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STRATEGIC E-BUSINESS FRAMEWORK: A HOLISTIC APPROACH FOR ORGANISATIONS IN THE CONSTRUCTION INDUSTRY

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SUMMARY*: Strategic consideration and actions are crucial for organisations in the construction industry to implement e-business successfully and have continuous improvement. However, only focusing on one concept is not sufficient for construction companies to formulate their e-business strategy because of the fragmented needs and requirements within the organisations. To address the industry's specific needs and requirements, an e-business strategy should include multiple elements rather than one element, and collaboration of partners should lie at the heart of the e-business strategy. Also, the strategic approaches currently available for e-business implementation are mainly 'reactive' and lack a long-term consideration or vision. To improve e-business implementation, it is important for organisations in the industry to create a positive organisational culture and consider both the emergent and long-term needs across organisation boundaries. This paper presents a Strategic e-Business Framework for organisations in the construction industry. The Framework provides a holistic approach for e-business strategy formulation and implementation. Organisations in the industry can work out a comprehension business solution for their e-business implementation using the Framework. The recommendations are also presented to illustrate how the Framework can benefit organisations in the construction industry potentially.*

KEYWORDS*: electronic business, construction industry, strategy, framework*

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1. INTRODUCTION

The concept of strategy was introduced to the e-business domain after the dot-com bubble burst, and organisations realised that technology alone was not adequate for the success of e-business implementation. There was a growing realisation that it must be accompanied with appropriate managerial and organisational practices (Jelassi and Enders, 2009; Chaffey, 2009; Laudon and Laudon, 2009). Currently there is a tendency for e-business strategy to be incorporated within the functional strategies, for example within a marketing plan or logistics plan, or as part of information systems (IS) strategy (Chaffey, 2009). However, the leaders in e-business have typically defined e-business as an element of their corporate strategy development and the importance of e-business strategy has been recognised by the senior management board (Deise et al., 2000; Norton, 2002; Jelassi and Enders, 2009; Chaffey, 2009). E-business strategy defines how organisations connected with external partners as well as how organisations operated within management activities, processes and systems (Zeng and Li, 2008). It enables organisations to promote the alignment of business and IT infrastructure in order to derive the maximum benefit from their investments in technology. According to Chaffey (2009), without a clearly defined e-business strategy, the following problems may result:

- *Missed opportunities*: because of a lack of evaluation of opportunities or insufficient resourcing of e-business initiatives;
- *Inappropriate direction in e-business development:* having no long-term consideration of e-business development and without clearly defined objectives;
- *Limited integration:* at only a technical level potentially resulting in "silos" (e.g. separate organisational team with distinct responsibilities that do not work in an integrated manner with other teams) of information in different systems; and
- *Resource wastage:* due to duplication of e-business development in different functions and limited sharing of best practice.

Therefore, it is important for all organisations to define an appropriate e-business strategy to guide its e-business implementation and support the overall corporate strategy. Organisations in the construction industry are no exception. However, the strategic consideration of e-business implementation in the construction industry was very limited. Ruikar et al. (2008) recommended a strategy development based on the e-readiness measurement and evaluation. Other experts stated that it was important to consider a holistic approach for e-business implementation in the construction industry since the approaches available were mainly 'reactive' and lacked a long-term vision or strategy (Ruikar, 2004; European Commission, 2006; Ruikar et al., 2006; Alshawi et al., 2008). However, the issues of the content of an e- business strategy and how it should be developed have not been discussed. This research is the first step towards bringing the current gap. This paper presents a Strategic e-Business Framework as a holistic approach for organisations in the construction industry to define, execute and review their e-business strategies. It focuses on the development and implementation of the Framework. The next section describes the adopted methodology to develop the Framework. This is followed by a review of different relevant approaches for e-business strategy formulation. A detailed description of the Framework and its evaluation are also presented. Future implementation consideration is discussed in the concluding section of the paper.

2. METHODOLOGY FOR DEVELOPING THE FRAMEWORK

A multi-methodological research design and a pragmatic mixed-methods approach, involving a combination of both quantitative and qualitative datasets, were adopted to investigate the e-business practices of organisations in the industry. These include an exploratory investigation (an industry survey with 250 industry organisations), and an explanatory investigation (four case studies with specific industry end-user companies). The collected data was analysed and problems were identified; the elements for a holistic approach to manage e-business implementation emerged. Mixed-method designs provide a basis for triangulation but, more often, become the source of different ways of conceptualising the problem, such as different instrument design for data collection (qualitatively and quantitatively), and various methods of data analysis and inference (statistically and qualitatively) (Tashakkori and Teddlie, 2003; Creswell, 2009). Therefore, besides the strengths of complementarity and triangulation, the mixed-method designs have other advantages, such as providing both

narrative and numeric data, interpreting a broader and more complete range of questions, increasing generalizability of results, and producing more complete knowledge to inform practice (Traynor, 2004).

As an initial step, an inclusive review of existing literature on the current available approaches (models, frameworks and tools) for e-business strategy formulation and implementation was carried out. The analysis of the industry survey and the multiple-case studies were then reviewed to generalise the shared themes. The emerged main themes revealed the essential elements for organisations in the construction industry to formulate and implement e-business strategy.

The industry evaluation was adopted to gauge the appropriateness and effectiveness of the Framework from an industry perspective. Details of the evaluation are described in Section 4.4 of this paper.

3. REVIEW OF RELEVENT APPROACHES

There have been many different views of the contents of an e-business strategy, such as focusing on technology (Anice et al., 2001), business and managerial practices (Norton, 2001; Charelsworth, 2011), human factors (Daghfous and AI-Nahas, 2006), environment (Pai and Yeh, 2008), inter-organisational relationships (Julta et al., 2001), networks (Sultan and Hussain, 2001), financial considerations (Levenburg and Magal, 2004), and markets (Jarvenpaa and Tiller, 2001). However, as more research work was undertaken in e-business strategy concepts and solutions, researchers started to realise that e-business strategies should not be limited to simply one aspect but also should include multiple elements (Mohammadian et al., 2010). Furthermore, to clearly define an appropriate e-business strategy, different models or frameworks were developed to support strategy formulation and implementation.

Several approaches for e-business strategy formulation and implementation were reviewed as a part of this study, but none of them were construction-specific. These approaches built on the theory of strategy formulation and management, but each had a different focus. Kalakola and Robinson (2004) defined the Roadmap for e-Business model, which had an emphasis on the continuous review and prioritisation of investment in new applications. However, this model is not suitable for organisations that wish to leverage their resources to improve e-business capabilities and provide an integrated approach for long-term e-business implementation. Jelassi and Enders (2009) identified the e-Business Strategy Framework, which suggested that organisations should undertake e-business strategy options based on the created value of implementing such options. However, the created value of e-business is difficult to be quantified in monetary terms sometimes when the value is associated with intangible benefits (Al-Mashari, 2002; Mogollon and Raisinghani, 2003; Fink, 206; Chaffey, 2009). Therefore, it would more persuasive to show the role of e-business strategy in improving the overall performance of the organisations and supporting the corporate goal. Chaffey (2009) established the Generic e-Business Strategy Process Model, which defined the elements of an e-business strategy and its development in a dynamic manner, and could be used as a guide for organisations to determine e-business strategic issues at a high level. However, since it is a generic model for all business sectors, industry-specific elements must be added when planning a holistic approach for organisations in the construction industry.

Other than the above three approaches, four other construction-specific approaches (models, frameworks or tools) relevant to the current study were also reviewed. These approaches included the PIECC Decision-Making Framework (Shelbourn et al., 2006), the e-business readiness assessment tool VERDICT (Ruikar et al., 2006), the IS/IT Organisational Readiness Model (Alshawi, 2007), and the Construction Process Protocol (Copper et al., 1998). The following gives an overview of each:

- *The PIECC Decision-Making Framework:* The PIECC (Planning and Implementing Effective Collaboration in Construction) Decision-Making Framework was designed to guide organisations in the planning and implementing effective collaborative working (Shelbourn et al., 2006). The Framework defines four key aspects and a set of sub-processes for each aspect to work through in order to develop a mutual acceptable collaboration strategy. The Framework also defined two activities for reviewing the collaboration strategy (e.g. reflections and feedback of collaboration, and measure the collaboration performance). However, it does not identify the way in which feedback and measures can be shared across the collaboration teams and project teams, so it will be difficult for organisations to learn lessons from previous collaboration practices. Moreover, the Framework defines an activity to obtain support externally (i.e. collaboration support from external sources), but the role of the external business partners is not clearly identified.
- *The VERDICT Application*: VERDICT (Verify End-user e-Readiness using a Diagnostic Tool) was designed for organisations in the construction industry to gauge their e-readiness (Ruikar et al., 2006). VERDICT defines the categories of criteria necessary to assess the ability of an organisation to adopt, use and benefit from e-business. The categories include Management, People, Process and Technology. VERDICT can also help in highlighting areas that must be addressed to achieve e-readiness. However, VERDICT does not define measures for organisations to address the issues of highlighting areas and the necessary procedures for them to go through to make improvement in such areas.
- *The IS/IT Organisational Readiness Model*: this was designed to assist organisations in the construction industry to successfully implement IT/IS (Alshawi, 2007). The Model identifies four categories of criteria to assess the ability of an organisation to successfully implement and evaluate IT/IS: People, Processes, Technology and Environment. The Model also defines the maturity level of each category for units of measurement. However, how organisations can improve their organisational readiness (e.g. improve the maturity level from the lowest to the highest) has not been addressed in the model.
- *The Construction Process Protocol:* this was developed to help construction project participants work together seamlessly through bringing together diverse functions/companies involved in construction projects under the common framework of a structured process (Process Protocol, 2011). The Process Protocol Framework incorporates the concepts of process gate and process review. The process gate concept (soft gate and hard gate) is designed to ensure that the key decision points in the process are respected, and the process review concept (feedback from the results of previous decisions) enables continuous process improvement (Copper et al., 1998). The Framework can be adapted to manage different processes sequentially. However, the Framework is not suitable for managing processes that are not sequential and not repeatable (e.g. one-off events or activities).

The Framework developed in this paper combines the aspects of five approaches: Chaffey's Generic e-Business Process Model, the PIECC Decision-Making Framework, the VERDICT application, the IT/IS Organisational Readiness Model and the Process Protocol Framework, and builds on them. The Generic e-Business Process Model was used as a guide to define the phases of the Strategic e-Business Framework, the PIECC Decision-Making Framework helped to identify the main activities of each phase, the VERDICT application and the IT/IS Organisational Readiness Model helped determine the factors responsible for the main activities of each phase in the Strategic e-Business Framework, and the Process Protocol Framework was adopted to identify the layout of the Strategic e-Business Framework. Fig 1 illustrates the development of the Strategic e-Business Framework.

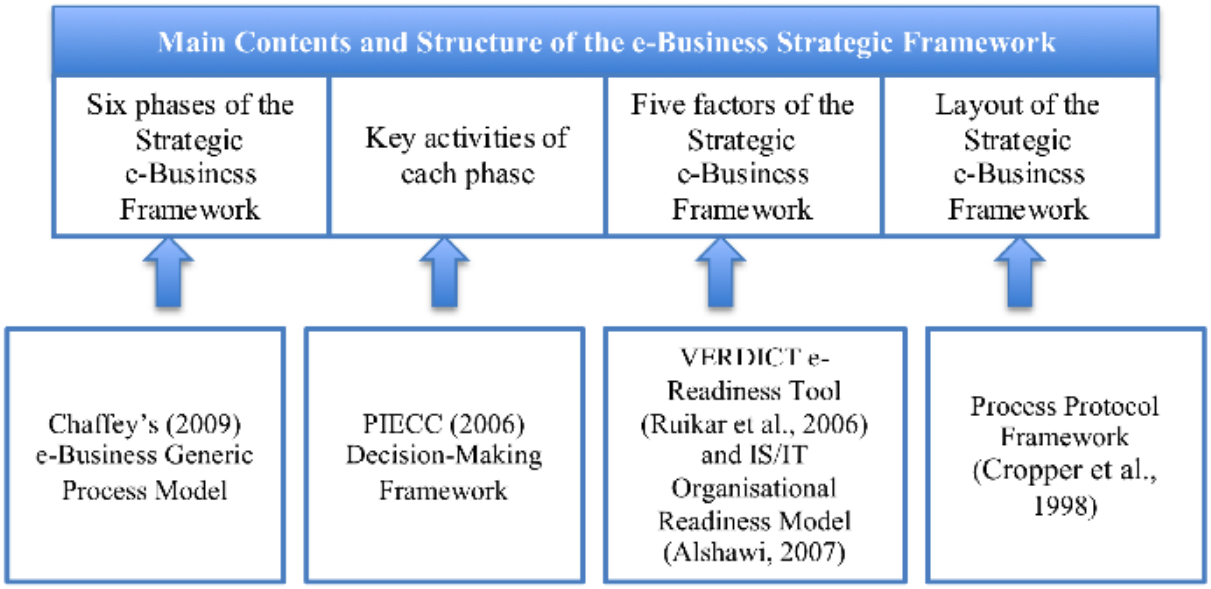

Figure 1 Reviewed Approaches and Their Relationships with the Framework Developed in This Paper

4. THE STRATEGIC E-BUSINESS FRAMWORK

4.1 BACKGROUND

The main purpose of the Strategic e-Business Framework was to provide a holistic approach for e-business strategy development and implementation in order to achieve the aim of the research. The Framework is a comprehensive manual on how to develop e-business strategies for organisations in the construction industry. It provides guidance for organisations in the industry to help them to utilise their available IT resources and maximise the benefits of e-business through strategic practices. The Framework is designed specifically for the senior IT management staff (e.g. company Senior IT managers, or corporate IT Directors) to define organisational level e-business strategies and implementation plans. However, the Framework also requires the involvement of other staff in the organisation, from the senior management to end- users.

The Framework comprises the following six main components (see Fig 2):

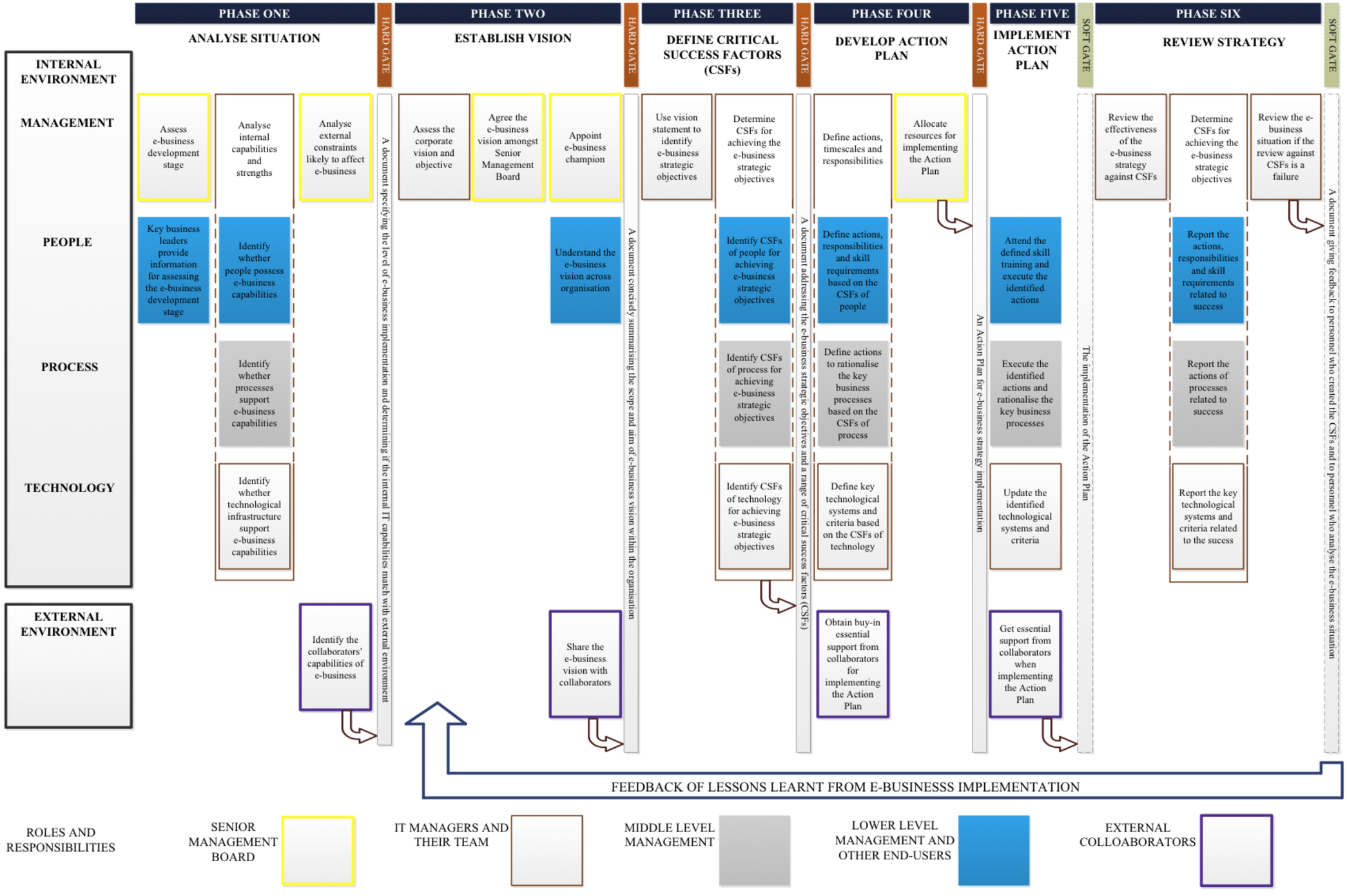

Figure 2 The Strategic e-Business Framework for Organisations in the Construction Industry

4.1.1 Phases

Phases are the high level elements of the Strategic e-Business Framework, which are the main subjects that organisations in the industry must work through when developing their e-business strategies. The Framework consists of six phases: Analyse Situation, Establish Vision, Define Critical Success Factors, Develop Action Plan, Implement Action Plan and Review Strategy. The details of each phase and the included activities will be presented in Section 4.3.

4.1.2 Activities

Activities are the actions within each phase. Once all the activities have been fully accomplished, the relevant phase has been successfully completed.

4.1.3 Factors

Factors refer to the categories used to group the activities within each phase. Factors emphasise the importance of different functions within an organisation to ensure strategic implementation of e-business and its continuous improvement. The Framework includes five factors: Internal Environment (Management, People, Process and Technology) and External Environment. The details of each factor will be presented in Section 4.2.

4.1.4 Sub-activities

Sub-activities refer to the actions within some activities, which are defined when these activities require input from people, process and technology.

4.15 Phase Gates

Phase gates include soft gates and hard gates, which are defined to ensure that the key decision points in the process are respected. The Framework consists of four hard gates and two soft gates.

4.1.6 Roles and Responsibilities

Roles and responsibilities refer to the teams or people identified as the appropriate parties responsible for carrying out the activities. Five groups of people were assigned to the activities and sub-activities: Senior Management Board, IT Manager and their teams, Middle Level Management, Lower Level Management and other End-users, and External Collaborators.

Organisations must go through the Framework phase by phase strictly when developing their e-business strategies. After accomplishing all the activities of each phase, they must check whether or not they have worked out the outputs that are displayed in the phase gates. For example, at the end of the Analyse Situation Phase, a document that specifies the level of e-business implementation and determines if the internal IT capabilities match with external environment should be produced when all the activities in the Phase are completed. If the outputs of the Phase are not obtainable, organisations need to review the performance of each activity and determine the reasons that cause the unachievable results.

Moreover, the senior IT management staff (e.g. company Senior IT managers, or corporate IT Directors) are responsible for tracking the accomplishment of each activity before the e-business champion is assigned, which includes ensuring the right people (check the role and responsibilities of each activity) do the right thing (check the performance of each activity) at the right time (check the activity is strictly performed phase by phase). The e-business champion is responsible for the tracking tasks when he/she is assigned.

4.2 FACTORS OF THE FRAMEWORK

4.2.1 Internal Environment

A complete e-business strategy requires a concerted effort within an organisation, including the commitment and involvement of senior management, the awareness and skills of employees, the rationalisation of key business processes and the support of technological infrastructure, systems and criteria. Management, people, process and technology are the four factors that were used to categorise the main activities of each phase in the Strategic e-Business Framework. The meaning and function of each factor in the Framework are explained in the next a few sub-sections.

4.2.1.1 Management

Management can be defined as a set of activities (including planning and decision making, organising, leading and controlling) directed at an organisation's resources (human, financial, physical and information) with the aim of achieving an organisation's goals in an efficient and effective manner (Griffin, 2005). Ruikar et al (2006) highlight the role of management in dealing with the strategic change. In the Strategic e-Business Framework, management refers to all the activities related to planning, decision making, organising, leading or directing, controlling, and staffing in order to define, implement and review the e-business strategies. In the Framework, the development of e-business strategies heavily relies on such management activities. Management acts as one of the major categories necessary to ensure the accomplishment of each phase.

4.2.1.2 People

In e-business implementation, the people factor includes the social and cultural aspects related to the people within an organisation (Ruikar et al., 2006). In the Strategic e-Business Framework, the people factor takes into account the awareness, understanding and skill requirements of staff within an organisation when implementing e-business. This factor acts as one of the major categories necessary to ensure the accomplishment of each phase.

4.2.1.3 Process

Process means a practice, or a series of actions, done for a specific purpose (Craig, 2004). In e-business implementation, process refers to part of a system that has a clearly defined purpose or objective and clearly defined inputs and outputs (Chaffey, 2009). In the Strategic e-Business Framework, process refers to the key business working rules and procedures used by construction organisations to implement e-business. The function of process in the Strategic e-Business Framework is similar to the people factor, and it is a necessary part of accomplishing each phase.

4.2.1.4 Technology

In e-business, technology refers to information and communication technologies (ICT) including both hardware and software availabilities and usage within an organisation (Chaffey, 2009). In the Strategic e-Business Framework, the technology factor refers to e-business tools/applications as well as the technological infrastructure or systems supporting information transaction and sharing. The function of technology in the Strategic e-Business Framework is similar to people and process, being a necessary part of accomplishing each phase.

4.2.2 External Environment

The External Environment gives organisations their means of survival but also represents a source of threats (Porter, 1985). In e-business implementation, the External Environment refers to the elements of the external environment that are likely to impact e-business implementation, which includes a consideration of both the micro-environment and the macro-environment (Chaffey, 2009). The micro-environment refers to the immediate competitive environment that a company faces, such as customer demand, competitor activity, marketplace structure and relationships with business partners. The macro-environment refers to the wider environment in which a company operates, which includes economic, social, legal and ethical factors (Johnson and Scholes, 2003). In the Strategic e-Business Framework, external environment also acts as one part that is necessary to complete each phase.

4.3 PHASES OF THE FRAMEWORK

4.3.1 Analyse Situation

Analyse Situation refers to the review of information about an organisation's internal processes and resources and external marketplace factors in order to define and plan e-business strategies (Chaffey, 2009). Organisations need to have clear picture of their available IT (or e-business) resources, the way in which their current internal processes work, and the kind of external environment they compete in. They then must decide when and how to respond to the macro-environment and the competitors (Smith and Taylor, 2004; McDonald, 2008; Jelassi and Enders, 2009; Chaffey, 2009). To define a complete and precise e-business strategy, organisations must design the analysis with a practical purpose in mind (Johnson and Scholes, 2003). This phase provides guidance and techniques to allow organisations to analyse their e-business situation. The outputs of this phase include: 1) a

document specifying the desired level of e-business implementation in the future, and 2) a determination of whether or not the company's internal IT capabilities and processes match with the capabilities and processes used by external partners and customers. The process gate at the end of this phase is a hard gate, which means that only when all the activities in this phase have been accomplished, can organisations initiate the activities described in the following phase. Five activities included in this phase: assess e-business development stage, key business leaders provide information for assessing the e-business development stage, analyse internal capabilities and strengths, analyse external constrain likely affecting e-business, and identify the collaborators capabilities of e-business.

4.3.2 Establish Vision

An e-business vision refers to a concise summary of the scope and broad aims of a company's future e-business activities, including the explanation of how these activities will contribute to the organisation and support its core business activities. Establishing a Vision requires the participation of a broad cross-section of company staff to work out the Vision that is usually captured in the form of a written document. Defining a specific vision can help organisations contextualise e-business in relation to the overall corporate strategies. It also helps place a long-term emphasis on e-business transformation within an organisation (Jelassi and Enders, 2009; Chaffey, 2009). This phase provides guidance to help companies establish their e-business vision. The output of this phase is a document concisely summarising the scope and broad aim of e-business activities within the organisation. The process gate at the end of this phase is a hard gate. Five activities included in this phase: assess corporate vision and objectives, agree the vision amongst Senior Management Board, appoint e-business champion, understand the vision across the organisation, and share the e-business vision with collaborators.

4.3.3 Define Critical Success Factors (CSFs)

Critical Success Factors (CSFs) refer to elements that are vital for a strategy's success. Defining CSFs can help organisations to translate their e-business vision into practical actions, investigate the applicability of strategic objectives, and review the effectiveness of the e-business strategy. Previous research has suggested that the CSFs of information technology are primarily technological related elements (Chaffey, 2009). Defining CSFs for e-business implementation should not be limited to considering technologies and systems, but also requires identifying CSFs related to people and process. This phase of the framework provides guidance to help a company define CSFs related to e-business implementation. The outputs of this phase include the e-business strategic objectives and a range of critical success factors. The process gate at the end of this phase is a hard gate. Two activities included in this phase: use vision statement to identify e-business strategic objectives, and determining CSFs for achieving the e-business strategic objectives.

4.3.4 Develop Action Plan

Develop Action Plan refers to identifying the required actions time horizons and resources for implementing the e-business strategic solutions within an organisation. After analysing the situation, establishing the vision and determining the strategic objectives and CSFs, organisations need to plan their actions for e-business implementation. In strategy development, an Action Plan refers to "a sequence of steps that must be taken, or activities that must be performed well, for a strategy to succeed" (Business Dictionary Online, 2011). A workable Action Plan should provide confidence that the strategic objectives are achievable within the constraints of time and cost (Billingham, 2008). This phase provides a guide for organisations to prepare for carrying out all the tactics that will be used to achieve the strategic objectives. The output of this phase is an Action Plan for e-business implementation. The process gate at the end of this phase is a hard gate. Three activities included in this phase: define actions, timescales, and responsibilities, obtain buy-in essential support from collaborators for implementing the Action Plan, and allocate resources for implementing the Action Plan.

4.3.5 Implement Action Plan

Implement Action Plan refers to executing all the planned actions to achieve the strategic objectives. Implementing a solution is the crucial part of strategies planning and execution (Johnson et al., 2008). This phase is a very difficult one to implement. At the Implement Action Plan Phase, Senior Management Board is not directly involved and other members in the organisation, such as Middle Level Management staff, and Lower Level Management staff, and other End-users, carry out all the actions. The e- business champion is crucial at this phase as a leader for the implementation of the Action Plan. The champion must ensure the

execution of all the defined actions and seek a suitable management approach to monitor the roll out of the Plan and address the problems that may arise during or after the execution of the various actions. This means that the e-business champion may have to carry out some corrective actions (e.g. the defined actions are not correctly executed). When problems arise, the e-business champion must consider the answers to the following key questions:

- *Evaluate the current situation:* What will happen if things continue as they are?
- *Consider various corrective solutions*: Are there any measures that could be applied and to assess the pros and cons of adopting each alternative course of action?
- *Select and implement one of the course action*: What should be done to solve the problem,
- *Link back into the monitoring process*: Has the corrective action had the desired effect?

The output of this phase is the implementation of Action Plan. The process gate at the end of this phase is a soft gate, which means that the activities in this phase and their related activities in the following phase can be executed sequentially or concurrently. For example, organisations can review the effectiveness of their e-business strategies against the CSFs of people, either during or after executing the defined actions related to people. Four activities included in this phase: attend the defined skill training and execute the identified actions, execute the identified actions and rationalise the key business processes, update the identified technological systems and criteria, and get essential supports from collaborators when implementing the Action Plan.

4.3.6 Review Strategy

Review Strategy refers to the process for evaluating the adopted strategies after they had been implemented, and determining lessons learnt from the review, which may include reshaping the vision and objectives, and modifying the CSFs. To achieve both the tangible and intangible benefits of e-business, organisations need to consider units of measurement to connect their organisational performance and their strategic actions. Moreover, organisations need to consider how to connect the critical success factors with their organisational-specific e-business capabilities when attempting to identify units of measurement for reviewing e-business strategies.

The Review Strategy Phase provides an effective way of reviewing e-business strategy, and more importantly, it enables companies to learn from their previous e-business implementation experience. The outputs of this phase include two reports: 1) a report giving feedback to the personnel who identified the CSFs, and 2) a report to personnel who analysed the company's e-business situation. The process gate at the end of this phase is a soft gate, which means that the activities in this phase and their related activities in the following phase can be executed sequentially. At this phase, the feedback loop is adopted to connect the Review Strategy Phase to the Analyse Situation Phase. This enables the Strategic e-Business Framework to act as a cycle for carrying out all the phases once again. Three activities included in this phase: review the effectiveness of the e-business strategy against CSFs, share the success of e-business strategy implementation across the organization, and review the e-business situation if the review against CSFs is a failure.

4.4 THE EVALUATION OF THE FRAMEWORK

The main purpose of the framework evaluation process was to gauge the appropriateness and effectiveness of the Strategic e-Business Framework from the industry perspective. The evaluation involved three steps: 1) preparing a questionnaire for conducting structured interviews; 2) carrying out the structured interviews with the industry practitioners; and 3) analysing the interview results and presenting the findings. Altogether, six evaluations were completed. Four evaluations were undertaken by the industry practitioners who took part in the multiple-case studies described in Section 2, which aided in the development of the Framework. The involvement of the same personnel sought to inspect the internal validity and consistency of the current research (Creswell, 2003). Industry practitioners who were new to the study carried out another two evaluations, which offered different perspectives and tested the applicability of the Framework in a wider scope (Wellington, 2000). Tab 1 displays the industry practitioners that participated in the framework evaluation processes.

Table 1 Industry Practitioners Participating in the Framework Evaluations

Evaluator	Organisation Discipline	Role of Interviewee	Experience	
			Industry	IT
Evaluator 1	Contractor, construction and engineering	System and Technology Director	38	22
Evaluator 2	Contractor, construction and development	Technical Service Director	25	20
Evaluator 3	Contractor, construction and engineering	Senior IT Manager	25	20
Evaluator 4	Consultant, construction, engineering and technical service	Information System Director	20	20
Evaluator 5	Consultant, architectural and engineering	Senior IT Manager	22	22
Evaluator 6	Consultant, construction and assess management	Technical Service Director	34	25

Overall, the findings of the evaluation revealed that the evaluators gave positive about the ease with which the framework could be implemented. The evaluators rated the Framework as highly appropriate in general. Moreover, the evaluators were highly satisfied with the provision of phases, included activities in each phase, and the factors considered for categorising the activities. The evaluators also reported that the applicability of the main activities was high and confirmed that those activities were appropriate in delivering the final outcomes of the associated phases. Furthermore, the evaluators reported that the Framework could benefit their organisations in the following areas:

- Helping them to recognise the attributes of their organisations in e- business practices, specifically by means of the strategic scanning or positioning at the Analyse Situation Phase;
- Providing a useful business case for organisations to evaluate the risks and requirements of e-business;
- Assessing the awareness and commitment of the Senior Management Board in e-business strategies and implementation;
- Helping them to establish a culture that is conducive to e-business implementation by including People as one main factor in the Framework and identifying associated activities;
- Guiding them to perform decision-making on technological issues by including Technology as one main factor in the Framework and identifying associated activities;
- Helping them carefully consider the e-business practices of external business partners by including External Environment as one main factor in the Framework and identifying associated activities.

5 RECOMMENDATIONS AND CONCLUSIONS

This paper presented a Strategic e-Business Framework that organisations in the construction industry can use to define, execute and review their e-business strategies.

The Framework was developed from an IT Director or Senior IT Manager's perspective based on a concept of harnessing the abilities and commitment of other staff within the organisation. The Framework addresses all factors necessary for developing and implementing an e-business strategy, such as advising organisations to review e-business strategies after execution, linking technological systems, people and processes within the strategy, and including external organisations in the strategy. The Framework enables IT Directors or Senior IT Managers to include multiple elements in their e-business strategies and carry out consistent e- business planning.

The Framework can also assist organisations in the construction industry to better utilise their available IT resources and maximise the benefits of e-business through strategic practices. Six phases and phase gates (hard gates or soft gates) defined in the Framework ensure a sequential approach for defining, managing and reviewing e-business strategies, and a feedback loop was defined to enable the Framework to act as a cycle for going through repeatedly, which makes the continuous improvement of e-business implementation possible within organisations. The outputs of each phase were defined to assist IT leaders in the review of procedures during their e-business implementation. Five factors defined in the Framework ensure organisations to have the opportunities to improve their capabilities in these areas, and to make organisations ready for immediate e-business implementation. Five groups of people or teams assigned to the activities of the Framework provided a basis for organisations to utilise their resources, specifically human resources. Three groups of Critical Success Factors (CSFs), people, process and technology, defined in the Framework, ensure that organisations can improve, execute and review their e-business implementation effectively and purposefully. The analysis of the evaluation of the Framework by practitioners have demonstrated the intense interest of industry practitioners in implementing the Framework to improve their current strategic practices in e-business and remain diligent in e-business strategy development.

The following recommendations are made on strategic implementation of e-business in the construction industry:

- The industry should consider a comprehensive business solution addressing both the organisation's current needs and its future emerging needs in order to make full utilisation of their existing investment in e- business including effective benefits realisation planning.
- The industry should consider their e-business solutions in a collaborative environment. Organisations must give serious thought to the engagement and support of external organisations. This includes linking e-business systems with the information set that is collected from the clients and submitted by suppliers. This is crucial because secure, transparent information exchanges and transfers along the whole supply chain are necessary to ensure the effective implementation of e-business and unlock the full substantial benefits that e-business has to offer.
- Organisations in the construction industry should consider the appropriate and effective staff training and skill assessment programmes in order to motivate employees to use e-business tools and applications, build their confidence in using new e-business technologies, and create a good culture to e-business practices.
- The industry should revise the measures and methods used for evaluating their level of success in implementing e-business. The current measures are limited and ineffective. The measures for evaluating e-business implementation should include performance metrics for implementation at both the organisational level and the project level. The measures used to evaluate e-business strategies should include criteria that ensure the success of strategy implementation. The evaluation of e-business strategies should define consistent methods for pursuing those success criteria.

In conclusion, the Framework is a positive step towards e-business management. Organisations in the industry can enhance their e- business development and plan proactively when new technologies emerge.

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