Chapter 3.1
A BIM Based Application to Support Cost Feasible 'Green Building' Concept Decisions

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ABSTRACT

The client's role in leading the change in the construction industry has been widely perceived as crucial and, on the theme of sustainable building, it is advocated that clients must play their role to lead in engaging industry stakeholders in managing sustainable performance of construction projects. In essence, it is the client that makes the initial decision to procure construction works and the way in which procurement takes place. This influences the degree of environmentally-friendly (or sustainable) practice that is implemented in a project. For most building owners and property developers, this decision is affected by cost. A proposed rule-based system that contains decision-support rules pertaining to the assessment of (whole-life) cost implications for building projects is described in this chapter. The system is to be developed to meet the assessment criteria of Singapore's BCA Green Mark Scheme and to support the use of BIM for designing energy efficient buildings and beyond.

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1. INTRODUCTION

In order for the Building Information Modeling concept to fully work and benefit for the all stakeholders of the construction industry, it is vital that all needs and requirements of the different stakeholders be considered in the aim of developing enabling applications that support the BIM's goal of allowing interoperability (between the

various different applications used in the industry throughout the lifecycle of the building). While many existing applications have mainly focused on a few key areas such as CAD, visualisation and simulation, the proposed rule-based decision support tool, as described in this chapter, is applicable to clients and their consultants during the initial briefing stage. This tool is relevant to the Green Building concept, as well as the whole-life costing.

2. BACKGROUND

Client's Role in the Green Building Concept

In the Green Building concept, any structure is designed, built, renovated, operated or reused with objectives to protect occupants' health, improve employees' productivity, use natural resources wisely and reduce the environmental impact. Analogous with industrial ecology which is the starting point for applying ecological principles to human systems, Kibert and Schultmann (2005) proposed that;

"Construction ecology would imply a built environment that is readily deconstructable at the end of its useful life, whose components are decoupled from the building for easy replacement, comprised of products that are themselves designed for recycling, whose bulk structural materials are recyclable, whose metabolism would be very slow due to its durability and adaptability, and that promotes health for its human occupants".

Understandably, applying this concept requires changes in the client's traditional approach and a clear change program established for other project stakeholders. In the aspect of design, sustainably designed buildings can lessen their impact on the environment and improve environmental quality through minimisation of consumption of non-renewable resources, elimination or minimisation of the use of toxins, and reduction of energy consumption. The main principles of sustainable design stress on the understanding of four elements - place, natural processes, environmental impact and people; and the connection with nature through embracing co-creative design processes (Manoliadis et al., 2006).

The client's role in leading change in the construction industry has been widely perceived as crucial. Studies of potential drivers of change towards sustainable building have emphasized the leadership role of clients and that the key is to ensure, their commitment (Egan, 1998; Addis and Talbot, 2001), their demand for better value and improved performance from suppliers, and their demonstration as good employers by procuring work in a way that allows best value to be delivered, as well as providing fair rewards for good performance (United Kingdom National Audit Office, 2001). Similarly, the introduction of client-orientated performance indicators has been recommended as an important driver for change (Winch and Courtney, 2001).

The general notion that clients are key drivers of construction performance improvement and innovation can be explained by their expected role as primary decision makers, especially during the initial stage of project conception and feasibility, that is, when deciding to procure construction work (Briscoe et al., 2004). Therefore, as they decide the way in which procurement takes place, they must also lead in engaging other project stakeholders in managing sustainable performance of the projects.

Client's Interest in Whole-life Costing

The whole-life cost of an asset is defined by Addis and Talbot (2001) as "the present value of the total cost of that asset over its operational life. This includes initial capital cost, finance costs, operational costs, maintenance costs and the eventual disposal costs of an asset at the end of its life. All future costs and benefits are reduced to present-day values by the use of discounting