SUSTAINABLE CONSTRUCTION – A NEW PROJECT OBJECTIVE IN HONG KONG

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ABSTRACT

Over recent years the importance of Sustainable Development has increased worldwide. Through several years of efforts by Hong Kong SAR Government to promote the concept, most of the local property developers and designers are now willing to incorporate sustainable designs in their projects. To achieve a Sustainable construction project, the contributions by the main contractor and sub-contractors are of equal importance to the design team, however, it seems that many local construction companies still hesitate to adopt Sustainable Construction methods. Time, cost and quality are the three fundamental measuring criteria traditionally used to quantify project performance. New criteria, such as environmental issues, are being introduced because rapid development in terms of the complexity and size of construction projects is gaining more public concern.

This paper analyzes how main contractors rank the objectives for their projects so as to evaluate their degree of intention of adopting the Sustainable Construction methods. As most main contractors in Hong Kong tend to sub-let most of the work to their sub-contractors, a survey was conducted to summarize the criteria that the main contractors are using to measure the performance of their sub-contractors. The survey results are therefore a good indication of how main contractors view the importance of different performance criteria.

Keywords: Sustainable Construction, Project objectives, Performance, Sub-contractor.

1. Introduction

Our living environment is being improved rapidly by advanced construction technologies. Unfortunately, construction work has the potential to adversely impact the nature environment and consume vast amounts of natural resources. The importance of Sustainable Development has thus increased in the recent years. The International Council for Local Environmental Initiatives (1996) defined Sustainable Development as development that delivers basic environmental, social and economic services to all residences of a community without threatening the viability of natural, built and social systems depends.

As a commitment to a better living environment, the Hong Kong SAR Government started to promote the Sustainable Construction concept in the last 1990s. Sustainable Construction is a regarded as a way for the building industry to contribute to Sustainable Development (Bourdeau, 1999). The Sustainable Construction concept introduced by Kibert (1994) is defined as the creation and responsible maintenance of a healthy built environment based on resources efficient and ecological principles. In 2002, Hong Kong SAR Government permits the green features such as prefabricated external walls to be exempted from the Gross Floor Area and/or Site Coverage calculations under Section 16 of the Building Ordinance. As a result, most of the property developers and designers are willing to incorporate aspects of various sustainable designs in their new projects.

Collaborative efforts by all the key players including design team, main contractors and sub-contractors are essential supports to achieve a Sustainable Construction project. Prefabrication, an application of Sustainable Construction method, has already been extensively implemented in the construction of the local
standard public housing estates in the last decade and there are increasing private sector projects adopting this method in the recent years. However, other than this area, most construction companies still hesitate to actively implement the sustainable construction approaches into other site operations. This study reviews the reasons behind these decisions.

2. Aims and Scope of Study

The aim of this study is to establish whether or not Sustainable Construction has already become an essential objective for local building construction projects. The core part of this study is to identify the essential criteria that main contractors currently use to evaluate the performance of their sub-contractors so as to reflect how they set the goals for their projects and hence to conclude their willingness of adopting sustainable construction method.

Most of the well-established construction firms have already established their own systems to periodically review the performance of their sub-contractors. However, they are very reluctant to release the details of the system to the public. This survey was thus designed to collect the viewpoint from main contractors’ staff as a reflection to the viewpoint of the companies.

In Hong Kong, main contractors of the building construction projects tend to sub-let almost all of their work to the sub-contractors. Many of these sub-contractors further sub-let the work to sub-sub-contractors. This sub-letting process may sometimes go down several levels and is referred to as a multi-level sub-contracting system. The workers actually carrying out the work may not even be the employees of the final level sub-contractors. This study only covers the building construction projects because the main contractor of the civil engineering projects would not sub-let too much of the work to their sub-contractors since the nature of work is not too labour intensive.

3. Project Objective

Time, cost and quality are the three most common fundamental project objectives for a building project from the client’s point of view (Stuckenbruck, 1981; Bennett, 1983; Walker, 1990). In recent years, due to the rapid development in terms of the complexity and size of construction projects, broader project objectives are being introduced. For example, Ofori (1992) defined the environmental issues as the fourth dimension to construction project performance. Sustainable Construction is currently a popular topic in HK and many other countries, which could be considered as another essential objective for a project in the near future.

It is quite normal for clients to expect all of a project’s objectives met, however, project objectives are not interdependent and, as pointed out by Ward, Curtis and Chapman (1991), trade-offs may have to be made between each objective. Also, during a project development process, a dynamic temporarily multi-organisation system is created that is continuously confronted with disparities between two levels of objectives: the temporary objectives of the construction project; and long-term objectives of the participating organisations and operational phase of the project (Mohsini and Davidson, 1992).

Due to business confidentiality, construction companies and their staff would not explicitly show their real intentions for a project. Sanvdo, Grobler, Parfitt, Govenis and Coyle (1992) defined the success for a given project as the degree to which project goals and expectations are met. Client satisfaction is an important tool to gauge the success of a project (Yasamis, Arditi and Mohammadi, 2002). In this study, client refers to the staffs of the main contractors. Therefore, one possible way to trace out the goals that main contractor set for a project is to analyze the criteria that they use to evaluate the performance of their sub-contractors.
4. Research Methodology

Various publications have attempted different approaches to assess the performance of contract (Dainty, Cheng and Moore, 2003; Yasamis, Arditi and Mohammadi, 2002; Liu and Walker, 1998; Tam and Harris, 1997; Ward, Curtis and Chapman, 1991; Frisby, 1990). This study adopted an integrated research approach including a questionnaire survey to collect quantitative data and in-depth interviews to explore the possible causes for the findings.

After the consultations with the experience industrial practitioners, essential sub-contractor performance evaluation criteria for building construction projects were shortlisted. These were categorized into different objectives including time, cost, quality, safety and health, sustainability, potential for long-term development and company image. Respondents who had worked in main contracting firms were requested to rate the level of importance from 1 (very important) to 7 (very unimportant) to several short questions. They were permitted to suggest other factors that not yet included in the list presented in Table 1. The questionnaires were randomly distributed through private relationship to the industrial practitioners. One hundred questionnaires were sent out and 27 valid replies were received.

<table>
<thead>
<tr>
<th>Objective: Potential for long-term development</th>
<th>Overall Score</th>
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<tbody>
<tr>
<td>Criteria:</td>
<td></td>
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<tr>
<td>Application of advance technology</td>
<td>2.38</td>
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<tr>
<td>Relationship with</td>
<td>2.64</td>
</tr>
<tr>
<td>a. Site representatives of the client/design team</td>
<td>1.73</td>
</tr>
<tr>
<td>b. Other sub-contractors</td>
<td>2.48</td>
</tr>
<tr>
<td>c. Your staffs</td>
<td>2.56</td>
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<tr>
<td>Administrative issues such as submission of records, sample, shop drawings</td>
<td>2.54</td>
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<tr>
<td>Availability of additional resources</td>
<td>2.31</td>
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<tr>
<th>Objective: Sustainability</th>
<th>Overall Score</th>
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<tr>
<td>Criteria:</td>
<td></td>
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<tr>
<td>Suggestions to improve the design in terms of:</td>
<td></td>
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<tr>
<td>a. Buildability</td>
<td>2.69</td>
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<tr>
<td>b. Durability</td>
<td>2.86</td>
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<tr>
<td>c. Maintainability</td>
<td>2.86</td>
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<tr>
<td>Amount of nuisance such as duct, noise, vibration etc generated</td>
<td>2.66</td>
</tr>
<tr>
<td>Amount of construction waste generated</td>
<td>2.61</td>
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<tr>
<td>Material wastage level</td>
<td>2.76</td>
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<th>Objective: Public image</th>
<th>Overall Score</th>
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<tr>
<td>Criteria:</td>
<td></td>
</tr>
<tr>
<td>Site tidiness</td>
<td>3.32</td>
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<tr>
<td>Worker’s working uniform</td>
<td>3.45</td>
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5. Data Analysis

The survey findings can be regarded as a manifestation of the common views of the industry as 44.4 per cent of the respondents have over eight years of working experience in construction industry. Table 1 above shows the mean of the scores assigned by the respondents to each criterion. This reflects the level of importance of these criteria in assessing sub-contractors’ performance. In this study, it was assumed that all the criteria are of equal importance to their respective performance evaluation objectives. Thus, the score for the performance evaluation objectives is the mean of the score of the criteria in the same group. Three experienced construction managers of main contractor were subsequently invited to express their views on the survey data through well-structure in-depth interviews. The following section summarises the general observations of their views.

5.1 Time

Time was the most important sub-contractor performance evaluation objective among the short-listed criteria for building projects. Its average overall score was 1.58, indicating that most of the respondents considered this as a priority target for their projects. The main reason being that performance in relation to this objective can be easily quantified by measuring the variance between the contract and actual project completion date. Respondents in general adopted a conservative approach to the management of their projects, for example, they prefer their sub-contractors to strictly follow the project programme rather than propose new methods to speed up progress.

5.2 Safety and Health

The average score for the Health and Safety objective was 1.93. The importance of this objective is slightly higher than those for quality and cost because construction companies have to face litigation and the site managements may be liable for personal responsibility for serious accident. Safety and health issue for building construction projects is getting more government concern in the recent years, for example, the Buildings Department issued the Technical Memorandum for Supervision Plans to specify the safety requirements for different grade of construction work and request the contractor to submit a supervision plan at the time of application for consent to the commencement of works.

The questions for assessing the criteria of this objective were similar to those for time. Respondents displayed a similar attitude for this item. They request their sub-contractors to follow the basic safety rules and do not expect them to propose new construction method to eliminate potential dangers to workers. The survey shows that well-experienced respondents were far more ready to accept new method for site safety management. Perhaps, this may be a warning signal to voice out the dissatisfaction of the site management on the current safety management system.

5.3 Quality

The average score for this objective is 1.98: rated as only a fairly important factor because it is difficult to quantify the overall level of workmanship of a project. Construction projects comprise thousands of small jobs and it is impossible to review all of them so as to consolidate a final score to represent the quality standard of a project. Another reason for not to set the quality as the top priority objectives being that the property developers always set a very tight programme for the development due to high land cost. They need to make a trade-off to relax the demand on the quality of works provided that the project can be completed on time. Consequently, main contractor would spend most their efforts to push their sub-contractors to meet the tight project programme and the control on the quality of work would be of second priority.

One possible way to measure the quality of construction work is to assess the degree of compliance of the work to the agreed standards. Works Specification of the contract is the official standard of workmanship for a project. Respondents prefer to adopt the industrial trade standard rather than the Works Specification
of the contract as the quality standard for their projects. This is because most of the standards specified in the Works Specification are unreasonably high in view of current tender price.

5.4 Cost

As commercial companies, it is no doubt that the prime objective of the main contractors is to earn maximum profit in their projects. However, the respondents take any other view on assessing the performance of their sub-contractors. Excessive claims and backcharges may cause additional financial burden to the project. However, the survey shows that respondents do not take this as a very important issue because main contractors are always at the favourable side in assessing the claims from their sub-contractors. The average score for this criterion is thus only 1.99.

In Hong Kong, it is common for the main contractor not to pay their sub-contractors for the claims and backcharges unless they have got the payment for the respective variation order from the client. Final account preparation is a long process and it is also easy for the main contractors to find an excuse to reject the claims. Most of the local sub-contractors are small companies and would not initiate any legal action immediately even though their claims are supported with solid evidences. Their main concern is that the additional payment does not always cover the expenses. Instead, they would desire the main contractor to compensate their losses by awarding them high profit margin contracts in the future if long-term relationship is maintained.

5.5 Potential for Long-term Development

Long-term relationships are a key ingredient required to cultivate the mutual trust between main contractors and their sub-contractors, which can significantly improve their performances. Main contractor would evaluate the potential ability of their existing sub-contractors as this is one of the considerations to commit long-term co-operation plan with them. However, according to the survey result, this is not considered as a very important criterion as its overall average score is only 2.38.

Because of temporarily contractual relationship nature between the two parties and commercial secrets, main contractors would not expect to learn too much advance technology from their sub-contractors. On the reverse, they may allocate additional efforts to help the sub-contractors to build up good relationship with the design team/client's site representative. Sub-contractors are not demanded to have strong ability in handling general administration work.

5.6 Sustainability

The average overall score for this item was 2.74, probably because sustainability is a new concept to the local construction industry and is not easy to measure and quantify. Most of the experienced industrial practitioners did not learn about the Sustainable Development concept in their formal study years ago. They always equal this concept with prefabrication technique and green building design. They tended to claim that additional resources are required for arranging environmental protection provisions for the project. A set of questions under this evaluation objective is designed to review their understandings on the different issues in the context of sustainable construction technology.

In the local multi-levels sub-contracting system, almost all the production work of a construction project is actually carried out by the sub-contractors. They are therefore well-qualified to suggest alternative proposal to improve the design in terms of buildability, durability and maintainability of the construction work. Among these three items, buildability is most important one because a constructible design can significantly speed up the progress as well as to enhance the quality of the work. Durability and maintainability are less essential to contractors because these issues will be out their businesses after the property is handed over to the client. Main contractors are relatively more concerned about sub-contractors’ performance in reducing the nuisances and wastes generated from the construction operations rather than on improving the design because they need to fulfill the stringent control imposed by local government.
5.7 Public Image

Marketing is a difficult task for construction companies. To upgrade the competitiveness of the company, they have started to allocate extra resources in this area. Apart from the development of company marketing plans, the efforts by the site staff should not be neglected. Tidiness of sub-contractors’ site facilities and their workers’ working uniforms are crucial factors that influence public’s impression on a project. This subsequently affects the image of the company. The survey result shows that site staffs do not regard this item as an important criterion as its average overall score is 3.32. They think that public would not keep close view on their projects unless it is landmark building. They prefer to concentrate their effort on the production work and the company marketing work should be centrally organized by head office.

6. Conclusions

In Hong Kong, the role of main contractor has already been transformed from the actual production work to the management of the sub-contractors. This study has made an attempt to analyze the criteria that they are using to assess the performance of their sub-contractors, which are used to trace out how they set the objectives for their projects.

According to the survey result, time is the most important criteria to evaluate the performance of sub-contractors. With the increasing public concerns on the safety and health issues of the construction projects, this item becomes as important as the other two traditional indicators, cost and quality. Respondents in general adopted a conservative approach to manage the matters related to time, safety and health. They demand their sub-contractors to strictly follow their instructions.

Quality and cost are fairly important factors. Industrial trade standard is used to compare sub-contractors’ quality of work. Sub-contractors are expected to make contribution in reducing the construction cost. Main contractors are not too keen to review the potential abilities of their sub-contractors for building up long-term relationship. Instead, they would like their sub-contractors to maintain a good relationship with the site representative of the client and design team.

Sustainable Construction is a new concept to local construction industry. Main contractor would not strongly request their sub-contractors to adopt the Sustainable Construction methods and to input additional resource for building up company image.

At the present moment, safety and health, not sustainability, becomes the fourth principal construction project objective in the local industry. However, it is expected that sustainability would be regarded as an essential objective that may be embedded within quality in near future when more and more local construction companies recognize the benefits they can gain from adopting the Sustainable Construction methods.

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