of success in public housing construction market. Though the technology is relatively well established, it still takes more than three years, according to most respondents, for firms to catch up with the market leaders. Further, most of the respondents needed “market share” to do so. It hints at the formulation of a competitive strategy based on cost leadership. This strategy could be implemented through gaining market share, thus exploiting economy of scale, bargaining power and the opportunity to learn as the firm moves up the learning curve.

FORMULATING AND IMPLEMENTING COMPETITIVE STRATEGIES

The second question is how the leading contractors have formulated and implemented their competitive strategies and policies. To answer this question, the responses from the NW1/Grade B contractors are compared with the NW2/Grade C ones, the former representing the small contractors and the latter the large ones. We want to find out whether small and large contractors differ in the formulation and implementation of their competitive strategies. Towards the end, we shall also discuss the responses from two contractors who were among the top three contractors in the public sector. This discussion will provide valuable insight into how leading contractors have become successful. Again, similar to Q.3, respondents were asked to state whether they would agree with the statement or not on a 5-point Likert scale [“strongly (dis)agree”, “(dis)agree” and “don’t know”]. The following table summarizes the respondents’ opinions on their corporate strategies.

Q.4 Corporate Strategies

Statement:	NW2/ Grade C Firms		NW1/ Grade B Firms		All Firms		Top 2 Firms
	Mean	SD*	Mean	SD*	Mean	SD*	Mean
Your firm strives to reduce cost so that you could offer very competitive tender prices.	1.8	0.6	1.7	0.5	1.7	0.6	1.5
Your firm strives to offer better construction services at premium prices.	1.8	0.6	1.9	0.3	1.8	0.5	1.5
Your firm strives to focus on a market niche.	2.0	0.5	2.3	0.6	2.1	0.5	1.5
Gaining market share is important to you.	2.5	0.7	2.2	0.6	2.4	0.7	2.0
You have more bargaining power over your suppliers than vice versa.	2.5	0.5	2.3	0.6	2.4	0.6	2.0
You have achieved economy of scale.	2.3	0.6	2.4	0.7	2.3	0.6	1.5
You have managed to obtain a large volume of work, and have learnt quite a lot from your projects.	2.2	0.9	2.2	0.7	2.2	0.8	1.0
You have had enough jobs to keep your resources fully utilized.	2.5	0.7	2.3	0.6	2.4	0.7	2.0
You have your in-house supply of plant, materials and labour, or largely through your subsidiaries.	2.8	0.7	2.9	0.8	2.9	0.7	2.5
You have obtained your supply of plant, materials and labour largely from outsourcing.	2.3	0.7	2.0	0.0	2.2	0.6	2.5

*SD: Standard Deviation

The descriptive statistics of large and small firms are listed in the 2nd to 5th columns, all firms in the 6th and 7th columns, and top 2 firms in the last column. Tests for equality of means [of responses from large and small firms] were conducted. The ANOVA F-statistics for all the statements have significance levels of not less than 16%, implying that the null hypothesis of equal means for each statement could not be rejected. There is no difference in the population means of opinions of the small and large firms. Thus, there is generally no difference between large and small contractors in this formulation and implementation of strategies. We shall therefore interpret the results based on the 6th and 7th columns only, the overall results of the collective responses from all firms.

All Firms

The first three questions at the 2nd to 4th top rows were set based on the three generic strategies of Porter (1980 and 1987): cost leadership [2nd row], differentiation [3rd row] and focus [4th row]. The strategies should be mutually exclusive. The survey demonstrates that indeed they generally were: the 3 correlation coefficients between the responses are low: 0.032 [cost leadership and differentiation], 0.15 [cost leadership and focus], and 0.23 [differentiation and focus]. There was low correlation between the strategies. Most of the respondents did respond to the three statements differently.

Most of the respondents admitted that they competed on price. The mean for low cost leadership strategy is 1.7. However, the means for differentiation and focus strategies are also about the same, 1.8 and 2.1 respectively. Generally all three strategies were adopted though the cost leadership strategy seemed to be marginally more common

among the respondents. Besides, the questions asked what they strived to do, not how successfully their objectives were achieved. For example, most respondents said that they aimed to offer better services at higher prices. Given the usual practice of lowest tender acceptance in the industry, it is doubtful that many of them could manage to routinely charge premium prices for their services.

Otherwise, the respondents tended to disagree with the rest of the statements. The range of the means are 2.2 to 2.9. The one they disagreed the most is the statement that they had in-house supply of plant, materials and labour. Instead, they agreed with the statement that they had relied on outsourcing for such inputs. It reflects the high level of sub-contracting, a grave concern of the Hong Kong Construction Industry Review Committee (CIRC, 2001), which noted about the issues of excessive sub-contracting, especially those arising from what they called the “non-value adding multi-layered subcontracting”.

Though many respondents said that market share was what they would need most if they were to catch up with market leaders in prefabrication, they tended to disagree with the statement that “gaining market share is important to you”. Indeed, the mean value of the statement “(y)ou have had enough jobs to keep your resources fully utilized” is 2.4, implying that there were more respondents who have not had enough jobs than those who have. This apparent paradox could be explained by the findings of Chiang *et al.* (2006). The study concluded that prefabrication, *ceteris paribus*, is not related to market concentration. The prefabrication requirement, which is mandatory in the case of public housing construction, has not raised the barriers to entry to the public housing construction market. It is not the prefabrication technology itself that makes a successful contractor, but the holistic managerial and technical competence. In view of the high level of sub-contracting, it is a demanding task to manage the large number of sub-contractors and suppliers. The logistics is daunting. However, it takes good managerial, organizational and negotiation skills to coordinate the diverse parties, each being involved in their otherwise own fragmented operations, to contribute to the construction project as a whole. It is well documented in literature that there is more scope for innovative process than products in such mature industry as construction [for examples, the series of studies by Nam and Tatum (1992a, 1992b, 1997 and 1998)].

The majority of our respondents have not had enough jobs to keep their resources fully utilized. This casts doubts on how successfully they have adopted a cost leadership strategy. It takes economy of scale, bargaining power over suppliers and incremental improvements to reduce costs. For these to happen, they need to have large market shares so that they could learn from mistakes and eventually have the opportunities of moving up the learning curve. When they could construct at lower costs, they could tender at lower prices to capture more market shares to reduce costs even lower, thus completing the virtuous circle (Ghemawat, 1985 & 2003, and Ghemawat and Spence, 1985). However, our respondents tended to disagree with the statement that they “have achieved economy of scale”, and also the statement that they “have managed to obtain a large volume of work, and have learnt quite a lot from (their) projects”. The survey results therefore give the general impression that the majority of our respondents have not had enough jobs to pursue cost leadership strategy.

Top 2 Firms

Yet, the last column suggests a different scenario for the very successful contractors. It shows the means of the responses from the two contractors who were among the top three contractors in the public housing and institutional building construction sectors identified by Chiang *et al.* (2006). Their perceptions were not quite the same as the overall, and indeed quite different from the rest. According to them, gaining market share was important to them and they had enough jobs to keep their resources fully utilized. Perhaps consequently, they had achieved economy of scale, had more bargaining power over their suppliers than vice versa, and had managed to learn quite a lot from their large volume of work. Further, not unlike the majority, both of them also disagreed or strong disagreed that prefabrication is rare, is imperfectly imitable and is non-substitutable. However, they did agree or strongly agree that it provides value to client, and both of them agreed that it is a sustainable competitive advantage to a firm. From the responses of these two top contractors, it looks like that our arguments on volume building to pursue cost leadership have found support. The acquisition of prefabrication technology still plays a strategic role on competitive advantage and corporate strategy.

CONSTRAINTS AND DIFFICULTIES IN SECURING MORE WORKS

The mandatory requirement of prefabrication, by itself, has not posed a technological barrier to smaller contractors. However, the analyses of the survey results so far have suggested that large volume of works is necessary for a contractor not only to develop their prefabrication technology, but also to move up the learning curve to pursue cost leadership strategy and to stay competitive. Yet, the large majority of the respondents considered that their total contract value of works in the last three years was either “about average” or “less than average”, when compared with their competitors in their category of listed contractors. Only the top contractors stated “within the top 10%” or “more than average”. Though many of our respondents who identified themselves in the questionnaire are already large contractors, they nevertheless still considered that they had not secured as much work as their counterparts. That probably explains their concern on market share. They did want more works so that they would become more competitive to get still more works. Based on our arguments built on the theories of volume building, contractors’ major constraints and difficulties in securing more works are, paradoxically enough, that there are not enough works to start with.

CONCLUSIONS

This preliminary analysis of our questionnaire suggests that to become and stay competitive in particularly the housing construction sector, the acquisition of prefabrication technology is the necessary but not sufficient condition. This technology does not pass Barney’s test to be a sustainable source of competitive advantage. However, it would still take a few years plus market share for a contractor to acquire this technology and to catch up with the market leader. Further, to pursue the cost leadership strategy, a contractor needs large volume of works to become an efficient as well as effective builder. Thus, the mandatory requirement of prefabrication by itself in public housing does not raise a formidable technological barrier of entry to smaller contractors. It does, however, accentuate the need of market shares to get more.

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