

Chapter 8

A Comparative Analysis of 2D Computer–Aided Estimating (CAE) and BIM Estimating Procedures

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ABSTRACT

Most estimators are trained with, and are used to, manual and Computer-Aided Design and Drafting (CADD) two dimensional (2D) drawings. The spatio-temporal limitations of these designs complicate information management, estimators' judgments, speed and accuracy. In addition, conventional estimating practices also need to cater to the nuances of diverse standard methods of measurements (SMM) and unstable market conditions. Building Information Modeling (BIM) promises major improvements that overcome the limitations of conventional 2D methods in both design and construction processes. It provides platforms for value integration, robust information sources, simultaneous access to design database, automated quantification, project visualization and simulation, among others capabilities. These capabilities facilitate accuracy, objective risk assessment, comprehensive information management and early integration of cost management principles during design. Arguably, the uptake of Information Technology (IT) in construction is increasing and this discipline-specific study on BIM highlights its considerable potential for improving professional service delivery. Consequently, the integration of BIM and process driven Computer-Aided Estimating (CAE) tools and applications provide robust opportunities for process improvement in Architectural, Engineering, Construction and Facilities Management (AECFM) industries. As part of a research initiative, this chapter reviews the impacts of BIM on cost

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estimating procedures. In a bid to develop a conceptual framework for underpinning BIM-propelled changes in estimating practice, CAE applications are categorized and compared. Moreover, some features for producing automated quantities from BIMs are compared with provisions of SMM used by estimators. The research concludes with recommendations about the capacity of BIM to revolutionize construction procurement and systems.

1 INTRODUCTION

Variability in the quality and accuracy of construction estimates present distinct challenges in the construction industry. This is also true for cash flow management. Professional opinions about estimating and cash flow management are often characterized by uncertainties, errors, conflicts of interest, omissions and other inadequacies (Tse, et al. 2005). Evidence abounds in literature regarding the impact of these problems on the image of construction project performance (Kometa, et al. 1995; Egan 1998 ; Hansen and Vanegas 2003; Kashiwagi and Richards 2004 ; Ankrah and Proverbs 2005). Issues like construction contract fraud, cost overrun and professional inadequacies have recently been prime concerns of governments and media discourse (Priemus 2004). This has resulted in various actions. For example, to alleviate the impacts of such challenges on national and territorial economies, the Honk Kong Housing Authority (HKHA) (2000) and Egan (1998) have suggested that it is necessary to develop realistic frameworks to restore public confidence in the industry. This is necessary if construction is to maintain its pride of place as a 21st Century procurement system driven by digital technology innovations.

Overcoming the effects of inefficient construction estimating procedures is an Achilles heel of the industry. This is because conventional design systems are mostly driven by geometric data only (Penttilä, et al. 2008). Chains of evidence from industry reports on the geometric limitations of manual and 2D CAD conventions indicate that these tools are vulnerable to omissions, conflicts, uncertainties, information dissipation and frus-

tration of work relationships (Bertelson 2003; Davison 2003; Gorse and Emmitt 2004 ; Acharya, et al. 2006; Abd El-Razek, et al. 2007). Olatunji and Sher (2009a) have related the impacts of these limitations to the sufficiency of constructed facilities in terms of their buildability, constructability, sustainability, energy sufficiency and other indices of project feasibility. Other reports have also argued that the processes and procedures of designing, estimating, planning and controlling projects could be jeopardized because of conflict between drivers of value and methods of expressing design information in conventional manual and 2D CAD systems (Gould 1998 ; Poon 2003; Kashiwagi and Richards 2004 ; Gruneberg and Hughes 2006).

Consequently, the industry is in dire need of systemic improvements which render stakeholders more accountable for their actions and inactions. Interestingly, from an estimating perspective, the industry is familiar with manual and computer-aided estimating (CAE) procedures, to which a new dimension is being added - that of Building Information Modeling (BIM). Whilst some reports argue that estimators are subjected to some tedious energy-sapping procedures that compel them to spend more time on manual estimating than on CAE methods, the accuracy of estimates generated using manual processes leaves more to be desired (Sher 1996; Endut, et al. 2005). Although, Ogunlana (cited in Lowe 1998) argues that the reliability of estimators' judgments is more likely to improve as the quality and quantity of their experience improves, emerging indications show that the industry may no longer be at the mercy of human manual limitations. Rather than

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