Third International Conference on Construction in the 21st Century (CITC-III)
"Advancing Engineering, Management and Technology"
15-17, September 2005, Athens

A Software Tool for the Life Cycle Management of Information Technology Projects in Construction: *ProjectIT*

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Abstract
As international competition continues to intensify, significant numbers of construction organisations are investing large amounts of resources into IT as they seek to gain competitive advantage. IT is increasingly being implemented for strategic reasons, so as to enable improved efficiency and to improve control and productivity of internal processes. The failure of realising expected IT-induced benefits has led to a growing number of senior executives to question the value of IT investments. This research study was inspired by the perceived lack of a structured framework for the life cycle management of innovative IT projects in construction. In addition to a structured IT project life cycle framework consisting of three modules representing each phase of the life cycle, namely, IT project selection, strategic IT implementation and IT performance evaluation, industry practitioners require a user-friendly software tool to assist them to undertake this arduous task. This paper details a summary of the previously developed framework and the current progress for the development of the *ProjectIT* software tool. Once finalised, *ProjectIT* should assist construction firms to rapidly select IT projects based on monetary and non-monetary benefits and risks, implement these projects in a well-planned strategic manner and evaluate the short- and long-term value generated from them.

Keywords
Information Technology, Information Management, Life Cycle Management

1. Introduction

Leading organisations use selection, implementation and evaluation processes uniformly at an enterprise level and within each business unit of the organisation. By contrast, there is very little or no uniformity in how risks, benefits, and costs of various IT projects are evaluated at project, business unit or organisational levels of an organisation (Stewart and Mohamed, 2003). Moreover, many organisations appear to approach the whole management of technology in an unstructured or *ad hoc* manner throughout the system's lifecycle (Irani and Love, 2001). This approach has partially resulted from the mixed and inconclusive results as the relationship between IT investments and organisation performance continues to be poorly understood (Mohamed and Stewart, 2003). This relationship has been described as the 'productivity paradox' by many researchers in the field of technology project management (Dos Santos and Sussman, 2000). The effective management of technology needs to be viewed as a structured iterative business process, which offers organisational learning during the lifecycle of the technology (Irani and Love, 2001). This investment management process should have elements of three essential phases: IT project selection (benefits, risks

and costs); IT implementation and monitoring (applications, deficiencies and reviews); and IT performance evaluation (measurements, corrective actions and lessons learned). However, each phase should not be viewed as a separate step. Rather, each is conducted as part of a continual, interdependent management effort. Information gained from one phase is used to support activities in each of the other two phases. Figure 1 illustrates the three phases of a lifecycle management process, relationships between phases and appropriate management tools. Also detailed are the relevant research papers associated with each phase of the lifecycle, previously disseminated by the author.

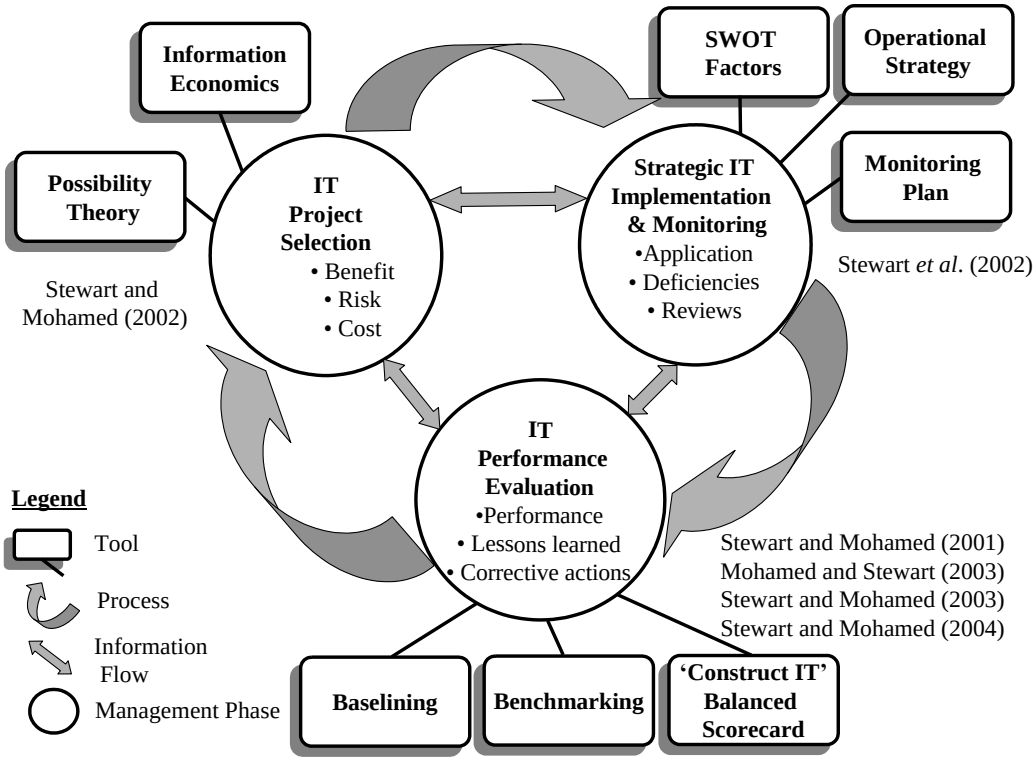


Figure 1: IT Project Lifecycle Management Process

2. Phase I: IT Project Selection

IT implementation is recognised as part of the solution to improve construction productivity, management and client satisfaction, as well as to reduce costs. By achieving these improvements, a construction organisation will obtain direct cost savings and gain competitive advantages that are vital to the organisation's future growth. Many IT projects that have commenced in the construction industry fail to meet the high expectations of the industry. This is because there is a lack of prior assessment of risks and returns before management commitment is made and funding approval is provided (Jung and Gibson, 1999). This failure to properly plan the implementation of IT investments results from the lack of understanding of the relationship between IT investments and organisational performance (Irani *et al*. 2001). Senior construction professionals lack the methods, skills and tools required for selecting a portfolio of IT projects and tools, which add the greatest value to the organisation (Stewart and Mohamed, 2002). An IT project selection method needs to be tailor-made for construction organisations to encompass all the intricacies of this unique industry. A well-structured IT project selection phase helps ensure that an organisation: (1) selects those IT projects that will best support organisational needs; and (2) identifies and analyses an IT project's risks and proposed benefits before a significant amount of funds and resources are

allocated. A critical aspect of this phase is management understanding and participation and the application of a structured decision-making process. Several methods have been proposed to help organisations make good IT project selection decisions. However, many of these methods have several limitations and do not provide a means to combine tangible and intangible 'business value' and risk criteria. To overcome the limitations of existing frameworks Stewart and Mohamed (2003) suggest a five-step IT project selection process: *Step 1*: Identify monetary and non-monetary factors; *Step 2*: Define possibility distributions; *Step 3*: Develop resultant aggregated possibility distribution; *Step 4*: Combine resultant aggregated possibility distribution; and *Step 5*: Rank IT projects.

3. Phase II: Strategic IT Implementation & Monitoring

Unfortunately, previously developed IT implementation frameworks and guidelines have done little to improve the efficiency of IT diffusion in the construction industry. Within the industry there are suggestions that IT investments are often accompanied by poor vision and implementation approaches, poor planning and coordination and little adoption of IT strategies linked to and supporting business strategies (Betts, 1999). The successful implementation of new and innovative IT in construction requires the development of strategic implementation plans prior to IT project commencement (Pena Mora *et al*. 1999). Unfortunately, little regard has been given to the future potential of IT within the construction industry giving rise to a large gap between output and expectation from these IT investments (Dos Santos and Sussman, 2000). Only recently, there has been growing interest in developing planning frameworks to aid the strategic implementation of IT in construction. In an attempt to improve the strategic implementation of IT projects in construction the author developed a step-by-step strategic IT implementation and monitoring framework (see Figure 2, Stewart *et al*. 2002). Their paper presents the framework in a detailed step-by-step methodology supported by the ten well-documented predictors for effective IT implementation (Gottschalk, 1999). They demonstrate its application in a case study involving the implementation of a new Project Management Information System (PMIS) by a large multi-national construction organisation based in Australia.

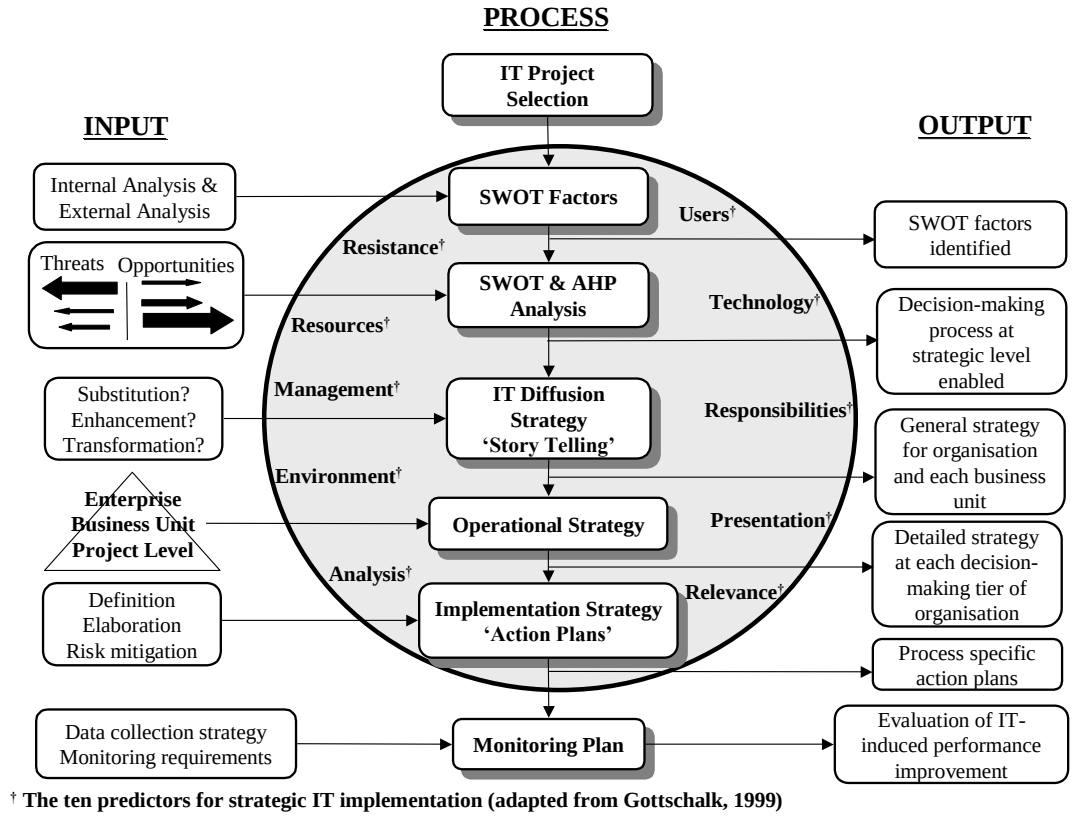


Figure 2: Strategic IT implementation framework (Stewart *et al.* 2002)

4. Phase III: IT Performance Evaluation

Generally, IT investment appraisal is more difficult than other investment decisions because IT-induced benefits are hard to identify and quantify (Stewart and Mohamed, 2003). As a consequence, more traditional investment appraisal methods such as Return on Investment (ROI), Net Present Value (NPV) or Internal Rate of Return (IRR) have been difficult to apply despite being widely understood by senior managers (Kumar, 2000). The IT productivity paradox prompted calls for new approaches to evaluate IT-related investments (Dos Santos and Sussman, 2000). In an attempt to provide a balanced approach to IT performance evaluation, the authors recently developed an IT performance evaluation framework, in the form of a 'Construct IT' BSC, for the construction industry (Stewart and Mohamed, 2001; Stewart and Mohamed, 2003; Mohamed and Stewart, 2003; and Stewart and Mohamed, 2004). This framework incorporates five (5) robust IT-related performance measurement perspectives (see Figure 3):

- **Operational Perspective (OP)**: Concerned with the impact of IT on productivity and efficiency.
- **Benefits Perspective (BE)**: Investigates the link between IT implementation and associated tangible (monetary) and intangible (non-monetary, i.e. time savings) benefits.
- **Technology/System Perspective (TS)**: Refers to the hardware and software, covering issues such as tool performance, reliability, availability, security and suitability to the process.
- **Strategic Competitiveness Perspective (SC)**: Focuses on the long-term strategic goals of the organisation and how the newly implemented technology creates competitive advantage.
- **User Orientation Perspective (UO):** Covers issues associated with the usage such as tool utilisation rate, availability of training and technical support and satisfaction with the tool.

These perspectives and their associated indicators were customised for the specific elements of IT and construction. The framework utilises project-, tool- and process- specific IT indicators designed to reflect

the particular aspects where IT implementation can improve project-based information management processes.

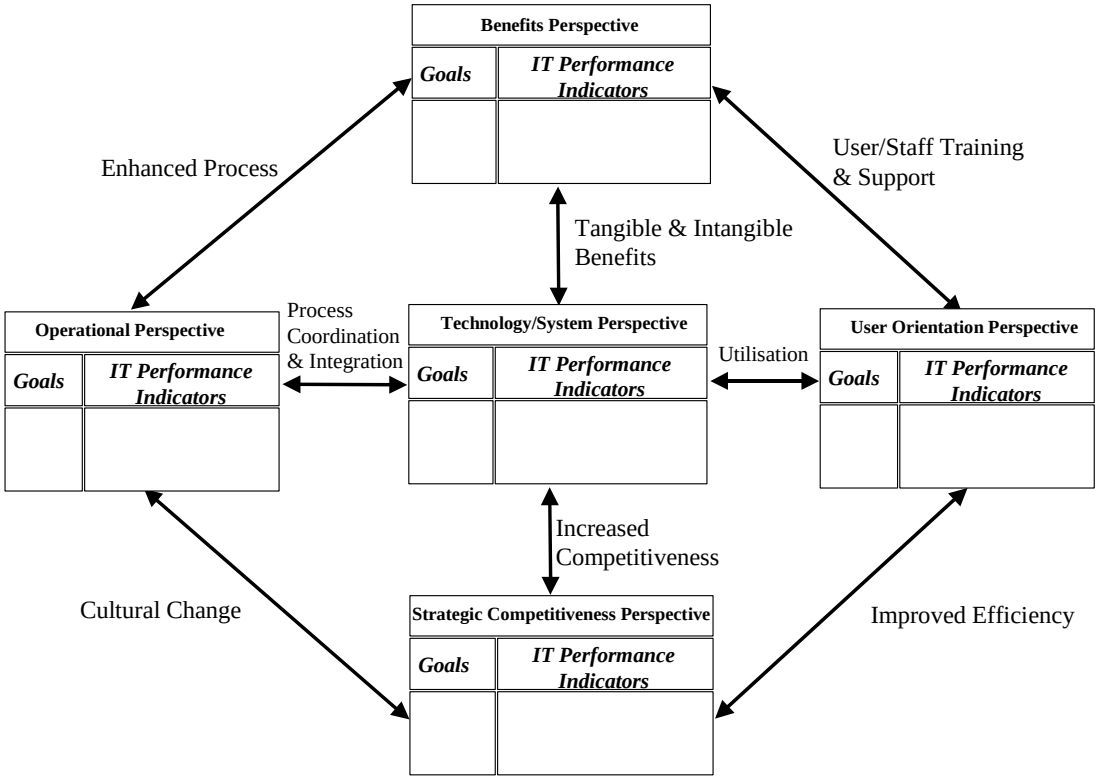
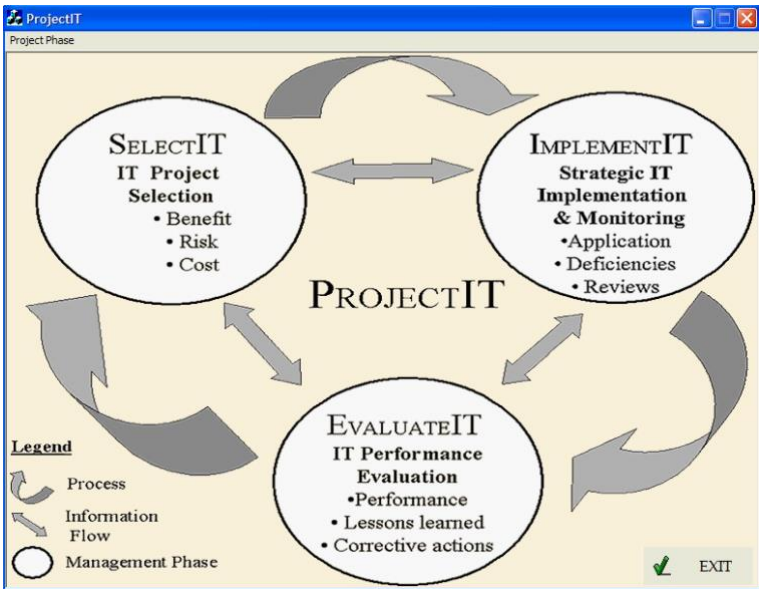


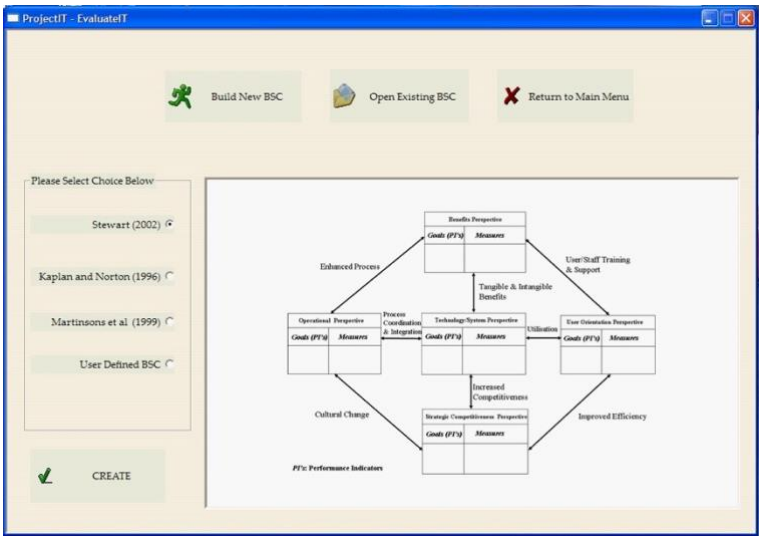
Figure 3: 'Construct IT' BSC (Stewart and Mohamed, 2003)

5. Software Tool Development: *ProjectIT*

Currently, the author is developing an integrated IT project lifecycle management tool (*ProjectIT*) based on the architecture briefly described above (see Figure 4). The primary objective of the windows-based software tool is to provide construction organisations with a user-friendly means to select, strategically implement and evaluate the performance of their IT projects. The software tool will include step-by-step procedure wizards which enable companies to develop user-defined frameworks for each phase of the IT project lifecycle. Additionally, the proposed framework will be supplemented with an all-embracing guidebook detailing illustrative examples. Eventually, the package will include an extensive reporting function that can be used by management to guide decision-making.



(a) Introduction Screen – Select a Phase of the IT Project Lifecycle



(b) *EvaluateIT* Screen – Select an Existing or User-defined BSC Framework

Figure 4: *ProjectIT* Software Tool

6. Summary

Industries, such as banking, finance, insurance, mining and manufacturing, are gaining benefits and competitive advantages from the successful implementation of innovative IT projects. Adopting an IT project lifecycle management approach is the first step to efficiently and effectively transform or re-engineer traditional construction business processes and, ultimately, improve the productivity of the construction industry. The contents of this research paper have many implications for the construction industry as it provides a lifecycle management framework, which has immense relevance to construction organisations. Such a framework would mitigate against IT project risk factors and ensure that efficient and effective IT project management occurs. The results of this research should increase an organisation's

motivation to pursue a more advanced approach to managing their IT projects. The IT project lifecycle management framework will help industry professionals select the most appropriate IT projects for their organisation, strategically implement these selected projects and continuously monitor and evaluate the implemented IT projects. Current research is focused on developing a software tool for the lifecycle management of IT projects in construction organisations.

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