A MODEL FOR ORGANISATIONAL READINESS IN INFORMATION TECHNOLOGY (IT) PROJECT IMPLEMENTATION IN THE MALAYSIAN CONSTRUCTION INDUSTRY

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FACULTY OF BUILT ENVIRONMENT
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Abstrak

Dalam persekitaran yang kompetitif, adalah penting bagi industri pembinaan untuk menggunakan Teknologi Maklumat / Sistem Maklumat (TM/SM) untuk kekal di hadapan. Walaupun banyak faedah TM/SM yang telah dilaporkan, kajian menunjukkan kegagalan pelaksanaan aplikasi TM/SM dalam industri pembinaan. Para penyelidik telah mengenal pasti punca kegagalan tersebut disebabkan oleh kegagalan untuk menangani isu yang berkaitan dengan manusia di dalam organisasi. Peranan manusia dalam menentukan kejayaan penggunaan TM/SM adalah sangat penting, namum isu ini seringkali diabaikan. Sehubungan dengan itu, bagi memastikan kejayaan pelaksanaan TM/SM, adalah penting untuk mengukur tahap kesediaan manusia atau keupayaan sesebuah organisasi. Kajian ini bermula dengan mengkaji beberapa model *e-readiness* yang telah dibina oleh pelbagai kumpulan dan institusi untuk mengukur kesediaan atau keupayaan oleh berbagai pihak. Walau bagaimanapun, terdapat beberapa kelemahan yang dikenalpasti seperti model yang diwujudkan hanyalah terhad untuk menilai keupayaan semasa tanpa memberikan sebarang cadangan untuk penambahbaikan. Tambahan pula, kebanyakan model *e-readiness* yang wujud tidak memberi tumpuan kepada isu yang berkaitan dengan manusia terutamanya di dalam sektor pembinaan. Oleh itu, kajian ini cuba untuk menangani batasan-batasan ini dengan memberi tumpuan kepada kesediaan manusia dalam sektor pembinaan. *People e-Readiness Maturity Model* (PeRMM) telah direkabentuk untuk membantu organisasi pembinaan untuk berjaya menggunakan TM/SM dengan mengenal pasti tahap kesediaan mereka sebelum penggunaan TM/SM. Di dalam proses merekabentuk ini, faktor-faktor kejayaan kritikal yang berkaitan dengan manusia telah dikenal pasti melalui kajian literasi bermula dari tahun 2000 hingga 2013. Hasil dari kajian literasi, 21 faktor kejayaan kritikal yang berkaitan dengan manusia telah dikenal pasti. Seterusnya, tujuh pengurus IT telah dipilih untuk mengambil bahagian dalam kajian perintis untuk mengesahkan kewujudan

21 CSFs diperolehi. Hasil daripada kajian perintis mendedahkan dua faktor kejayaan kritikal yang berkaitan dengan manusia, iaitu *personal management competencies* dan *independent*. Faktor-faktor ini kemudiannya digunakan untuk merekabentuk kajian soal selidik. Satu set soal selidik telah dihantar kepada 1000 organisasi pembinaan di Malaysia yang berkapasiti saiz kecil, sederhana dan besar, bagi mengenal pasti isu manusia yang kritikal. Sebanyak 31.1% maklum balas telah diterima. Beberapa analisis telah dilakukan untuk mengenalpasti beberapa faktor-faktor kejayaan kritikal yang berkaitan dengan manusia yang terpenting untuk dimasukkan ke dalam *preliminary people e-readiness maturity model.* Lima organisasi pembinaan dipilh untuk terlibat dalam kajian kes untuk mengesahkan kesesuaian model dengan keadaan semasa. Model ini dijangka dapat digunakan untuk mengenalpasti tahap kesediaan sesebuah organisasi sebelum penggunaan TM/SM, tahap kesediaan semasa dan juga membantu organisasi untuk merancang sasaran masa hadapan. Selain itu, model ini juga dapat mengenal pasti jurang kesediaan mereka yang perlu diperbaiki. Model ini juga akan bertindak sebagai alat pengukuran yang boleh membantu organisasi pembinaan untuk mengenal pasti peningkatan yang diperlukan untuk menjamin kejayaan pelaksanaan TM/SM. Adalah dijangkakan model ini juga akan memberi sumbangan kepada bidang TM/SM dengan menambah dimensi baru TM/SM yang memberi tumpuan kepada perspektif manusia.

Abstract

In a highly competitive environment, it is imperative for the construction industry (CI) to adopt IT/IS to stay ahead. Despite the numerous benefits of IT/IS adoption, findings show poor success rate of IT/IS implementation in the CI. Researchers has identified the failure is related to the people issues within an organisation. People issues are clearly significant, yet neglected, and need to be considered for successful IT/IS implementation. Thus, to measure people readiness or capabilities of an organisation prior to new implementation of IT/IS is extremely important to ensure its successful implementation. This study begins with reviewing several e-readiness models that have been developed to measure readiness or capabilities by various groups and institutions. Several limitations have revealed that such models were restricted to assess the current capabilities without indicating previous achievements and recommendations for improvement. Furthermore, majority of the available readiness models for IT/IS implementation does not focus directly on the people issues specifically for the CI. Therefore, this research attempt to address these limitations by focusing on the people readiness issues in the CI. A People e-Readiness Maturity Model (PeRMM) was developed to assist the construction organisation to successfully implement IT/IS by identifying their readiness level prior to IT/IS investments. Prior to developing the PeRMM, people critical success factors (CSFs) were identified through the literatures dated from year 2000 to 2013, which reveal 21 people CSFs. Seven IT managers were selected to participate in the pilot study to confirm the existence of the 21 CSFs obtained. Findings from the pilot study revealed two additional people CSFs; personal management competencies and independent. The 23 people CSFs were then used to design the questionnaire survey. The questionnaire was sent to 1000 Malaysian construction organisations ranging from small to large-sized, and received 31.1%

responses. Several analysis were performed in shortlisting the people CSFS to be included in the preliminary people e-readiness maturity model. Subsequently, 5 construction organisations participated in the validation exercise to validate the model with current practices. This model is anticipated to assess the organisation's previous achievements, current readiness level and help them to determine their future target as well as identify their readiness gaps that need to be filled. This model will also act as a measurement tool that can help construction organisations to identify the improvements needed to successfully implement IT/IS. It is expected that this model will contribute to the IT/IS field by adding to new dimensions of IT/IS evaluation which focus on the people perspective.

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List of Abbreviations

CI- Construction industry

CSFs- Critical Success Factors

IT - Information technology

IT/IS – Information technology / Information system

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1) Aziz, N. M., & Salleh, H. (2010). *E-Readiness Model: A Comparative Review*. Paper presented at the Second International Conference on Construction In Developing Countries (ICCIDC-II), Cairo, Egypt.
2) Aziz, N. M., & Salleh, H. (2011). Managing Organisation/ Business Readiness towards IT/IS Implementation: A Model Comparison. *Australian Journal of Basic and Applied Sciences*, *5*(2), 215-221.
3) Aziz, N. M., & Salleh, H. (2011). A readiness model for IT investment in the construction industry. *African Journal of Business Management*, *5*(7), 2524-2530.
4) Aziz, N. M., & Salleh, H. (2011, 24-26 August). *People Critical Success Factors of IT/IS Implementation: Malaysian Perspectives.* Paper presented at the International Conference on Economics, and Management of Business, Innovation and Technology, ICEMBIT 2011, Paris, France.
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6) Aziz, N. M., & Salleh, H. (2012). The Critical Success Factors (CSFs) in Information Technology/ Information System (IT/IS) in Construction: A Case Study of People Issues in Malaysia. *Wulfenia Journal, 19*(9), 215-235.
7) Aziz, N. M., Salleh, H., & Mustafa, N. K. F. (2012). People critical success factors (CSFs) in Information Technology/Information System (IT/IS) implementation. *Journal Design + Built, 5*.

Chapter 1

Introduction

1.1 Introduction

The rapid change and advancement of information technology/information system (IT/IS) has revolutionised the business process. The business world is continuously changing due to the advancement and the development of IT/IS. IT/IS played an important role since 1950s (Peslak 2005) and its use in construction industry (CI) has proven to create an efficient and effective project implementation (Adriaanse *et. al.*,2010). The new technologies enable the construction organisations to speed up operation, reduce errors, enhance collaboration and improve information exchange (Alaghbandrad *et. al.*, 2012; Kivrak *et. al.*, 2010; Underwood and Khosrowshahi, 2012). The potential benefits and opportunities of IT/IS implementation for CI has been emphasized by numerous scholars (Ahuja and Shankar, 2010; Alaghbandrad *et. al.*,2011; Chen and Kamara, 2011). Many construction organisations are starting to invest in IT/IS to increase performance, productivity and competitiveness (Alaghbandrad *et. al.*, 2012; Md Rasli *et. al.*, 2011). This has been reflected in the increase of IT/IS investment pattern.

A report by The Knowledge Practice (2010) revealed that the total value of IT/IS spending in UK CI's is £1 billion annually, which shows an increase of over 60% compared to the result of a similar study carried out in 1992. Based on the same report, contractors spent about 0.74% of their turnover for IT/IS spending, and 0.80% for housing builders and developers (The Knowledge Practice 2010). The professional consultation firms on the other hand, spent about 3.6% of organisational income for IT/IS expenditure. Investment for software is expected to increase as most organisations plan to invest in the new-breed of software applications (The Knowledge Practice 2010). Malaysian government has also taken initiatives to encourage the implementation of IT/IS by making IT/IS major components of the country's future development plan. This can be seen in the country's IT/IS spending, which has increased by 9% to USD$6.5 billion in 2011 compared to USD$ 5.9 billion in 2010 (Business Monitor International 2011). Malaysia's software spending had reached USD$827 million in 2011 and is predicted to rise to USD$1.2 billion in 2015 (Enterprise Innovation Editors 2011). The growing application of IT/IS in Malaysia is proven with the increasing popularity and usage of enterprise resource planning (ERP) and customer relationship management (CRM) (Enterprise Innovation Editors 2011).

The CI has also taken steps to be in line with the country's development plan. The Construction Industry Development Board (CIDB) had collaborated with other construction professionals to develop the Construction Industry Master Plan (CIMP), 2005-2015 for the future direction of this industry (Construction Industry Development Board (CIDB) Malaysia 2006). One of the strategic thrusts proposed in this master plan highlighted the need to leverage IT/IS in this industry.

Despite the increased investment in IT/IS, there were numerous high-profile implementation failures. As reported by Batenburg and Constantiou (2009), empirical studies have revealed that most of the organisations fail to obtain the benefits of IT/IS.

Agourram (2009) also reported that IT/IS tend to be unsuccessful most of the time even with the billions of dollars invested yearly. According to Sessions (2012), the cost of IT/IS failure worldwide is about USD500 billion per month, which is about USD6.18 trillion per year. The United States Government (2013) reported an increase of 15% of failure rate reported year-on-year. For the past three years, the failure rates have been gradually rising from 30% in 2007, 43% in 2008 and 66% in 2009 (International Data Corporation 2013). Ibrahim *et al.* (2010), also reported that the application of IT/IS is one of the major issues in Malaysian CI.

Back in the 1960's, technical issues had been identified as the contributing factors for IT/IS failure (Griffith *et. al.,* 1999; Lyytinen and Hirschheim, 1987). Current research findings stated that IT/IS failed because organisations place too much attention on the technology without knowing their current ability to use the technology (Lin *et. al.,* 2007). More research findings confirmed that technical issues have small influence on the successful implementation of IT/IS (Nitithamyong and Skibniewski, 2006; Peansupap and Walker, 2005). Ahuja *et al.* (2009) reported that 80% to 90% of IT/IS failure are not related to technical issues. Other researchers added that the main challenge to successfully implement IT/IS in the CI is the people issue (Lou and Alshawi, 2009; Ogunyemi and Johnston, 2012; Sidawi, 2012). Findings from Razavi and Ahamad (2011) showed that people have a direct influence on the success and failure of IT/IS implementation. According to Adriaanse *et al.* (2010), the unique nature of the CI made the implementation of IT/IS complicated, leading to failure. The collaboration of multiple firms with different expertise and skills in a long time span of construction project which involved variety of tasks, are the underlying problem which contributes to the failure. Being the ultimate user of the technology, people have strong influence to the success or failure of implementing IT/IS. It is very important to understand people and their ability to cope with the technology that is going to be used or is being used in the organisation (Un and Price, 2007). According to Ruikar *et. al.*, (2006), the implementation of IT/IS is less likely to succeed when people are not ready. This is due to the fact that people have direct influence on the success of IT/IS implementation in CI (Xue *et. al.,* 2012). Thus, people readiness become the major concern to positively adapt IT/IS implementation in the work process (Lou and Alshawi, 2009; Vaezi and Bimar, 2009). Sidawi (2012) and Margherita and Petti (2010) suggested, further investigation on people issues should be carried out to reduce the failure in IT/IS implementation. Furthermore, research carried out by Ogunyemi and Johnston (2012), also found that people is one of the factor that have the significant and positive contributions towards readiness.

In Malaysia, the Malaysian Productivity Corporation (MPC) revealed that, only 17% of the organisations in this country used electronic transaction in the year 2009 (Hashim and Said, 2011). The remainder believed that the application is not suitable, poor knowledge of the process and financial constraint (Hashim and Said, 2011). According to Zakaria *et. al.*, (2010), the low readiness level to implement IT/IS is one of the contributing factors which led to the failure in Malaysian SMEs . The high level of failure rates for the past thirty years had motivated researchers to identify the key reasons (Ashurst *et. al.,* 2008).

In an attempt to reduce the IT/IS implementation failure, organisation need to know and measure their current readiness level (Xue *et. al.,* 2012). For this, several e-readiness evaluations models/tools had been developed by various groups and institutions around the world over the past years. The e-readiness concept emerged during the late 1990s to provide a unified framework to evaluate the breadth and depth of the digital divide between developing and developed countries (Mutula and Brakel, 2006). The first effort in defining the e-readiness was undertaken in 1998 by the Computer Systems Policy Project (CSPP), where they defined it as the community that has a high speed access in a competitive market, with constant access and application of IT in school, government offices, businesses, healthcare facilities and homes; online security and user privacy; and government policies which support and promote connectedness and use of the network (Beig *et. al.,* 2007; Nabavi *et. al.,* 2009).

With the development of the first e-readiness models/tools (hereby referred to as models), more models were created to evaluate several factors in relation to the degree of development and usage of IT/IS. Each of the developed models covered different aspects such as society, economy and e-governance issues. There were models which had been developed specifically to measure the people readiness level to use IT/IS, such as the People Capability Maturity Model (P-CMM) which was developed by the Software Engineering Institute (SEI) in 1995 (the baseline version) and its version 1.0 was released in August 1998. The model was then updated to version 2.0 in 2001 (Curtis *et. al.,* 2002). The other people readiness model developed is the Technology Readiness Index (TRI), which was developed by Parasuraman and Rockbridge Associates in year 2000. The P-CMM evaluates 22 areas which were group into four major elements, which include developing competency, building workgroup and culture, motivating and managing performance and shaping the workforce. On the other hand, TRI evaluates elements such as optimism, discomfort, innovativeness and insecurity. Factors or elements evaluated in both models were not tested in the CI. Furthermore, due to the different of nature and process of the CI, the successful application of these generic model from other industries might be inappropriate for CI without necessary modification (Zhai and Liu, 2007). Moreover, TRI model only evaluates the readiness level without making any recommendation for improvement.

There are e-readiness models which had been developed specifically for the CI as there is no one-size-fits-all solution (Vosloo and Van Belle, 2005). There are (i) Benchmarking and Readiness Assessment for Concurrent Engineering in Construction

(BEACON) developed by Khalfan (2001), (ii) Verify End-user Readiness Using a Diagnostic Tool (VERDICT) developed by Ruikar (2004) and (iii) Structured Process Improvement for Construction Environments (SPICE) developed by University of Salford (1998). Unfortunately, none of these models specifically focus on evaluating the people readiness issue. BEACON was developed to identify construction organisations' readiness level in implementing concurrent engineering, which involved evaluating of four elements: process, people, project and technology. VERDICT on the other hand was developed to evaluate the readiness of end-users involved in CI in using the e-commerce technologies. The evaluation involves four elements: management, process, people and technology. SPICE was created to help organisations understand their level of process capability in terms of their process maturity in facilities management context. Thirteen elements were evaluated in this model: brief management, project planning, project tracking and monitoring, contract management, quality assurance, project change management, risk management, organisation process definition, training programme, inter-disciplinary co-ordination, peer review and technology management.

The concept of maturity models were employed in all of these models as its application enabled organisations to verify their previous achievement, current status and act as a framework to guide for future improvement initiatives. The application of the maturity model has been proven useful to evaluate organisational readiness (Man, 2007). The application of the maturity model provides a comprehensive framework for organisation to organise, evaluate, plan and manage their IT/IS capabilities based on the description stated in every levels (vom Brocke *et. al.*, 2012). Organisations can easily access their e-readiness level and systematically improve their e-readiness level in a systematic way to meet with their targets. This concept was first introduced in the Total Quality Management (TQM) system for the statistical process control (Cooke-Davies and Arzymanow, 2003). The successful application of this model has encouraged other industries to develop the same concept. The most widely adopted model is the Capability Maturity Model (CMM), which was developed almost 20 years ago by the Software Engineering Institute of Carnegie-Mellon University to measure the organisational process maturity. More maturity models were developed by researchers in various industries ever since (Pöppelbuß and Röglinger, 2011).

1.2 Problem Statement

The growing number of IT/IS failures for the last four decades have motivated researchers to find ways to reduce it (Agourram, 2009). Much research on IT/IS failure originated back in 1960's concerns the hardware and softwares deficiencies (Bartis and Mitev, 2008). Current research identified the people issue as one the salient reasons for the failures (Lou and Alshawi, 2009; Muhammad, 2012; Ogunyemi and Johnston, 2012; Razavi and Ahamad, 2011). People, as the source of competitive advantage are the fundamental elements in every organisation and could determine if the IT/IS implementation is a success or a failure. Sidawi (2012), Margherita and Petti (2010) and Aggarwal (2010) have highlighted the necessity to emphasize the people aspects in implementing IT/IS in order to increase the success rate.

In an attempt to increase the success rates, several e-readiness assessment models had been developed to evaluate the readiness or capability in order to provide a platform for comparison and forecast. Each of the developed models has their own intended purpose, thus covered different aspects. Majority of the e-readiness models evaluate organisational e-readiness in more than one element such as technology, infrastructure, environment and others. Unfortunately, none of the developed models focuses specifically on the people issues for the CI. Researchers do agree that a one-size-fits-all model may not be attainable (Vosloo and Van Belle, 2005; Molla and Licker, 2005) due to the different nature of every industries (Zeb *et. al.,* 2012). CI is unique in its own way, where a group of organisations get together to design, construct and maintain a construction project and the group is disbanded after the project has been completed (Ballan *et. al.,* 2011). Fengyong and Renhui (2007), further highlight the limited research on the e-readiness area in the CI, which creates the need for further investigation.

Therefore, this research was undertaken to extend knowledge in measuring the people readiness level for construction organisation. Researchers such Alshawi and Arif (2011), Aggarwal(2010), Alshawi and Goulding (2008) and Gajendran and Brewer (2007) and Salleh (2007) had recommended to evaluating the people issue in a proactive manner before implementing IT/IS. According to Alshawi and Goulding (2008), limited research is carried out regarding this area, thus creating the need to develop models or guideline to help the organisations to effectively implement IT/IS.

With regard to this matter, this research was undertaken to help the construction organisations to successfully implement IT/IS. The maturity model and e-readiness model are the two main types of models used worldwide in consideration of the impact of IT/IS in CI (Eadie *et. al.,* 2012). E-readiness models are meant to guide the IT/IS improvement effort by providing benchmark for comparison and evaluation progress (Bridges.org 2005). The maturity model on the other hand, is a framework that maps the organisation development through various stages overtime until it reaches the highest level of perfection (Molla *et. al.,* 2011). Hence, the concept of maturity model is adopted in this research. Furthermore, Pöppelbuß and Röglinger (2011), Wendler (2012) and Röglinger *et. al.,*(2012) have reported some of the maturity model benefits as follows: (i) to serve a descriptive purpose to evaluates the current organisation e-readiness level, (ii) to serve a prescriptive purpose to identify the desirable maturity level and provide guideline for improvement measures and (iii) to serve a comparative purpose for internal and external benchmarking. Therefore, this study proposed to develop the People e-Readiness Maturity Model (PeRMM) to help the organisations to evaluate their current readiness level and the required level in order to assists them to successfully implement IT/IS in organisation.

1.3 Aim and Objectives

This thesis aims to develop the People e-Readiness Maturity Model (PeRMM) in order to evaluate e-readiness levels for construction organisation prior to the IT/IS project implementation.

Objectives:

1. To explore the people critical success factors of IT/IS implementation in multi industries.
2. To classify the people critical success factors (CSFs) of IT/IS implementation in the CI.
3. To construct a preliminary people e-readiness maturity model.
4. To establish a People e-Readiness Maturity Model (PeRMM) for the CI.

1.4 Research Methodology

This section explains the research methodology employed in achieving the objectives listed in the section above. The research begins with preliminary study which includes the literature review on the subject matter and followed by the pilot study to certain critical success factors (CSFs) obtained from the literatures. The research then proceeds with questionnaire survey in short listing the CSFs identified in developing the preliminary people maturity model. Finally, the model is validated through the case study method.

Phase 1: Preliminary Study

a) Literature Review

This research begins with reviewing the IT/IS evaluation issues in CI in finding the critical area that needs further attention from researchers. This then led to the review of existing IT/IS evaluation models, which include identifying e-readiness models and maturity models. The author also looks into the people CSFs of IT/IS implementations across industries, to establish a preliminary model. Literature reviews included books, academic journals articles, research papers, conference proceedings, industry and organisational reports, thesis, etc.

b) Pilot Study

Pilot study was carried out to confirm the list of CSFs for implementing IT/IS found in literature from multi-industries. The list of CSFs obtained from the literature review was then tested for the Malaysian CI by interviewing seven (7) IT/IS managers from the government, semi-government organisations and private organisations.

Phase 2: Developing Preliminary People Maturity Model

a) Questionnaire

The list of CSFs obtained from the pilot study was then used as the basis in designing the questionnaire survey. The questions were designed to include only close ended questions, with measurements that included the range of nominal and ordinal scale. One thousand questionnaires were sent to Malaysian construction organisations to identify the most important people critical success factors in implementing IT/IS in CI. Among the construction organisations participating in this research include developers, contractors, consultants (e.g: architect firms, surveying firms and engineering firms), as well as government and semi-government bodies. The selected organisations are large, medium and small-sized organisations that have IT/IS department and were located throughout Malaysia. Respondents' address and phone number were obtained from the official website of their profession such as the Board of Architect Malaysia to obtain the list of Architect firms and Contractor Service Centre (PKK), to obtain the list of contractors. This phase is very important in achieving Objective 2 and in assisting the author to develop the preliminary maturity model.

b) Literature Review

In developing the preliminary people maturity model, each factor was re-reviewed (literature) again to determine its scopes and types. The review of the existing maturity model that appears to measure the identified CSFs were taken into consideration, too, as a basis of identifying the boundary of each level.

Phase 3: Validating Preliminary People e-Readiness Maturity Model

a) Case Study

Case study method was employed to validate the preliminary maturity model for the Malaysian CI. Five construction organisations were selected to participate in this study. This method was chosen as it allows the study of a phenomenon in its real world context (Yin, 2003).

The proposed PeRMM model is able to evaluate the current readiness level of the organisation and also recommend ways of improvement and assist the organisation to successfully implement IT/IS. Figure 1.1 illustrates the research methodology employed in this research.

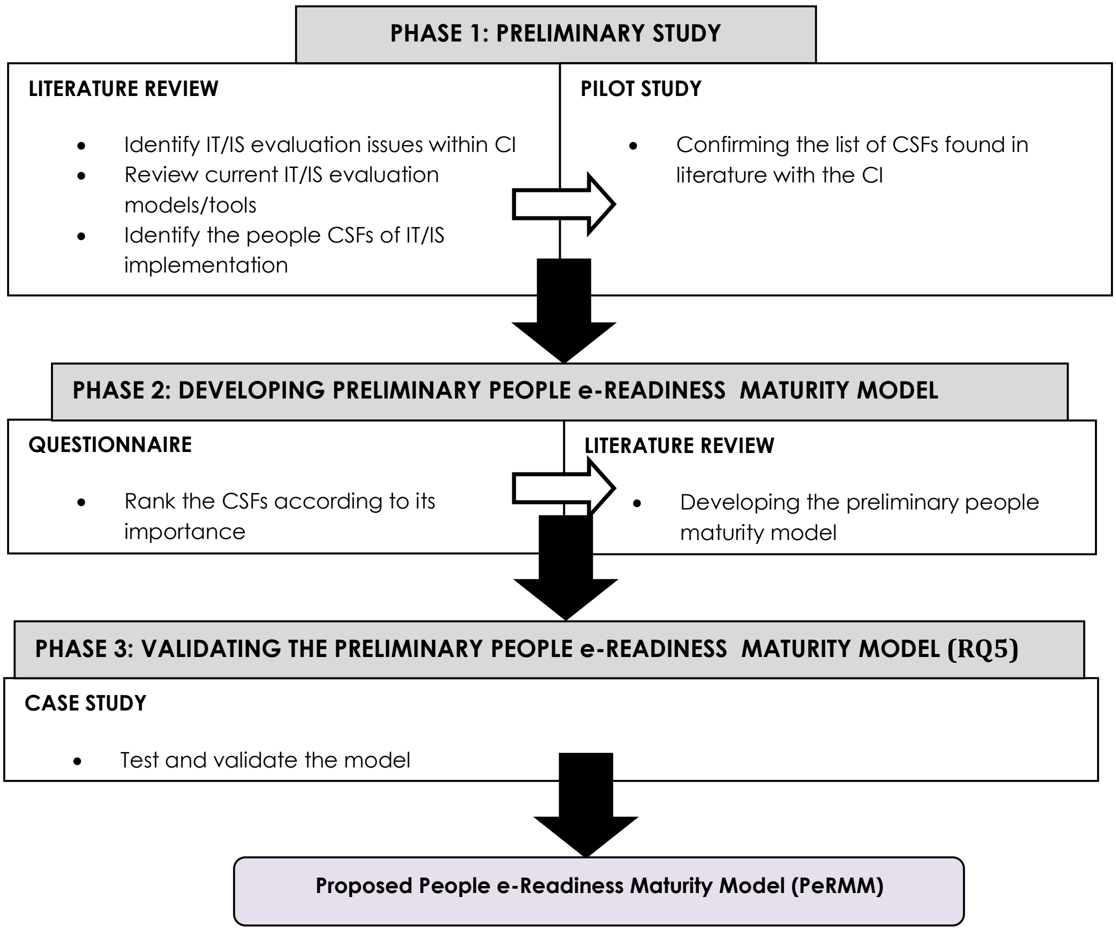


Figure 1.1: Research Methodology

1.5 Scope and Limitations

The main objective of this study is to develop an e-readiness maturity model which can be used by the construction organisation (which among others include government, semi-government, developer, contractors, consultants and suppliers) to evaluate their current readiness level and benchmark against the future target for improvement. This study has no intention of identifying the relationship among the CSFs used in developing the PeRMM.

Further refinement in terms of the description of the model may be needed if the model is going to be applied in any developed country to suit with their current readiness level, as the development of the model only involved construction organisations in Malaysia.

During the questionnaire survey (Phase 2), there was a difficulty in determining the sample size of the construction organisation that have IT Departments due to the non-existence of the database. Therefore, a phone call was made to construction organisations to confirm the existence of an IT Department in their organisation.

Difficulties also arose during the validation process (phase 3), where the interviewee involved in the case study did not know the detail history of the system adoption such as the details on the customisation made on the selected system. Furthermore, the validity of the information obtain in this phase solely depended on the interviewee due to the lack of documents and document confidentiality. Information obtained from them may be based on their assumption or personal views, which might be due to the lack of experience. Thus, several interview sessions were conducted with several interviewees to validate the information obtained.

The development of the PeRMM does not consider the synchronization between the vertical levels and horizontal requirement for each of the factor. This opens ups the opportunity for further investigation in the future.

1.6 Research Contributions

It is anticipated that the model contributes to both practical and theoretical fields. The case study conducted proved that the people e-readiness maturity model is applicable in the real case scenario and not just a theoretical model. The application of this model does not directly solve the e-readiness problem but it can be used as the first step in helping the organisation evaluate their e-readiness level and determine their future target. This will then help the organisation to develop a more robust strategic plan in preparing the people in their organisation to be e-ready.

1.6.1 Theory/Knowledge

a) The study has broadened the area of e-readiness research in CI by identifying the people CSFs in IT/IS implementation and also by developing the new people e-readiness maturity model (PeRMM).

b) The proposed model is able to evaluate the people readiness level prior to IT/IS implementation for the Malaysian CI.

1.6.2 Practical/Industry

a) This research is important as it underpins the need for the construction organisations to take a proactive interest in evaluating their current people e-readiness level and predict their future.

b) The proposed model provides detail guidelines for effective IT/IS implementation that is suitable for construction organisations who are already using IT/IS, as well as for those who are considering implementing it.

1.7 Thesis Structure

This thesis has been divided into nine chapters as follows:

Chapter 1: Introduction

This chapter acts as the preface of the thesis, highlighting the background of the research. A justification on the research aims, objectives, research methodology and the limitation are described in this chapter. It provides the introduction that guide the reader into the research topic.

Chapter 2: IT/IS Implementation in CI

Literature reviews provide an overall understanding on IT/IS implementation from the CI perspective. This includes the definition of IT/IS, the implementation of IT/IS in Malaysia and the in Malaysian CI. This chapter then explores the importance of implementing IT/IS for the CI. Furthermore, the importance of people readiness was also highlighted here, followed by the review of the current IT/IS evaluation models that include e-readiness models and maturity models. The definition, concept, and the available e-readiness model and maturity model were also explored.

Chapter 3: Critical Success Factors of IT/IS Implementation

This chapter begins by identifying the critical success factors of IT/IS implementation across industries. Only factors relating to the people issue will be highlighted in this chapter.

Chapter 4: Research Design and Methodology

This chapter clarifies the methods used in collecting the information needed in this research, which includes the literature review, pilot study, questionnaire survey and case studies.

Chapter 5: Findings of Pilot Study and Statistic

This chapter begins with presenting the finding from the pilot study conducted with seven (7) construction organisations. A questionnaire was then prepared and sent out to developers, contractors, consultants (e.g: architect firm, surveying firms and engineering firms), as well as government and semi-government bodies. Quantitative data analysis was then performed to analyse the data obtained.

Chapter 6: Developing the Maturity Model

This chapter describes the purpose of maturity model, its scope and type. The chapter also explains the suitable timescale to apply the model and the people involved in using the model. Details on the preliminary model will be described in this chapter, which includes the models' structure, the proposed levels and the selected factors.

Chapter 7: Validating the Preliminary People e-Readiness Maturity Model

The validation process of the Preliminary People e-Readiness Maturity Model will be explained in this chapter. Case study is used to measure the usability of the model in the real-world context in the construction organisation.

Chapter 8: People e-Readiness Maturity Model (PeRMM)

This chapter discusses the enhancement made to the preliminary People e-Readiness Maturity Model, based on recommendations and suggestions from the organisations involved in the validation process (the case study).

Chapter 9: Conclusion and Recommendations

The last chapter provides the conclusions and recommendations for this research by analyzing all the chapters that has been discussed earlier in this thesis.

1.8 Conclusion

This chapter presents the overview of the research topic by describing the increasing failure of IT/IS implementation, the contributing factor towards the failure and the limitation of the available e-readiness model. The need to develop the new e-readiness model was also highlighted in this chapter. This chapter also briefly described the methodology used, limitations and contributions. A summary of the thesis structure was also included.

Chapter 2

IT/IS implementation in the Construction Industry (CI)

2.1 Introduction

The rapid growth of the IT/IS has revolutionized business processes, leading to the development of IT-based technologies such as e-commerce (Ruikar *et. al.,* 2005). Its application has transformed the business process in the form of managing information that is how information is being saved, retrieved and exchanged. Business opportunities which were previously limited are now expanded with the application of IT/IS (Aziz and Salleh, 2011). International transactions become common practice as transactions can be completed in shorter time and is inexpensive. The benefits of implementing IT/IS in organisation which are not limited to gaining competitive advantage and increase productivity (Moh'd Al-adaileh 2009) has encouraged the CI to adopt it. The application of IT/IS has changed the traditional business pattern into a modern way which is much more simple and effective, making achieving business target no longer impossible. The implementation of the construction project become more effective and efficient with the application of IT/IS (Adriaanse *et. al.*, 2010). Coordination and collaboration between the construction parties were proven to be improved with the application of IT/IS due to the ability to real time access of information (Ahuja *et. al.*, 2010). IT/IS has been recognised as a powerful tool that improves the speed of information flow, increases the efficacy and effectiveness of communication and lessens the cost for information transfer (Chen and Kamara, 2011). In the early twentieth century, the emergence of telephone and telegraph had a little impact on CI (Froese 1999). Subsequently, things starting to change with the introduction of fax machine as it allows the transmission of drawings over a distance.

Later in the 20th century, the invention of computer helped the CI to have instant access to relevant information, reduce in cost in relation to the elimination of paper-based processes and also provide precise calculation in determining the building loads (Haas *et. al.*, 2002). CI started to experience major transformation with the invention of element analysis software in the 1960's (Bjork 2006) and computer aided drafting software in the 1970's (Sukumar and Malsch, 2006). The emerging trend of IT/IS application continues in the CI with the development of systems for design, planning, estimating, cost control, operations and CAD (Shen and Chung, 2007). Technology can only expand and get better; hence, more new technologies were introduced to improve the efficiency of construction processes. This has encouraged many countries to emphasize on the use of IT/IS as major tools in CI (Abdul Kareem and Abu Bakar, 2011; Alaghbandrad *et. al.*, 2011; Chien and Barthorpe, 2010). The Taiwanese government for example, has stressed on the usage of IT/IS especially in the design and construction process which will improve their communication, productivity, quality and effectiveness (Chien and Barthorpe, 2010). Being a major contributor to the national economy of most countries, it is important for the CI to enhance the management process by integrating IT/IS in their work process (Budiwibowo *et. al.*, 2009; UKCG, 2009). Several countries such as Singapore and Hong Kong has taken initiatives to integrate IT/IS in CI by introducing the electronic submission, processing and approval of building project document (Abdul Rahim, 2004).

Problems arise when CI unable to obtain the full benefit of IT/IS implementation (Mat Lazim, 2010; Pollaphat and Miroslaw, 2011; Tambovcevs, 2010). Extensive research on IT/IS implementation failure had discovered that 'soft issue' which involves people and their readiness prior to IT/IS implementation are the reason (Limsarun and Anurit, 2011; Sidawi, 2012; Xue *et. al.*, 2012). Organisations currently emphasize on the evaluation of the hard issue aspect such as speed, profit returns and quality of the information produced, which are all being evaluated after the project had been completed (Amid *et. al.*, 2012; Garg, 2010; Kim and Kankanhalli, 2009). This is reflected when the organisation usually evaluate the IT/IS investment through the return on investment (ROI) (Garg 2010) and also scheduling overrun (Amid *et. al.*, 2012). Ignoring or underestimating the people issue will not help the organisation to successfully implement IT/IS (Xue *et. al.*, 2012). By evaluating the organisation's previous and current performance, it will help the organisation to get more information on the effectiveness and the efficiency of the IT/IS that they are using and help them to identify the gap between their current status and their future target (Ogunyemi and Johnston, 2012; Vermulen, 2011). This leads to the question, 'how to measure the readiness level?' Several e-readiness models has been developed over the years which help to evaluate the current readiness level against best practices. Therefore, this chapter introduces literature that would help to achieve the aim and objectives. This begins with the review on the literature regarding the definition of IT/IS and followed by the importance of IT/IS in CI. It then leads to the IT/IS success and failure rates and reasons. The current e-readiness models were then reviewed. The literature review of this research was illustrated in Figure 2.1.

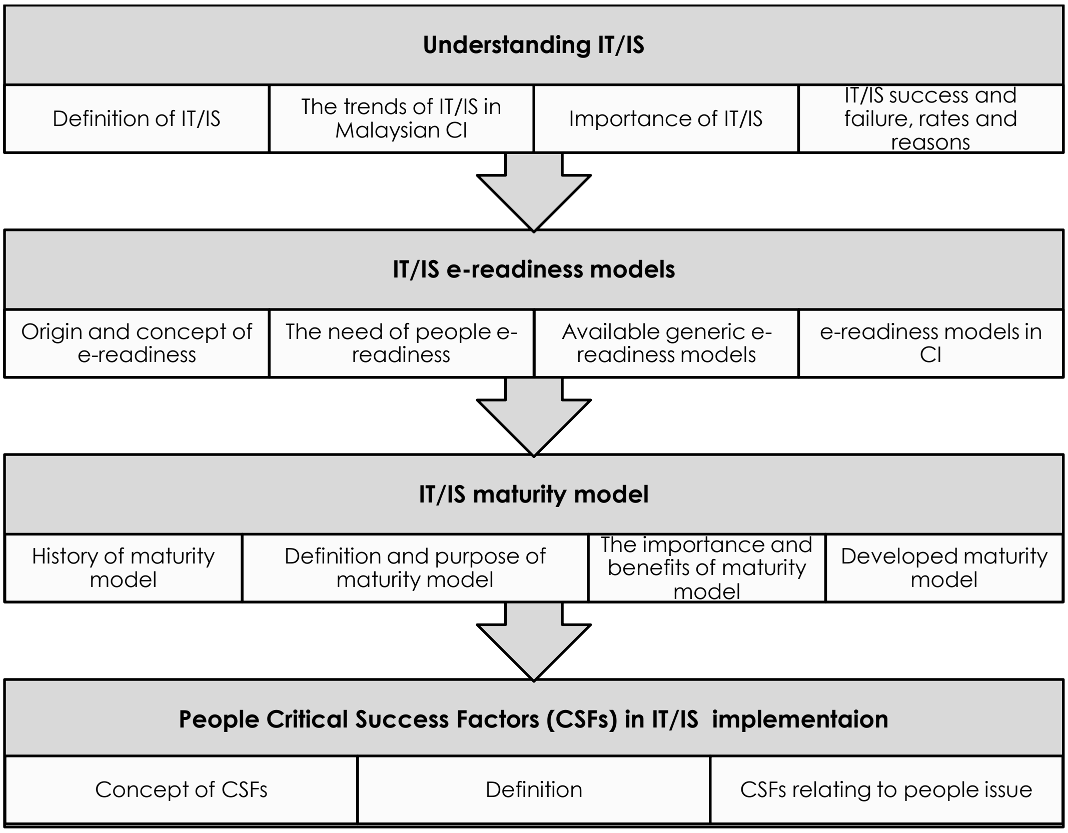


Figure 2.1: Literature review work flow

2.2 Understanding IT/IS from CI Perspectives

2.2.1 Definition of IT/IS

Various definition of Information Technology (IT) can be found in literature. Abusafiya and Mazumdar (2008) defined IT as any hardware and software that is used to support the management of the organisations. According to Laudon and Laudon (2012), IT comprises of all the software and hardware that an organisation needs to help them achieve their business objectives. It does not only refer to the computer hardware and storage device but also includes software. On a wider perspective, Kroenke (2011), defined IT as '*the products, methods, inventions and standards that are used for the purpose of producing information. It refers to the hardware, software and data components*'.

Information system (IS), on the other hand is defined by Bester (2006) as the combination of people, data, communication, hardware and procedure that enables data transformation into valuable information which will assist organisation in achieving their objectives. Similarly, Whitten *et. al.,* (2007), defined IS as '*an arrangement of people, data, process, communication and information technology that interact to support day to day operations in business, as well as to support the problem solving and decision making needs of the management and users*'. Information system also can technically be defined as a system that is used to that gather or retrieve, process, save and distribute information to support decision making and control in an organisation (Shamekh 2008) . On top of that, the application of IS also may assist managers and staff to analyse problems, visualize complex subjects and create new products (Laudon and Laudon, 2012).

From the above definition, it can be conclude that IT refers to the technological and infrastructure components such as computer hardware and software and also data storage and communications. IS on the other hand is a combination of people, IT, business and methodology in order to produce a useful information to be used by different levels of people in the organisation (refer Figure 2.2). Therefore, separating IT and IS would be impossible in supporting the organisation business process. Thus, this research opts to use the term IT/IS.

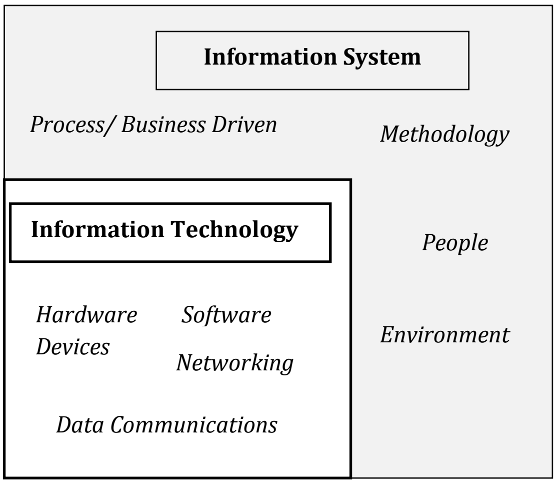


Figure 2.2: The Components of IT/IS

2.2.2 The trend of IT/IS in Malaysian CI

The tremendous benefits of IT/IS encouraged the Malaysian government to improve the usage of IT/IS in this country, thus becoming one of the components in the Malaysian Plan. Malaysia Plan is the country's five years development plan, which outlines the policies and key programmes to achieve targeted objectives in five (5) years timeframe (2006). In supporting the development of IT/IS in the country, several institutes were developed - the Malaysian Institute of Microelectronic Systems (MIMOS) was established in 1985 to provide the critical infrastructure for the advancement of the local electronic industry. This is followed by the development of National Information Technology Council (NITC) under the 7th Malaysian Plan 1996-2000, to help the country promote the growth of IT development. The Multimedia Super Corridor (MSC) was launched during this period to provide an ideal environment for IT/IS related activity and provide Malaysians with fast and reliable access to global information. MSC can be regard as Asia's version of Silicon Valley which covers a 15 by 40 kilometre area stretching south from Kuala Lumpur (Ibrahim *et. al.*, 2010). The Malaysia Communication and Multimedia Commission (MCMC) was set-up to encourage the growth of IT/IS; the objectives of MCMC are to promote Malaysia as an IT hub through broadcasting, telecommunications and internet services (Jehangir *et. al.*, 2011).

The 8th Malaysian Plan 2001-2005 on the other hand, focused to provide a stronger platform for the transition towards a knowledge-based economy. This resulted to an increase of 4.7% annual growth rate in IT/IS spending from overall economic sectors (Jehangir *et. al.*, 2011). This effort continued with the 9th Malaysian Plan 2006-2010, which focused on the advancement of the digital environment and encouraging an extensive application of IT/IS in every aspect of everyday life (The Economic Planning Unit 2006). For this, the government allocated USD 3.55 billion for IT/IS development, which is 64% more compared to the budget allocated for 8th Malaysian Plan. In the 10th Malaysian Plan, it focussed on the twelve National Key Economic Areas (NKEAs) which have potential to generate high income, which included information and communication technology (ICT) (The Economic Planning Unit 2010). In this plan, MSC Malaysia was given the responsibility to identify and support the development of niche areas in software and e-solutions, creative multimedia, shared services, outsourcing as well as e-business. The government will also take part in promoting the application of ICT in other industries parallel to the development of this sector. Emphasis were given on the training and education in preparing people to get involved in this sector. In 2010, the share of ICT value added to Gross Domestic Product (GDP) is 8.5% (Enterprise Innovation Editors 2011). In the 10th Malaysian Plan, the government targeted to increase it to 10.2% by 2015 (Economic Planning Unit 2010).

Even with the strong support from the Malaysian government, research by Abdul Kareem and Abu Bakar (2011) conclude that the implementation of IT/IS in the country is still low. A research to evaluate the organisation readiness to use e-commerce was carried out by the Malaysian Productivity Corporation (MPC) in 2009; this revealed that only 17% of the organisations used e-commerce transaction; 35% believed that e-commerce is not suitable for their business; 32% admit that they do not have the required knowledge to use IT; and 10% indicated financial factors as the barrier to adopt e-commerce (Abdul Rahim, 2010; Hashim and Said, 2011). Zakaria *et. al.,* (2010) highlighted that organisations in Malaysia fail to implement IT/IS because they are not ready. They also emphasize on the importance of having a suitable readiness model that is able to measure their current readiness level to adopt IT/IS.

In supporting the Malaysian government towards maximising the potential of IT/IS, a comprehensive plan for the future direction of the Malaysian CI known as Construction Industry Master Plan (CIMP) 2005-2015 had been developed (Construction Industry Development Board (CIDB) Malaysia 2006). There are seven strategic thrusts proposed in this master plan. The sixth strategic thrusts aimed on leveraging on IT/IS in CI (Construction Industry Development Board (CIDB) Malaysia 2006). The implementer of the CIMP, the Construction Industry Development Board (CIDB), also encourages the usage of IT/IS to be in line with the government initiatives (Abdul Kareem and Abu Bakar, 2011). Yusuf and Osman (2008) found that 91% of Malaysian construction organisation have computerised their work and 78.6% have adopted advanced IT/IS applications. Research carried out by Gaith *et. al.,* (2009) showed that the main application of IT/IS in Malaysian CI is for design, technical calculations, scheduling and resource planning, costing, tendering process, invoicing Bills of Quantities, maintenance planning for real estate, material control and purchase and marketing. However, the full benefits of IT/IS were not exploited by Malaysian construction organisation (Lim *et. al.,* 2002).

Majority of organizations adopt IT/IS not because of their needs but by simply following other successful organisations (Lim *et. al.,* 2002). Research by Ibrahim *et al.* (2010) identified technology as one of the challenging factors in Malaysian CI. This has been proven by the failure of an e-tendering portal known as e-bina, which was lead by a consortium of large contractors. The failure was due to security concerns as the CI players are unwilling to share information with each other (Hashim and Said, 2011). The low number of experts that have the knowledge in IT/IS as well as construction, contributes to the failure of IT/IS implementation. It is important for the CI to have skilled people to utilise the technology in the industry.

2.2.3 The importance of IT/IS implementation in CI

The impact of the internet revolution has made IT/IS as essential tool in assisting the CI to cope with increasing complexity and demand (Oladapo 2007). Researchers have highlighted the benefits of adopting IT/IS in the CI (Alaghbandrad *et. al.*, 2011; Chien & Barthorpe, 2010; Underwood and Khosrowshahi, 2012). Research by Abdul Kareem and Abu Bakar (2011) revealed that the application of IT/IS in CI have improved organizational business processes and growth, information quality, work relationship and reduce the duration of the projects. On top of that, Ajam *et. al.*, (2010) added that the application of IT/IS helped to reduce costs and save time, which led to increased profitability. According to Lee *et. al.*, (2011) the main purpose of IT/IS application in the CI is to assist in the management and exchange of information. CI practitioners can easily access, store, observe and exchange information with the help of technology. Thus, information exchange between the project team (client, contractor, consultant, sub-contractor, supply chain, etc.) became faster, more reliable, extra secure and added flexibility (Underwood and Khosrowshahi, 2012). Furthermore, IT/IS also have important roles in design, management and implementation of construction projects as it allows easy access for accurate and updated information and make complicated calculation become possible (Alaghbandrad *et. al.*, 2012).

2.2.4 IT/IS investment rates, success and failure reasons

The benefits of implementing IT/IS in CI has encouraged construction organizations to invest in it - this is clearly reflected by the increasing trend of IT/IS investment. Gartner Group (2012), reported that worldwide IT spending is about $3.6 trillion in 2012, an increase of 3% compared to 2011 (refer to Figure 2.1). IT spending in Asia Pacific is forecast to reach $740 billion in 2013, an 8.2% increase over 2012 spending (Gartner Inc, 2013). Based on the same report, worldwide IT services spending are expected to reach $718 billion in 2013, an increase on 7.9% compared to last year (refer Table 2.1).

Table 2.1: Worldwide IT Spending Forecast (Billions of US Dollars)

	2012 Spending	2012 Growth (%)	2013 Spending	2013 Growth (%)	2014 Spending	2014 Growth (%)
Devices	665	9.0	718	7.9	758	5.7
Data Centre Systems	141	1.9	146	3.7	152	4.0
Enterprise Software	279	3.5	297	6.4	316	6.7
IT Services	878	1.5	918	4.5	963	4.9
Telecom Services	1,655	-0.4	1,688	2.0	1,728	2.4
Overall IT	**3,618**	**2.1**	**3,766**	**4.1**	**3,917**	**4.0**

Source: Gartner Inc, 2013

International Data Corporation (IDC) expects worldwide IT spending to exceed $2.1 trillion, up 5.7% from 2012 (IDC, 2013). Based on the same report, IDC predicts that 2013 IT spending in emerging markets- including the Central and Eastern Europe, Middle East and Africa, Latin America and Asia Pacific will grow by 8.8% to exceed $730 billion (IDC, 2013).

KPMG International predicted worldwide enterprise IT spending to increase 2.5% to $2.679 trillion in 2013, a 2.5% increase of 2012 spending (Figure 2.3) (KPMG International 2011). The worldwide enterprise IT spending increased 3.9% to $2.7 trillion in 2012 (Figure 2.3) (KPMG International, 2012). Enterprise IT spending in the Middle East and Africa reached $53 billion in 2012, a 6.3% increased compared to 2011 (Gartner Group 2012). India and China also had a significant growth rate of 10.3% to $39 billion.

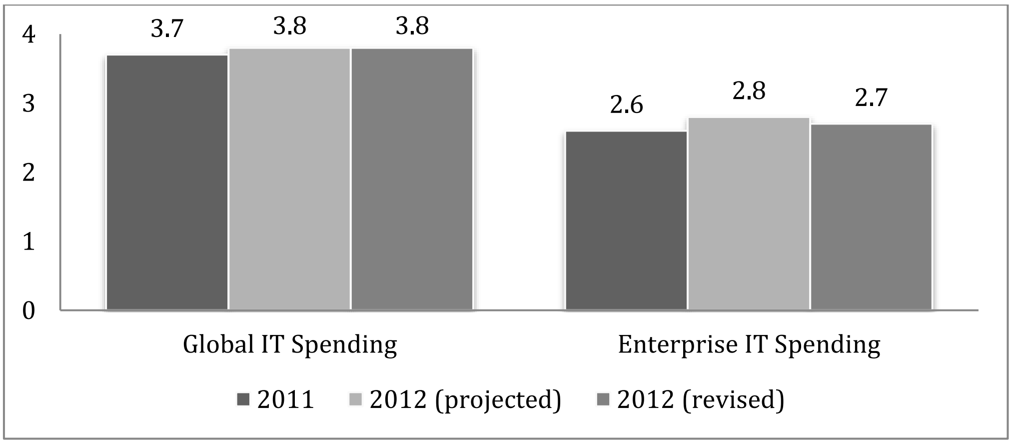


Figure 2.3: Global and Enterprise IT Spending in 2011, 2012 (US$ trillion) – projected vs. Revised
Source: KPMG International, 2012

The association representing the IT industries in Malaysia or also known as PIKOM predicts that IT spending in Malaysia will grow at least 12%, which will reach about $8.2 billion in 2012 (MOSTI and PIKOM, 2012). According to report by Gartner Group (2012), there are five major area that IT investment is expected to grow - devices, data centre system, software, IT services and telecom services. Table 2.2 shows the investment predicted according to the five areas.

Table 2.2: Predicted IT Investment According to the Five Areas

	% increase compared to 2012	Value ($ billions)
Devices	+12.3	229.7
Data centre system	+9.5	28.6
Software	+11.9	33.9
IT services	+7.5	91.5
Telecom services	+4.8	359.4

Source: Gartner Group, 2012

Investments in IT/IS is constantly rising in the CI, unfortunately, its implementation seem to give limited added value (Adriaanse, Voordijk et al. 2010). Findings from Hartmanna *et. al.*, (2009) showed that most construction projects do not obtain the full potential benefits of IT/IS implementation. Furthermore, even though the application of IT/IS has increased business productivity, its application failure however has increased to a large extent (Heli and Wiander, 2011). According to Heli and Timo, (2010) and Heli and Wiander, (2011), IT/IS implementation is vulnerable and often fails. Moreover, Drevin and Dalcher (2011) stated that the phenomenon of IT/IS failure still exists even though studies on this topic had been carried out for a few decades. The IT/IS failure usually relates to exceeding budget and schedule, not meeting expectations and giving poor return on investment (Malcolm, 2009; McManus and Wood-harper, 2008).

Failure is subjective and it depends on the individuals expectations; what failure is to one person might not be failure to the other person (Miller 2010). According to Longman Dictionary of Contemporary English (2009), failure is defined as the lack of success in achieving or doing something. The standard measures usually used in defining project success including IT project are time, cost and quality (Ahsan and Gunawan, 2009; Anuar, 2011). Having a different set of criteria for failure will give a big impact on the success rate of the study. The Standish Group categorise project success/failure into three (3) categories:

i) Project success: completed on time, on budget and fully functional

ii) Project challenged: completed but one or more of the criteria are not met

iii) Project failure: the project is cancelled before completion

This definition is also adopted by the Computer Weekly in identifying project success (Huber 2003). KPMG on the other hand define project as success or failure based on the project budget or project schedule overrun by 30% or the project was cancelled due to the inability to deliver the planned benefits (Whittaker 1999). Peterson and Kim (2000) on the other hand, defined IT/IS project success according to four (4) different views; the system, the users, organisation and strategic views of a short-term and long-term objectives.

From the above description, it is difficult to define the success or failure of IT/IS project, as some IT/IS project may be within the budget and time scale but unable to reach the expectations (Standing *et. al.*, 2006). Even though it is impossible to find agreement on the definition of IT/IS project success or failure, it does not prevent the researchers in finding the cause behind it.

Research on the failure originated back in the 1960s, where most practitioners believe that failures are related to technical issues (Griffith *et. al.*, 1999; Lyytinen and Hirschheim, 1987). The spotlight was then turned towards the lack of user involvement and user resistance in 1970's (Argyris 1971). Lin *et. al.,* (2007), highlighted that IT/IS failure occurs because organisations emphasize on implementing the technology rather than evaluating their current performance.

Ahuja *et. al.,* (2009) stated that 80% to 90% of IT/IS failure were not related to technical issues. Many researchers suggest that the failure is related to people issues. People have the direct influence on the success of IT/IS application in CI (Xue *et. al.,* 2012). This is similar with findings revealed by Limsarun and Anurit (2011), which indicates that people are the main element that contribute to the successful application of IT/IS. More research findings continue to support that people are one of the influential factors that contribute to the success of IT/IS in CI (Lou and Alshawi, 2009; Razavi and Ahamad, 2011; Sidawi, 2012). On top of that, Ogunyemi and Johnston (2012) found that people play important roles in the implementation of IT/IS. Research findings by Kim *et. al.,* (2009) also revealed that user resistance towards the implementation of IT/IS had been identified as the major cause of failure.

According to Adriaanse *et. al.,* (2010) the fragmented nature of the CI are the cause for the failure in implementing IT/IS. The CI is unique compared to other industries as it involves collaboration among several firms that have different expertise, with a variety of tasks for a long construction phase. To make matters worse, no projects are similar and the project teams are always different. According to Ballan and El-Diraby (2011), construction sites can be described as reactive environments, where unexpected amendment to work frequently happen, unexpected events as well as temporary critical problems are unavoidable.

Factors that contribute to failure had been analyzed by several researchers to formulate successful strategies to implement IT/IS (Ballan and El-Diraby, 2011; Bharadwaj *et. al.,* 2009; Yang, 2009). According to Lou (2010), it is important for the organisation to have the required readiness level to successfully adopt IT/IS. Therefore, in reducing failure, there is a need to evaluate the readiness capability prior to IT/IS implementation for the industry to identify and plan their IT/IS implementation in order to attain a better and higher success rate. Thus, creating the need for a systematic e-readiness evaluation models (Vaezi and Bimar, 2009).

2.3 E-readiness

2.3.1 The origin/concept of e-readiness

The definition of e-readiness can be grouped into two (2) categories; that focus on the basic infrastructure or a nation's readiness for business and economic growth (e-economy), and those that focus on the ability of the overall society to benefit from IT/IS (e-society) (Bridges.org 2005). Various definition of e-readiness could be found from literature for both categories. Among the earliest definition of e-readiness in the e-society category were undertaken by the Computer Systems Policy Project (CSPP) in 1998, in which e-readiness was defined as the community that have stable access and application of IT/IS in school, government offices, businesses, healthcare facilities and homes; online security and user privacy; and government policies which encourage and promote the use of the network (Beig *et. al.*, 2007). Economist Intelligence Unit (2011) on the other hand, defines e-readiness as the capability of people, government and business to exploit their country's IT/IS infrastructure for their own benefits.

Dada (2006) defined e-readiness in the e-economy category as the evaluation to identify the state of readiness of a country, nation or economy to attain the advantages of implementing IT/IS. McConnell International defines e-readiness as the capability of nations to be involved in the digital economy (Budhiraja and Sachdeva, 2002). Bui *et. al.*, (2003) defines e-readiness as the ability of the economy to use IT/IS to transform the traditional business process into the new economy.

From the above, it can be concluded that there is no accurate definition for the concept of e-readiness because e-readiness depends on various contexts, different situations and different users. Numerous definition of e-readiness exists due to the variety methods of measurement, analysis and benchmarking from many different perspectives (Shareef and Janowski, 2008). In this research, the term e-readiness is defined as measuring the people readiness level to adopt IT/IS prior to its implementation. This research will look into the people aspects of e-readiness for construction organizations.

2.3.2 The need for people readiness

People have been highlighted as the main contributor towards the success and failure of IT/IS implementation and are the prime assets in the organisations. They are the key to unlock the benefits of IT/IS implementation (Muhammad, 2012), despite the organisations' size. People, by definition, do not only refer to the staff but apply to all organizational stakeholders. In this research, people include those sitting as Board of Directors, Executives, senior managers, middle management and the operational teams. Each of these stakeholders has their own agenda and responsibility in the organisation, thus has different readiness level towards IT/IS implementation.

People readiness is extremely important when organisations undergo a transition period, such as the introduction of new technology. People play major roles in determining the success and failure of an organisation; regardless how big or small their roles might be (Muhammad, 2012). Xue *et. al.*, (2012) also highlighted the direct influence of people towards IT/IS implementation in CI. People resistance is a natural reaction towards changes (Havelka 2002). They resist to changes as they do not understand the reasons for changes, fear of losing their job and responsibilities, worry about their lack of skills and competencies (Peszynski and Corbitt, 2006). Therefore, in order to successfully implement IT/IS, it is important to make sure that people are well prepared and ready for the changes (Kwahk and Lee, 2008; Ogunyemi and Johnston, 2012). When people in organisations are ready, they are more likely to positively participate in the changes, thus contribute towards its success (Tran *et. al.,* 2011).

According to Vaezi and Bimar (2009), a systematic e-readiness evaluation is important as means of plan implementation. Several types of e-readiness models can be used to evaluate the performance of the nations, society or organisation towards the use of IT/IS (Bui, Sankaran et al. 2003, Ifinedo 2008). According to Bridges.org (2005), e-readiness evaluation offers benchmarking for comparison and evaluation in guiding the development process. The need to evaluate the e-readiness capability becomes extremely important in order for the CI to identify and plan for their IT/IS implementation (Alshawi and Goulding, 2008). Proper planning is essential to reduce the pitfalls and yield positive outcomes. From the evaluation, areas that need more attention can be identified in order to successfully implement IT/IS.

2.3.3 The generic e-readiness models

Numerous surveys or evaluation on e-readiness had been carried out over the years. As described in the previous section, Bridges.org (2005) divided e-readiness evaluation models into two main categories; e-economy and e-society. Example of the e-economy model is the APEC E-commerce Readiness Assessment Guide, which was created to evaluate the readiness level of economies, cities and the communities in taking part in the digital economy (Information Technology and Broadcasting Bureau 2000). The example of the e-society is designed by McConnell International in the year 2001; 'Ready? Net. Go!' (McConnell International and World Information Service and Technology Alliance (WITSA), 2001), which was created to evaluate a country's e-readiness, or capacity to take part in the global digital economy (Dutta *et. al.,* 2003). Briefly described below are some of the e-readiness models that are widely used.

<u>Readiness for the Networked World</u>

The readiness model for the Networked World was developed by the Centre for International Development of Harvard University and IBM in 2001 (Harvard Center for International Development 2006). It is a generic model that evaluates the e-readiness capability of the community in developing countries. There are 19 different categories of indicators which can be grouped into 5 different sections that are Network Access, Networked Learning, Networked Society, Networked Economy and Network Policy. Each indicator was rated based on a scale from 1 to 4 with a different criterion for each stage.

<u>E-Readiness Rankings</u>

This model was created in year 2002 to measure a country's ICT infrastructure as well as the capability of governments, consumers and businesses to obtain benefits by implementing IT (Economist Intelligence Unit 2009). Created by the Economist Intelligence Unit, it consist more than 100 different qualitative and quantitative criteria which can be grouped into 6 main categories. Each category has their own weight depending on their importance as influencing factors. The categories are Connectivity and Technology Infrastructure (20% weightage), Business Environment (15% weightage), Social and Cultural Environment (15% weightage), Legal Environment (10% weightage), Government Policy and

Vision (15% weightage) and Consumer and Business Adoption (25% weightage).

E-commerce Readiness Assessment Guide

This readiness tool was created by APEC in the year 2000 to evaluate the e-readiness capability of the economies, cities and the communities in taking part in the digital economy (APEC 2000). There are 6 indicators; Basic Infrastructure and Technology, Access to Necessary Services; Current Level and Type of Use of the Internet; Promotion and Facilitation Activities; Skill and Human Resources and Positioning for the Digital Economy.

Readiness Guide for Living in the Networked World

There are hundreds of criteria that are being used to evaluate e-readiness for the networked world which can be grouped into 5 main categories. These include The Network Infrastructure, Networked Places Access, Networked Applications and Services, Networked Economy and Networked World Enablers. Developed by Computer systems Policy Project (CSPP) in 1998, the guide was created to measure the level of readiness of a town, city, county, state, country or any community (Computer Systems Policy Project (CSPP) 1998).

Ready? Net. Go!

The framework designed by McConnell International and Worlds Information Technology and Services Alliance (WITSA) in year 2001, was created to evaluate a country’s e-readiness, or capacity to take part in the global digital economy (McConnell International and World Information Service and Technology Alliance (WITSA), 2001). Five dimensions were used in this framework in evaluating the country's e-readiness capability. Connectivity, E-leadership, Information Security, Human Capital and E-business Climate were used in determining the country's e-readiness level.

Technology Readiness Index (TRI)

The TRI developed by Parasuraman and Rockbridge Associates in year 2000 was designed to evaluate people's readiness to interact with technology. TRI refers to people's tendency to accept and use technologies to realize their goals in home life and at work (Parasuraman 2000). Four dimensions were used; which are optimism, discomfort, innovativeness and insecurity.

Global Diffusion of the Internet Project

This model was developed in 1998 by the Mosaic group (Goodman *et. al.*, 1998). The main purpose of this model is to indicate the phases of internet development focusing on six internet statistics. These are pervasiveness, geographic dispersion, sectoral absorption, connectivity infrastructure, organisational infrastructure and sophistication of use.

International Survey of E-Commerce

Developed by Worlds Information Technology and Services Alliance (WITSA) in the year 2000, this model was used to find out business and consumer awareness on electronic commerce and to identify potential action areas using 7 main criteria of evaluation: trust, technology, workforce issues, public policy, taxation, business process, costs and consumer attitude (WITSA 2000).

Network Readiness Index (NRI)

Designed by the Center for International Development (CID) at Harvard and the World Economic Forum, this model was to be used by communities of any size, to measure technological capabilities according to a four level scale. The evaluation criteria are the environment for IT, the readiness of the community and the actual use of IT (Center for International Development (CID) 2002).

IT/IS Readiness Maturity Model

This model was developed by Salleh and Alshawi (2007) which was designed to be used prior to the implementation of IT/IS in organisations (Salleh 2007). This model evaluates fourteen soft issue aspects that can be grouped into four major organisational elements: IT infrastructure, process, people and work environment.

People Capability Maturity Model (P-CMM)

People Capability Maturity Model (P-CMM) was developed by the Software Engineering Institute (SEI) in 1995 and then updated to version 2 in 2001 (Curtis *et. al.,* 2001). This model was developed to serve as a roadmap for continuously improving the staff’s ability in organisations. Elements evaluated in this model include: developing competency, building workgroups and culture, motivating and managing performance and shaping the workforce.

a) The comparison of generic e-readiness models

Every model described above have their own focus. It can either be e-economy or e-society. E-economy are those that focus on basic infrastructure or a nation’s readiness for business or economic growth, while e-society are those that focus on the ability of the overall society to benefit from ICT (Bridges.org, 2005a). Each of the models were developed to measure the readiness level of the society or economy in adopting IT/IS. Therefore, all of these models have their own e-readiness definitions and different method of evaluation. According to Bridges website these models can be grouped into four categories (Bridges.org 2005) as illustrated in Figure 2.4.

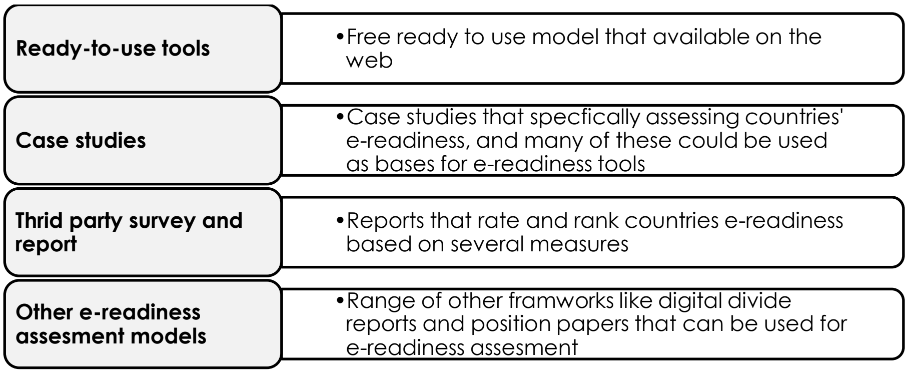


Figure 2.4: Categories of e-readiness models

Every model developed is unique and has their own differences. The models were then compared based on the following criteria:

i. Purpose of evaluation

ii. Evaluation criteria

iii. Evaluation method

iv. Evaluation result

v. Strength

vi. Weakness

i) Purpose of Evaluation

Every model was developed with specific aim and objectives. The e-readiness models were developed not only to measure the number of computer servers, websites and mobile phones in the country but the abilities of the community to employ the technology, the degree of the government's support to encourage the use of technologies and also the transparency of their business and legal systems. All of the listed models were compared in terms of their purpose and tabulated in Table 2.3.

Table 2.3: Purpose of e-Readiness Models

MODELS	DEVELOPER	PURPOSE
Readiness for the Networked World	Centre for International Development of Harvard University and IBM	Evaluates the e-readiness level of the community in the developing country
E-Readiness rankings	Economist Intelligence Unit	Measure country's ICT infrastructure as well as the capability of government, consumers and businesses
E-commerce Readiness Assessment Guide	APEC	Evaluates the readiness level of the economies, cities and the communities
Readiness Guide for Living in the Networked World	Computer systems Policy Project (CSPP)	Measure the level of readiness of town, city, county, state, country or community
Ready? Net. Go!	McConnell International and Worlds Information Technology and Services Alliance	Evaluates a country's e-readiness to evaluate who is e-ready: which countries are enabling businesses, governments and citizens to flourish in network economy.
Technology Readiness Index (TRI)	Parasuraman and Rockbridge Associates	Evaluates people's readiness to interact with technology
Global Diffusion of the Internet Project	Mosaic group	Measure and analyze the growth of internet throughout the world
International Survey of E-Commerce	Worlds Information Technology and Services Alliance	To find out business and consumer awareness on electronic commerce and to identify potential action areas.
Network Readiness Index	Center for International Development (CID)	Designed to be used by communities of any size, to measure technological capabilities according to a four level scale
IT/IS Readiness Maturity Model	Salleh and Alshawi	Evaluating the e-readiness level in the organisation prior to IT/IS implementation

ii) Evaluation criteria

Each of the models was developed with their own purpose thus have different evaluation criteria. All of the listed models were then compared according to their evaluation criteria as tabulated in Table 2.4.

Table 2.4: Comparisons on the different evaluations criteria

MODELS	EVALUATION CRITERIA
Readiness for the Networked World	• Network access • Networked learning • Networked society • Networked economy • Network policy
E-Readiness rankings	• Connectivity and technology infrastructure • Business environment • Social and cultural environment • Legal environment • Government policy and vision • Consumer and business adoption
E-commerce Readiness Assessment Guide	• Basic infrastructure and technology • Access to necessary services • Current level and type of use of the Internet • Promotion and facilitation activities • Skill and human resources • Positioning for the digital economy
Readiness Guide for Living in the Networked World	• Network infrastructure • Networked places access • Networked applications and services • Networked economy • Networked world enablers
Ready? Net. Go!	• Connectivity • E-leadership • Information security • Human capital • E-business climate
TRI index	• Optimism • Discomfort • Innovativeness • Insecurity
Global Diffusion of the Internet Project	• Pervasiveness • Geographic dispersion • Sectoral absorption • Connectivity infrastructure • Organisational infrastructure • Sophistication of use
Network Readiness Index	• Environment for IT • Readiness of the community • Actual use of IT
International Survey of E-Commerce	• Trust • Technology • Workforce Issues • Public Policy • Taxation • Business Process • Costs • Consumer Attitude

Table 2.4: Comparisons on the different evaluations criteria

(cont'd)

MODELS	EVALUATION CRITERIA
Negotiating the Net Model	• Background and history • Key players in internet development • Internet development and ICT policy • Negotiation between the players in developing the country's internet
IT/IS Readiness Maturity Model	• IT infrastructure, • Process, • People, and • Work environment

iii) Evaluation methods and results

Evaluation method refers to the evaluation techniques used in identifying the e-readiness level used in each of the models. Several evaluation methods were used which involved qualitative, quantitative and also mixed methods. Therefore, each of the models has different evaluation results. These results are important as they indicate the readiness level of the subject evaluated. Comparisons on the evaluation methods and results used by each of the models were tabulated in Table 2.5.

Table 2.5: Comparisons on the different evaluation method and results

MODELS	EVALUATION METHOD	EVALUATION RESULTS
Readiness for the Networked World	Questionnaire, Statistic	Diagnosis
E-Readiness rankings	Statistic	Description
E-commerce Readiness Assessment Guide	Questionnaire, statistic	Diagnosis, proscription
Readiness Guide for Living in the Networked World	Questionnaire, statistic	Diagnosis
Ready? Net. Go!	Statistic, best practices, historical analysis	Description, diagnosis
TRI index	Questionnaire	Description

Table 2.5: Comparisons on the different evaluation method and results (cont'd)

MODELS	EVALUATION METHOD	EVALUATION RESULTS
Global Diffusion of the Internet Project	Questionnaire, statistic, best practices, historical analysis	Description
International Survey of E-Commerce	Questionnaire, statistic	Diagnosis Proscription
Network Readiness Index	Questionnaire, statistic	Diagnosis
Negotiating the Net Model	Statistic, best practices, historical analysis	Description, Diagnosis
IT/IS Readiness Maturity Model	Questionnaire, historical analysis, best practices	Description, diagnosis

iv) Strengths and Weaknesses

Each model is uniquely developed for specific purpose, hence, they have their own strength and weaknesses. Comments on each of the models - strengths, weaknesses and comments of the models were tabulated in Table 2.6.

Table 2.6: The Strengths and Weaknesses of the Models

MODELS	STRENGTHS	WEAKNESSES	COMMENTS
Readiness for the Networked World	A general tool that is applicable to various developing countries	Does not provide guideline in using the models	Can be used in identifying the current level of e-readiness
E-Readiness Rankings	Provide useful comparison on the technology aspects among countries	No recommendation for improvement	Half of the evaluation criteria in this model are relating to the capability of the government
E-commerce Readiness Assessment Guide	Clearly stated area of improvement (those with less than optimal answers)	Stressing on the government related criteria making it complicated to carry out changes	Were used by the governments to develop policies, based on input from the business community

Table 2.6: The Strengths and Weaknesses of the Models (cont'd)

MODELS	STRENGTHS	WEAKNESSES	COMMENTS
TRI index	Can be use as evaluation tools to identify technology readiness of staff	Does not recommend ways for improvement	A model that focus solely on the people readiness concerning the technology
Readiness Guide for Living in the Networked World	A self evaluation tool that is applicable for any country and fairly easy to use.	Only an approximate measurement on the technology usage	Suitable to identify either the community/ country is ready for the implementation of ICT
Ready? Net. Go!	Focusing exclusively on e-business and e-government	No indication of overall evaluation of a country's e-readiness.	The model can be used as a guide in comparing the e-readiness level of nations
Global Diffusion of the Internet Project	Provide a detail analysis on economic, political and social factors in technology growth and usage	Only focus on internet diffusion and not on ICT in general	A useful model to study about community in developing the policy as it makes a comparative analysis of nations; complex with a balanced approach addressing individuals, government and business stakeholders.
International Survey of E-Commerce	Highlights 8 global issues which is the primary concerns in developing e-business	Highlighting on policy issues involving the government, making it complicated to carry out changes	Most of the criteria evaluates in this model are dealing with policy issue which are under the government's concern
Network Readiness Index	Clearly shows the performance of the nations in relation to the ICT development	No recommendation for improvement	The model mainly focus on the infrastructure
Negotiating the Net Model	Able to identify major controversial issues likely to remain problematic in the future	Not a one-size-fits all model	Describes the processes and outcomes of negotiations between key players over the phases of development
IT/IS Readiness Maturity Model	A self-evaluation model that can be used by any organisation to evaluates their readiness level	The CSFs evaluates in this model was not validated from the CI perspectives	This generic model can be used by all the different departments in any organisations to identify their readiness level

b) Comments on the available e-readiness models

Three models have been identified as suitable to be applied in the CI with some modifications. The models are the:

i. Technology Readiness Index (TRI) developed by Parasuraman and Rockbridge Associates (2000) (Parasuraman 2000),
ii. Network Readiness Index (NRI) developed by Center for International Development (CID) at Harvard and the World Economic Forum (Center for International Development (CID) 2002)
iii. IT/IS Readiness Maturity Model developed by Salleh and Alshawi (2007) (Salleh 2007).

All the three models however, address different issues. The TRI index is focusing on evaluating people's readiness to interact with technology, while the NRI is focusing on the infrastructure development and IT/IS Readiness Maturity Model focuses on evaluating the readiness level in the organisation prior to IT/IS implementation.

Even though TRI is focused on evaluating the people e-readiness level, this model however requires some modifications as it was not specifically developed for the CI. The evaluation criteria used in TRI model might not suitable for the CI. Therefore, certain modification on the criteria used in this model may be needed to suit with the CI perspective. The limitation identified for this model is it does not recommend ways for improvement.

Same as TRI, NRI can be used in CI with some modification made on the evaluation criteria to suit with the nature of the CI. This model was designed to be used by communities to measure their technological capabilities in terms of environment for IT, readiness of the community and the actual usage of IT. This model however does not make any recommendation for improvement.

IT/IS Readiness Maturity Model developed by Salleh and Alshawi (2007) is a generic model that evaluates four (4) elements; IT infrastructure, people, work environment and process. Even though it is a generic model, this model has been tested in the CI. However, the evaluation criteria used in this model can be doubted as it is never been validated from the CI perspective.

The other models that had been reviewed were found to be not really suitable for implementation in the CI because most of them address issues relating to e-governance which are beyond the control of the industry. These evaluation criteria were instead used in helping governments to develop policy prior to the ICT implementation.

Furthermore, these models do not consider the unique characteristic of every country and society and assume that it is a one-size-fits-all model. The results obtained from using these models will not be accurate as every country and society is different. The result obtained from the evaluation using these models will reveal a large gap between theory and practice.

Moreover, some of the models only evaluate the current readiness level without giving recommendations for further improvements. Thus, the usefulness of these models may be questioned.

On top of that, most studies do not provide detail information on how the evaluation criteria (refer Table 2.4) were constructed or adjusted, taking into consideration of the contextual differences (Dada 2006). Consequently, this will lead to serious limitation in terms of applicability and flexibility.

Another limitation that has been identified is the lack of guideline on how to use the models. Specific guideline describing how to use the models, how to gather information, suitable people to be involved in the evaluation process and how the outcome should look like should be provided. Clear indication on how to use the result also should be explained for an effective usage of the models.

The limitation of TRI, NRI and the IT/IS Readiness Maturity Model create the needs to develop a new e-readiness model, which is the main intention of this research. In developing the new e-readiness model, the author analysed the available e-readiness model in CI.

2.3.4 E-readiness models in CI

In an effort to successfully implement IT/IS in CI, several e-readiness models have been developed. According to Khalfan *et. al.*, (2009) a specific e-readiness evaluation for CI is needed in order to carry out the implementation of IT/IS. Three e-readiness models identified to be specifically developed for use in CI were analysed and their differences identified. These models are:

i) BEACON (benchmarking and readiness assessment for concurrent engineering in construction) model,

ii) VERDICT (verify end-user readiness using a diagnostic tool) model, and

iii) SPICE (structured process improvement for construction environments) model.

In finding the most suitable models, the three models were compared based on the following criteria; purpose of evaluation, evaluation criteria, evaluation phase, people involved, method of evaluation, strengths and weaknesses.

a) The comparison of the construction e-readiness models

i) Purpose of Evaluation

BEACON was created to evaluate the construction organizations' readiness level in implementing concurrent engineering with the aim of improving the project delivery process (Khalfan *et. al.*, 2001), while VERDICT was develop to evaluate the overall readiness of end-users involved in CI in using e-commerce technologies (Ruikar *et. al.*, 2006). SPICE FM on the other hand was created to help organisations understand their level of process capability in terms of their process maturity in facilities management context. SPICE FM is scoped to only integrate the design process, construction and maintenance procedures of a construction organisation (Finnemore and Sarshar, 2000).

ii) Evaluation Criteria

The elements evaluated in each of the models would depend on the objective of developing the models. Evaluation criteria for each of the models were compared and tabulated in Table 2.7.

Table 2.7: Comparison on the different evaluation criteria

MODELS	BEACON	VERDICT	SPICE FM
Evaluation Criteria	• Process • People • Project • Technology	• Management • Processes • People • Technology	• Brief Management • Project Planning • Project Tracking and Monitoring • Contract Management • Quality Assurance • Project Change Management • Risk Management • Organisation Process Focus • Organisation Process • Definition • Training Programme • Inter-disciplinary Coordination • Peer Review • Technology Management

BEACON model

In the BEACON model, the four elements evaluated were: process, people, project and technology. These were divided into four quadrants (Figure 2.3). Five criteria of process elements were evaluated in the first quadrant, which include management system, process focus, organisational arrangements, strategy deployment and agility. In the second quadrant, four critical factors relating to the people element were used to evaluate the readiness level in organisation. The third element which is project comprises three critical project factors: facility design, quality assurance and client focus. The final quadrant focuses on the technology highlighting five critical technology criteria which comprises of task support, integration support, information sharing, co-ordination support and communication support. Five levels of maturity were adopted for all the four elements. The levels are ad-hoc, repeatable, characterised, managed and optimising.

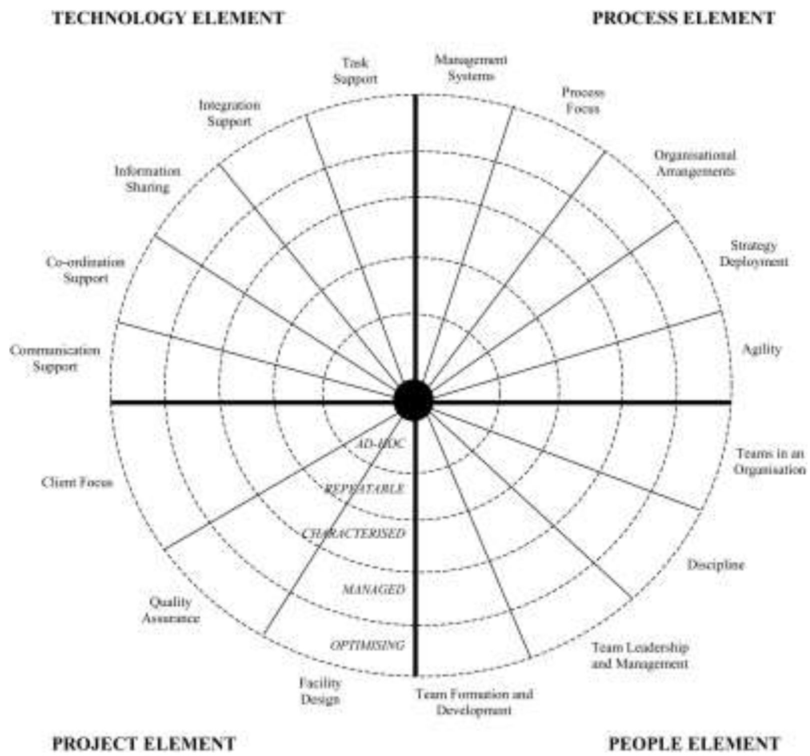


Figure 2.5: BEACON model [Source: Khalfan *et al.* (2001)]

VERDICT model

Four key elements were used to evaluate readiness levels in the VERDICT model, which include management, processes, people and technology. Management was identified as the critical elements that will affect the success of IT implementation in the organisation. Full commitment from management is essential to acquire full benefits of adopting the technology. Process was defined as a series of actions, changes, or functions bringing about result, making it one of the important elements for successful IT implementation. Analysing companies' existing process is crucial in order to identify weaknesses and find ways of solutions. The third element which is people factor, is an important issue that can affect an organisation's overall readiness as the introduction of any new technology (or change) will affect the workforce within that organisation (Ruikar *et. al.*, 2006). The final element, technology, is necessary to support the business functions and it includes the usage of both hardware and software.

SPICE FM

SPICE FM, developed based on the capability maturity model (CMM), has five maturity levels in its framework (Figure 2.6). These maturity levels define a scale for measuring the maturity of a construction organisation's processes, and evaluating its process capability (Amaratunga *et. al.*, 2002). Level one which is the lowest level of the model shows that process in the organisation is unpredictable and constantly changes as the work progresses. Level two is when the organisation has established policies and procedures for managing the major project-based processes. Level three is when the organisation is better defined with all the management and engineering activities well documented. Level four is when the organisation has the ability to set aims for the product and when the productivity and quality are measured. The final level (level five) is when the organisation is looking towards continuous process improvement by identifying the process weaknesses and strengthening it before any problems arise.

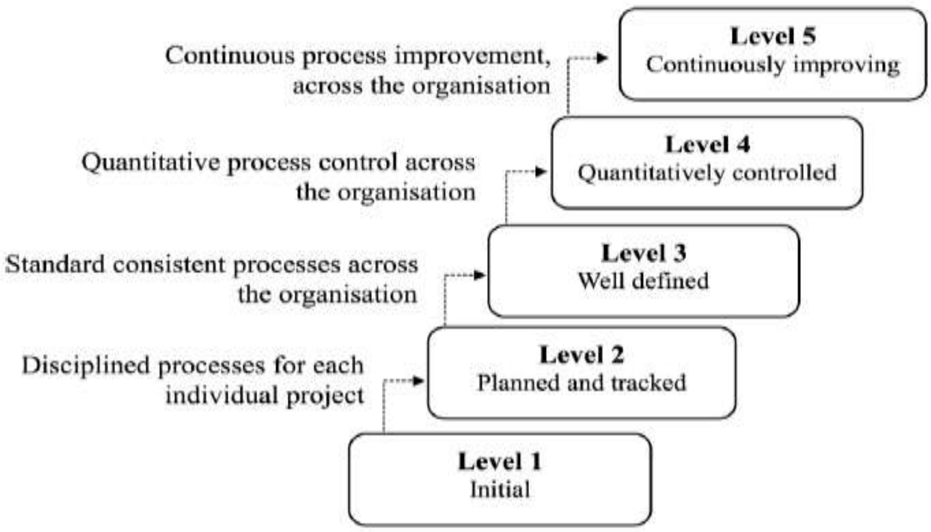


Figure 2.6: SPICE framework

iii) Evaluation phase

The evaluation phase refers to the time of conducting the evaluation. It can either be predictive (ex-ante) evaluations or post-implementation (ex-post) evaluations. Predictive (ex-ante) evaluations are normally conducted prior to IT investment, while post-implementation (ex-post) evaluations are conducted after IT implementation (Salleh, 2007). All the three models can be used to evaluate the readiness level prior to IT investment or after adopting it. The VERDICT model was designed to evaluate the readiness level not only for companies that are currently adopting IT into their work practise but also for those who have yet to use the technology.

iv) People involved

The people involved in the evaluation comprise those who are closely related to the purpose of the evaluation. Evaluations using the BEACON model will involve clients, consultants, contractors, sub-contractors and material suppliers as the model was designed to evaluate the readiness level for concurrent engineering in construction (Khalfan *et. al.,* 2001). VERDICT model was specifically designed to evaluate the readiness level of the end user of construction organisations, thus the evaluation will include consultants, contractors and project managers (Ruikar *et. al.,* 2006). Organisations that are directly involved in CI such as contractors, architects, engineers and suppliers will be chosen to participate in the evaluation of the SPICE FM model as information from them are required in identifying their current maturity level (Finnemore and Sarshar, 2000).

v) Methods of evaluation

A model-based questionnaire (BEACON Questionnaire) has been developed for use in evaluating construction organisations such that the elements covered in this model would be evaluated using this questionnaire (Khalfan *et. al.*, 2001). To evaluate the readiness level using VERDICT model, a form of web-based questionnaire was developed. Several methods were used in collecting data to evaluate the readiness level using the SPICE FM model. The methods involves SPICE FM questionnaire, interviews and analysis of archival records and documentation.

vi) Strengths

BEACON model

The main strength would be that the model is specifically designed to fit the requirements of the CI supply chain, which comprise of four main elements of the concurrent engineering. Results from the evaluations clearly identify aspects that require improvements. The model also provides a guideline for effective implementation of concurrent engineering. The survey and evaluation could be carried out either in the form of structured interviews or alternatively, an electronic version of the questionnaire could be completed by remote respondents. On top of that, the model can be use to evaluate the level of readiness of the four elements involve in the organisation even if the organisation has no intention to implement concurrent engineering (Khalfan *et. al.*, 2001).

VERDICT model

The strong point of VERDICT is its ability to evaluate the readiness level of construction organizations, departments within a company, or even individual work groups within a department. The traffic light indicator used in this model highlights the organisation strengths and weaknesses, clearly indicating areas that need improvement. On top of that, the radar diagram used to plot scores on each category gives a visual representation of their readiness level compared to the best-of-breed in construction. In conclusion, areas that need improvement can easily be identified by using the VERDICT model (Ruikar *et. al.*, 2006).

SPICE FM model

Among the benefits identified when adopting the SPICE FM model is that its' usage had been found to create strong platforms to discuss improvements, which is due to its ability to identify process strengths and weaknesses. Furthermore, finding from the evaluation will help the organisation to prioritize areas that need improvements. In addition, the maturity concept applied in this model gives a structured approach and a clear guideline for the organisation to develop a series of potential process improvements activities (Amaratunga *et. al.,* 2002). Furthermore, this model can be used as an evaluation tool to benchmark the capabilities with different organisations.

vii) Weaknesses

The BEACON model was developed almost a decade ago (2001) and updating the model with the current technology is necessary in order for it to be aligned with current industry needs. The main drawback of the VERDICT is that it does not indicate ways of improvement or how the organization could improve. Expert advice on how readiness can be achieved is therefore essential in producing a comprehensive model.

Several weaknesses of the SPICE FM model include that the model is only applicable for design process, construction and maintenance procedures, excluding finance or marketing aspects. As such, modification of the model is necessary to differentiate FM and construction. Moreover, the terminology used in the SPICE FM questionnaire might create confusion among the participants. All the three e-readiness models were compared and summarised in the Table 2.8.

b) Comments on the available e-readiness models

Stewart *et. al.,*(2004) found that compared to other industries, the CI is still lagging behind in achieving comparable rates of IT implementation due to the limited funding on IT/IS and also the conservative practice of business. Despite the numerous readiness models developed over the years, only three readiness models were found to be specifically designed for use in the CI (Aziz and Salleh, 2011). All the three models described have unique evaluation criteria with different evaluation methods. Each of the models have its advantages and disadvantages, therefore re-designing are crucial in producing comprehensive models. Four aspects were evaluated in VERDICT and BEACON models, while thirteen aspects were evaluated in SPICE FM. All of these models evaluate the hard and soft issue aspects. Evaluating more than one element in the models is deemed to generate less efficient result in identifying the current level of readiness. This is due to the fact that the developer needs to concentrate on all the highlighted elements, thus some important issues may be overlooked.

Table 2.8: Comparison of the three e-readiness models in CI

MODELS	PURPOSE	STRENGTHS	WEAKNESSES
VERDICT	Measuring the e-readiness of construction sector end-users	• Applicable to evaluates the e-readiness of construction companies, department(s) within a company, or even individual work groups within a department • Show a clear result on the organisation strengths and weaknesses • Identifying areas that need improvement	• Does not provide guidelines for improvement
BEACON	Evaluates readiness of construction companies to improve project delivery processes through implementation of concurrent engineering	• Specifically focused on construction supply chain • Identify aspects of its project delivery process that require improvements • Provide guideline for effective implementation of concurrent engineering	• Need to be update to meet the industry needs as well as the recent technology
SPICE	Evaluate the key construction processes within a construction organisation	• The framework indentifies process strength and weaknesses • Create strong platforms to discuss improvements • Give clear guideline in identifying ways of improvements	• The models only can apply for design process, construction and maintenance procedures; finance or marketing aspects are not included • Some participants are confused with the terminology used in the questionnaire • Modification needed to apply the model in CI to differentiate FM and construction

An appropriate model that only addresses a specific element is necessary for the CI to evaluate their readiness level. According to Xue *et. al*. (2012) there is a direct relation between people and the successful implementation of IT/IS. This is supported by findings from Muhammad (2012), who revealed that people related factor will determine the end result of any IT/IS implementation. Lou and Alshawi (2009) also highlighted the failure of IT/IS implementation related to the people and process issues, rather than the technical aspects. The idea of the people issue as the barrier towards IT/IS implementation in CI also had been supported by other researchers (Ogunyemi and Johnston, 2012; Razavi and Ahamad, 2011; Sidawi, 2012). Far too little attention had been paid to the people issue which motivates the author to develop a model specifically designed for this issue. Margherita and Petti (2010) also suggested further investigation of people issues in minimising the failure of IT/IS implementation.

2.4 IT/IS maturity model

2.4.1 History of maturity model

The concept of maturity originates from the Total Quality Management movement, where the application of statistical process control (SPC) shows the improvement of the maturity in any technical process leads to process improvement (Cooke-Davies and Arzymanow, 2003). The possibility of continuous improvement has encouraged other industries to develop the same concept. The most widely adopted model is the Capability Maturity Model (CMM), developed by Software Engineering Institute of Carnegie-Mellon University in 1986 (Grim 2009). CMM was developed to measure the organisational process maturity. Since then, hundreds of maturity model have been developed by researchers in various industries (Pöppelbuß and Röglinger, 2011).

Among the developed maturity models were the Enterprise Architecture Maturity Model, European Foundation for Quality Management (EFQM) Excellent

Model, Process Maturity Model, Project Management Maturity Model and others. All of these models were developed to measure the maturity of knowledge management, IT service capability, business management, enterprise architecture, process management maturity and others.

2.4.2 Definition and purpose of maturity model

According to the Longman Dictionary of Contemporary English (2009), maturity, which came from the word mature has various meaning. Some of the meanings are fully grown and developed, as well as old enough. The CMMI Product Team (2002) defined maturity as '*the extent to which an organisation has explicitly and consistently deployed processes that are documented, managed, measured, controlled, and continually improved*'. According to Man (2007), maturity model is a framework that have several levels that describe the ideal development in achieving the desired improvement. Pullen (2007) described maturity models as '*a structured collection of elements that describe the characteristics of effective processes at different stages of development*'.

Maturity model is also known as stages-of-growth models, stage models and stage theories (Prananto *et. al.*, 2003). The main purpose of the maturity model is to help organizations to evaluate their current performance and benchmark against future target for improvement (Abu Khadra *et. al.*, 2009). Gottschalk (2009) stated that, a maturity model represents the stage-by-stage progress of the organisation's capabilities along the anticipated, desired or logical path. According to Stevanović (2011), a maturity model is a structured series of elements that aim to describe some aspects of development in the organisation. Every maturity model indicates: (i) initial step of project, (ii) measuring advantage from former experience or projects, (iii) aspects that combine numerous objectives together, (iv) framework for priority determination and (v) justification on the improvement that will affect the organisation (Morton 2009).

2.4.3 The importance and benefits of maturity model

According to the United States General Accounting Office (2000), maturity models have been proven to be highly effective evaluation methods, thus the overall adoption of the maturity model is expected to increase in practice (Scott 2007). The increasing interest of the researcher in developing maturity model has also been reported by researchers (Becker *et. al.*, 2010; Pöppelbuß and Röglinger, 2011). Furthermore, Röglinger *et. al.*, (2012) have highlighted the importance of maturity model in IT management.

A lot of benefits of adopting maturity model have been highlighted by researchers (Eadie, *et. al.*, 2012; Peng *et. al.*, 2011; Stevanović, 2011). In general, the benefits of adopting maturity model are:

i) Help the organisation to verify what they have achieved by looking back at the activities that they already did (Khoshgoftar and Osman, 2009; vom Brocke *et. al.*, 2012).

ii) The organisation current achievement also can be determined by describing their current activities (Jia *et. al.*, 2011; Peng *et. al.*, 2011).

iii) Allow the organisation to benchmark within the organisation or with other organisations (Pöppelbuß and Röglinger, 2011; Wendler, 2012).

iv) Assist the organisation in prioritizing the necessary improvement by comparing the result of the maturity evaluation and the description in the maturity model. By doing so, it will give insights on the strength and weaknesses that they have (Eadie *et. al.,* 2011; ValdÃ©s *et. al.,* 2011).

2.4.4 Developed maturity model

The successful story of CMM has encouraged many industries to develop similar models due to the constant pressure to gain competitive advantage (vom Brocke *et. al.,* 2012). In contrast, the CI usually overlooks the management process due to the fragmented nature of the industry itself (de Bruin and Rosemann, 2005). According to Fengyong and Renhui (2007), there is a limited number of maturity models which were developed specifically for the CI. Listed below are several maturity models that were selected to be compared. These models are:

i) Organisational Project Management Maturity Model (OPM3)
ii) Portfolio, Programme and Project Management Maturity Model (P3M3)
iii) Capability Maturity Model (CMM)
iv) Project Management Maturity Model (PMMM)
v) Project Management Process Maturity Model (PM2)
vi) Kerzner Maturity Model
vii) Construction Supply Chain Maturity Model (CSCM)
viii) Construction Industry Macro Maturity Model (CIM3)
ix) P2MM
x) People CMM

a) Comparisons of the maturity model

All maturity models listed above are different from each other because they were developed for a specific purpose. Therefore, each of them covered different aspects and may have different maturity levels. The comparisons of these models were used as a guide in developing the people readiness maturity model.

i) Purpose of evaluations

Most of the listed models were developed for construction project management. The comparisons on the purpose for each of the models selected were tabulated in Table 2.9.

Table 2.9: Purpose on developing the maturity models

MODELS	PURPOSE
OPM3	To assists the organisation in evaluating their current maturity level and helping them to improve by identifying priority and guidance for planning
P3M3	Describe the portfolio, program and project related activities within process areas that contribute in achieving intended results
CMM	This model was developed to evaluate the software process ability for software organisations process
PMMM	Developed for organisations to benchmark their ability in terms of project management
PM2/Berkley Project Management Process Maturity	To assist project managers to measure the link between organisational maturity and return on investment (ROI)
Kerzner Maturity Model	Developed for organisation to benchmark their ability in terms of project management
CSCM	This model was developed as a guideline to improve operational and performance of construction supply chain
CIM3	Developed for the macro level in the CI to provide indicators of project performance, enables comparisons between countries and region and provide guidance for CI improvement
P2MM	Provide framework for organisation to evaluate current readiness level and identify improvement with best practise
People CMM	Guides organisations in improving their process for managing and developing their workforce

ii) Other comparisons

All the listed maturity models were then compared in terms of its scope, number of maturity level and its name, as well as criteria evaluated. The comparisons were tabulated in Table 2.10.

Table 2.10: Comparisons of the maturity models

MATURITY MODELS	SCOPE	MATURITY LEVELS	ASPECTS COVERED
OPM3	Project management	Level 1: Standardize Level 2: Measure Level 3: Control Level 4: Continuous improvement	• Portfolio • Program • Project
P3M3	Project management	Level 1: Initial process Level 2: Repeatable process Level 3: Defined process Level 4: Managed process Level 5: Optimised process	• Portfolio • Programme • Project management
CMM	Software	Level 1: Initial level Level 2: Repeatable level Level 3: Defined level Level 4: Managed level Level 5: Optimised level	• Continuous process improvement • Quantitative management • Process standardisation • Basic project management
PMMM	Project management	Level 1: Initial Level 2: Repeatable Level 3: Defined Level 4: Managed Level 5: Optimizing	• Project integration management • Scope management • Time management • Cost management • Quality management • Project human resource management • Communication management • Risk management • Procurement management • Management oversight, • Project office • Professional project management development
PM2	Project management	Level 1: Ad-hoc Level 2: Planned Level 3: Managed at project level Level 4: Managed at corporate level Level 5: Continuous PM process improvement	• Project Management Knowledge Areas • Project processes
Kerzner	Project management	Level 1: Common Language Level2: Common Processes Level3: Singular Methodology Level4: Benchmarking Level5: Continuous Improvement	• Efficiency, • Performance • Benefits, and • Customer satisfaction

Table 2.10: Comparisons of the maturity models (Cont'd)

MATURITY MODELS	SCOPE	MATURITY LEVELS	ASPECTS COVERED
CSCM	Project management	Level 1: Ad hoc Level2: Defined Level3: Managed Level4: Controlled	• Process • Technology • Strategy • Value
P2MM	Project management	Level 1: Awareness process Level 2: Repeatable process Level 3: Defined process Level 4: Managed process Level 5: Optimised process	• Management control • Benefits management • Financial management • Stakeholder engagement • Risk management • Organisational governance • Resource management
CIM3	Project management	Level 1: Initial Level 2: Repeatable Level 3: Defined Level 4: Managed Level 5: Optimising	• Cost management, • Quality management, • Health and safety management and • Human resource
People CMM		Level 1: Initial Level 2: Managed Level 3: Defined Level 4: Predictable Level 5: Optimizing	• Improving individual competency • Building workgroups and culture • Motivating and managing performance • Shaping the workforce

b) Comments on the maturity model

The above maturity models were compared in terms of their scope, levels of maturity and aspects covered. Most of the models focused on the project management area and only one of them focused on people issues. However the suitability to adopt the people-CMM in CI is debateable because this model is not developed specifically for the CI (Curtis *et. al.*, 2003). Furthermore, due to the different of nature and process of the CI, the successful application of generic model in other industries might be useless in CI without necessary modification (Zhai and Liu, 2007). However, the application of maturity model had been proven to be an effective evaluation technique as it helps organisations to improve their technical development and management process (United States General Accounting Office 2000).

2.5 Conclusion

With rapid development of technology, all industries including CI are finding the best possible ways to exploit the power of IT/IS for continuous competitive advantage. Despite the high investment rate in IT/IS, the failure rate is still increasing (Amid *et. al.*, 2011). Therefore, being e-ready is a must to fully utilise the technology. Identifying their readiness level is crucial to be aligned with the latest technology. The e-readiness evaluation model can be employed as an instrument to measure the readiness of construction organisations to successfully implement IT/IS (Ruikar *et. al.*, 2005). To effectively implement the technology, everyone has to be e-ready. In an attempt to reduce the failure rates, several e-readiness models have been created and used by different groups, each looking at different angles of IT/IS, society, and economy. Surprisingly, limited number of models were found to be developed for the CI. Each of the models was developed for specific purposes in finding the intended results. Four aspects were evaluated in VERDICT and BEACON models, while thirteen aspects were evaluated in SPICE FM. All of these models evaluate the hard and soft issue aspects. Evaluating more than one element in the models is deemed to generate less efficient result in identifying the current level of readiness. This is due to the fact that the developer needs to concentrate on all the selected elements, therefore some of the important issues in one of the elements may be overlooked.

Findings from the literature indicate that it is necessary to create a specific model for construction organizations to evaluate their readiness level. In response to literature synthesis, it is necessary to develop a model that focuses on the people aspects as it is one of the factors that contribute towards the successful implementation of IT/IS.

Far too little attention is being paid to the people issue which motivates the author to develop a model specifically designed for this particular issue. For this purpose, the maturity model was identified as an ideal model, based on its importance and benefits as discussed in section 2.4.3. Several maturity models were selected and compared to be used as a guide for the author in developing the people e-readiness maturity model.

Chapter 3

People Critical Success Factors (CSFSs) of IT/IS Implementation

3.1 Introduction

In an effort to develop people readiness maturity model in CI, it is important to identify people critical success factors (CSFs) that contribute to the success and failure in implementing IT/IS. CSFs relating to people issues were extracted from various industries due to the lack of information regarding this matter from the CI. Therefore, this chapter will begin with the need of people readiness and followed by the concept of CSFs, which includes its definition and identifying the CSFs related to people issues from various industries. The list of people CSFs obtained were then tested in CI and will be discussed in the next chapter.

3.2 The concept of CSFs

The concept of CSFs originates back in 1960's by D. Ronald Daniel of McKinsey and Company (Carali 2004) and it was then popularized a decade ago by Jack F. Rockart of MIT's Sloan School of Management (Yen-Ching *et. al.,* 2010). This concept was initially developed as a method to identify the major factors that need special attention from the top level management (Laosethakul 2005). The concept started to evolve over the years and was used in various industries to achieve business mission and objectives. According to Jafari *et. al.,* (2006), this approach has been widely used by managers as a guideline for strategic planning that helps them to identify factors that need positive result to accomplish organisational objectives. Zhou *et. al.,* (2011) also claims that the correct implementation of CSFs will guarantee the progress of an organisation, or else, opposite result will be obtained if attention is not given to these factors.

Lu and Yuan (2010) stated that there are two (2) situations that can successfully apply the CSFs methods; firstly, when there is a need to reduce a number of factors due to managing the complex system; secondly when there is a need to identify the most important factors due to the limitation of resources.

3.3 CSFs definition

Various definitions of CSFs can be found from literature since its introduction in the 1960s. Bullen and Rockart (1981) defines CSF as ‘certain aspects that need to be right for the successful operations of the organisations and achieving their business objectives’. Méndez *et. al.,* (2008) define CSFs as ‘to carry out certain activities in the right way to meet intended objectives’; Austin (2002) describes CSFs as ‘critical areas that need to perform so that the organisation can achieve its goals’; Gajendran *et. al.,* (2005) defines CSFs as ‘certain aspects that need special attention in order to achieve business objectives’. Basically, CSFs is about the limited number of factors, which if address significantly, will influence the end results and increase the chances of achieving intended objectives.

3.4 Benefits of CSFs

Among the benefits of applying the CSFs approach as identified as Rockart (1979), are:

i) Helps the organisation to determine which factor that needs more attention, thus ensuring those factors receive careful and continuous scrutiny.

ii) The identification of CSFs allows a clear definition of the amount of information that must be collected by the organisation.

iii) The identification of the CSFs will then forces the manager to develop a good measure for those factors identified and seek reports on each of the measures.

3.5 Identifying CSFs

There are many techniques that can be used to identify CSFs. According to Esteves de Sousa , case study and survey based on interview are frequent methods used in determining the CSFs. Usually, participants are asked to create a list of the most relevant CSFs or examining it using a scale which indicates low, normal or high relevance (Amberg *et. al.,* 2005). Olszak and Ziemba (2012), identified several methods that is usually used in identifying the CSFs, which comprise of the analysis of relevant literature, case studies, Delphi techniques, group interviews, multivariate analysis, questionnaire, scenario analysis and structured interview. Rockart (1979), introduced a two phase method in identifying the CSFs, which begin with:

i) interview based method that begin with a discussion of an executive goals and the underlying CSFs

ii) followed by the development of the CSFs measures

Carali (2004), on the other hand introduced a five step method; define scope, collect data, analyse data, derive CSFs, analyse CSFs. The CSFs were derived from the document review and analysis of the goals and objectives of key management personnel, as well as interviews with those individuals about their specific domain and barriers they encountered in achieving the organisations goals and objectives (Carali 2004).

According to Jafari *et. al.*, (2006), there are three (3) steps in using the CSFs method. First, list the objectives, followed by classifying the major CSFs in achieving the objective; finally, recommend means of measuring the CSFs. Carali (2004), on the other hand introduced a five (5) steps approach; define scope, collect data, analyse data, derive CSFs and analyse CSFs. This method provides a way of determining CSFs through document review and analysis as well as interviewing the person related to the subject under study (Carali 2004).

3.6 CSFs in IT/IS implementation relating to people issues

Identifying CSFs in construction management showed great potential for the identification of some important factors to reduce the complex nature of the management issues, thus, helping the organisation to efficiently manage those factors using limited resources (Wang *et. al.*, 2010). However, little research is conducted on the CSFs in IT/IS implementation in CI with the primary focus on people issues. According to Longman Dictionary of Contemporary English (2009), people are defined as a group or an indefinite number of humans. In this research, the term ‘people’ are referred to a group of human beings, who work together in an organisation to implement IT/IS. Identifying the CSFs for the people issues are important as these factor were identified as the reasons contributing to the failure of IT/IS implementation (Hung *et. al.*, 2010; Limsarun and Anurit, 2011; Lou and Alshawi, 2009).

Literature review was conducted on eighty one (81) documents on CSFs in IT/IS implementation across industries. All of the article/theses however, do not solely focus on CFSs in IT/IS relating to people issues and only findings relating to people issues were extracted from the literature. The literature date was limited between year 2001 to 2013 in order to get relatively new findings.

Table 3.1: List of people CSFs

PEOPLE CSFs	AUTHORS	NO. OF CITATIONS
Motivation	Davis and Songer(2008) , Nahar *et. al.,*(2006) , Peansupap and Walker(2005) , Al-Alawi *et. al.*, (2007), Amid *et. al.,* (2012), Jurisch *et. al.,* (2012)	6
Training/ skills	Peansupap and Walker (2005), Nahar *et. al.,* (2006), Kelegai and Middleton(2004) , Buruncuk and Gülser(2001) , Eadie *et. al.,* (2007) , Habib(2009) , Aggarwal(2010), Stewart *et. al.,* (2004) , Sabherwal *et. al.,* (2006), Limsarun and Anurit,(2011), Gorla and Lin (2010), Raj *et. al.,* (2011), Abbaszadeh *et. al.,* (2010), Ooi, *et. al.,* (2010), Ahmad and Pinedo Cuenca (2012), Jurisch *et. al.,* (2012)	16
Senior management support	Nahar *et. al.*,(2006), Kelegai and Middleton (2004), Buruncuk and Gülser (2001), Hussein *et. al.,* (2007) , Eadie *et. al.,* (2007), Standing *et. al.,* (2006) , Habib (2009), King (2001), Lind and Culler(2009) , Aggarwal (2010), Lou and Alshawi (2009), Chrusciel and Field (2003), Moh'd Al-adaileh (2009), Young and Jordan (2008), Doom *et. al.,* (2010), Stewart *et. al.,* (2004), Sabherwal *et. al.,*(2006), Pollaphat and Miroslaw (2011), Md Rasli *et. al.,* (2011), Kandelousi *et .al.,* (2011), Mehregan *et. al.,*(2012), Amid *et. al.*,(2012)	22
Communication	Nahar *et. al.*,(2006), Havelka (2002), Gajendran *et. al.,* (2005), Habib,(2009), Lind and Culler (2009), Mazri (2005), Wikforss and Löfgren (2007), Hartmanna and Fischer (2009), von Urff Kaufeld *et. al.,* (2009), Chrusciel and Field (2003), Ngai *et. al.,* (2008), Bhatti (2005), Moohebat *et. al.,* (2010) , Kronbichler *et. al.,* (2009), Al-Alawi *et. al.*,(2007), Mehregan *et. al.,* (2012), Jurisch *et. al.,* (2012)	17
Knowledge and experience	Nahar *et. al.*,(2006), Kelegai and Middleton (2004), Buruncuk and Gülser (2001), Hussein *et. al*., (2007), Eadie *et. al*., (2007), Standing *et. al.,* (2006), Habib (2009), King (2001), Mazri,(2005), Thong (2001), Tambovcevs (2010), Sabherwal *et. al.,* (2006), Estelle *et. al.,* (2010), Å temberger *et. al.,* (2011),	14
Leadership/ IT Leader	Standing *et. al.,* (2006), Aggarwal (2010), Gottschalk and Karlsen (2005), von Urff Kaufeld (2009), Doom *et. al.,* (2010), Stewart *et. al.,* (2004), Gorla and Lin (2010), Hung *et. al*., (2010)	8
Willingness to process change	Peansupap and Walker (2005), Davis and Songer (2008), Havelka (2002), Chrusciel and Field(2003), Limsarun and Anurit (2011), Amid *et. al.,* (2012), Jurisch *et. al.,* (2012)	7
IT staff roles and responsibility	Jiang, Klein and Pick (2003), Martinsons and Cheung (2001), Salleh (2007), Hung *et. al.*,(2010), Stahl (2003), Jurisch *et. al*., (2012)	6
Organisational culture	Eadie *et. al.,* (2007), Habib (2009), Yeganeh (2000), Indeje and Zheng (2010), Gallivan and Srite (2005), Xiao and Dasgupta (2005), Poku (2003), Twati (2008), Abbaszadeh *et. al*.,(2010), Jamali *et. al.,* (2010), Mehregan *et. al.,* (2012)	11
Commitment	Peansupap and Walker (2005), Buruncuk and Gülser (2001), Havelka (2002), Standing *et. al.,* (2006), Gajendran *et. al.,* (2005), Habib (2009), Aggarwal (2010)	7
Management style	Hussein *et. al.,* (2007), Standing *et. al.,*(2006), Jamshidian and Rahnama (2004), Gorla and Lin (2010), Xue *et. al.,* (2012), Rezaei *et. al.,* (2009)	6
User involvement	Buruncuk and Gülser (2001), Havelka (2002), Habib (2009), Lind and Culler (2009), Thong (2001), Sabherwal *et. al*., (2006), Jamali *et. al*., (2010), Limsarun and Anurit,(2011), Gorla and Lin (2010), Amid *et. al.*,(2012)	10
Attitude	Davis and Songer (2008), Nahar *et. al*., (2006), King (2001), Abukhzam and Lee (2010), Mazri,(2005), Sabherwal *et. al.,* (2006)	6
Team work/ Collaboration	Mazri (2005), Utley (2001), Ngai *et. al.,* (2008), Hwang and Xu (2007), Bhatti (2005), Kronbichler *et. al.,* (2009), Ahmad and Pinedo Cuenca (2012), Jurisch *et. al.,* (2012)	8
Interest in IT	Lou and Alshawi (2009), Vries and Boonstra (2012), Jackson and Sloane (2009)	3
Staff behaviour towards IT/IS	Lou and Alshawi(2009), Hedelin and Allwood (2002), Blismas *et. al.,* (2004), Mingaine (2013)	3
Awareness	Stewart *et. al.,* (2004), Adriaanse *et. al.,* (2010), Hollenstein (2004), Habib (2009)	4
Focus and vision	von Urff Kaufeld *et. al*., (2009), McKeen and Smith (2003), Amid *et. al*., (2012), Janom and Zakaria (2009)	4

Table 3.1: List of people CSFs (Cont'd)

PEOPLE CSFs	AUTHORS	NO. OF CITATIONS
Trust	Al-Alawi *et. al.,* (2007), Aberer and Despotovic (2001), Li *et. al.,* (2004), Politis (2003), Ahmad and Pinedo Cuenca(2012)	5
Interpersonal relationship	Park and Abels (2010), Mullen (2005)	2
Satisfaction	Attar and Sweis (2010), Adam Mahmood *et. al.,* (2000), Colman (2007), Sabherwal *et. al.,* (2006), Floropoulos *et. al.,* (2010), DeLone and McLean (2003), Maes and Poels (2007)	7

The review of eighty one (81) documents revealed twenty one (21) CSFs that contribute to the successful implementation of IT/IS in relation to the people issue. The factors are senior management support, communication, user involvement, IT staff roles and responsibility, training/skills, leadership/ IT leader, organisation culture, knowledge/experience, motivation, awareness, focus and vision, satisfaction, teamwork/collaboration, willingness to process change, attitude, commitment, management style, interest in IT, staff behaviour towards IT/IS, trust, interpersonal relationship and personal characteristic (refer Table 3.1).

Literature shows that senior management support, communication and training/ skills are highly cited by researchers as the CSFs for IT/IS implementation. The findings are almost similar with research carried out by Habib (2009) and Nahar *et. al.,* (2006) where both identified these factors as critical for IT/IS implementation success.

3.6.1 Senior Management Support

Most researchers identify senior management support as the main factor contributing to the successful implementation of IT/IS. However, until now, there is no definite definition for the senior management support. Some researchers define it as devoting time as proportion with cost and potential benefits of a project, while others define it as the degree in which the senior management understand the importance of the project functions (Kandelousi *et. al.,* 2011). The identification of the senior management also varies from one organisation to the other, depending on the organisational structure. Example positions of the senior management will include Chief Executive Officer (CEO), Chief Operations Officer (COO), Chief Finance Officer (CFO), Chief Technology Officer (CTO) and Chief Visionary Officer (CVO) among others. Senior management were responsible to provide the organisation with enough financial support and resources, which include manpower and equipment prior to IT/IS implementation. Their responsibility does not end there as they also involve in changing the policy and work procedure, as well as monitor and give feedback in order to have smooth implementation of the technology. In particular, the senior management needs to actively show their support by expressing their determination and appreciation through concrete actions (Gajendran and Brewer, 2007). According to Dong (2008), senior management support is important throughout the entire IT/IS implementation process. Evidence shows that inadequate support from senior management leads to IT/IS implementation failures (Aggarwal, 2010; Doom *et. al.*, 2010). The willingness of the senior management to be involved in the system implementation and provide resource support are the key to the successful IT/IS implementation (Doom *et. al.*, 2010; Moh'd Al-adaileh, 2009). Most of the research agreed that senior management play a crucial role to successfully implement IT/IS in organisation (Aggarwal, 2010; Daojin, 2010; Doom *et. al.*, 2010; Rezaei *et. al.*, 2009; Young and Jordan, 2008). This shows that this factor is widely accepted as 'a must' for successful IT/IS implementation.

3.6.2 Communication

Communication is necessary to successfully implement IT/IS. Excellent level of communication is required to create understanding among staff, for interaction and information sharing as well as to communicate with the entire organisation. Excellent level of communication is characterised when everyone in the organisation convey messages to each other (verbally or non-verbally) in a way they are clearly understood (Mazri 2005, Rajhans 2012). On the contrary, inadequate level of communication can be defined as inability to convey messages to the other person or groups (Ahuja *et. al.,* 2010). Inadequate level of communication will make it impossible for the organisation to successfully implement IT/IS. This is because, the staff involved does not have clear information on their roles, contributions and also achievement (Raj *et. al.,* 2011). Supporting evidence from Moohebat *et. al.,* (2010) and Habib (2009) acknowledges the importance of this factor. Communication is very important as it serves the basic functions in managing an organisation (Bhatti 2005). It can be described as the interaction process of conveying information, ideas, opinion, instructions, decisions, rules and plans throughout the entire organisation. This factor was usually underestimated and overlooked (Daojin 2010). Ineffective communication will lead to the failure of IT/IS implementation because the staff do not have clear information about their contribution, roles and the achievements (Habib 2009). Communication is essential in every organisation to create an understanding, information sharing, getting approval and communicating with the entire organisation to achieve business objectives. Moohebat *et. al.,* (2010) also agreed that regular and effective communication leads to successful IT/IS implementation in organisation. Having a corporate communication strategy plan is important in an organisation as it lays out how to handle the various forms of communication spread in the company (Raj *et. al.,* 2011). Argenti *et.*

al.,(2005) suggested an effective method of communication based on the communication functions as outlined in the Table 3.2:

Table 3.2: Effective communication method

COMMUNICATION FUNCTIONS	TARGETTED GROUP	EFFECTIVE COMMUNICATION METHOD
Staff communications	Staff	Meetings, memos, newsletter
Financial communications	Investors, analyst, media	Conference calls
Marketing communications	Customer, all key constituent	Advertising, promotion
Media relations	All constituencies, media	Press release, interview
Community relation	Communities, NGOs, media	Events, speeches, philanthropy

Source: Argenti *et. al.,* 2005

3.6.3 Knowledge/Experience

Knowledge/experience is another critical factor to successfully implement IT/IS. Adequate knowledge/experience of senior management, IT leader and staff will contribute towards the effective use of the system in the organisation. Adequate knowledge/experience refers to their background, experience and awareness in IT/IS activities, their recognition towards IT/IS potential and others (Rezaei *et. al.,* 2009). Insufficient knowledge/experience will lead to lack of enthusiasm which will become a barrier in adopting the technology (Kelegai and Middleton, 2004). Findings by Thong (2001) revealed that lack of knowledge/experience had cause failure to use the system; similar to findings by Tambovcevs (2010) and Eadie *et. al.,* (2007). Rezaei *et. al.,*(2009) in their research found that knowledge/experience will give a positive influence in the extent on the usage of technology in the organisation. Adequate knowledge/experience will influence management's perception of IT/IS, its responsibilities, usefulness due to the more favourable views of the technology that they have (Nahar *et. al.,* 2006; Rezaei *et. al.* 2009). This factor also relates to personnel issues especially for the older generation who are not computer literate (Eadie *et. al.,* 2007). These people will have difficulties in keeping up to advances in IT/IS related issues as they are used to the traditional way of work (Eadie *et. al.,* 2007). Several researchers agree that prior knowledge/experience on the using of IT/IS will influence the success of its application (Å temberger *et. al.,* 2011; Estelle *et. al.,* 2010; Selwyn, 2005; Wilfong 2006). Finding from Bromideh (2012) shows that age is one of the factors that have a negative impact on e-readiness levels. According to Vermulen (2011), IT/IS early adopters usually do not have problems to adopt IT/IS due to their prior knowledge/experience, which give them natural interest to explore it.

3.6.4 Training/Skills

Researches also pointed the importance of training/skills to successfully implement IT/IS. This factor is frequently cited by researchers because it will help staff to understand and be comfortable with the system thus ensuring their acceptance to use the system (Abbaszadeh *et. al.,* 2010; Limsarun and Anurit, 2011, Raj *et. al.,* 2011). It is also a way of educating staff and help them to fully optimize the system effectively. Many failures of IT/IS implementation reported were due to the lack of training/skills (Tambovcevs 2010). According to Limsarun and Anurit (2011), organisations should provide adequate training for staff to enable them to obtain full benefits of the technology. Sufficient training is not only for staff without experience but also for those whom are using it daily. Training is important as sometimes, the system used are complicated, thus requires certain level of skills to use it. Training will also help staff to understand how to effectively optimise the system. Without training/skills, the staff are unable to utilise the benefit of technology which may lead to the failure of IT/IS implementation. Gorla and Lin (2010) also stated that training will enable staff to understand the system well, thus making them feel the importance of using the system in their work routine. Comprehensive training provided will also increase staff's skill which will lead to increased productivity that benefits the organisations (Kilkelly 2008). Heierhoff *et. al.*, (2011), proposed seven (7) training plan process for IT/IS implementation:

i) Identify the business process that have been changed by the introduction of the new system

ii) Identifying the affected staffs: changes to business process will affect staffs differently, depending on the affected functional areas. Different staffs group will have different training requirement due to the skills and knowledge they already have.

iii) Deliver preliminary training: This is important to give a basic understanding to staffs as their roles might be changing with the implementation of the new system.

iv) Prepare training curriculum

v) Reviewing and testing the documents to identify problems

vi) Identifying the trainer either in-house trainer or appointing the third party

vii) Evaluate training effectiveness to ensure that the training meets the objectives.

3.6.5 Motivation

Motivation can be defined as a driving force that leads to achievements of objectives (Abukhzam and Lee, 2010). According to Davis and Songer (2008), strong motivation is important as it can overcome many difficulties in using the new technology. Motivation can be improved by understanding organisational cultures, identifying needs and preference as well as rewards (Nahar *et. al.*, 2006). According to Krogh (2010), motivation and leadership are linked together. This is proven when Muhammad (2010) and Krogh (2010) made a study on these two factors, which revealed that a significant relationship exists between leadership and its impact on the staffs' motivation in an organisation. Significant relationships exist because the leader has influence on the social process as they are involved in determining the organisation's objectives and also encourage certain behaviour in achieving these objectives (Almansour 2012). Thus, a leader needs to motivate staff in establishing the desired behaviour to achieve the objectives (Cho *et. al.*, 2011).

3.6.6 Staff Behaviour towards IT/IS

People are the critical factor that influence the success and failure of IT/IS implementation in collaborative environment of the organisations (Lou and Alshawi, 2009). Their behaviour towards IT/IS has a direct effect on the way the system is being used. Staff behaviour can be defined as staffs' outward expression of attitude towards things or particular situation (Sheng and Tian, 2010). According to Shen and Khalifa (2008), organisational routines, rules, procedure, regulations, norms, values and history serve as powerful templates in determining staffs behaviour. Staffs' behaviour towards

IT/IS implementation can either be positive or negative (Kwasi and Kwesi, 2011). Positive behaviour will lead to:

i) A clear vision and a good conditions for IT/IS implementation (Mingaine 2013),

ii) An on time job completion thus improving the staffs' performance (Kanwal and Manarvi, 2010).

On the other hand, \negative staff behaviour will lead to an isolation as staff perform their job without interacting with each other, and redundancy as the staff work are taken over by computers (Kwasi and Kwesi, 2011).

3.6.7 Interpersonal Relationship

Interpersonal relationship can be defined as mutual emotional interactions and people behaviour or experience derived from different needs (Imamoglu and Aydin, 2009). Interpersonal relationship is believed to have positive impact on the communications patterns which influence the successful implementation IT/IS in an organisation (Park and Abels, 2010). Strong interpersonal relation among staff is an advantage as they are willing to put more time and effort to help each other to utilise IT/IS in the organisation (Mullen 2005). This factor, however is often neglected by the organisation due to the lack of awareness on the importance of this factor (Kozuh and Arzensek, 2011). Positive interpersonal relationship in an organisation gives good impact to the whole organisation as it gives good effect on staff's attitude, commitment and support (Song and Olshfski, 2008; Zagenczyk *et. al.,* 2010).

3.6.8 Commitment

Commitment is defined as the state or quality being dedicated for certain cause or activity (Longman Dictionary of Contemporary English, 2009). Commitment from organisation and staff is a crucial factor for its successful implementation (Gajendran *et. al.*, 2005). According to Chang *et. al.*, (2010), staff commitment in the context of IT/IS implementation refers to:

i) The acceptance of the goals and values of the IT/IS implementation,

ii) Staff willingness to engage with other team members on the implementation IT/IS

iii) Their desire to maintain the IT/IS application

Staff commitment is important as they have to devote themselves to use the technology, and senior management commitment is essential to provide support to the staff (Habib 2009). Havelka (2002) proved that high level staff's commitment to use IT/IS gives positive influence on IT/IS success. Peansupap and Walker (2005) identified that the basic requirement to successfully implement IT/IS is to have full commitment from staff and organisation. Numerous examples of failures due to the lack of commitment had been discussed by many researchers over the years (Aggarwal, 2010; Habib, 2009; Peansupap and Walker, 2005). Furthermore, Lam *et. al.*,(2010), had identified that the organisation commitment to implement IT/IS is usually influenced by:

i) the business communication and sharing of knowledge

ii) increase global competitiveness

iii) enthusiasm to be at the forefront of the technology development

3.6.9 Attitude

Attitude plays an important part in life and organisation for successful IT/IS implementation (Abukhzam and Lee, 2010). Having staff with positive attitude would help the organisation to strive as they are not negative towards anything (Broady *et. al.*, 2010; Graham, 2009). The organisation can make certain effort in encouraging a positive attitude in staff such as giving fair and equal treatment to all staff, recognise and award staff achievement, regular feedback from the senior management, having open and honest communication among staff and the management and also equal opportunities to all staff (Beheshtifar *et. al.*, 2012). The implementation of a new system would be easier when staff were looking forward towards the benefits of the new technology. Empirical studies have recognised positive attitude towards IT/IS as a necessary condition for their successful implementation (Davis and Songer, 2008; Nahar *et. al.*, 2006). Attitude can be defined as a nature to respond either favourably or unfavourably to an object, person, institution or event based on their inner thought or feelings (Bertea 2009). The response can either be a positive or negative (Alazzam *et. al.*, 2012). Alazzam *et. al.*, (2012), further identified four (4) dimensions of attitude; usefulness, confidence, anxiety and aversion. Research by Alazzam *et. al.*, (2012), further revealed that attitude plays a critical role in determining the capability of the people to use the IT/IS. Other researchers have also derived similar findings and agree that attitude is the most important factor for reaching the successful implementation of IT/IS (Bertea, 2009; Broady *et. al.*, 2010; Laumer *et. al.*, 2012).

3.6.10 Leadership

Leadership is one of the factors that contribute to the success of IT/IS implementation as it deals with the issue of how to achieve collaboration and unity in organisation. According to von Urff Kaufeld *et. al.,* (2009), the effectiveness of the IT/IS leader has a direct influence on the successful application of IT/IS. Doom *et. al.,* (2010) also stated the importance of having strong leadership to increase success. Hung *et. al.,* (2010) believed that the position of the IT leader in the organisation hierarchy also plays an important role. When the IT leader is in a higher level of the organisation, they have the authority to allocate more resources for the IT/IS development (Gorla and Lin, 2010). By sitting higher in the organisation hierarchy, the staff believe that IT/IS will gain more importance in policy making within the organisation. Having a strong leader will directly or indirectly promote higher levels of staff self-efficacy and empowerment (Peansupap and Walker, 2005; Walumbwa *et. al.,* 2005). This will also encourage effective use of the system and eventually lead to its success. According to Cho *et. al.,* (2011), a leader is important to increase the IT/IS success rate through:

i) Idealized influence: the leaders lead-by-example causing staff to follow the leaders

ii) Inspirational motivation: enhance staff confidence in using the system by articulating an appealing vision and expressing high level of expectations and optimism on staff's ability to use the system

iii) Individualised considerations: coach and mentor their staff and provide individual support while concern and listening to the staff needs

iv) Intellectual simulation: leaders can stimulate staff's problem solving skills by challenging them, making them to take risks and seek staff ideas for better usage of the system.

3.6.11 User Involvement

Havelka (2002) defined user involvement as participation of actual users of the application in the development process. User involvement is important as it require the users to use their skills, experience and knowledge to successfully implement IT/IS. It also gives the users the authority to make decisions, able to control their work and taking responsibility, thus develop the sense of ownership (Chen *et. al.*, 2011). The strong feeling of ownership may increase commitment and lead to positive impact to successfully implement IT/IS (Karlsson *et. al.*, 2012). As the end user of the system, involving the user will increase work satisfaction and acceptance towards the implementation of the technology. According to DÃ-ez and McIntosh (2009), the type of user involvement in the system development can be grouped into three (3) life cycle stage; pre-implementation, implementation and post-implementation. The types of processes involved in the three (3) life cycles are illustrated in the Figure 3.1.

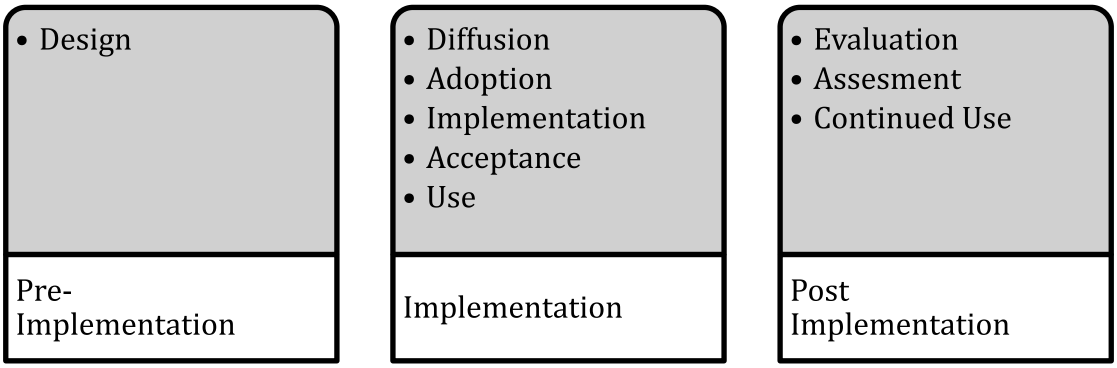


Figure 3.1: System Development Life Cycle

DÃ-ez and McIntosh (2009), defined the involvement of users in the system development as follows:

i) Pre-implementation: the involvement of user in determining the design of the software and data structures to support the development process

ii) Implementation: the involvement of user in deploying the system in their works that include acquisition, diffusion and assimilation.

iii) Post-implementation: the involvement of user in the evaluation process to evaluates the usefulness of the system and determines the continuous usage of the system in the organisation.

3.6.12 Team Work/Collaboration

Team work/collaboration has a powerful influence in gaining staff acceptance towards the introduction of the new system in the organisation (Utley 2001). Teamwork/ collaboration refers to the presence of mutual influence among people in the organisation which enables open and direct communication and coordination (Chang *et. al.,* 2010). Teamwork/collaboration involve interactions of people to achieve a common purpose through information sharing and coordination of activities (Mishra *et. al.,* 2012). Research by Hwang and Xu (2007), Bhatti (2005) and Kronbichler *et. al.,* (2009), identified teamwork as one of the factors that influence the system's success. However, this factor does not have a direct impact on successful IT/IS implementation but it would affect the way IT/IS is used and the benefits obtained from its usage (Hwang and Xu, 2007). According to Al-Fawaz *et. al.,* (2008), some IT/IS implementation require involvement from several department in an organisation, thus collaboration from them become important. Mishra *et. al.,* (2012), identified two (2) types of collaboration that usually take place in an organisation; working together to accomplish a tasks and discussing with each other to solve problems.

3.6.13 Focus and Vision

A clear focus and vision of the organisation and the leader is very important (McKeen and Smith, 2003) as they are responsible to guide the staff towards achieving organisational goals. Everyone in the organisation needs to have the same focus and vision as this features require directing their major attention towards achieving successful IT/IS implementation in their organisation (von Urff Kaufeld *et. al.*, 2009). According to Janom and Zakaria (2009), the vision should be widely communicated and understood throughout the company. Furthermore, research finding by Limsarun and Anurit (2011), revealed that clear vision regarding the IT/IS implementation is very important as it will lead the organisation to have a positive mindset towards the benefits and the importance of implementing IT/IS. According to Qutaishat *et. al.,* (2012), organisation vision is a very important factor in IT/IS implementation and all staff should know and understand whether the IT/IS implementation is a strategic tool or just a mere software solution. Al-Fawaz *et. al.,* (2008) and Nah *et. al.,* (2003), identified factors that contribute to the failure of IT/IS which are not related to system implementation, but more towards the expectations of the board of directors, and staff, which resulted from the lack of focus and vision. On top of that, organisations frequently selects systems which are not suitable with their business, which is due to the lack of vision of optimisation of their business process (Pabedinskaitė 2010).

3.6.14 IT Staff Roles and Responsibilities

Usually, IT Department will comprise of a technician, programmer, analyst, head of IT Department or a Manager (Mourmant and Voutsina, 2010). Among the responsibilities of IT staff are to plan, develop, implement and maintain IT/IS in the organisation (Xiaojing 2012). According to Kim and Wright (2007), it is important for the IT staff to have a clear definition and understanding of their roles and responsibility, either individually or within a team, as it has a critical contribution towards the successful implementation of IT/IS. Salleh (2007) and Jiang (2003) in their studies found that IT staff roles and responsibilities are positively related to the successful implementation of IT/IS. Furthermore, it is necessary for the IT Manager to delegate the right roles and responsibilities to the right IT staff. Besides reviewing the IT staff's qualification, this can be done by evaluating the IT staff skills and also their ability to handle stress without compromising the quality of work (Xiaojing 2012).

3.6.15 Management Style

Management style can be describe as the process of getting activities completed effectively and efficiently through people to achieve desired goals (Nwadukwe and Timinepere, 2012). This factor is important as it will influence, coordinate and direct people's activity towards achieving organisation objectives (Hussein *et. al.*, 2007; Xue *et. al.*,2012). Several management styles have evolved throughout the years in helping the managers to utilise different approaches to effectively manage the organisation. Researchers have identified different types of management styles since the 1950's, such as participative, paternalistic, exploitative, autocratic and consultative (Likert 1967). Commonly exhibited management styles are autocratic, democratic, paternalistic, delegating and also laissez-faire (Hodgkinson, 2009; Koslowsky *et. al.*, 2011; Thornton, 2008). According to Rezaei *et. al.*, (2009), practising a suitable management style along with an adequate budget will lead to a staff friendly system. Gorla and Lin (2010) has stressed out the need for the organisation to change their management style in order to successfully adopt IT/IS. Depending on the situation, sometimes, it is necessary for the organisation to use the autocratic management style to impose the usage of the new IT/IS dramatically, but, it most cases, the participatory management style is more effective (Bakkabulindi *et. al.*, 2008). Participatory management style is effective as staff are well informed about the changes that is going to be made, which leads to a positive attitude towards the IT/IS implementation (Nwadukwe and Timinepere, 2012).

3.6.16 Willingness to Process Change

According to Peansupap and Walker (2005), one of the factors that contribute to the failure of IT/IS system is willingness to process change, as it involves changes of staff behaviour to use the new system. Staff usually refuse to change as they are already comfortable with the current work practice (Havelka 2002). Davis and Songer (2008) identified that individuals at a higher hierarchy in the organisation are more willing to change as they have the authority to adjust the changes to suit their requirements. The implementation of IT/IS in an organisation will cause a large number of changes, which will result in opposition, confusion and errors (Pabedinskaitė 2010). According to Shah *et. al.*,(2011), the introduction of new IT/IS in an organisation will demand changes in terms of technical and social. Therefore, the staff need to be informed about the benefits that they may gain, and the challenges that they may face during the IT/IS implementation in preparing them to accept the changes and change accordingly (Jurisch *et. al.*, 2012). Pabedinskaitė (2010), furthermore revealed that the success of

IT/IS implementation is directly proportionate to an organisation determinant to undergo changes. Lunenburg (2010), highlight seven (7) reasons that contribute to the lack of willingness to process change:

i) Fear of the unknown: This usually occurs when the reasons for changes are not clearly understood.

ii) Disagreement with the change: When people do not agree with the changes and feels like it is not appropriate, they tend to resist.

iii) Fear of losing: This occurs when people perceive the changes as a threat to their job, status and power

iv) Disturbance in comfort zone: People will resist to change when they have already established a comfort zone

v) Failure experience: This usually occurs when people involved had experienced failures with changes before

vi) Lack of skills: Implementing new system usually will require new skills, and people are likely to resist the changes when they feel that requiring the new skills is beyond their capabilities

vii) No participation: People tend to resist changes when they are not consulted about it. They feel ignored and perceived as they are not part of it.

3.6.17 Organisational Culture

Understanding the organisational culture is very important as it will give positive or negative effects on staff and workplace. The characteristic of organisational culture such as information sharing, team working, trust, fairness, enthusiasm have a high positive influence with successful IT/IS implementation (Habib 2009). According to Ke and Wei (2008), organisational culture is defined in terms of the way people think, which has a direct influence on the way they behave. Mehregan *et. al.*,(2012) adds that culture comprises beliefs, values, norms and social custom that form the way individuals act and behave in an organisation. Du Toit and Roodt (2008), divided culture into two (2) categories:

i) Those related to external environment: include strategy, mission, goals and objectives of the organisation to reach the goals

ii) Those related to the internal environment: which include staffs, management process and management orientation

According to Karimi and Syed Abdul Kadir (2012), existing culture of an organisation will provide a corporate framework that will lead and provide guidance on issues such as how work is done, the use of technology, how people think and standards for interactions and communication. Research findings from Jigeesh (2011), revealed that culture is one of the factors that have influence on the successful implementation of IT/IS. According to Jamali *et. al.,* (2010), failure to understand organisational culture will result in disappointment to reap many of the perceived benefits of IT/IS. Literature further indicates that organisational culture gives impact on the technology adoption, usage as well as performance (Agourram, 2009; Jigeesh, 2011; Karimi and Syed Abdul Kadir, 2012).

3.6.18 Awareness

Awareness is one of the most important qualities which is necessary in implementing anything including technology. Stewart *et. al.,* (2004) identified that low level of awareness or exposure to IT/IS is one of the factors that inhibit the successful implementation of IT/IS in organisation. The limited awareness on the benefits of IT/IS implementation will further limit its application (Adriaanse *et. al.*, 2010). This is proven when the research findings by (Hollenstein 2004) revealed that the adoption of IT/IS is limited when the managers have insufficient awareness on the benefits of adopting IT/IS. Habib (2009), suggested a guideline in creating awareness which include:

i) Explaining the benefits achieved by implementing IT/IS before adopting it

ii) Senior management needs to be informed and aware on the resources needed and the benefits that will be obtained

iii) The roles and responsibilities of staffs should be clear before the IT/IS implementation

iv) Having proper planning in carrying out the IT/IS awareness events within the organisation

3.6.19 Trust

Trust between co-workers, trust on the system and trust to the management are essential attributes which is believed to have a strong effect to successfully implement IT/IS (Al-Alawi *et. al.*, 2007; Politis, 2003). The existence of trust is required among the staff in order to respond openly and share their thoughts and perceptions which leads to successful implementation of IT/IS (Al-Alawi *et. al.*, 2007). According to Tung *et. al.*, (2008), trust will be built upon executive capability, reliability and integrity of the IT/IS that is going to be used in the organisation. Komiak and Benbasat (2008) and HernÃ¡ndez-Ortega (2011), distinguished two (2) different phases of trust:

i) Pre-trust: referring to the trust before the employment of the technology.

ii) Post-trust : referring to the trust after the employment of the technology

Pre-trust will influence the staff's intention towards adopting the technology while post-trust will modify the staff's intentions of continuing to employ it (HernÃ¡ndez-Ortega 2011). Pre-trust is built according to staff's assumption, their experience with other IT/IS application and their knowledge on IT/IS (Xin Li *et. al.*, 2008). When staffs adopt IT/IS, their experience may confirm or contradict with their early assumption, thus contributes to the increase or decrease in their level of trust (HernÃ¡ndez-Ortega 2011). Staff's experience will determine their post-trust level, thus determining their intention in continuing to use the IT/IS (Rotchanakitumnuai and Speece, 2009; Urban *et. al.*, 2009).

3.6.20 Satisfaction

Staff are the valuable assets of the organisation as their satisfaction leads to the success or failure of the organisations (Attar and Sweis, 2010). According to Colman (2007), the level of staff satisfaction has mainly been accepted as a sign for a successful system. Research findings by DeLone and McLean (2003) revealed that staff's satisfaction is critical for system success. Dezdar and Sulaiman (2011), defines staff satisfaction as those feelings and attitude towards a variety of factors that are related to the delivery of information, products and services. Staff satisfaction can be grouped into two (2) categories; those that focus on the overall staff satisfaction with little attention paid to individual factors and those that focus on single dimension (Munir *et. al.*, 2011). Researchers have considered staff satisfaction as a major factor that contributes to the successful implementation of IT/IS (Floropoulos *et. al.*, 2010; Qutaishat *et. al.*, 2012).

Research findings revealed that there are several factors that contribute towards the level of staff satisfaction which include system understanding and training, involvement in the implementation process, interaction with IT Department and also knowledge (Qutaishat *et. al.*, 2012).

3.6.21 Interest in IT/IS

Interest in IT/IS refers to the interest level of the senior management and staff in the organisation to implement IT/IS. According to Jackson and Sloane (2009), the level of interest may vary and can be grouped as follows:

i) Low interest: This usually occurs when people do not believe in the benefits obtained from implementing the IT/IS. This can be caused when the IT/IS application used was unable to meet the organisational goals, and when there is an increase in the operational costs.

ii) High interest: This happens when the application of IT/IS is able to support the organisational goals. A high interest occurs when the organisation realises the benefits of implementing IT/IS, such as improving the decision making process and improving the business process.

Findings by Vries and Boonstra (2012) furthermore revealed that, a low level of interest in implementing IT/IS will demonstrate the resistance to change in behaviour which further contributes to a negative effect in implementing IT/IS.

This study is proposed to develop a people readiness maturity model in a quest to successfully implement IT/IS in construction organisations. According to de Bruin and Rosemann (2005), identifying the CSFs is important in developing the maturity model as it clearly indicates what exactly needs to be measured. Without identifying the CSFs, it is difficult to determine specific improvement strategies (de Bruin and Rosemann, 2005). The list of CSFs can be collected through extensive literature review and then need to be validated in the specific industry to obtain a comprehensive list of CSFs.

3.7 Conclusion

This chapter explained about the CSFs relating to people issues. This began with the concept of CSFs, followed by definition of CSFs and also the techniques used to identify the CSFs. People CSFs in IT/IS implementation were extracted from various literature from multiple industries. The identified CSFs will then be tested to confirm its existence in CI.

Chapter 4

Research Methodology

4.1 Introduction

Research methodology refers to the system of collecting data to identify solutions for problems (Goddard and Melville, 2004). It also justifies the adopted techniques in collecting, analysing and data interpretation (Carrillo 2001). This chapter will begin with reviewing the range of research approach available in social science research, followed by the methodologies and processes used in this research and the rationale behind the selected method.

4.2 Purpose of research

Research that mainly aims to find patterns of regularity in social life is known as social research (Babbie 2010). It addressed questions that are relevant to the social scientific field such as sociology, human and politics, and this type of research may be motivated by development and changes in society (Bryman 2008). Thus, the built environment can be considered as a field of social science (du Toit and Mouton, 2013; Vischer, 2008). According to Babbie (2010), there are three (3) purposes of research in social science; exploration, description and explanatory. Exploration is carried out so that researcher can familiarise with the research topic. There are three (3) main reasons to carry out exploration study:

i) For researcher’s better understanding

ii) Testing the feasibility of undertaking extensive research

iii) To identify method that is suitable for the research (Babbie 2010)

Exploratory studies are important for the researcher in identifying a new research field and the main objective of this study is to identify patterns or ideas (Ahmad and Usop, 2011). This study allow the researcher to yield the insights of the research topic (Babbie 2010). Several techniques are usually used in exploratory research, such as case studies, observation and historical analysis. These techniques enable the researcher to obtain quantitative, qualitative or multi types of data (Ahmad and Usop, 2011). These studies however, are unable to provide definite answers for issues or problems but provide guidance for future research.

Description research on the other hand is suitable to describe the situations or events. Researchers need to observe situations or events, and describe what they observed. Descriptive studies are undertaken when researchers already know the research problem due to previous studies conducted (Babbie 2010). Collected data of this method is usually quantitative and need statistical analysis to summarise the information (Ahmad and Usop, 2011).

Explanatory research studies are carried out to examine beyond the exploratory and descriptive studies to discover the real reasons behind the phenomenon by identifying the fundamental relations among them (Babbie 2010). This study allows elaboration and building theories and adds projections where possible. Scientific methods were used to test evidence which may lead into discovering of new issues and topics. Table 4.1 summarises the different purpose of research.

Table 4.1: Summary of different purpose of research

	EXPLORATORY	DESCRIPTIVE	EXPLANATORY
AIMS	Identify patterns or ideas that can be tested and form the basis for further research	To identify and obtain information on characteristic of particular problem or issue	To explain the reasons behind every phenomenon or events
RESEARCH TECHNIQUES	Case studies, observation, review previous related studies	Quantitative technique are usually used	Locating and identifying different factors or variables involved

Source: Ahmad and Usop, 2011

4.3 Process of the research

In social sciences, process of the research is usually classified into qualitative and quantitative methods (Muijs, 2004; Myers and Avison, 2002).

4.3.1 Qualitative Research

Qualitative research involves the use of non-numerical data and interpretation of observations in order to understand and explain the current situation. According to Myers and Avison (2002), this method allows researchers to analyse social and cultural phenomena; and also help researchers to understand, describe, discover and generate hypothesis. In depth understanding of social phenomena can be obtained through well-planned observational method. Action research, case study and ethnography and grounded theory are examples of techniques used in qualitative methods (Babbie 2010).

a) Action Research

Action research is also known as participative or collaborative research. It is a progressive problem solving method which requires the researcher to be involved in situation under investigation. Reason and Bradbury (2001) defined action research as

'a participatory ,democratic process concern with developing practical knowing in the pursuit of worthwhile human purposes, grounded in the participatory worldview which we believe in emerging at this historical moment. It seek to bring together action and reflection, theory and practice in participation with others, in the pursuit of practical solutions to issues of pressing concern to

people, and more generally the flourishing of individual persons and their communities'.

This method requires active collaboration from the researcher and people involved in the selected situation (Ahmad and Usop, 2011). The main advantage of this research method is it produces workable and practical outcomes as it involves collaboration among the researchers and the selected population. The solutions proposed however, are only practical for the selected population and may not be applicable for others.

b) Case Study

According to Yin (2003), a case study presents empirical inquiries of a phenomenon in its real sense context. This involves detailed investigation of individuals, teams or organisations. In a case study research, sample groups were chosen to represent the whole population to demonstrate certain aspects of the research topic. Several methods can be use in collecting data, which include observation, interviews and use of documents and texts (Myers and Avison, 2001). This method can be regarded as a holistic approach as the in-depth investigation of the selected case is required. According to Ahmad and Usop (2011), case studies can be used to formulate theories, or be:

i) Descriptive: where current practice is described in detail

ii) Illustrative: where the case studies illustrate new practices adopted by organisation

iii) Experimental: where difficulties in adopting new practice or procedures are examined

iv) Explanatory: where theories are used as a basis for understanding and explaining practices or procedures

Among the advantages of adopting this research method is it allows researchers to describe and explore data in the real situation which may be impossible to be captured through experimental or survey research (Zainal 2007). Furthermore, the instrumental and collective approaches to the case study allow for qualitative and quantitative analysis of data. Some studies rely on qualitative data, while others may need numerical evidence for research purpose (Zainal 2007). This has been stressed out by Yin (2003) as some case studies may entirely be based on quantitative evidence.

The major disadvantage of this method is, the findings obtained may be not be generalised to other cases, as the experience form one case study might not be applicable to the other cases (Merriam 2009). Case studies are also often criticised due to its lack of rigour, as possible biases in data collection and interpretation may occur since a single person collects and analyses the data (Yin 2003). Besides that, a case study usually requires a long duration of time, is difficult to conduct and involves a large amount of documents (Zainal 2007).

c) Ethnographic

Ethnographic research comes from the anthropology and sociology field, which require the ethnographer to be involved with the group under study for a significant amount of time (Myers and Avison, 2002). This method is usually used to gather data relating to human societies and cultures, with the aim to describe its nature. The main method to collect data in this study is through participant observation. However, other methods like interviews, document review and detailed notes could also be used.

Among the advantages of this method is that it allows the researcher to collect rich and in-depth information from a natural environment which gives a more realistic perspective (Creswell 2009). This will reveal the qualities of a group experience which cannot be obtained from other research methods. However, difficulties may occur in generalising the findings as the result obtained is only applicable for the group under study. However, this issue can be overcome by using multi site studies (Nurani 2008).

d) Grounded Theory

According to Strauss and Corbin (2008), grounded theory is a research method that uses a systematic procedure to gather and analyse data to develop a theory about a phenomenon. By using this method, it allows researchers to develop a theoretical account of the general features of a topic while simultaneously grounding the account in empirical observations or data (Martin and Turner, 1986). Listed below are some of the characteristic of the grounded theory as described by Charmaz (2003):

v) Data collection and analysis are performed concurrently.

vi) Analytic codes and categories are developed from the data and not from the hypothesis.

vii) Making comparison between data and data, data and concept, concept and concept.

viii) Literature reviews are carried out after the analysis had been performed.

Grounded theory can be regarded as one of the more rigorous method of qualitative analysis (Babbie 2010). This method allows researchers to engage with the research environment without the need to develop hypothesis or theories. However, some of the limitation of this method had been raised by Hodkinson (2008), where theories produced from this type of research method are often small scale and do not consider the impact of the broader world upon respondent's lives. Besides that, the lack of explicit hypothesis at the beginning of the research seems not to acknowledge all researchers that bring values into their research.

4.3.2 Quantitative Research

Quantitative research explains the phenomena by analysis of numerical data collected using mathematical-based methods (Aliaga and Gunderson, 2003). By using quantitative research, it provides connections between observation and mathematical expression. Among the data analysis technique usually used are Structured Equation Modelling (SEM), regression and factor analysis. There are many ways that can be used to collect quantitative data, but the most popular forms are experiments and surveys.

a) Experiments

It involves scientific research of selected subjects under controlled experimental conditions and controls to identify and analyse the causal relationship of phenomena (Ahmad and Usop, 2011). Variables involved in this research can be controlled in observing the effects on the studied subjects. Studies were usually carried out in a laboratory as it allows the researcher to control variables in rigorous way.

b) Surveys

This method studies a large number of samples to represent the population and data is collected through response of the research instruments. Example of research instruments are such as questionnaires and interviews. The surveys used can either be personal surveys, telephone surveys or mail surveys. There are two types of survey; descriptive surveys that concerns the frequencies of response among the survey group, or an analytical survey which investigates the relationship between different variables in a sample group (Ahmad and Usop, 2011).

This method is suitable to be used when there is a need to obtain data from a large population (Babbie 2010). Furthermore, surveys are inclusive in the type and number of variables that can be studied, require minimal investment to develop and administer, and are relatively easy for making generalisation (Goddard and Melville, 2007). Information about attitude, which is difficult to measure using observational techniques can easily be gathered using survey (Glasow 2005). Biases may occur in this method especially when there is a lack of response from intended participant or in the nature and accuracy of the responses received (Creswell, 2009; Mathiyazhagan and Nandan, 2010).

4.3.2 Qualitative vs. Quantitative Research

As discussed above, both qualitative and quantitative research methods have their advantages and disadvantages – but when used in accordance to its strength or to be combined, it could be a powerful research tool. Quantitative research involves numerical data which can be examined in an unbiased manner, while qualitative research is more subjective and may include bias. Table 4.2 identifies features of qualitative and quantitative research method, which was adopted from (Miles and Huberman, 1994).

Table 4.2: Comparison the on qualitative and quantitative methods

QUALITATIVE	QUANTITATIVE
The aim is complete with detailed description	The aim is to classify features, count them, and construct statistical models in an attempt to explain what is observed.
Researcher may only know roughly in advance what he/she is looking for.	Researcher knows clearly in advance what he/she is looking for.
Recommended during earlier phases of research projects.	Recommended during latter phases of research projects.
The design emerges as the study unfolds.	All aspects of the study are carefully designed before data is collected.
Researcher is the data gathering instrument.	Researcher uses tools, such as questionnaires or equipment to collect numerical data.
Data is in the form of words, pictures or objects.	Data is in the form of numbers and statistics.
Subjective : individuals interpretation of events is important, e.g., uses participant observation, in-depth interviews etc.	Objective: seeks precise measurement and analysis of target concepts, e.g., uses surveys, questionnaires etc.
Qualitative data is more 'rich', time consuming, and less able to be generalized.	Quantitative data is more efficient, able to test hypotheses, but may miss contextual detail.
Researcher tends to become subjectively immersed in the subject matter.	Researcher tends to remain objectively separated from the subject matter.

Source: Miles and Huberman, 1994

4.3.3 Mixed Method Research

The combination of qualitative and quantitative methods gained its popularity in the social science research (Babbie 2010). According to Miles and Huberman (1994), the combination of qualitative and quantitative methods may offset the weakness of each method, thus, increasing the validity and reliability of research findings. The usage of the two methods can ensure that the results are valid and not methodological artefacts (Jick 1979). According to Creswell (2009), mixed method research can be grouped into three categories:

i) Sequential mixed methods - researcher elaborates the findings of one method with another method. For example, the research begins with a quantitative method and further explore in detail with the qualitative method.

ii) Concurrent mixed methods - this involves the combination of qualitative and quantitative method in providing a thorough analysis for the topic under study.

iii) Transformative mixed methods - researcher focus on a selected topic of interest and using sequential mixed and concurrent mixed methods.

4.4 Thesis research techniques

Multiple research techniques was employed in this research. The following three (3) phases were undertaken to complete this research:

Phase 1 - the preliminary study involved reviewing literature of the selected topic. This phase is very important as this will help identify the research problems. A pilot study was also conducted at this phase to confirm findings from the literature with the CI.

Phase 2 - the author developed the preliminary people e-readiness maturity model. Questionnaire survey and literature review were performed at this phase. Findings from the questionnaire survey will help to identify the most critical factors to be used in developing the preliminary maturity model.

Phase 3 - to validate the proposed maturity model to suit with the current CI practice.

The overview on how the research was carried out in this study is illustrated in Figure 4.1.

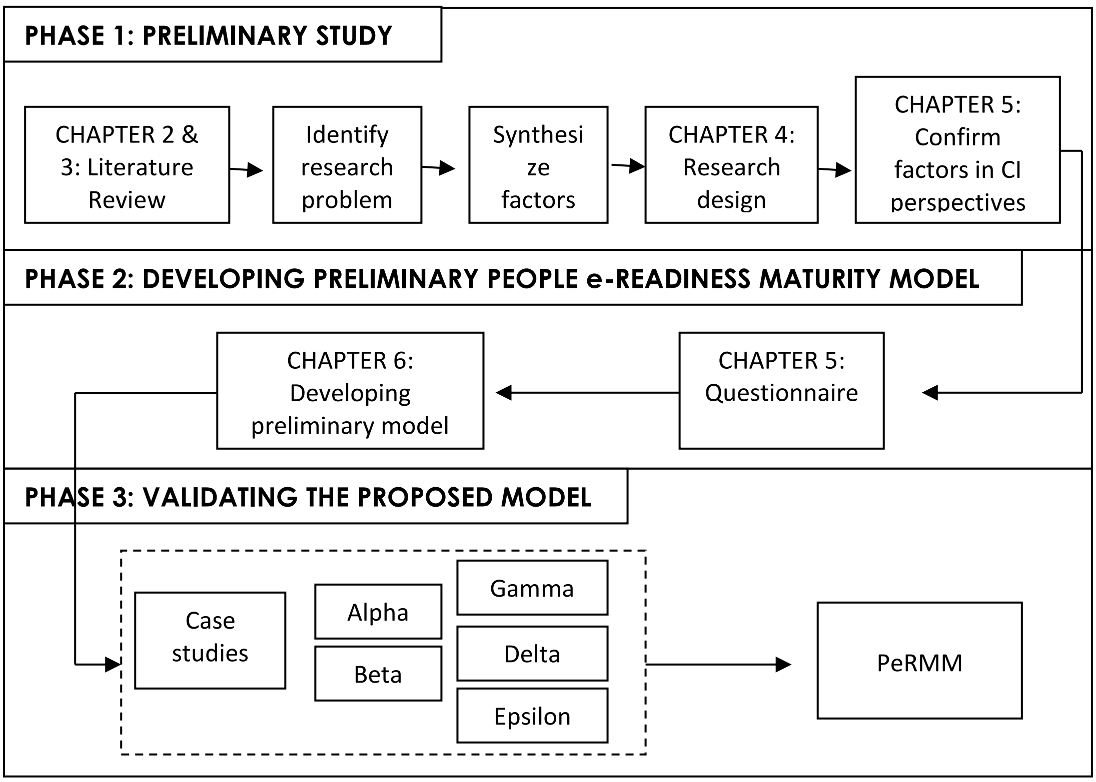


Figure 4.1: Overview of research process

4.4.1 Phase 1: Preliminary Study

Literature is the main source of ideas in determining the research problem, research design and result of the analysis. Firstly, literature reviews can help to identify the main issues of the topic, which will help in developing the research objectives and to identify the potential in developing e-readiness maturity model for CI. This involved reviewing journals, conference proceedings, research papers, books, reports and theses. The reviewing process covered issues within the construction management, IT/IS management, IT/IS critical success factors, e-readiness issue and also maturity model. During the literature review phase, a few research problems were identified:

a) IT/IS implementation failed because people are not ready (Ogunyemi and Johnston, 2012; Vaezi and Bimar, 2009; Zakaria *et. al.*, 2012)
b) Limited research in this area (Margherita and Petti, 2010; Sidawi, 2012)
c) Lack of people evaluation model to evaluate the readiness level focusing on people issue (Xue *et. al.*, 2012; Alshawi and Goulding, 2008)
d) There is a need to evaluate the people issue in a proactive manner before implementing IT/IS (Alshawi and Ariff, 2011; Aggarwal, 2010)

The literature review was carried out for the following purposes:

a) To identify issues relating to the IT/IS investment in CI such as the investment rates, success and failure rates, reasons for success and failures.
b) Reviewing and comparing the current IT/IS e-readiness models from across industries and within the CI.
c) Reviewing and comparing the developed maturity model from across industries

d) Identifying people critical success factors contributing to the success/failure of IT/IS implementation.

Twenty one (21) people critical success factors that contribute towards the successful implementation of IT/IS from across industries were extracted from the literature and became the basis for this research. The factors are:

a) Senior Management Support
b) Communication
c) User Involvement
d) IT Staff Roles and Responsibility
e) Training/Skills
f) Leader/ IT Leader
g) Organisation Culture
h) Knowledge/Experience
i) Motivation
j) Awareness
k) Focus and Vision
l) Satisfaction
m) Teamwork/Collaboration
n) Willingness to Process Change
o) Attitude
p) Commitment
q) Interest in IT
r) Management Style
s) Staff Behaviour towards IT/IS
t) Trust

u) Interpersonal relationship.

The unique characteristic of the CI makes it essential to confirm the existence of these CSFs in this industry. Therefore, a pilot study was conducted with IT/IS managers in seven (7) construction organisations. Factors contributing to success/failure of IT/IS implementations found in literature from across industries were then tested during this phase. This is important to affirm the existence of these factors in CI. According to de Bruin and Rosemann (2005), it is important to confirm the factors selected from multiple evidentiary source to improve the findings of the developed model. Using the interview method will further validate and establish the list of CSFs. Therefore, semi-structured interviews were employed to reflect the reality of the current situation. This allowed rich collection of data in terms of experience and perception through probing the conversation in detail, where the collected data cannot be measured in quantitative approach. Semi-structured interviews offer sufficient flexibility to ensure that all relevant areas were covered. The content of the semi-structured interviews were based on extensive literature review. Major questions were developed in the form of a general statement which was then followed by a sequence of sub-questions for further probing. The method allows the researcher to explore and clarify relevant comments made by the respondents. It also allows researcher and respondent to discuss important issues relevant to the study.

Interview sessions were undertaken with the seven (7) IT/IS managers from seven (7) construction organisations. Only seven (7) construction organisations participate during this stage since the theoretical saturation has been reached, where the interviewing process do not discover anything new (Baker and Edwards 2012).

The interviews took place in the interviewees' office and lasted between 40 to 60 minutes. The interviews were tape-recorded to secure an accurate account of the conversations and avoid losing data since not everything can be written down during interview. The semi-structured interview included sections on the following key areas:

i) organisation background and history,

ii) reasons for adopting the IT/IS,

iii) details of IT/IS

iv) issues in implementing IT/IS (CSFs)

a) Sample selection

In this study, the chosen organisations were based in Klang Valley, Malaysia. The selected organisations have an IT/IS department and had been using an IT/IS for more than ten (10) years.

b) Selected organisations

The organisations selected were from the government, semi-government and private construction organisations which include a maintenance provider, property developer, quantity surveying firms and integrated services organisations.

4.4. 2 Phase 2: Developing Preliminary People e-Readiness Maturity Model

Further investigation on the CSFs identified in the pilot study is necessary to find the most important CSFs that influence the IT/IS implementation in CI. For this, a broad quantitative survey was conducted.

a) Purpose of questionnaire

The questionnaire was designed to identify the critical factors that contribute to the successful implementation of IT/IS in the Malaysian CI. Understanding the important factors will enable researcher to develop preliminary model of people readiness.

b) Design of questionnaire

The questions were deliberately constructed to include only close-ended questions, with measurements that included the range of nominal and ordinal scale. This method is used to measure the statistical influence of the CSFs of IT/IS implementation in CI. The questionnaire consisted of two sections, namely A and B. Section A contained questions pertaining to respondent profile and organisation background. Whereas section B contained the CSFs to be measured on five-point Likert-type scales that vary from 1= not important to 5= extremely important was adopted from Al-Tmeemy *et.al*., (2010), Elwakil *et. al.*, (2009); Garbharan *et. al.*, (2012) and Salleh (2007) (refer Figure 4.2)

Not important	Quite important	Important	Very important	Extremely important
1	2	3	4	5

Figure 4.2: Illustration of the Likert-type scales used in the questionnaire

c) Sampling design

It is important to select the right individual from every organisation in order to get the right answer for the subject matter. In this research, IT Managers of the construction organisation were targeted to obtain their feedback in identifying the success factors in implementing IT/IS in their organisation. Following Mohd

Zin and Egbu (2011) and Rivard (2000), 1000 questionnaires were sent to the respondents. The author chooses to follow them since there is no database on the number of construction organisations that have IT Department, which makes this as the limitation of this research. Furthermore, research performed by Mohd Zin and Egbu (2011) and Rivard (2000) were conducted in the construction industry. Furthermore, the maximum number of samples based on the sampling table is only 384 for the population size of 100,000 (Krejcie and Morgan, 1970). In this research, the respondents are from the government and semi-government bodies, consultants, contractors and sub-contractors. Different types of construction organisation were selected to participate in this study to reflect a true representation of the CI. The reason for random sampling is because it is impossible to obtain feedback from the entire population. The selected organisations are large, medium and small-sized organisations that have IT/IS department and were located throughout Malaysia. Table 4.3 illustrates the sampling distribution.

Table 4.3: Sampling distribution

BUSINESS SECTOR	TOTAL SENT	TOTAL RECEIVED
Surveying	102	54
Civil and Structural	115	16
Contractors	108	23
Supplier	76	5
Integrated Services	134	55
Architect Consultancy	121	43
Mechanical and Electrical	106	22
Sub-contractors	68	26
Construction Developer	135	43
Others (maintenance provider, property developer, highway concessionaires)	35	21
Total	**1000**	**311**

Before the questionnaires were send out, content validity was performed to determine if the questionnaire survey is relevant and represent the purpose of evaluation. It involved five (5) experts in research methodology, two (2) academics experts in IT/IS and four (4) expert practitioners in IT/IS.

d) Distribution of questionnaire

The online questionnaire survey forms were e-mailed to the selected IT Managers using the free online survey builder known as KwikSurveys. However, due to slow response, postal and self-administered questionnaires were then personally sent out to the IT Manager of the construction organisations. In the postal survey, the questionnaires were post to the respondents' office. The self-administered procedure on the other hand involved a self delivery and collection of the questionnaire. Respondents were given a week to fill in the questionnaire form before collection is made. A total of two months was spent on distributing the questionnaires. The list of targeted respondents was obtained from several sources including construction related organisations magazines; architecture, engineering, surveying and construction related websites; www.asiabuilders.com, www.ilamalaysia.org, www.bqsm.gov.my, www.lam.gov.my, www.cidb.gov.my and www.pkk.kkr.gov.my. Before the questionnaires were distributed, a phone call was made to each organisation to determine whether the organisation has an IT Department. It is important to send the questionnaire to the right organisations to obtain accurate feedback.

e) Analysis of questionnaires

A phone call or a reminder letter or emails were send out to the respondent who did not reply the questionnaire after reaching the deadline given. After two weeks of not receiving any reply, the statistic tests were then performed as it has already reached the common response rate of 20% to 30% (Dulaimi *et. al.*, 2003; Yang *et. al.*, 2009). The data were analysed using the Statistical Package for Social Science (SPSS) version 20. Descriptive analysis was performed first to identify the normality of the distribution, the reliability of the responses as well as its means and standard deviation. Then, Relative Importance Index (RII) and mean was used to rank the CSFs according to their importance to the success of IT/IS implementation in CI. These two (2) analyses were chosen to ensure the result obtained valid. According to Wong and Vominsatit (2012), RII has been widely used to evaluate the comparative importance of a single factor to the others. Furthermore, the application of RII is usually used for the ranking of organisational elements such as people (Eadie, *et. al.*, 2011). Seven people CSFs were chosen based on further tests in identifying their relative importance, using Spearman's Correlation Coefficient test. This statistical test was selected as it is a nonparametric technique for evaluating the degree of linear relationship between two factors (Frank, D. K., *et. al.*, 2010). Furthermore, the technique operates on the rank data and it is relatively insensitive to outliers (Gauthier, 2001). Moreover, this statistical test had been used by many researchers throughout the world in identifying the relative importance of the factors (Chan *et. al.*, 2011; Frank *et. al.*, 2010; Memon, *et. al.*, 2001). Table 4.4 summarised the tasks involved in analysing the questionnaire.

Table 4.4: Tasks involved in analysing the questionnaire

TASKS	PURPOSE	TESTS USED/METHOD INVOLVED
i) Content validity (before the questionnaire were send out):	To determine whether the instrument are relevant and represent the purpose of evaluation	Involved 5 experts in research methodology, 2 academics experts in IT/IS, 4 practitioner experts in IT/IS
ii) Descriptive Analysis	To identify the reliability of the response To determine whether the data collected were normally distributed To identify the central tendency of the distribution To calculate the dispersion of the spread values around the mean	Cronbach's Alpha coefficient Skewness Mean Standard deviation
iii) Ranking of CSFs	To rank the CSFs	Relative Importance Index (RII) and mean
iv) Correlation among the selected CSFs	To identify the strength of linear relationship among the selected CSFs	Spearman Correlation Coefficients

Findings from this phase are important for the researcher to develop preliminary maturity model. There are several stages involved in developing the maturity model. According to de Bruin and Rosemann (2005), there are six stages involved in developing the maturity model which include (i) scope, (ii) design, (iii) populate, (iv) test, (v) deploy and (vi) maintain (refer Figure 4.3).

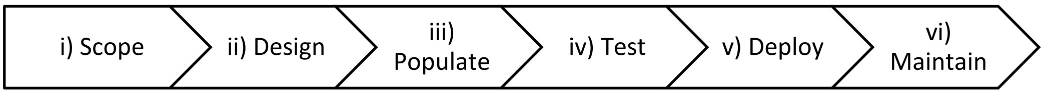


Figure 4.3: The development process

f) Determining the scope

It is to identify the scope of the proposed model as it will set out the boundaries for its application and usage (Tapia, 2006). In this research, the model was developed for the Malaysian CI to identify the people IT/IS readiness level prior to its implementation, which involved all parties in this industry.

g) Designing the model

The second stage in developing the maturity model is to determine the design of the model. This will be the basis for further development as the research progresses. At this stage, it is important to identify:

i) the importance of applying the models in CI,

ii) how to use the model,

iii) person or group that need to be involved in applying the model

iv) the outcome achieved after applying the model

h) Populate

Factors that need to be measured will be decided. In this research, only CSFs relating to people issues in implementing IT/IS will be considered. Then, it is important to determine the maturity of the selected CSFs. For this, comprehensive literature reviews were conducted and the number of maturity levels also should be determined at this stage. Majority of the maturity model have five levels, following the Capability Maturity Model (CMM); which had been widely accepted. Furthermore, 88% of the maturity models used five maturity levels, with the remaining using four levels (Eadie *et. al.,* 2012). Other maturity models that have 5 levels are BEACON (benchmarking and readiness assessment for concurrent engineering in construction) and SPICE (Structure process improvement for construction environments). The development of the maturity model also involved literature review where other maturity models that are related with the selected factors were reviewed. The review served as a reference in determining the maturity of each CSFs in developing the maturity model.

4.4.3 Phase 3: Validating People e-Readiness Maturity Model

The developed maturity model in phase 2 (known as the preliminary maturity model) will be tested if it is relevant to the Malaysian CI (refer Figure 4.4, stage iv). According to de Bruin and Rosemann (2005), it is necessary to test the model's construct and instrument for validity and reliability. Methods recommended for this purpose include case study and focus group (de Bruin and Rosemann, 2005; Tapia, 2006). In this research, the case study method was selected as it allows the exploration of data in the real situation. This method enables researchers to obtain holistic and meaningful characteristic of events (Yin 2003). The case study method is not only used to validate the preliminary maturity model but also to make improvement to the model based on the recommendation made by the participating organisations.

a) Units of analysis

According to Yin (2003), determining the unit of analysis is a vital step in defining the case study. The unit of analysis can be a person, an event, or an entity. In this research, the unit of analysis will be the IT Manager, staff, senior management and also individuals that have past experience with IT/IS in the particular organisation. The selection of this unit of analysis will allow:

i) a holistic view of data collection because it is not limited to certain individuals who are currently involved with IT/IS in the particular organisation but also include individuals that have past experience with the selected projects.

ii) collection of data is not limited to one department only

b) Multiple case studies

Multiple case study approach is adopted to investigate a particular phenomenon at a number of different sites (Stake 2006). By using this approach, it allows comparisons to be made which is important to validate the preliminary maturity model. Multiple case studies are often considered as compelling and more robust (Yin 2003). In this research, the validation process required the researcher to obtain the chosen organisation's status in implementing IT/IS in the current organisational situation and their future prediction. The investigation begins by tracking the records on the progress of IT/IS project and then, mapped on the preliminary maturity model to identify the gap. The progress of the project was strictly tracked and any problems arising during the different development phase were noted. Comparisons of the case study were made in validating the description of each level proposed in the preliminary maturity model. The usage of the multiple case study approach enables the researcher to understand the differences and the similarities between the cases (Yin 2003).

c) Selection of case study

In choosing the case studies, several issues were considered:

i) Commitment of the organisations
ii) The maturity of the IT/IS process
iii) The degree of interest to participate in this research

According to Stewart (2000), large construction organisations are most likely to have a mature IT/IS process, which is suitable for this research. The number of case studies selected will be influenced by the organisation's willingness to disclose information relating to the development and current IT/IS process. Besides that, the organisation's commitment relating to staff's time to participate in the case study also should be considered. The following criteria were used to select the organisations to participate in this study. The criteria are:

i) The construction organisation that has implemented IT/IS which can reflect the evolution of the system
ii) The organisation that used specific IT/IS to perform construction business process
iii) Organisation that have strategic IT/IS planning
iv) If possible, to find an organisation that feels the needs to identify their current readiness level so that they are genuinely motivated to participate in this study and it is not just considering their participation as an academic exercise
v) The organisation's willingness to disclose sensitive information relating to current IT/IS implementation and its development strategy

From the above listed criteria, only five (5) organisations were selected. All the selected organisations have been established for more than twenty (20) years. Organisation selected in this research refer to any construction organisations which include contractor, developer, suppliers and consultants.

d) Data collection

Data was collected in the form of semi-structured interviews for a period of about twelve (12) weeks. The interviews were deployed to identify the organisation's background and IT/IS development history and to identify the current readiness level of IT/IS implementation, their past history and future prediction.

The usage of semi-structured interviews allow the probing process for any particular issue relating to the identified CSFs. The semi-structured interview session was conducted in the interviewee's offices and was digitallyrecorded to allow verification and further analysis. The case study data were reviewed and analysed using the transcript, recorded interview and supported documents and involved further discussion with interviewees to expand or clarify their responses. This is important to ensure the data collected is accurate, consistent and reliable. The interviews were carried out in groups or several individual sessions depending on the availability of the interviewees to gather wide variety of information from a large number of subjects.

The number of participants involved in each case study is varied, from three (3) to five (5) persons. Several sessions were needed to finish the interviews, ranging from three (3) to five (5) sessions. The types of participants involved in this case study are shown in Table 4.5.

Table 4.5: Participants involved in the interview sessions

ORGANISATIONS	POSITION	CATEGORY
Organisation Alpha	General Manager	Senior management
	IT Manager	Middle management
	IT Executives	Technical staff
	Engineer	User/ staff
Organisation Beta	IT Manager	Middle management
	Quantity Surveyor	User / staff
	Technician	Technical staff

Table 4.5: Participants involved in the interview sessions (cont'd)

ORGANISATIONS	POSITION	CATEGORY
Organisation Gamma	IT Director	Senior management
	IT Manager	Middle management
	Senior IT Executives	Technical staff
	Engineer	User / staff
	Technician	Technical staff
Organisation Delta	Deputy General Director	Senior management
	IT Manager	Middle management
	Architect	User/ staff
	Engineer	User/ staff
Organisation Epsilon	IT Manager	Middle management
	IT Executives	Technical staff
	Quantity Surveyor	User/ staff

e) Case study protocol

There are several items should be included in the case study protocol, and this includes:

i) Case study overview: this include objectives, discussion on issues under this study, a brief explanation on the case study selection criteria and explanation on how the data will be analysed. A copy of the preliminary maturity model was also prepared to ensure that the interviewee was able to respond to the questions.

ii) Procedure administering the case study: detailed background of the selected organisations, list of people to be interviewed, list of documents that will be requested from the organisations to support their answer, definition for every terms used during the interview session and schedule to ensure the interview conducted within a suitable duration.

iii) The case study questions: This comprised of the list of questions which were written in manner to prompt the researcher with response depending on the answer given by the interviewee. The prompt will include any possible supporting documents needed to support the responses.

f) Data analysis

Miles and Huberman (1994) suggested a guideline to analyse the qualitative data by categorising evidences in a matrix, categorising the information, creating data display and tabulating the frequency of the different events. Therefore, in this research, data collected were transcribed and categorised according to the CSFs. Data from each case study were then summarised and compared.

4.5 Conclusion

The content of this chapter can be divided into two (2) sections. The first section introduced the theory of research which explains the different types of research and the different types of research methodology. This is followed by the second section, where the overall research method adopted in this study is explained - starting from phase 1- which involved the preliminary study, followed by phase 2- developing the preliminary people e-readiness maturity model and finally phase 3- validating the proposed model.

Chapter 5

Pilot Study and Questionnaire: Findings and Analysis

5.1 Introduction

This chapter presents the findings of the pilot study and questionnaire survey which was conducted in phase 1 and phase 2 in this research. The pilot study was conducted with the CI to confirm the existence of the twenty one (21) people CSFs found in the literature, which were reviewed from the multiple industries, due to the limited literature on this matter. Findings from the pilot study revealed two (2) additional people CSFs (independent and personal management competencies), which were then used by the author to develop the questionnaire survey. The questionnaire survey is important to identify the most important people CSFs in CI. Table 5.1 describes the purpose of pilot study and the questionnaire survey involved in this research.

Table 5.1: Purpose of pilot study and questionnaire survey

METHOD	PURPOSE	RESPONDENTS	OUTCOME
Pilot Study	To confirm the existence of 21 people CSFs reviewed from literature	IT Manager or IT/IS Senior Executives from 7 construction organisations (government, semi-government and private sector) involved in the semi-structured interview	21 people CSFs obtained from literature are confirmed to be existed in the CI. 2 additional CSFs encountered during the pilot study
Questionnaire Survey	To identify and rank the most important people CSFs that influence the successful IT/IS implementation in CI using the 23 CSFs obtained from the pilot study	IT Manager from 1000 construction organisations that have IT Department	Ranking of People CSFs according to its importance within the CI

5.2 Pilot study findings

Seven (7) construction organisations were involved in the pilot study, ranging from the government, semi-government and private organisations. The overviews of the organisations involved in this pilot study were tabulated in Table 5.2. The interviewees involved were the IT/IS Managers or IT/IS Senior Executives.

All the CSFs found in literature are proven to exist in the CI. On top of that, two (2) additional CSFs were found during the interviews. They are personal management competencies and independent.

All the interviewees agree that personal management competencies do contribute to a successful system's implementation. The personal management competencies refers to the ability of staff from every level of the organisation to have positive thinking, ethical thinking, continuous learning, balancing the work and non-work life, time management, career management and also stress management. According to majority of the IT/IS Managers or IT/IS Senior Executives, having staff with good personal management competencies is important especially during the early phase of introducing the new system to the organisation.

Table 5.2: An overview of the selected organisations in Pilot Study

	ORGANISATION A	ORGANISATION B	ORGANISATION C	ORGANISATION D	ORGANISATION E	ORGANISATION F	ORGANISATION G
Establishment Year	1872	1997	1988	1974	1976	1976	1963
Business Category	Government	Semi-Government	Private	Private	Private	Private	Private
Business Sector	Technical consultancy, project management and asset/facilities maintenance management	Housing developer	Infrastructure maintenance provider	property development, construction, infrastructure and wood based manufacturing	engineering and construction	Quantity surveying, Value & Risk Management, Cost, Time & Quality Management & Asset Management	property development and health care services
Type of IT system	Database Management System	Enterprise Resource Planning	Computerised Maintenance Management System	Enterprise Resource Planning	Document Management System	Enterprise Collaboration System	Computerise Maintenance Management System
Reasons for systems adoption	Problems to control and monitor construction and to generate information in preparing report on the status of the project	Problem in managing data due to the many projects throughout Malaysia	Difficult to keep track on the status of maintenance work	Difficult to track information such as sales transaction, loan information and others	Difficulties to respond quickly to the changing business needs	Problems in controlling their projects information and its security	Too many customisation to fulfil client requirement
System's Implementation year	26 years	11 years	11 years	10 years	4 years	11 years	7 years
System Development	Developed	Customised	Customised	Customised	Developed	Customised	Developed
IT System Developer	In-house	Vendor	Vendor	Vendor	In-house	Vendor	In-house
IT System Customizer	In-house	Vendor	Vendor	In-house	In-house	In-house	In-house
Staff	Approximately 30,000	Approximately 2,000	Approximately 900	Approximately 1000	Approximately 2300	Approximately 200	Approximately 400

From the experience of the IT/IS Manager from all the seven (7) organisations, independence also contributes towards the successful implementation of IT/IS in the organisation. This factor refers the ability of the people to use the new introduced system independently in their organisation. The effectiveness of the system will be affected when the staff are too dependent on the other parties to use the system.

- Based on the interview, all the listed CSFs were confirmed to exist in CI. However, the importance level of each CSFs were different from one organisations to the other. *Training/Skills*: Findings show that all organisations emphasize on training. Even though the duration of training and the gap between training and implementation varies in all organisations, this factor remains fundamental in all organisations.
- *Communications*: This factor is considered important as all organisations have effective interactions amongst them. Methods of communications include e-mail, meeting, telephone, memo and web-based portal.
- *Knowledge/ Experience*: Knowledge/experience of IT leader and IT staff is very important as this will lead to a high level of IT/IS usage in the organisation. Findings show that some organisations managed to develop their own IT/IS system because they have the required knowledge/ experience. Past knowledge/experience that the IT leader and IT staff have will make them feel more confident in using IT/IS, and this will further increase the success of its implementation. This shows that knowledge/experience is fundamental in all organisations.
- *Motivation*: Every organisation uses different types of motivational methods to encourage staff to use IT/IS. This includes the using of rewards system and also the introduction of mobile offices (where staff have the advantage to

complete their work without being in the office). Furthermore, some organisation introduced an open communication between the senior management and the staff, where the staff were given the opportunity to raise any issues regarding the application of IT/IS within the organisation. This method will make the senior management aware about the staff problems and furthermore take the necessary action to overcome the problems. Other motivational methods were also used such as preparing a proper training plan to train staff and make them familiar with the IT/IS.

- *Staff behaviour towards IT/IS:* One (1) out of seven (7) organisations has a negative response towards the implementation of IT/IS. This behaviour is expected as staff are not involved in the system development. This behaviour however is only temporary. Staff in other organisations however, are involved in the determining their requirement during the development of the system. Therefore, they do not have this problem at the early stage of the system implementation. Staff reaction towards the IT/IS implementation will give effect to their commitment to use it, thus influence the successful implementation of IT/IS. This factor is considered important as it may influence the successful implementation of the system.
- *Interpersonal Relationship*: Good interpersonal relationship enables staff to solve problems they face during the system's implementation. Based on the interviews, this factor does not directly affect the system's implementation's success. Therefore, this is the least important CSF.
- *Commitment*: Everyone from every level in all of the organisations gave full commitment in using the system and this has strongly influenced the successful implementation of the system.

- *Attitude*: Staff from the seven (7) organisations showed different attitude towards the implementation of IT/IS. Some are excited and confident to use it, while others show a negative attitudes as they are comfortable with the current work process. Their attitude towards IT/IS implementation are influenced by other factors such as their level of involvement during the system development, their willingness to change and also the staff characteristic. This factor will determine how staff will use IT/IS, thus will affect the success or failure of the IT/IS implementation.
- *Senior Management Support:* Studies on the seven (7) organisations show that the senior management highly support the implementation of IT/IS in their organisations. They actively participate in sharing information with staff, give advice, are involved in changing policy (when problems arise due to system's implementation) and always kept in touch with the IT Department throughout the implementation process. The senior Management were also regularly asked for updates and suggested input for process improvement, such as faster work order reporting. This is a strong factor contributing to the successful implementation of IT/IS.
- *Leader/ IT leader*: Having a leader with good leadership skills is important in determining the success of IT/IS implementation. All the leaders in the seven (7) organisations perform their duties well such as encourage staff to use the system, showing positive behaviour towards the IT/IS implementation (which will also influence their staff behaviour) and taking responsibility in making the right decisions. The leader's role is critical and has influence in determining the successful IT/IS implementation.

- *User involvement*: The level of user involvement varies in all the organisations. However, all seven (7) organisations emphasized on user requirement, confirming the importance of this CSF.
- *Teamwork/ collaboration*: Everyone from all the seven (7) organisations help each other either from the same department or from different departments whenever they have problems in using the system. This factor, however, does not directly affect the success of the system's implementation. However, it also has an effect on how the system is used as well as in how individuals and organisations benefit from teamwork/ collaboration. Therefore, this factor is a less important CSF for successful IT/IS implementation
- *Focus and vision*: The entire seven (7) organisations have clear focus and vision which leads to the successful implementation of IT/IS. This factor is well in place in all the organisations, confirming it as an important CSF.
- *IT staff roles and responsibilities*: There are different roles and responsibilities of IT staff encountered in all the organisations. Some are responsible to develop, maintain and customise the system, while others may be only responsible to maintain the system. The different roles and responsibilities are influenced by the number of IT staff and IT experts' that the organisation has. Their job function is strongly correlated and contributes towards the successful implementation of the system. This indicates that the IT staff is an important factor for IT/IS implementation.
- *Management style*: Participative management style is employed in all the organisations involving staff in decision-making. This factor, however, does not have direct effect on the system's implementation's success, but affects the

relationship between the senior management and staff and also staff motivation towards the using of IT/IS.

- *Willingness to process change*: There are different feedbacks obtained from the organisations. However, the staff's willingness to process change is strongly correlated to successful implementation of IT/IS; had therefore, this is an important CSF.
- *Organisation culture*: Findings show that all the organisations had managed to create a culture that fits with the characteristic of the implemented IT/IS. This is reflected when they manage to implement the system successfully and manage to overcome all problems. Therefore, this factor is considered important for successful implementation of IT/IS.
- *Awareness*: The staff in one (1) of the seven (7) organisations are not aware of the system's implementation due to the existence of the steering committee, as not all staff are involved in this committee. This factor, however, does not directly affect the system's implementation's success, thus making it a less important CSF.
- *Trust*: Staff in all the organisations trust the system, the management and their colleagues as they share their opinions and perceptions of the system. This factor is important as it may influence the successful implementation of the system.
- *Satisfaction*: This factor does not directly affect the system's implementation's success. User satisfaction however will influence the level of IT/IS application. Staff will continuously use the IT/IS when they are satisfied with the system. Based on the interviews, this factor is considered less important.

- *Interest in IT*: Most of the staff in all the organisations are interested with technology, something that the older generations tend to have problems with. It is an advantage for the organisation if they have staff who are interested with technology as they will be self-motivated to use the system. This factor does not directly affect the system's implementation's success, thus, making it a less important CSF.

Summary of the interview findings are tabulated in Table 5.3.

Table 5.3: Summary findings of the Pilot Study

Elements	ORGANISATION A	ORGANISATION B	ORGANISATION C	ORGANISATION D	ORGANISATION E	ORGANISATION F	ORGANISATION G
Training/ skills	Staff are formally trained by the IT Department a month before the system implementation. The 3-day training enables staff to use the system effectively	Staff are trained 5/6 months earlier before the system implementation. The training took about 3 days and is conducted by the system vendor	Formal training to staff is given by the IT Department prior to system's implementation. A two-day training is given a week before the system's implementation.	Staff were trained by the system vendor for about 2 days. The training usually carried out a month before the system implantation	Staff were trained for about 4 to 5 days by the system vendor. The training however was carried out after the system had been implemented.	Half day training was provided by the IT Department. The training was held one or two months before the system implementation	One or two days training was conducted by the IT Department about three to four months before the system implementation
Communication	A robust line of management reporting is established in this organisation as staff are required to report everything to the senior management. Communication methods include e-mail, meeting, telephone and memo	Communications are usually via e-mail and through web-based portal. Formal meetings are only carried out when necessary	Communications are usually by e-mail, telephone, memo and meeting when necessary	The organisation has effective interactions amongst them. Their method of communications include e-mail, meeting, telephone, memos, intranet and others	The organisation has effective interactions amongst them. Their method of communications include e-mail, meeting, telephone, memos, intranet and others	Methods of communications in the organisation are usually via e-mail, meeting, telephone, memos, intranet and others	Good communication line established in this organisation. They usually communicate via e-mail, meeting, telephone, memos, intranet and others
Knowledge and experience	IT leader and staff have the required knowledge and experience to enable them to develop and maintain their own system	IT leaders and IT staff also have the required knowledge and experience. However, they are only responsible for maintaining the system and hardware in these organisations due to the limited number of workforce	IT leader and staff have the required qualifications. But, they were only required to maintain the system due to the limited number of workforce.	IT leader and IT staff have required knowledge and experience as they manage to maintain their own system	IT leader and IT staff have required knowledge and experience as they manage to develop and maintain their own system	IT leader and IT staff have required knowledge and experience as they are able to maintain and customised the system	IT leader and IT staff have the required knowledge and experience as they are able to maintain and customised the system
Motivation	Staff in this organisation have no choice but to use the system since the senior management only accept report using the system format. However, they are motivated to use the system when they understand its benefits.	Staff are motivated to use the system as it can speed up their work, are easy to use and enable them to perform their job effectively.	Staff are motivated to use the system as it is user friendly, speeds up their work and enables them to enjoy the benefits of mobile office	Staff were motivated to use the system as it enables them to perform job effectively and easy to use	Staff were motivated to use the system as it enables them to perform jobs effectively, easy to use and enable them to perform their work effectively. Staff were also being rewarded when they use the system	Staff were motivated to use the system as it enables them to perform their work effectively and user friendly	Staff were motivated to use the system as it enables them to perform their work effectively, user friendly and able to generate reports automatically.

Table 5.3: Summary findings of the Pilot Study (Cont'd)

Elements	ORGANISATION A	ORGANISATION B	ORGANISATION C	ORGANISATION D	ORGANISATION E	ORGANISATION F	ORGANISATION G
Staff behaviour towards IT/IS	Most staff gave negative reactions towards the system's implementation at the early stage. Their behaviour is as expected since they are not involved in developing the system due to the existence of the steering committee; however this problem is only temporary.	Positive feedback obtained from staff as they are aware of the system thus enabling them to give positive reactions towards the IT/IS	Positive reactions towards the implementation of IT/IS are obtained from staff as they are aware of and are involved in the systems adoption	Staff show positive reactions towards the implementation of IT/IS	Staff show positive reactions towards the implementation of IT/IS	Staff show positive reactions towards the implementation of IT/IS	Staff show positive reactions towards the implementation of IT/IS
Interpersonal relationship	The existence of social association among people in this organisation enables them to overcome problem relating to system's implementation	Everyone interacts and socialises with one another which enables them to solve any problem faced during the system's implementation.	Social interactions among people in this organisation are proven to help them encounter any problem regarding the system application	There is a good relationship with everyone in the organisations which help them to solve any problems during the system's implementation	There is a good relationship with everyone in the organisations which help them to solve any problems during the system's implementation	Everyone interacts and socialises with one another which enables them to solve any problem faced while using the system	There is a good relationship with everyone in the organisation
Commitment	Everyone in this organisation from the senior management to staff give full commitment to utilise the system	Everyone gives full commitment to use the system	Everyone gives full commitment and is excited to use the system due to the benefits that they will gain by using it	Everyone give full commitment in using the system	Everyone give full commitment in using the system	Everyone from every level give full commitment in using the system	Everyone from every level give full commitment in using the system
Attitude	Most of the staff give negative reactions towards the system's implementation as they are not confident of using it	Most of staff gives positive reaction towards system's implementation and they are excited and very confident to use the system.	Mixed reactions encountered from staff. Even so, majority of them are confident to use the system	Mixed reactions obtain from staff, however majority shows a positive attitude	Mixed reactions obtain from staff, however majority shows a positive attitude	Mixed reactions obtain from staff, however majority shows a positive attitude	Mixed reactions obtain from staff, however majority shows a positive attitude
Senior management support	They actively participate in giving advice and suggesting improvement. They are also involved in changing policies when problems arise due to system's implementation	Senior management actively advises/encourages the use of the system especially during meeting. Staff are instructed to update information in the system.	The senior management is very supportive as they regularly ask for updates and suggest input for process improvement such as faster work order reporting and increase revenue	They highly support it by actively participate, giving advice, regularly ask for updates, provide enough resources and others	They actively encourage staff to use the system by giving advice, regularly ask for updates, provide enough resources and others	High support form senior management as they actively participate in the system implementation by providing enough resources, giving advice, regularly ask for updates, and others	Senior management highly supports the using of the system. they regularly ask for updates, give advice and provide enough resources

Table 5.3: Summary findings of the Pilot Study (Cont'd)

Elements	ORGANISATION A	ORGANISATION B	ORGANISATION C	ORGANISATION D	ORGANISATION E	ORGANISATION F	ORGANISATION G
Leadership/ IT Leader	The IT manager has adequate leadership skills as he is able to perform his work without any problem	The IT manager has adequate leadership skills as he is able to perform his tasks without any problem	The IT manager has adequate leadership skills as he is able to perform his tasks without any problem	IT Leader manage to perform their duties very well as he is able to carry out their work without any problems	IT Leader have adequate leadership skills as he able to perform his duties very well and able to carry out his work without any problems	IT Leader have adequate leadership skills as he is able to perform his duties very well and able to carry out his work without any problems	IT Leader have adequate leadership skills as he is able to perform his duties very well and able to carry out his work without any problems
User involvement	Steering committee is involved from the early development of the system until completion	Users are asked to identify their requirement before the organisation purchase and customise the system. User however are not involved in testing the system after the customisations are made.	Users were involved in Business Requirement Study (BRS) to identify their needs. Then they were asked to test the trial version and gave feedback on the system before the organisation decided to buy the system	Users were fully involved from beginning to the end of the development of the system	Users were involved from beginning to the end of the development of the system	Users were only involved at the early stage of system implementation by identifying user's requirement	Users were involved from the early stage until the end of the development of the system
Team work/ Collaboration	Everyone from the same or different department and even different profession help each other when they have problems in using the system	A very high level of cooperation as staff help each other when they encounter problems with the system	A very high level of cooperation as staff helps each other when they encounter problems with the system	There is a high level of cooperation from everyone	Everyone in the organisation helps each other when they have problems with the system	High level of cooperation from everyone in this organisation as they help each other when they have problems with the system	Everyone cooperates as they help each other when they have problems with the system
Focus and vision	IT Manager has clear focus and vision which lead to the successful implementation of the system.	IT Manager has clear focus and vision which leads to the successful implementation of the system	IT Manager has clear focus and vision which leads to the successful implementation of the system	There is a clear focus and vision which leads to the successful implementation of the system	There is a clear focus and vision which leads to the successful implementation of the system	There is a clear focus and vision which leads to the successful implementation of the system	There is a clear focus and vision which leads to the successful implementation of the system
IT staff roles and responsibility	IT staff have very important roles as they are responsible for developing and maintaining the system	Their roles and responsibilities are limited to maintaining the system only	IT staff are responsible for maintaining and customised the system	Staff are only responsible to maintain and customise the system	Staff are responsible to develop and maintain the system	Staff are given responsibility to customise and maintain the system	Staff are responsible to develop and maintain the system

Table 5.3: Summary findings of the Pilot Study (Cont'd)

Elements	ORGANISATION A	ORGANISATION B	ORGANISATION C	ORGANISATION D	ORGANISATION E	ORGANISATION F	ORGANISATION G
Management style	Participative management style is employed in identifying the most suitable system for the organisation. Decision on the system is made based on opinions from staff (steering committee)	Participative management style is employed as staff's opinions are considered when purchasing the suitable system for the organisation.	Participative management style is introduced in this organisation to help them find the most suitable system	Participative management style is employed	Participative management style is employed	Participative management style is employed	Participative management style is employed
Willingness to process change	Majority of staff resisted to use the system at the early stage. However, they accepted the system with better understanding of its benefits.	A minority of the staff were reluctant to use the new system at the early stages of the system's adoption. However, they do not have much choice but to use the system as they receive instruction from senior management	A minority of staff resisted to use the system at early stages. However, logical explanation like system obsolescence, faster system adoption helps to overcome the situation.	Some staff have issues to use the system as it involved changes in their work process.	Minority of staff resisted to use the system at the early stage	Older generations have problems to use the system at the early stage	Minority of staff resisted to use the system at the early stage
Organisational culture	Positive culture exists in this organisation as they manage to successfully implement the system.	Organisation culture is believed to be in good order as it manages to overcome problems arising due to the system's implementation	Positive culture exists in this organisation as it manages to successfully implement the system.	The organisation practised good culture as they manage to implement the system successfully and overcome all problems arise during the system implementation	The organisation practised good culture as they manage to implement the system successfully and overcome all problems arise during the system implementation	Organisational culture is believed to be in good order as the organisation manage to overcome problems arising due to the system's implementation	The organisation practise good culture as they manage to overcome problems encountered during the system's implementation
Awareness	Majority of the staff are not aware of the development of the system as they are not involved with it since the organisation has its own steering committee. However, when the system is about to be used in the organisation, everyone is informed about it during the meeting	Staff are aware of the system's implementation as they were asked to identify their needs in the early stages	Staff are aware of the system's implementation as they are involved from the early stages to testing the prototype	Staff aware about the system because they were involved from the early stage to the end of the system development	Staff aware about the system because they were involved from the early stage to the end of the system development	Staff aware about the system because they were involved at the early stage of the system development	Staff aware about the system because they were involved in the system development

Table 5.3: Summary findings of the Pilot Study (Cont'd)

Elements	ORGANISATION A	ORGANISATION B	ORGANISATION C	ORGANISATION D	ORGANISATION E	ORGANISATION F	ORGANISATION G
Trust	Staff are able to use the system without any doubt which indicates their trust on the system. They also share their perception of the system which shows their trust of their colleagues and the management	No issues regarding trust of the system or of the management ever arise in this organisation which indicates positive feedback on this factor	Staff trust their colleagues and management as they share their perception and opinions of the system. They also have no issues regarding trust of the system	Staff trust the system, colleagues and management	Staff trust the system, colleagues and management	Staff trust the system, colleagues and management	Staff trust the system, colleagues and management
Satisfaction	Staff are satisfied with this system as it helps them to perform their work effectively.	Staff are satisfied with the system as it helps them to perform their work effectively.	Staff are satisfied with the system as it enables them to enjoy the flexibility of mobile office	Staff were satisfied with the system that they used	Staff were satisfied with the system that they used	Staff were satisfied with the system that they used	Staff were satisfied with the system that they used
Interest in IT	Staff were interested in IT as the technology helps them to perform their work effectively. Only older generations have problems with IT	Staff were interested in IT as the technology helps them to perform their work effectively	Staff were interested in IT as the technology helps them to perform their work effectively	Staff were interested in IT as the technology helps them to perform their work effectively	Majority of staff were interested in IT as the technology helps them to perform their work effectively	Majority of staff were interested in IT as the technology helps them to perform their work effectively	Majority of staff were interested in IT as the technology helps them to perform their work effectively
Personal management competencies	Some staff have negative thinking towards the adoption of the new system as for them it will delay their work	Majority of staff do not have problems with this factor.	Minority of staff have issues with this factor such as stress at the early usage of the system	Majority of staff do not have problems with this factor	Minority of staff have issues with this factor such as negative perception towards the system	Minority of staff have issues with this factor such as disagree with continuous learning	Majority of staff do not have problems with this factor
Independent	Majority of staff are too dependent at the early stage of using the system	Majority of staff are able to use the system independently	Minority of staff depend on other people to use the system	Minority of staff depend on other people to use the system	Majority of staff able to use the system independently	Minority of staff depend on other people to use the system	Majority of staff able to use the system independently

5.3 Questionnaire survey findings

Findings from the questionnaire survey are critical as it indicates the most important CSFs that influence successful IT/IS implementation in CI. Therefore, several objectives for this phase were outlined as follows:

i. Determine whether the questionnaire survey was relevant and represent the purpose of evaluation by evaluating the data from the questionnaire.
ii. To identify the degree of reliability of the responses received.
iii. To carry out descriptive analysis of the responses which include the reliability test, normality tests, mean and standard deviation.
iv. To rank the CSFs by using Relative Importance Index (RII) formula and mean.
v. To identify the strength of linear relationship among the selected CSFs using the Spearman's Correlation Coefficient.

5.3.1 Content validity

To achieve objective (i) as outlined in this phase, content validity was performed. A total of 1000 questionnaires were distributed to IT/IS Manager in CI throughout Malaysia. Prior to distributing the questionnaire, content validity of the questionnaire was carried out to examine whether the questionnaire were relevant and represent the purpose of this research. This involved comprehensive discussion with five (5) experts in research methodology, two (2) academic experts in IT/IS and four (4) expert practitioners in IT/IS. Feedback and recommendations were included in the final questionnaire to make it more comprehensive and appropriate to the research.

5.3.2 Distribution of questionnaire

The questionnaires were distributed for eight (8) weeks using the means of:

i) Postal: where the questionnaires were posted to the respondents' office

ii) Online survey: the questionnaires were sent to the respondents' email using the free online survey builder known as KwikSurveys

iii) Self-administered: The questionnaires were sent and collected at the respondents' office. Respondents were given a week to fill in the questionnaire form before collection is made.

Respondents' address and phone number were obtained from several websites such as www.asiabuilders.com, www.ilamalaysia.org, www.bqsm.gov.my, www.lam.gov.my, www.cidb.gov.my and www.pkk.kkr.gov.my. The questionnaires were sent to 1000 Malaysian construction organisations, targeting the IT/IS Manager in the organisations. The questionnaire consisted of two sections namely A and B. Section A contained questions pertaining to respondent profile and organisation background, and section B contained twenty three (23) CSFs to be measured on five-point Likert-type scales that vary from 1= not important to 5= extremely important. A total of 311 completed questionnaires were received, making the response rate 31.1%. According to Yang *et. al.*, (2009) and Dulaimi *et. al.*, (2013), the normal response rates for questionnaire surveys for the CI is between 20%-30%. Table 5.4 illustrated the number of questionnaire sent and its response through the different distribution methods.

Table 5.4: Distribution Methods and Response Rates

METHODS	TOTAL SENT	TOTAL RESPONSE	PERCENTAGE
Online survey	60	4	6.7%
Self-administered survey	140	109	77.9%
Postal survey	800	198	24.8%
Total	**1000**	**311**	**31.1%**

5.3.3 General respondent's demographic

This section explains the detail of the respondents regarding their background, occupations and number of years of experience in IT/IS related matters.

a) Organisation's background

The largest number of respondents came from integrated services (referring to an organisation that provide several services such as construction, trading, manufacturing, quarry and others) (17.7%), followed by surveying firms (17.4%), construction developer and architecture firm (13.8%), sub-contractors (8.4%), contractors (7.4%), civil and structural firms (5.1%), suppliers(1.6%) and other organisations (government, semi-government, highway concessionaires) at 7.7%, as shown in Figure 5.1.

Figure 5.1 clearly shows that the responses received covered the whole range of business sectors involved in CI. This shows that the results obtained presenting the CI perspectives. Majority of the responses received are from integrated services (an organisation that provide several services) and the surveying sector, that may use a lot of IT/IS in their business process. It is believe that a lot of IT/IS were used in the integrated services sector due to the wide spread of staff across several geographic sites, since the organisation may have several branch offices to cater to the different types of services that they provide. The usage of IT/IS is important to them for inter-networking and communication, information sharing, increase productivity and enable easy monitoring of the business process (Saldanha and Krishnan, 2011). In the surveying sector on the other hand, the application of IT/IS is necessary in helping them to provide better service and maximise their efficiency (Abdul Kareem and Abu Bakar, 2011).

The lowest response received are from the supplier, perhaps due to the lack of IT/IS usage in their business. In Malaysian CI, the majority of the supplier still use the conventional method to introduce and promote their products such as participating in exhibitions like The Malaysia International Building, Architecture and Construction Technology Exhibition, Malaysian IBS International Exhibition (MIEE) and International Construction Week (ICW).

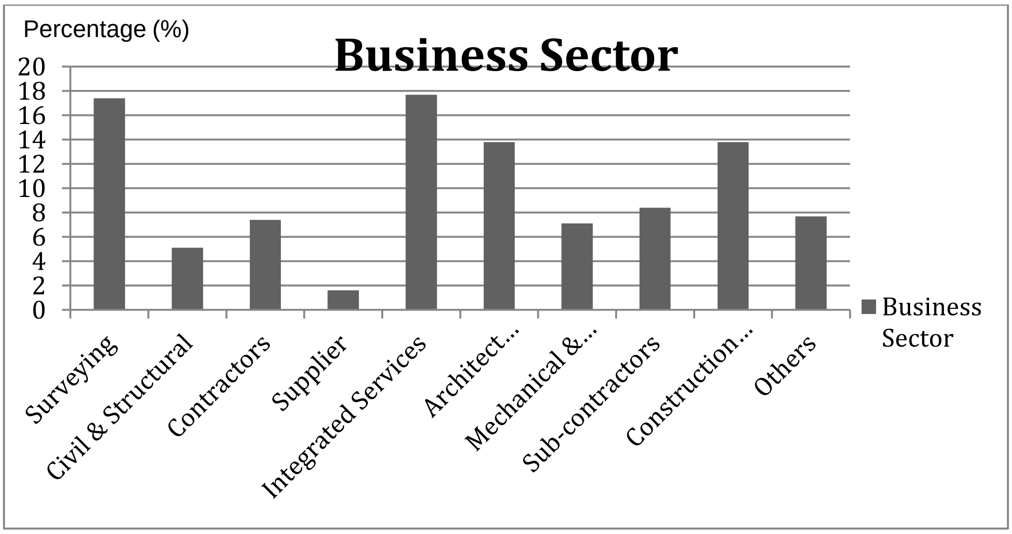


Figure 5.1: Respondents' business sectors

b) Respondents’ occupations

Regarding the respondents’ occupation, Figure 5.2 indicates that majority of respondents are IT Manager or Head of IT/IS Department (75.2%), followed by General Managers (8.4%), Senior IT/IS Management (11.3%) and IT/IS Executives (5.1%).

Figure 5.1 clearly shows that majority of the respondents hold IT-related management-level positions, with majority (75.2%) being the IT Manager or Head of IT/IS Department. This is beneficial as a managerial perspective is important to provide valid findings based on their technological background, IT familiarity or understanding.

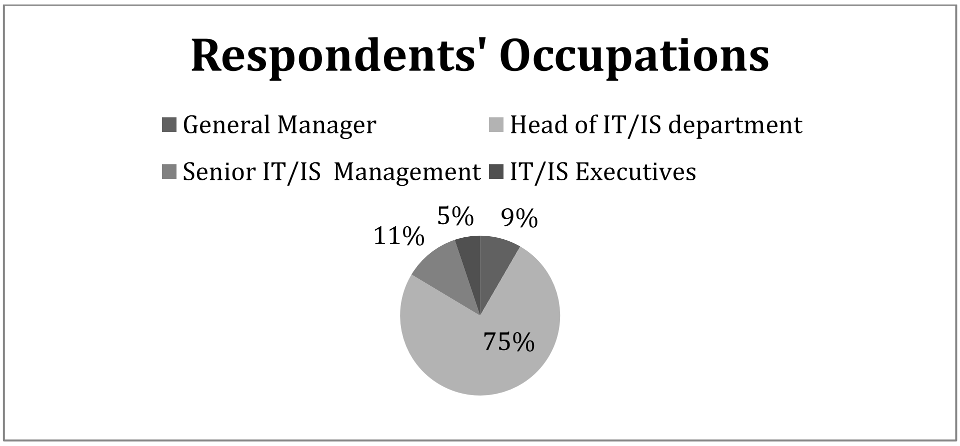


Figure 5.2: Respondents’ occupations

c) Respondents’ years of experience in IT/IS

Most of the respondents (60%) are very experienced, with more than 10 years working experience in construction IT Departments, while 32% of the respondents have 5 to 10 years experience and only 8% of respondents have less than 5 years experience as shown in Figure 5.3.

This shows that majority of the respondents have been in the CI for a number of years, thus have better understanding and experience about the issue under study. Having experienced respondents is beneficial as their experience and expertise in this issue will give reliable findings.

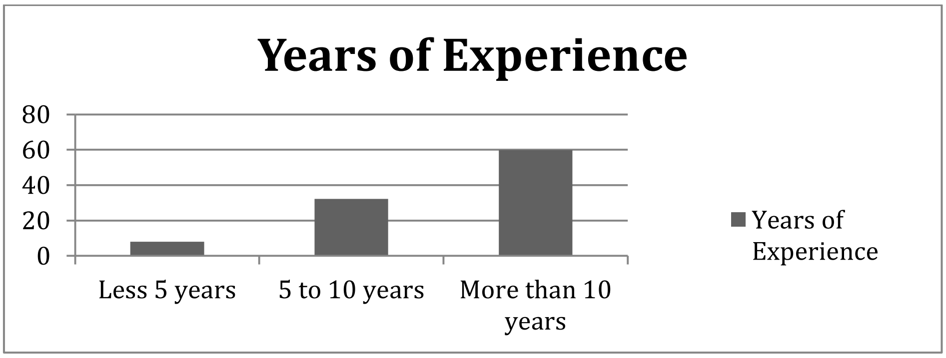


Figure 5.3: Respondents' years of experience in IT/IS related matter

5.3.4 Statistical analysis

There are 4 types of analysis performed in this study. There are reliability test, descriptive analysis, ranking of CSFs and correlation coefficient test.

a) Reliability test

This test was performed to identify the degree of reliability in terms of internal consistency (Momeni and Fa'al Ghayyumi, 2008). For this purpose, Cronbach's Alpha coefficient test was used. Cronbach Alpha reliability normally ranges between 0 to 1, where the closer Cronbach alpha is to 1, the greater the consistency (Aggarwal 2010). According to Hung *et. al.,* (2010), the minimum value of Cronbach Alpha should be at least 0.7 to be considered reliable. The results of Cronbach's Alpha in this research range between 0.854 to 0.870 which indicates that all factors are reliable and have a high internal consistency. According to

Leech *et. al.,* (2011), Cronbach's Alpha value of more than 0.7 are regarded as sufficient.

Table 5.5: Result of Reliability Test

	CSFs	CRONBACH'S ALPHA
1	Motivation	.856
2	Training/skills	.859
3	Senior Management Support	.859
4	Teamwork/collaboration	.855
5	Independent	.863
6	Knowledge and experience	.863
7	Willingness to process change	.855
8	Leadership/IT Leader	.854
9	Communication	.860
10	Organisational culture	.857
11	IT Staff roles and responsibilities	.857
12	User involvement	.862
13	Trust	.867
14	Interpersonal relationship	.866
15	Personal management competencies	.858
16	Commitment	.858
17	Attitude	.870
18	Interest in IT	.863
19	Staff behaviour towards IT/IS	.867
20	Awareness	.862
21	Focus and vision	.860
22	Management style	.860
23	Satisfaction	.869

b) Descriptive analysis

Three different tests were used in this stage. There are mean, standard deviation and normality tests.

The central tendency of the distribution is calculated by means, which was in the range of 4.08 to 2.22. Standard deviation will be used to calculate the dispersion of the spread values around the mean. The results indicate that the standard deviation range was between 0.926 to 0.638. When the standard deviation value is close to the mean, it shows that the responses are fairly uniform, where the standard deviation is small (Spyros *et. al.*, 2010). In contrary, if the value is far from the mean, it shows that the there is a wide variance in the responses (Gorla and Lin, 2010). All the CSFs involved in this analysis were normally distributed with the range value of between -1 to +1. Table 5.6 illustrated the results of the descriptive analysis.

Table 5.6: Descriptive Analysis

No.	CSFs	MEAN	SD	SKEWNESS
1	Motivation	3.907	0.767	0.074
2	Training/skills	3.897	0.801	-0.040
3	Senior management support	4.084	0.736	-0.133
4	Teamwork/collaboration	3.360	0.926	0.133
5	Independent	2.984	0.725	-0.027
6	Knowledge and experience	3.444	0.878	0.216
7	Willingness to process change	3.897	0.772	0.052
8	Leadership/IT leader	3.473	0.864	0.100
9	Communication	3.302	0.798	0.244
10	Organisational culture	3.379	0.845	0.286
11	IT Staff roles and responsibilities	3.637	0.811	0.099
12	User involvement	4.003	0.805	-0.342
13	Trust	2.823	0.703	-0.186
14	Interpersonal relationship	2.219	0.721	-0.355
15	Personal management competencies	3.434	0.733	0.255
16	Commitment	3.463	0.798	0.045
17	Attitude	2.650	0.688	0.167
18	Interest in IT	2.605	0.638	0.276
19	Staff behaviour towards IT/IS	2.367	0.808	0.014
20	Awareness	3.389	0.714	0.182
21	Focus and vision	3.186	0.829	-0.019
22	Management style	3.691	0.733	0.060
23	Satisfaction	2.437	0.832	0.048

c) Ranking the CSFs

Relative Importance Index (RII) and mean were used to rank the CSFs. Several researchers (Wahab and Lawal, 2011; Yang and Wei, 2010) have used RII to rank factors in their research. Table 5.7 shows the rank order using mean and RII. The RII method was calculated using the following formula:

$$\text{Relative Importance Index (RII)} = \frac{\Sigma \mathrm{W}}{\mathrm{AN}}$$

W = weighting given for each CSFs by the respondents range from 1 to 5 (where 1= not important to 5= extremely important)

A = highest weight (five in this case)

N = total number of sample

Table 5.7: Rank order using Mean and RII

No	CSFs	RII	MEAN	RANK
1	Motivation	0.781	3.907	3
2	Training/skills	0.779	3.897	4
3	Senior management support	0.817	4.084	1
4	Teamwork/collaboration	0.672	3.360	14
5	Personal characteristic	0.597	2.984	17
6	Knowledge and experience	0.689	3.444	10
7	Willingness to process change	0.779	3.897	4
8	Leadership/IT leader	0.695	3.473	8
9	Communication	0.660	3.302	15
10	Organisational culture	0.676	3.379	13
11	IT Staff roles and responsibilities	0.727	3.637	7
12	User involvement	0.801	4.003	2
13	Trust	0.565	2.823	18
14	Independent	0.444	2.219	23

Table 5.7: Rank order using Mean and RII (Cont'd)

No	CSFs	RII	MEAN	RANK
15	Personal management competencies	0.687	3.434	11
16	Commitment	0.693	3.463	9
17	Attitude	0.530	2.650	19
18	Interest in IT	0.521	2.605	20
19	Staff behaviour towards IT/IS	0.473	2.367	22
20	Awareness	0.678	3.389	12
21	Focus and vision	0.637	3.186	16
22	Management style	0.738	3.691	6
23	Satisfaction	0.487	2.437	21

The usage of RII and mean shows the same ranking position for each factor. This is reflected in the small variations of standard deviations and skewness, which shows strong consensus for all factors among the respondents (Goldman *et. al.,* 2008). The value of RII will be between 0 to 1, and the closer to 1 the value gets; the more important it is perceived to be (Umar *et. al.*, 2012).

d) Correlation Coefficient Test

CSFs that have a very high influence on the successful implementation of IT/IS were then shortlisted based on the RII value of more than 0.7 (Ezzat Othman and Harinarain, 2012; Park, 2009) and a mean value of more than 3.5 (Famakin *et. al.,* 2012; Okotie, 2012). According to Pöppelbuß and Röglinger (2011), shortlisting of the CSFs is necessary as it is impossible to include all CSFs in developing the maturity model. The correlation for these factors was then tested to identify their relative importance. For this, Spearman's Correlation Coefficient was selected as it is a common non-parametric method used for correlating factors (Filed 2009). The results of this test will produce a mathematical value that shows the strength of linear relationship between the CSFs. Table 5.8 shows the correlation among the seven (7) CSFs.

Results from this test were interpreted by correlation coefficients (r). The value of *r* shows the strength of the correlations between two factors. When the value of *p* is at 5% level, it shows that the variables have a strong correlation (Filed 2009). The null hypothesis versus the alternative hypothesis used in this study was:

$H_{0:}$ p (two-tailed) > .05 – the factors are not significant

H_1: p (two-tailed) < .05 – the factors are significantly correlated

If the *p* value is less than 0.05, it means that the factors are significantly correlated. If the significant level is greater than 0.05, the hypothesis will be rejected and vice versa. Based on the above hypothesis, all factors are strongly correlated to each other. Any changes to motivation, training/skills, senior management support, willingness to process change, IT staff roles and responsibilities, user involvement and management style may have a significant effect on the success of IT/IS implementation.

Table 5.8: Results of Spearman's Correlation Coefficients

		(1)	(2)	(3)	(4)	(5)	(6)	(7)
Motivation(1)	Correlation Coefficient	1.000	. 450	.467	.516	.314	.448	.379
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000
	N		311	311	311	311	311	311
Training/skills (2)	Correlation Coefficient		1.000	.486	.425	.322	.401	.280
	Sig. (2-tailed)			.000	.000	.000	.000	.000
	N			311	311	311	311	311
Senior management support (3)	Correlation Coefficient			1.000	.423	.342	.368	.292
	Sig. (2-tailed)				.000	.000	.000	.000
	N				311	311	311	311
Willingness to process change (4)	Correlation Coefficient				1.000	.372	.477	.323
	Sig. (2-tailed)					.000	.000	.000
	N					311	311	311
IT staff roles and responsibilities (5)	Correlation Coefficient					1.000	.282	.341
	Sig. (2-tailed)						.000	.000
	N						311	311
User involvement (6)	Correlation Coefficient						1.000	.164
	Sig. (2-tailed)							.004
	N							311
Management style (7)	Correlation Coefficient							1.000
	Sig. (2-tailed)							
	N							

5.4 Discussion

Based on the above statistical analysis there are seven (7) people CSFs that are significantly related to successful IT/IS implementation for the Malaysian CI. These are motivation, training/skills, senior management support, willingness to process change, IT staff roles and responsibilities, user involvement and management style. This finding supports the earlier literature findings by Davis and Songer (2008), Daojin (2010), Limsarun and Anurit (2011), Doom *et. al.*, (2010), Tambovcevs (2010), Hung *et. al.*,(2010), Gorla & Lin (2010) and Rezaei *et. al.*, (2009). Organisations should give more attention and start focusing on these factors which have significant impact on the success or failure of the system implementation.

Findings reveal that 'senior management support' was ranked first by majority of the respondents. This factor is a critical element and widely accepted as the compulsory element for IT/IS implementation (Abbaszadeh *et. al.*, 2010; Daojin, 2010). This is critical because the senior management is responsible to provide the necessary resources, such as finance, political will and manpower that is needed during the implementation of IT/IS in any organisation. IT/IS systems cannot be effectively implemented when there is lack of support from the senior management. Moreover, findings by Palanisamy *et. al.*, (2010) in North America (that involved 183 organisations) also identify senior management support as an influential factor to IT/IS acquisition. This is also supported by research carried out by Ifinedo (2008) which involved 44 organisations in Finland and Estonia, which agree on the significant relation of senior management support and IT/IS success. Their roles were not only limited to encourage the staff to use the system, but also ensure the effective usage of the system and to be actively involved with the system implementation. The importance of this factor is undeniable as majority of the respondents are IT Managers or the Head of IT Department that has more than 10 years working experience in IT/IS related matters.

The second most important factor is 'user involvement'. User involvement is defined as the participation of the actual user in the development process (Havelka 2002). This is an important factor as it requires the user to use their skills, experience and knowledge to successfully implement IT/IS. This will give them the authority in decision making, controlling their own work and be more responsible (Evans and Lindsay, 2002), thus developing the sense of ownership. The strong feeling of ownership may increase user's commitment and lead to positive impact to successfully implement IT/IS (Havelka 2002). Organisations should start to consider involving user in the decision-making process due to its high impact on the success rate, which has also been proven by previous studies (Habib, 2009; Lind and Culler, 2009). The survey among 65 worldwide organisations conducted by Raman *et. al.*,(2006) revealed that the lack of user involvement may affect the IT/IS utilization which will lead to the implementation failure.

The third factor identified in this study is 'motivation'. This factor is important as it is a driving force that leads to achieve objectives. According to Davis and Songer (2008), strong motivation is important as it can overcome many difficulties such as fear of changes, lack of knowledge and limited skills (Jurisch *et. al.,* 2012) in using the new technology. New technologies are usually complex, thus, having a high motivation will encourage staff to adopt IT/IS more effectively. Therefore, managers should take initiatives to motivate staff to use IT/IS. Motivating staff is important as it may affect their reaction towards the usage of the system. According to Nahar *et. al.,* (2006), motivation can be improved by understanding organisational cultures, identifying needs and preference as well as rewards.

'Training /skills' and 'willingness to process change' share the same spot at number four (4). The importance of training/skills factor had been highlighted by many researchers over the years (Buruncuk and Gülser, 2001; Raj *et. al.,* 2011). Adequate training will help the user to understand the system well and use the system effectively. According to Limsarun and Anurit (2011), training can be regarded as a way of educating and motivating user to use the IT/IS in the organisation. It also helps the user to understand their new roles and responsibilities, thus, creating effective environment for IT/IS implementation (Abbaszadeh *et. al.,* 2010). According to Ooi *et. al.,* (2010), training creates an environment that will encourage the user to use IT/IS within the organisations. The significance of this factor is not only for the CI, but also for other industries as proven by research carried out by Chang *et. al.,* (2010) from their research on 87 samples of four real estate organisations in Taiwan; it demonstrated that adequate training/ skills enables efficient usage of IT/IS among users. On the other hand, Ranjan and Bhatnagar (2013) showed that the user's willingness to process change has major influence on the success of IT/IS system implementation. Users will naturally refuse to change due to habits they acquired over time, as they need to change their behaviour to handle the new system (Peansupap and Walker, 2005). Major action should be taken by the organisations to overcome this problem. They should find ways to encourage the user to change; as the changes will bring benefits to them by enabling them to perform their work effectively and providing a competitive advantage to the organisations. Davis and Songer (2008), identified that individuals in the higher position in the organisational hierarchy are more willing to change as they have the authority to adjust the changes to suit their requirements.

Ranked at number six is 'management style'. Management style is an approach used by the management to organise, influence and control human activities to achieve organisations objectives (Rezaei *et. al.*, 2009). Ison and Kempton (2007) have categorised management styles into staff oriented and task oriented. In staff oriented style, managers' takes close control of staff, regularly giving instructions and not delegating any responsibilities to them. In task oriented, the staff dictates how their work is done and is ultimately responsible for their own actions as long as the desired outcome is achieved. The importance of management style in successfully implementing IT/IS had been highlighted by many researchers (Erdogan *et. al.,* 2008; Xue *et. al.*, 2012). This is due to the fact that management style will influence the organisations' performance by facilitating internal behaviour consistency (Rahman and Kumaraswamy, 2005). Research findings by Lu and Wang (1997) and Hussein *et. al.,* (2007) revealed that management style has a positive relationship with the IT/IS implementation success. Gorla and Lin (2010) also stated that good management is able to lead to successful implementation of IT/IS. The importance of this factor is not only reflected in CI, but also other industries. A survey among the agricultural industry players in Iran regarding the impact of organisational factors on management information success by Rezaei *et. al.,* (2009) revealed that management style is highly correlated to IT/IS success.

IT staff ‘roles and responsibilities’ was ranked at number seven. IT staff refers to the IT manager, programmer, technician, analyst; who are responsible in maintaining, developing and implementing all IT/IS related activity within the organisation. The successful implementation of IT/IS will also depend on the roles and responsibilities of IT staff. The IT staff, on an ongoing basis, need to not only install and maintain the IT/IS but also need to make sure that it fits effectively into the organisation overall plan for IT/IS implementation. Without IT staff, it will be difficult for the organisations to implement the new technology. This indicated the importance of the IT staff’s roles and responsibilities in implementing IT/IS. The lists of the seven people CSFs are illustrated in the Figure 5.4.

5.5 Conclusion

This chapter discuss finding obtained from the pilot study (phase 1) and questionnaire survey (phase 2). Seven (7) construction organisations were involved in the pilot study to test the list of people CSFs obtained from the literature. All the 21 CSFs were confirmed to exist and contribute towards the successful implementation of IT/IS in Malaysian CI. On top of that, two (2) additional CSFs were found during the interviews; independent and personal management competencies. Thus, a total of 23 people CSFs were used as the basis in developing the questionnaire survey to enlist the most important people CSFs that influence the implementation of IT/IS for the Malaysian CI. To obtain this list, three analyses were used; descriptive analysis, Relative Importance Index and Spearmen Correlation Coefficient test. From the statistical analysis, seven (7) CSFs were identified to have the most influence on IT/IS implementation. These are motivation, training/skills, senior management support, willingness to process change, IT staff roles and responsibilities, user involvement and management style. The identified CSFs will now be the basis for developing the preliminary people e-readiness maturity model.

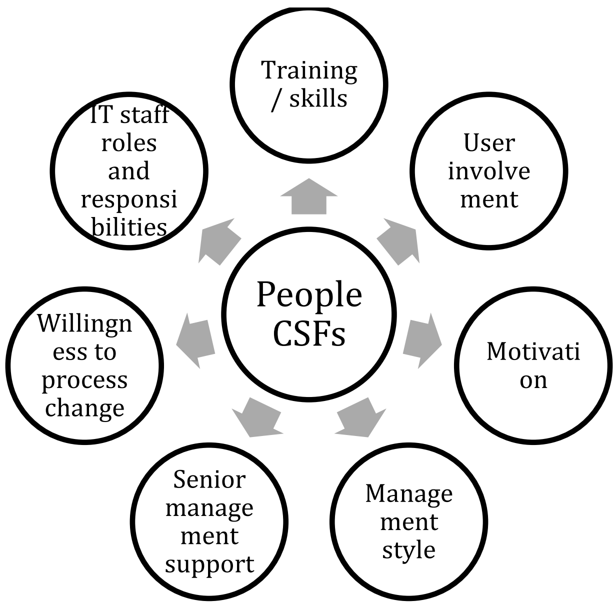


Figure 5.4: Seven People CSFs that Have the High Priority

Chapter 6

Preliminary Maturity Model

6.1 Introduction

Developing an e-readiness model focusing on the people issue for the CI is the main aim of this thesis. An ideal model should be able to evaluate the previous achievements, current status and expected people capabilities in adopting IT/IS in the organisation. This chapter will explain the purpose of developing the maturity model and the process of designing the maturity model, as proposed by Tapia, (2009). The designing of the model involved the model's scope, model's type and its structure, proposed level and the factors selected.

6.2 Purpose and scope of the model

The people e-readiness maturity model was developed for the following purpose:

- To evaluate the current capabilities of the construction organisations' readiness level prior to IT/IS implementation (Becker *et. al.*, 2009).
- To help the organisation identify their desirable maturity levels (Becker *et. al.*, 2009)

- To provide guideline for further improvement as every level of maturity will have a detail and specific action suggested (Maier *et. al.*, 2009)
- To be used for internal and external benchmarking by comparing the similar business units or organisations (de Bruin and Rosemann, 2005; Maier *et. al.*, 2009)

Identifying the scope of the proposed model is important as it will set the boundaries for its application and usage (Tapia, 2006).

In this research, the proposed model was designed specifically for the CI focusing only on one element which is the people readiness issue, since majority of the available model evaluates more than one (1) element such as technology and process. The model can be applied to any size of construction organisation including small, medium and large. Furthermore, the application of this model is fit for any IT/IS system being used in the organisation, as the development of this model does not focus specifically on any specific system.

6.3 Maturity model designing process

Most of the developed maturity models do not discuss their development process, and this topic is not widely covered in either scientific or practical literature (Haris 2010). Therefore, this research use the maturity model development process suggested by Tapia (2009), as illustrated in Figure 6.1.

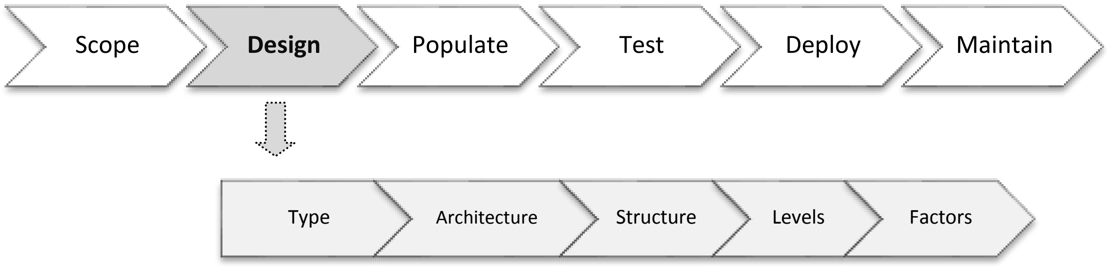


Figure 6.1: Generic maturity model development process

In designing the maturity model, there are several maturity model concepts that should be considered which include:

a) Types of model

The concept of maturity model is adopted and it is designed to be a self-evaluation model, which enables organisations to carry out the evaluation themselves in identifying their current readiness level. Knowing their current readiness levels will enable the organisation to see areas that need improvement in order to achieve the highest maturity level.

b) Architecture

The architecture of the maturity model describes the manner in which the maturity levels can be reached. The proposed maturity model is cumulative, which means that the organisation usually will fulfil the lower requirement first before they can reach the higher levels. However, due to certain circumstances, some of the levels may not be experienced by the organisation, and some may even need to repeat the proposed levels.

c) Model's structure

The maturity model consists of levels; factors and description of maturity for each factor (refer Table 6.1). Levels will indicate the readiness level of the organisation starting from the lowest maturity level to the highest maturity level. While factors and its description explain how each factor progresses towards the highest maturity levels.

Table 6.1: Model's structure

LEVELS	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	FACTOR 6	FACTOR 7
5	*Description*	*Description*	*Description*	*Description*	*Description*	*Description*	*Description*
4	*Description*	*Description*	*Description*	*Description*	*Description*	*Description*	*Description*
3	*Description*	*Description*	*Description*	*Description*	*Description*	*Description*	*Description*
2	*Description*	*Description*	*Description*	*Description*	*Description*	*Description*	*Description*
1	*Description*	*Description*	*Description*	*Description*	*Description*	*Description*	*Description*

d) Levels proposed

Following the Capability Maturity Model (CMM) from the Software Engineering Institute, the proposed preliminary maturity model has five (5) levels; starting from level 1 to level 5. According to Eadie *et. al*., (2012), 88% of the maturity model used five (5) maturity levels, with the remaining using four (4) levels. Among the maturity models that have five (5) levels are BEACON (benchmarking and readiness assessment for concurrent engineering in construction) and SPICE (Structure process improvement for construction environments).

e) Factors Selected

There are seven (7) people CSFs chosen for the model development (refer to Table 6.2), which is based on the statistical analysis which had been explained in chapter 5. These are IT staff roles and responsibilities, management style, senior management support, user involvement, willingness to process change, training/skills and motivation.

Table 6.2: The selected CSFs for developing the Preliminary Maturity Model

FACTORS	DESCRIPTION
IT staff roles and responsibilities	Roles and responsibilities of the IT staff in the organisation
Management style	The management style practiced in relation to the selected system in the organisation
Senior management support	This factor describes the way senior management shows their support in implementing IT/IS
User involvement	The levels of user involvement in the development of IT/IS
Willingness to process change	The extent of organisations willingness to adopt IT/IS in their business process
Training/skills	Training of IT/IS provided by the organisation and the skills obtain by staff to use IT/IS
Motivation	Method that the organisation use to motivate staff to encourage them to use IT/IS

6.4 Maturity of the selected factors

The maturity of each factor will be described below.

a) IT staff roles and responsibilities

This factor refers to the roles and responsibilities of IT staff in the organisation. At the lowest maturity level, it will start with no specific roles and responsibilities because the organisation does not have an IT/IS or technical department yet. When the organisation starts to establish the IT Department, IT staff will have minimal roles and responsibilities. Their roles and responsibilities will increase and move towards the business management responsibilities. Finally they will progressively mature towards strategic responsibilities. Details on how this factor matures are illustrated in Table 6.3.

Table 6.3: The maturity of IT staff roles and responsibilities

MATURITY LEVELS	IT STAFF ROLES AND RESPONSIBILITIES
Level 1	No roles and responsibilities
Level 2	Minimal responsibilities
Level 3	Maximum in-house responsibilities
Level 4	Business management responsibility
Level 5	Strategic responsibility

b) Management style

This factor describes the management style practiced in the organisation. At the lowest stage of maturity, organisation practices an autocratic style where the top management has full control on every activity in the organisation. This will be followed by the paternalistic style that is practiced with some tolerance and flexibility. In this style, the senior management will make the final decision with careful consideration of inputs and feedback from staff. They are more aware of the staff's needs rather than just a plain business. The organisation will then start to practice an open collaborative style, which is the participative/democratic management style. Before reaching the highest maturity level, the organisation will practice delegating management style and finally the laissez-faire management style. The maturity of this factor is illustrated in the Table 6.4.

Table 6.4: The Maturity of management style

MATURITY LEVELS	MANAGEMENT STYLE
Level 1	Autocratic
Level 2	Paternalistic
Level 3	Participative/democratic
Level 4	Delegating
Level 5	Laissez-faire

c) Senior management support

This factor describes the way senior management shows their support in implementing IT/IS in the organisation. At the lowest level, the senior management does not support the implementation of IT/IS in the organisation and is in favour of the existing situation. At the next level, support from senior management starts when they realise the importance of IT/IS. The senior management will start to provide the necessary resources in terms of financial and workforce. Next, the senior management will start to show their interest and starts to interact frequently with the IT Department. This is followed by monitoring and evaluation of IT/IS investment and finally personal involvement and participation. Table 6.5 illustrates the maturity of this factor.

Table 6.5: The maturity of senior management support

MATURITY LEVELS	SENIOR MANAGEMENT SUPPORT
Level 1	No Support
Level 2	Resources Support
Level 3	Frequent Interactions
Level 4	Monitoring and Evaluation
Level 5	Involvement and Participation

d) User involvement

This factor describes the levels of user involvement in the development of IT/IS in the organisation. At the lowest level of maturity, the user are usually not involved in IT/IS development. This will then be followed by initial involvement, formal involvement, collaborative involvement and finally strategic involvement. The maturity of user involvement is illustrated in Table 6.6.

Table 6.6: The maturity of user involvement

MATURITY LEVELS	USER INVOLVEMENT
Level 1	No involvement
Level 2	Initial involvement
Level 3	Formal involvement
Level 4	Collaborative involvement
Level 5	Strategic involvement

e) Willingness to process change

This factor describes the organisational level of willingness to adopt IT/IS in the existing business processes. Unwilling or no intention to change is the lowest level for this factor, followed by the transition level. The next level will be the acceptance level, integration, and finally the optimizing level. Table 6.7 illustrates the maturity of organisational willingness to process change.

Table 6.7: The maturity of willingness to process change

MATURITY LEVELS	WILLINGNESS TO PROCESS CHANGE
Level 1	Unwilling
Level 2	Transition
Level 3	Acceptance
Level 4	Integration
Level 5	Optimizing

f) Training/ skills

This factor refers to the training of IT/IS provided by the organisation and the skills to be obtained by the staff. At the lowest maturity level, the organisation will not provide any IT/IS training to staff; the next maturity sees the organisation providing informal training, focused training and structured training. At the highest maturity level, the organisation continuously provide training for their staff. The maturity of this factor is illustrated in Table 6.8.

Table 6.8: The maturity of training/skills

MATURITY LEVELS	TRAINING/SKILLS
Level 1	No training
Level 2	Informal training
Level 3	Focused training
Level 4	Structured training
Level 5	Continuous training

g) Motivation

This factor describes the methods that the organisation uses to motivate staff to use IT/IS. The lowest level for this factor is the top down approach and followed by the reward system. Subsequently, the organisation will openly communicate with its staff to encourage them to use IT/IS. Training is then given to boost staff's confidence. At the highest maturity level, the organisation may use the application of IT/IS for career development. Table 6.9 illustrated the maturity of this factor.

Table 6.9: The maturity of motivation

MATURITY LEVELS	MOTIVATION
Level 1	Top-down approach
Level 2	Reward system
Level 3	Open communication
Level 4	Training
Level 5	Career development

6.5 Proposed Preliminary Maturity Model

The maturity model is also known as the state of growth model, where the maturation process is cumulative (Pöppelbuß and Röglinger, 2011). Fulfilling the lower stage of maturity will become the basis in achieving the higher level of maturity. Organisations however have options to determine which level they want to be based on their current resources availability which include people, budget and other resources. In this proposed model, the readiness level can occur between level 1 (the lowest level of maturity) to level 5 (the highest level of maturity). The proposed preliminary maturity model is used to evaluate the organisations' e-readiness level. The model will be able to capture the characteristics of the organisations and place them in specific maturity in the model. It is possible for the organisations to have different levels for different factors. Some organisations may also remain at particular levels for an extended period of time before moving forward to the next levels. Other organisations may even move backwards from their current position due to the changes in the organisations. In developing the preliminary maturity model, literature will be revisited. The resources would be combined, reworded, rephrased and revised to suit the Malaysian CI. The description for each selected factor will begin with the lowest level of maturity (level 1) to the highest level of maturity (level 5).

a) IT/IS staff roles and responsibilities

This factor refers to the roles and responsibilities of the IT staff in the organisation. The resources used for this factor is tabulated in Table 6.10.

Table 6.10: Resources used for IT staff roles and responsibilities

IT STAFF ROLES AND RESPONSIBILITIES	
Name of levels:	expert consultation
Description:	Pelz-Sharpe *et. al.,*(2009), Reich and Benbasat (1996), Symons (2005)

The maturity for this factor is described below:

Level 1: <u>No Role and Responsibilities</u>

IT Department does not exist in the organisation (No roles and responsibilities)

Level 2: Minimal Responsibility

Provide technical support to the organisation, minimal responsibilities (outsourcing majority of IT/IS works)

Level 3: Maximum In-House Responsibility

Maintain, customised and handle all IT/IS related activities, high responsibility (minimal outsourcing of IT/IS works)

Level 4: Business Management Responsibility

The IT Department is able to develop a system and start to manage information across organisation and set-up IT/IS strategy

Level 5: Strategic Responsibility

IT Department is responsible to align IT/IS strategy with the organisation's strategies. It should be integrated into all the organisation's strategies, where IT is an enabler for success.

b) Management style

This factor refers to the management style practiced in the organisation. The resources used for this factor is tabulated in Table 6.11.

Table 6.11: Resources used for management style

MANAGEMENT STYLE	
Name of levels:	Hodgkinson (2009)
Description:	Description: Hammer (2007), McShane and Travaglione,(2003), Hodgkinson (2009), Pihie *et. al.,* (2011), Chaudhry and Javed (2012), Mansor *et. al.,* (2012), Koslowsky *et. al.,* (2011)

Level 1: Autocratic

Organisation has full control in all activities (top-down approach) and staff are directly supervised

Level 2: Paternalistic

Supervision still exists in this management style but there is tolerance and flexibility

Level 3: Participative/ Democratic

Organisation starts to shift to an open collaborative style and starts to welcome feedback and information from staff

Level 4: Delegating

Organisations starts to delegate control and authority to the lower level of management

Level 5: Laissez-faire

Organisation is managed through achieving their vision and mission rather than command and control

c) Senior management support

This factor describes the way the senior management shows their support in implementing IT/IS. The resources used for this factor is tabulated in Table 6.12 below.

Table 6.12 Resources used for senior management support

SENIOR MANAGEMENT SUPPORT	
Name of levels:	Young (2005)
Description:	Zqikael *et. al.,*(2008), Zwikael (2008), Zwikael (2008), Kramer *et. al.,* (2007)

Level 1: <u>No Support</u>

IT/IS investment is done in an ad-hoc basis

Level 2: <u>Resources Support</u>

Senior management allocates specific resources for IT/IS investment

Level 3: <u>Frequent Interactions</u>

Senior management frequently communicates and interact with IT Department to be well informed with the current status and give advice

Level 4: <u>Monitoring and Evaluation</u>

Senior management becomes part of steering committee and continuously monitor and evaluate the IT/IS investment

Level 5: <u>Involvement and Participation</u>

Senior management leads the steering committee and become decision maker

d) User involvement

This factor explains the levels of user involvement in the development of IT/IS. The resources used for this factor is tabulated in Table 6.13.

Table 6.13: Resources used for user involvement

USER INVOLVEMENT	
Name of levels:	Salleh (2007)
Description:	Majid *et. al.*, (2010), Cohen *et. al.*,(2010), Sørensen and Nicolajsen (2010), Ruparelia (2010)

Level 1: <u>No Involvement</u>

Organisation has full control on IT/IS development

Level 2: <u>Initial Involvement</u>

User partially involved in the ‘System Development Life Cycle’ on ad-hoc basis

Level 3: <u>Formal Involvement</u>

User involved in many phases of the ‘System Development Life Cycle’ and become the reference in developing IT/IS

Level 4: <u>Collaborative Involvement</u>

User fully involved in the ‘System Development Life Cycle’ and continuously collaboration with IT/IS department

Level 5: <u>Strategic Involvement</u>

User fully involved in the ‘System Development Life Cycle’ and become a part of the steering committee

e) Willingness to process change

This factor describes the levels of the organisation’s interest to adopt IT/IS in their business process. The resources used for this factor is tabulated in Table 6.14.

Table 6.14: Resources used for willingness to process change

WILLINGNESS TO PROCESS CHANGE	
Name of levels:	Prosci (2004)
Description:	Turban *et. al* (2006), Mentzas (1994), Mundbrod *et. al.,* (2012), Liu *et. al.,* (2010)

Level 1: Unwilling

No IT/IS application being used

All IT is outsourced.

Level 2: Transition

Common IT/IS for operational business process are used such as the use of MS Office. The application may be limited to basic tasks only such as preparing payroll.

Level 3: Acceptance

Specific construction IT/IS application are used on construction project base such as the application of CAD and master bill.

Level 4: Integration

Integrated IT/IS application among departments which supports the monitoring process, controlling process and decision making

Level 5: Optimizing

IT/IS are used to support long range planning activities of senior management

f) Training/skills

This factor explains on the training provided and skills available to use IT/IS. The resources used for this factor is tabulated in Table 6.15.

Table 6.15: Resources used for training/skills

TRAINING/SKILLS	
Name of levels:	expert consultation
Description:	Chatzimouratidis *et. al.*,(2012), Treven (2004), (American Institute of Certified Public Accountants and Canadian Institute of Chartered Accountants (2011), Noudoostbeni *et. al.*, (2010)

Level 1: No Training

Training is base on individual effort and own expenses. Skill development is limited. Organisation offers no training.

Level 2: Informal Training

Basic training on how to use the system is introduced. Staff acquire basic skills to use the system

Level 3: Focused Training

Organisation provides training focusing on specific systems. Staff obtain skills required for specific tasks

Level 4: Structured Training

Organisation provides training based on real working situation. Staff obtain advance level skills

Level 5: Continuous Training

Staff are sent for continuing professional development (CPD) and professional training. Staff obtain professional skills

g) Motivation

This factor expresses the motivational factors that encourage staff to use IT/IS. The resources used for this factor is tabulated in Table 6.16.

Table 6.16: Resources used for motivation

MOTIVATION	
Name of levels:	Banks (1997) and expert consultation
Description:	Banks (1997), Flynn (2011), Abuhmaid (2011), Rajhans (2012)

Level 1: Top-Down Approach

No specific motivation. Staff are given instruction by the management to use IT/IS

Level 2: Reward System

Organisation provides rewards system to encourage staff to use IT/IS

Level 3: Open Communication

Organisation has open communication with staff to help inspiring and motivate them

Level 4: Training

Organisation gives training to staff on how to use the system. One-to-one training is also available for those who need it

Level 5: <u>Career Development</u>

Application of IT is used as staff KPI, which will affect their performance appraisal evaluation

The proposed preliminary model can be referred in Table 6.17.

6.6 Evaluation methodology

This section will explain the examples of the indicators used in determining the levels of maturity for each factor. These indicators are obtained from literature and serve as a guideline only. It is not fixed and other indicators may be discovered during the case study conducted.

a) IT staff roles and responsibilities

For the lowest level of this factor (level 1), there are no definite roles and responsibilities of IT staff as the IT Department is not existant in the organisation. Therefore, to determine whether the organisation has been through this level, the history of the organisation was examined to identify the existence of an organisation have IT Department during its establishment.

In level two, IT staff have minimal responsibilities, where they only provide technical support and majority of the IT/IS responsibilities are outsourced to third parties. To determine whether the organisation was in this level, indicators such as major outsourcing of IT/IS works and IT staff providing technical support are used.

Table 6.17: preliminary people e-r MM

In level three, the IT staff have maximum in-house responsibility, where they are responsible to maintain, customise and handle all IT/IS related activities and only minimal IT/IS outsourcing. For this level, the indicators are the IT staff are responsible to maintain and customise the system and also minimal outsourcing is used.

As stated in the preliminary maturity model, IT staff will have business management responsibility in level four. At this level, the IT staff will be able to develop their own system and manage information across organisations and set up IT/IS strategy. The business management responsibilities of the IT staff will be used to identify if the organisation was in this level or not. Examples of the roles include:

i. creating mission, vision and value statement (indicator: mission analysis, vision statement) (Brown 1992)
ii. identify strategic analysis: this is to identify through strategic analysis, the events, forces and experienced that impact and modify the strategy (indicator: involved in environmental scan, internal scan, strategy of record review, key issue identification) (Brown, 1992; Modimogale and Kroeze, 2011)
iii. strategy formulation: This is to define where and how the organisation will compete (indicator: strategy map, financial model, strategic change agenda) (Garnett 2012)

In level five, the IT leader will become part of the board of directors and is involved in determining the organisation’s strategic direction. IT staff will keep up with the strategic needs of the group. Among the indicators used to identify whether an organisation has IT/IS strategy maps are, the organisation has:

i. Balanced scorecard: this is used to establish metrics and targets to measure and manage the performance of the organisation against the strategic objectives (Symons 2005)

ii. IT portfolio: This is used to ensure the most valuable projects are approved and prioritized for implementation (Symons 2005).

iii. IT governance: This is to ensure that the decisions on IT investment are made in a way that maximise business value, minimizes risks, and complies with all regulatory requirements (Symons 2005).

iv. One year or five years IT business plan that outlines the organisational business strategies and programme (Reich and Benbasat, 1996)

b) Management style

In level one, the autocratic management style was proposed in the preliminary maturity model, where the senior management has full control in all activities (top-down approach) and staff were directly supervised. Indicator for this level are such as, no discussion among the management and staff were used to identify whether the organisation practiced this management style or not (Poon *et. al.,* 2005).

Paternalistic management styles were described in the level 2 where supervision exists with tolerance and flexibility. Discussions among top management and staff (Koslowsky *et. al.*, 2011) are used to identify whether the organisation practiced the paternalistic management style or not.

In level three, the organisation is expected to practice the participative/democratic management style. At this stage, the organisation has started to shift to an open collaborative style and starting to welcome feedback and information from staff, and have discussions or meeting sessions that give opportunity for staff to give feedback (Koslowsky *et. al.*, 2011).

The delegating management style is described in level four of the preliminary maturity model. In this level, the organisation has started to delegate control and authority to the lower level of management. Examples of the indicators are:

i. Tasks assigned by the team not supervisor (Thornton 2008)
ii. Staff are responsible for inputs, processes and outputs (McShane and Travaglione, 2003; Thornton, 2008)
iii. Staff responsible for correcting problems (McShane and Travaglione, 2003; Poon *et. al.*, 2005)
iv. Staff receive team-level feedback revealing organisation financial performance (McShane and Travaglione, 2003; Thornton, 2008)

The highest maturity level for this factor is level five, the laissez-faire management style. In this style, the organisation is managed through achieving vision and mission, rather than command and control. Organisations hoping to achieve this level would have to fulfil some of the indicators identified below:

i. Give the IT Department complete freedom to complete their tasks and make decisions (Chaudhry and Javed, 2012)
ii. Provide necessary resources such as manpower and financial (Pihie *et. al.*, 2011)
iii. The senior management participate to only answer questions and not involve in making decision (Mansor *et. al.*, 2012)
iv. Avoid giving feedback (Chaudhry and Javed, 2012)

c) Senior management support

At the lowest level for this factor, the senior management do not provide any support for IT/IS investment. Any investments are decided on an ad-hoc basis.

In level two, only specific resources for IT/IS investment are allocated by the senior management. Among the indicators used to for this level are:

i. Certain amount of money allocated for specific use (Gunasekaran *et. al.*, 2001)
ii. A project manager is appointed to create a project team, consisting of existing IT staff, operational staff and consultants in the project team (Zqikael *et. al.*, 2008)
iii. Plan for resources needed used it accordingly (Gunasekaran *et. al.*, 2001)
iv. Make long term funding commitment (Gunasekaran *et. al.*, 2001)

Frequent interaction is described in level three, where the senior management frequently communicate and interact with the IT Department to be well informed with the current status and give advice. Examples of the indicators used to identify this level are:

i. Communicate regularly with IT Department about project objectives, business environment, changing priorities, etc. (Kramer *et. al.*, 2007)
ii. IT/IS investment were properly managed, evaluated and reported (Gunasekaran *et. al.*, 2001)
iii. The senior management actively giving advice on the resourcing of project plan, training requirements (Gunasekaran *et. al.*, 2001)

In level four, the senior management are expected to be involved in monitoring and evaluating process of the IT/IS project. This is reflected when they become part of the steering committee and continuously monitor and evaluate IT/IS investments. Among the indicators used to determine this level are:

i. Follow up on results (Wagner *et. al.*, 2005)
ii. Interim installation audits (Klos and Krebs, 2008)
iii. Post installation audits (Rodríguez *et. al.*, 2010)
iv. Spend time reviewing the plans and programs (Khan, 2003; Rodríguez *et. al.*, 2010)
v. Initiating continuous improvement plans (Khan, 2003; Wagner *et. al.*, 2005)
vi. Corrective action were taken to re-align with targets (Khan, 2003)

In the highest maturity level, the senior management are expected to be directly involved and participate in IT/IS investment. At this level, they are expected to lead the steering committee and become the decision maker. Among the indicators that indicate their support are listed below:

i. Regularly attend meetings (Prasad, 2008)
ii. Senior management to lead the steering committee (Prasad, 2008)
iii. Senior management to become decision maker (Kramer *et. al.*,2007)
iv. Step in to remove organisational barriers (Kramer *et. al.*,2007)

d) User involvement

At the lowest level, there is no involvement from users in developing IT/IS in the organisation (level 1).

Level two describes the initial involvement of users, where they are partially involved in the System Development Life Cycle (SDLC) on an ad-hoc basis. To determine the maturity level of the organisation, a SDLC diagram is illustrated in Figure 6.2.

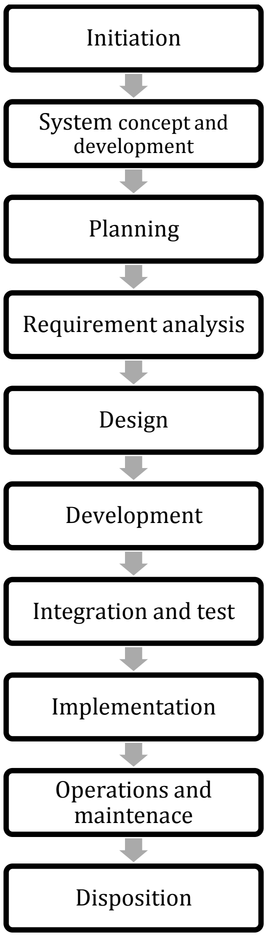


Figure 6.2: SDLC Diagram

In level three, users are expected to have formal involvement in the development of IT/IS in the organisation. At this level, the users are involved in some parts of the SDLC in a formal way.

In level four, users are expected to work collaboratively with the IT Department in the development of IT/IS in the organisation. This is reflected when they are fully involved in the SDLC.

Strategic involvement from user is expected at the highest maturity level (level 5). At this level, the users are fully involved in the SDLC and become part of the steering committee.

e) Willingness to process change

The lowest level (level 1) for this factor starts when the organisation does not willingly adopt IT/IS in their business process. This is reflected when most organisational processes are performed manually.

In level two, the organisation is regarded to be in a transition period, where it starts to use common IT/IS application for business process. The applications may be limited to basic tasks only, whereby some tasks are performed using IT/IS application. Among the indictors used are:

i. The use of Transaction Processing System (TPS) such as sales and marketing system, manufacturing and production system, finance and accounting system and human resource system; including applications such as e-mail, file sharing systems, database, staff records, benefits system, staff skills inventory, general ledger, payroll, fund management system, purchase order system, quality control system (Turban *et. al.*, 2006)

ii. Office Automation System (OAS) such as word documents and spreadsheets (Turban *et. al.*, 2006)

In level three, the organisation is expected to be in the acceptance level, where the application of IT/IS is widely used in the organisation. At this level, they are expected to use extensive IT/IS applications for construction projects base, which refer to the usage of Knowledge Work System (KWS) such as CAD, analysis system, estimating system, virtual reality system, virtual reality modelling language (VRML), Engineering workstation, graphic workstation, managerial workstation, document imaging, electronic calendars (Mundbrod *et. al.,* 2012).

Integrating IT/IS applications is described in level four, where IT/IS applications are integrated among various departments; whereby the IT Department supports the monitoring process, controlling process and decision making. This is reflected when the organisation starts to use decision-support systems (DSS) and management information systems (MIS), such as sales regional analysis, cost analysis, annual budgeting, relocation analysis, inventory control, production scheduling, capital investment analysis and profitability analysis (Liu *et. al.,* 2010).

Optimising the IT/IS applications will be the highest maturity level for this factor. IT/IS are used to support long term planning activities of senior management. This is demonstrated when the organisations starts to use the executive support system (ESS) / executive information system (EIS), such as sales trend and forecasting, operation plan development, budget forecasting, profit planning and manpower planning (Henriksson 2009).

f) Training/skills

This level (level 1) begins when no specific IT/IS training is provided for staff. During this time, training is based on individual efforts and at their own expenses, thus, skill development is limited. Organisations are regarded to be in this level when they do not provide any training and have no intention to train their staff.

In level two, informal training is given to the staff. This is basic training on how to use the existing system and staff will acquire basic skills to use the system. Organisations are considered to be in this level when training given to staff is based on company handbooks, guide sheets, and CD-ROM (Noudoostbeni *et. al.*, 2010).

Organisations are considered to be in level three when they start to provide training focusing on specific systems; and staff obtain skills required for specific tasks. Among the indicators used to identify this level is when they identify specific staff who need specialist knowledge, skills, abilities or competencies for the system (Noudoostbeni *et. al.*, 2010).

In level four, the organisation is expected to provide structured training to their staff. The training is based on real working situations, thus, staff will obtain advanced level skills. Examples of the indicators used for this level are:

i. Demonstration: where staff are trained on how to perform their tasks (Chatzimouratidis *et. al.*, 2012)
ii. Coaching: intensive method of training that involves close working relationship between staff and trainer (Noudoostbeni *et. al.*, 2010).
iii. Job rotation: staff were given several job succession to gain experience of a wide range of activities (Kilkelly 2008)
iv. Projects: staff join a myriad of project teams which gives them exposure to other parts of the business (Chatzimouratidis *et. al.*, 2012; Traven, 2004)
v. Organisation have formal scheduled training/ yearly training programme (Noudoostbeni *et. al.*, 2010).

Continuous and additional training provided for staff will be the highest maturity level for this factor (Laoledchai *et. al.*, 2008). In this level, training for staff will be based on continuing professional development (CPD) courses/training and professional qualifications. This will enable staff to be trained professionally with industry-based knowledge and skills. This is reflected when the internal staff becomes an internal trainer; and where the organisation conducts collaborative training with other organisations such as Construction Industry Development Board (CIDB), Public work Department (PWD) and Institute of Engineers Malaysia (IEM).

g) Motivation

In level one, there is no specific motivation method used by the organisation. Staff are only given instruction by top management to use IT/IS.

A reward system will be introduced in level two, where the organisation provides reward to encourage staff to use IT/IS. Rewards such as money, trips and vacations are example of the indicators used for this level (Banks 1997).

In level three, the organisation is expected to openly communicate with their staff to help inspire and motivate them to use IT/IS. Examples of indicators used for this level are:

i. Communicating regularly with staff (Flynn 2011, Rajhans 2012)
ii. Visiting staff in their work areas (Banks 1997, Flynn 2011)
iii. Listening to staff' concern (Banks 1997, Flynn 2011)
iv. Accepting feedback from staff (Flynn 2011) and take necessary action accordingly (Rajhans 2012)

In level 4, the organisation gives training to staff on how to use the system; one-to-one training is also available for those who need it. This is reflected when the organisation has a formal and complete training plan and provides personal training to needed staff (Abuhmaid 2011).

To continuously motivate staff, IT/IS application becomes part of staff KPI, which will affect their performance appraisal (level 5). Organisations are regarded to be in this level when the application of IT/IS influence the incentives and promotions given to the staff (Flynn 2011).

6.7 Suitable time to use the model

The proposed model is ideally to be used before the implementation of IT/IS. This is to enable the organisation to understand their current readiness level before implementation and being able to take action to overcome the weakness. Organisations planning to implement IT/IS and those already implemented IT/IS can also use the model, which will serve as guideline for future improvement.

All levels of people using IT/IS in the organisation should be involved in the evaluation processes which include senior management, middle management, technical staff and also staff. The involvement from all levels is necessary as statements given by the senior management will be confirmed by the middle management and also staff.

6.8 Conclusion

This chapter describes the development of the preliminary people e-readiness maturity model. This model is developed to be used by itself without the need of appointing external parties. The development of this model involved reviewing of various models, literature review that includes rewording, rephrasing and others. The development of this model enables organisations to obtain comprehensive information about their current readiness level and consequently use this information to improve their strategic plans and future activities.

Chapter 7

Case Studies

7.1 Introduction

The aim of the case studies was to validate the preliminary maturity model. This involved testing and modification on the descriptions of the preliminary maturity model to reflect the current practice. For this purpose, construction organisations were selected to participate in this study. Due to confidentiality and to protect anonymity, the organisations and the system used will be referred to as organisation Alpha (system V), organisation Beta (system W), organisation Gamma (system X), organisation Delta (system Y) and organisation Epsilon (system Z). The organisations were selected as they have met the following criteria:

a) The construction organisation have implemented IT/IS which can reflect the evolution of the system

b) The organisation uses specific IT/IS to perform construction business process

c) Organisation that have strategic IT/IS

d) If possible, to find an organisation that feels the needs to identify their current readiness level so that they are genuinely motivated to participate in this study and not just considering their participation as an academic exercise

e) The organisation’s willingness to disclose sensitive information relating to current IT/IS implementation and its development strategy

It is important to collect multiple types of data from multiple sources to increase its reliability (Stake 2006). In order to validate the maturity model, it is important to receive feedback which incorporates the perspective of the senior management, IT manager, IT staff and also users. The chosen case studies were all based in Klang Valley.

All the case studies are discussed in an identical structure starting with organisational background and history, types of services provided, size of the organisation and its structure. This will be followed by the history of the system adoption which includes all the customisation made for the system. After that, the organisational e-readiness level will be identified for each factor, which are IT staff roles and responsibilities, management style, senior management support, user involvement, willingness to process change, training/skills and motivation.

Each factor will be discussed separately to identify the organisation’s previous achievements, their current status and their future plans. The organisation’s achievement will be based on a single system that is currently being used. In this case study, the term ‘previous achievement’ refers to the organisations’ achievement before the application of the selected system; ‘current status’ refers to the organisation achievement during the application of the system; ‘future target’ will focus on organisations’ future planning for the particular system or the IT Department. The organisations’ e-readiness gap can be identified from the differences between the organisation’s current status and their future target. Suggestions for the organisation on how to move forward to their targeted status will be given based on the identified e-readiness gaps.

7.2 Organisation Alpha's case study

7.2.1 Organisation background

Organisation 'Alpha' was formed in 1988 as a highway maintenance provider. Alpha currently has more than 900 staff and expanded their business into other sectors of the maintenance industry such as airport airside maintenance, commercial building maintenance and plant shutdown maintenance in the oil and gas industry.

This organisation is separated into six (6) departments - Corporate Strategy and Business Development Department, Finance and Accounting Department, Human Resource and Administration Department, Information Technology Department, Operations Departments and Soil Centralab Department. There are three units located under the Operations Department; Maintenance Operations, Projects and Contracts and Procurement. The organisational chart for Alpha is illustrated in Figure 7.1.

7.2.2 History of system adoption

Being the maintenance specialist in Malaysia, they have acquired a systematic way to manage and control their facilities – Alpha used MS Access to facilitate them. MS Access is a database management system that allows creation and modification of data. List of products, inventory, reports and other things can be created in helping the organisation managing and monitoring their assets. The MS Access application enables the organisation to import and export data to many formats which include Excel, Outlook, SQL, Oracle and others.

The application of MS Access in the late 1997 has eased many problems faced by the organisation. Four (4) years after implementing MS Access, Alpha started to experience problems due to the limitation of MS Access. The first limitation is the restricted number of staff to using the software. If more than 20 staff access the database, the performance and the response time will slow down, which leads to the delay of work process and the in-availability of real-time data. Secondly, the database may get corrupted when multiple operating systems like Window 98, Windows ME, Windows 2000, Windows XP or Windows Vista are used to access the same database. In addition, the software is only accessible in the headquarters only as MS Access was not designed as a web-based application. This has started to cause difficulties for Alpha to manage and monitor activities of regional offices located throughout Malaysia.

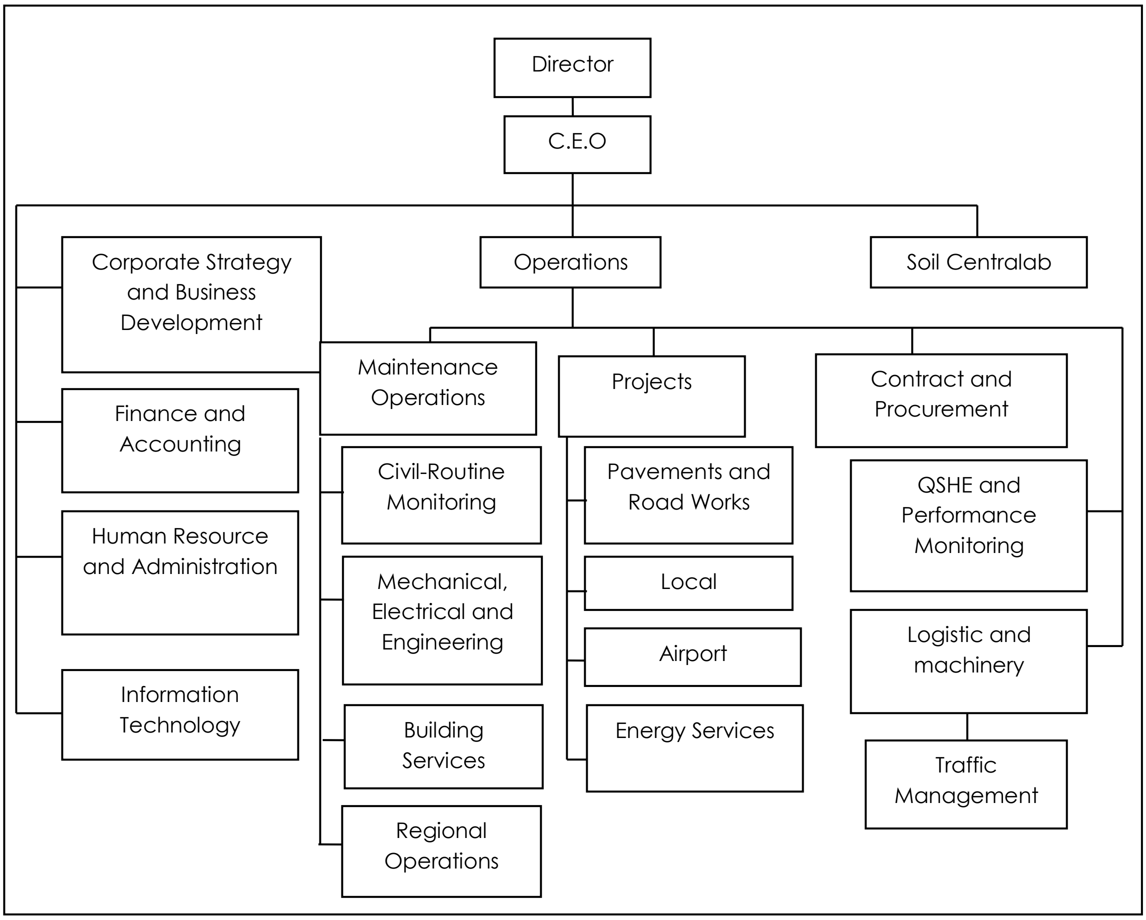


Figure 7.1: Organisation chart for Alpha

MS Access also created the following issues for Alpha:

- Size limitation – MS Access has data limitation when it reaches 2GB of data, which is insufficient for Alpha.

- Software performance – MS Access performance will slow down when it approaches 2GB of data.
- Software updates - when updates are made by the administrator, a new code needs to be sent to all staff to avoid them using invalid data which will generate invalid reports.
- Not for business automation - MS Access was not employed to automate the business process. Its main use was providing office automation and personal productivity tools for staff. Due to the limitations that MS Access has, the senior management instructed the IT Department to find a new system that is able to overcome this problem.

System V version 4 (V.4), a database management system was proposed by the IT Department in late 2004. This system is an off-the-shelves system that was found to be suitable for Alpha and was launched in 2005. System V was able to overcome all limitations that the previous system had, except for the networking problem. System V.4 was a standalone system that allowed automated asset management activities such as analysing costs and assets status, managing inventory and labour resources, plan maintenance and service activities. On top of that, system V.4 has a larger memory size than MS Access, thus, have gives performance even when a large number of staff are using it at the same time. System V.4's performance will not be slow as the system has a larger memory size. The first customisation of V.4 was made in 2006 due to the limited database fields of the system. In the process of data entry, the current database did not provide sufficient field size for the staff to key in the data, and as a result only limited words can be entered. Because of that, the staff needs to repeat the process of data entry. The customisation was proposed by the senior management based on complaints by the staff. System V.4 is a standalone system that only allows on-site application and this caused difficulties for the senior management to monitor and control activities of the regional offices. In early 2007, the senior management proposed the use of Citrix MetaFrame Server to allow system V.4 to be run from anywhere in the world with connections of the local area network (LAN). This allowed real time access to the information from any regional office and the HQ.

In early of 2010, Alpha upgraded to system V version 7 (V.7) due to the compatibility issue with system V version 4 (V.4) and the Windows operating system was unable to support system V.4. There are seven modules of system V.7 used by Alpha, which were Planning, Preventive Maintenance, Civil, MEE and ED Work order, Request for JRCV, Equipment Breakdown Work Order Activity, Managing of MEE and Guardrail Spare Parts and Asset/ Inventory Management, illustrated in Figure 7.2.

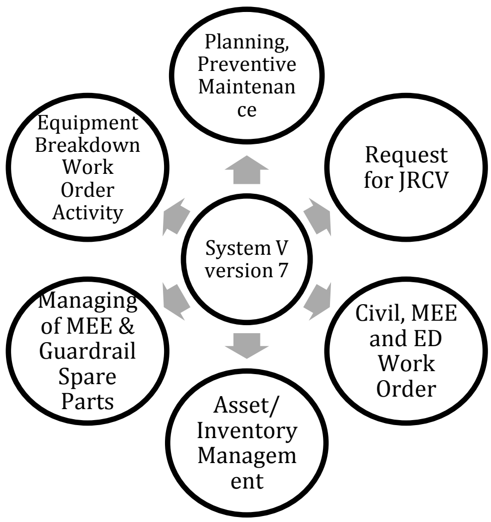


Figure 7.2: System V.7 modules

The first customisation of system V.7 was proposed by end of 2010 and fully launched by March 2011; was to integrate between Alpha and the client. This integration allowed the client to easily monitor the activities carried out by Alpha. Every activity and claim can be monitor directly by the client through the system. The customisation was proposed by the client themselves for easy monitoring and to align with their current target of a paperless environment. The second customisation was proposed in late 2011 and was fully implemented in 2012, which was to add an online Purchase Order and Purchase Request (POPR) as requested by the staff. With this new online form, the staff were able to request procurement or buying products online, monitor the requesting process until they receive the requested products. This requesting process also took less time compared to the older method.

The third customisation was still new and was launched in March 2012 with a new feature, the ‘Diary’. The purpose of adding this feature was to simplify the monitoring of day-to-day activities of workers on site. The ‘Diary’ was specifically for the engineering department only. The person responsible for every team was required to update everyday activities in this diary. With this, the senior management can easily monitor staff activities, machinery used for each activity, the amount of money that they spend and others. This feature will also help to reduce paperwork. All system customisation were made by an external vendor due to the limited number of internal staff and expertise. Figure 7.3 illustrate the timeline development of system V.

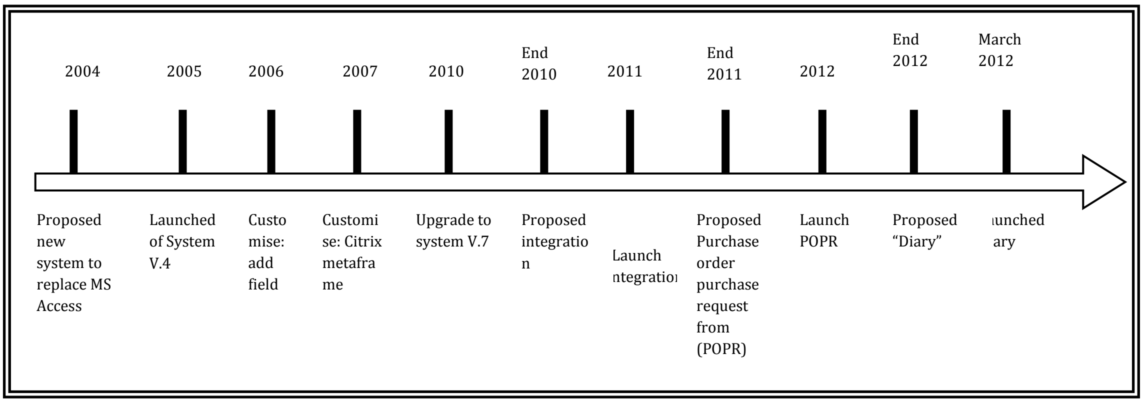


Figure 7.3: Development timeline of System V

7.2.3 Analysis and discussion

These factors will be discussed separately starting with identifying organisation Alpha's previous achievement, current status and future planning.

1) <u>IT staff roles and responsibilities</u>

   a) Organisation's previous achievement

      - When Alpha was first established, there was no IT Department *[Level 1: No Roles and Responsibilities]*. Prior to the implementation of MS Access, common Office Automation System such as MS Office and spreadsheets were used. During this time, the IT Department was formed as Alpha needed a specific department to handle all IT/IS related matters such as troubleshooting, installing software and others. There were only two personnel in this department - the Head of ICT and technical assistant. Most of IT/IS works were outsourced to the vendor due to the limited number of IT staff *[Level 2: Minimal Responsibilities]*.
      - Before the application of system V.4, '*Periodic Maintenance Schedules'* for MS Access was prepared by the internal IT staff, who were also responsible to do the periodic maintenance. This is required for MS Access as large amount of data will slow down the information processing. In addition, a 'compact and repair' database tool is required to be implemented to improve operational efficiency and effectiveness of the system.
      - Internal IT staff prepared the '*MS Access Training Plan*' as they were also responsible to provide basic training for staff. IT staff was responsible to identify suitable systems or appliances to be used in the

organisation and on how to integrate the new system between HQ and site offices.

- During this time, the responsibility of IT staff has increased and they work collaboratively with the system vendor. The vendor first trains the internal IT staff; before the internal IT staff starts to train the other staff. The IT staff also responsible to maintain MS Access.
- Based on the above description, the roles and responsibilities of the IT staff had increased, placed the organisation at level 3.

b) Organisation’s current status

- In 2010, the Human Resource and Administration Department established their new ‘*Workforce Planning’*, where IT staff were given the responsibility to maintain and customise all IT systems in organisation Alpha. In the case of system V, the IT staff were responsible to perform the adaptive maintenance (to enhance the system by adding features and function) in response to any new requirements or upgrades that have been made.
- With the increasing roles and responsibilities, more IT staff were hired and new positions were introduced, such as the senior programme analyst, programme analysts and computer support technicians.
- The IT Department was scheduled to have weekly meetings with the management team to discuss about the progress activities such as staff support, schedule maintenance, replacement of equipments at the end of its service life and plan strategies accordingly.
- The senior management recognized the involvement of IT staff in developing the organisation’s IT strategy. The formulation of the IT

strategy included a long-range plan on effective management concerning the IT Department’s strengths and weaknesses, defining a three (3) to five (5) years vision and mission, setting up objectives, strategies and policy.

- Currently, the IT Department is now part of the management team (as shown in Figure 7.1) and their responsibility extended beyond providing the IT technical support to the organisation. However, they have no responsibility to develop IT systems because Alpha preferred to buy *off-the-shelves* system which benefited them in terms of cost and expertise. Therefore, Alpha is currently identified to be in between level 3 and level 4 of the preliminary maturity model.

c) Organisation’s future planning

- In Alpha’s latest ‘*Five Years Strategic Planning’*, IT will become a strategic partner and the key driver of the organisation. A Chief Information Officer (CIO) will become a part of the Board of Directors in Alpha. Currently the Human Resource and Administration Department is preparing the CIO’s job description, which include identification of its roles and responsibilities, grade, salary code and others.
- To align the IT/IS strategy and construction business strategy, the Administration and Management Unit in the IT Department will be given responsibilities to formulate a long term IT business plan, which identifies how IT can be used to support business objectives and measure the IT performance against the organisation strategic objectives (refer to Figure 7.4).

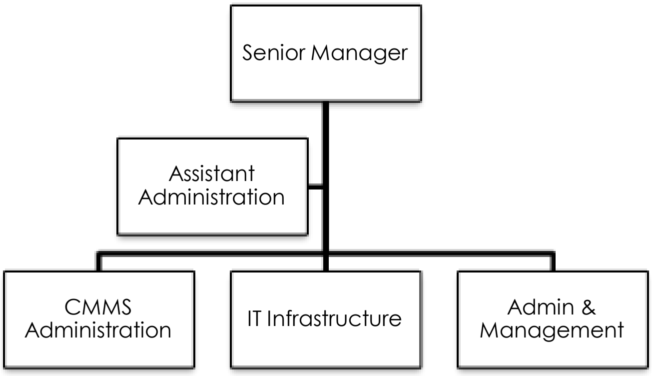
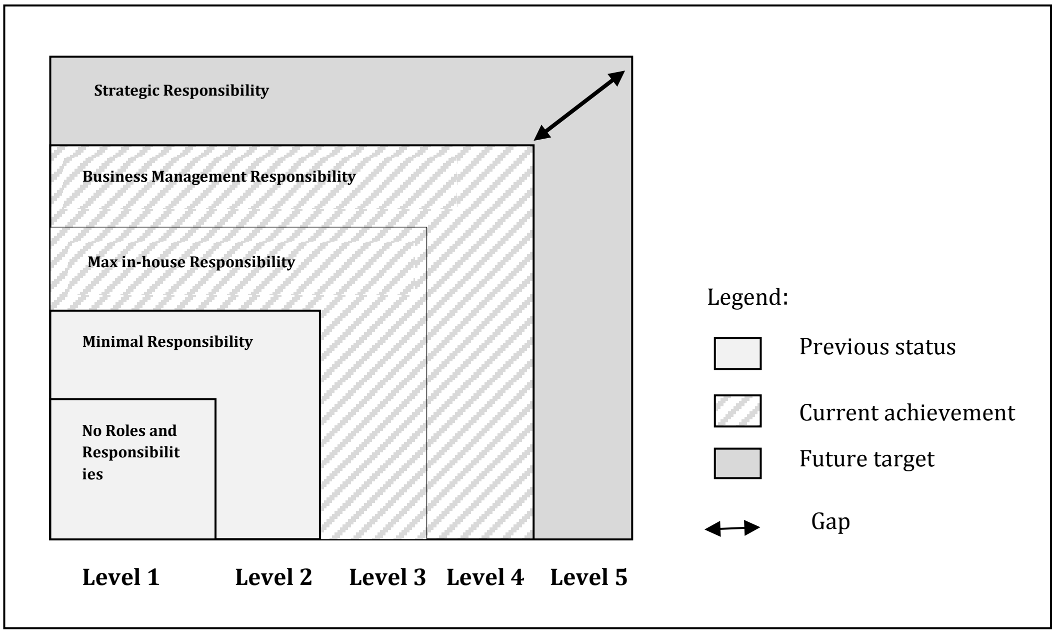


Figure 7.4: The new structure of IT Department

- Based on the above description, organisation Alpha is heading towards achieving level 5, by making IT the organisation's strategic partner, thus, increasing the roles and responsibilities of IT staff to the strategic responsibility.

The analysis of organisation Alpha's status for IT staff roles and responsibilities is as follows:



2) Management style

a) Organisation's previous achievement

- Before the development of system V, Alpha practiced the laissez-faire management style *[Level 5: Laissez-faire]*. During this time, the IT Department was given complete freedom to find a system that was able to help the organisation in managing their data. The IT Department made the decision to use MS Access without consulting with senior management or staff. Lots of problems were encountered with MS Access, such as limitation on the number of staff, system performance and corruption issues. The IT Department did not take any action to overcome this situation, which resulted in the senior management's intervention in the IT Department.
- At this stage, they started to practice autocratic management *[Level 1: Autocratic]*. Top down approach was adopted and it was very directional. A duration of six (6) months were given by the senior management to the IT Department to propose a strategic plan in finding a practical solution to problems faced by the system.
- In 2004, three (3) systems were proposed by the IT Department to replace MS Access. Based on the proposal of the IT Department, system V was selected for the best interest of organisation and staff *[Level 2: Paternalistic]*.

b) Organisation's current status

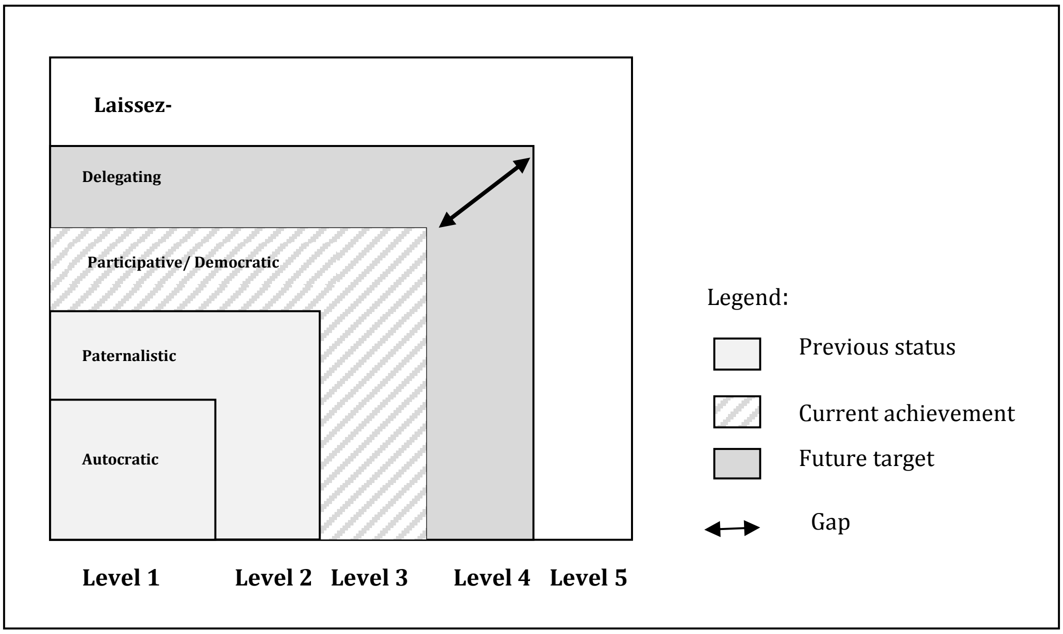
- Currently, Alpha has shifted from controlling to a more open collaborative style. Staff are encouraged to give feedback and opinion for the better future of the organisation. A '*Proposal Meeting'* is held once a month, where staff are gathered together to propose new ideas. At the end of 2011, staff proposed the online POPR form during the ‘*Proposal Meeting*’ and staff were required to vote for or against the proposals. Since the proposal received majority of the votes, the customisation was then made in 2012 to add to the online POPR form.

- Alpha is currently identified to be practicing the participative/democratic management style (*level 3*).

c) Organisation’s future planning

- Based on Alpha’s ‘*Five Years Strategic Planning*’, more responsibility will be given to the Administration and Management unit under the IT Department. This unit will be responsible to formulate the organisation’s long term IT business plan that indicates how IT can help to support Alpha’s business objectives.
- Alpha is heading towards the delegating management style where authority and control will be passed down to the lower level of management (*level 4*).
- The organisation currently does not target the laissez-faire management style, as they think it is not suitable for Alpha.

The analysis of Alpha's status for management style is as follows:



3) <u>Senior management support</u>

a) Organisation's previous achievement

- During the early establishment of Alpha, IT/IS investment was on an ad-hoc basis due to the non-existence of IT Department *[Level 1: No Support]*. When the IT Department was formed, the senior management allocated specific resources for IT/IS investment in terms of financial and workforce. This was reflected when two IT personnel were hired to form the IT Department *[Level 2: Resources Support]*.
- After Alpha adopted MS Access, several weaknesses of the system were encountered. Senior management then instructed the IT Department to form a research team to discover any available systems that would overcome the limitations of MS Access. A weekly meeting between them was scheduled to discuss the progressive reports of its findings. A six months time frame was allocated for this purpose.

- Senior management in Alpha was previously identified to be in level 3, where they frequently interact with the IT Department.

b) Organisation's current status

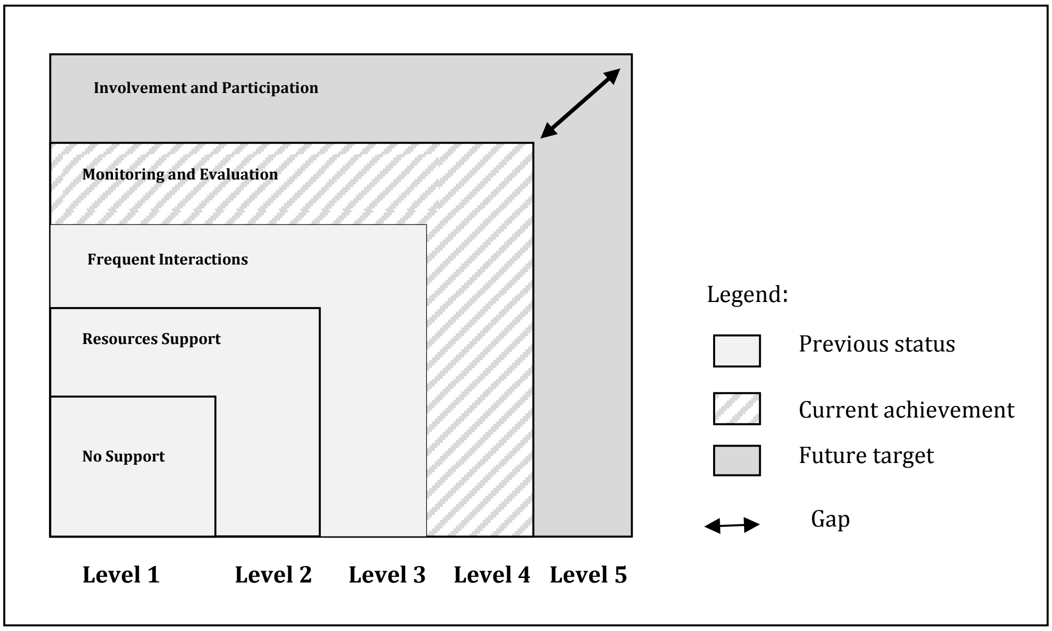
- Senior management is currently part of the management team in the development of system V. They were involved in continuous investment evaluation, progress tracking and take corrective action when any targeted plans were not achieved. Among the actions taken include revising the '*Standards and Procedure*', strategies, activities, structures, systems or support.
- For example, during the implementation of system V, the IT Department was restructured with the recruitment of more IT staff (such as the senior programme analyst, programme analysts and computer support technicians). This resulted in revising the activities of the IT Department with three new-subunits with distinct roles and responsibilities. As a consequence, the standard and procedures of the IT Department had also been revised in response with the changes.
- With this scenario, senior management support in Alpha is currently identified as in level 4, where they continuously evaluate and monitor system V's investment.

c) Organisation's future planning

- Alpha is planning to bring the position of Chief Information Officer (CIO) as part of senior management. As stated in Alpha's latest *Five Years Strategic Planning*, they recognized the significance of IT in their organisation, thus the Human Resource and Administration Department is now evaluating the proposed job description for the CIO, which will cover the CIO's responsibility in emphasizing the value of information, people and IT as the critical elements in the organisation.

- Based on the above description, the senior management support in Alpha is moving towards level 5, where they will have direct involvement.

The analysis of Alpha's status for senior management support is as follows:



4) <u>User involvement</u>

a) Organisation's previous achievement

- The decision to use MS Access was purely made by the IT Department without consulting with staff. As a result, Alpha found that the adoption of MS Access was ineffective and did not meet the users' expectation and needs.
- The level of user involvement in Alpha was identified at in level 1, where they were not involved at all.

b) Organisation's current status

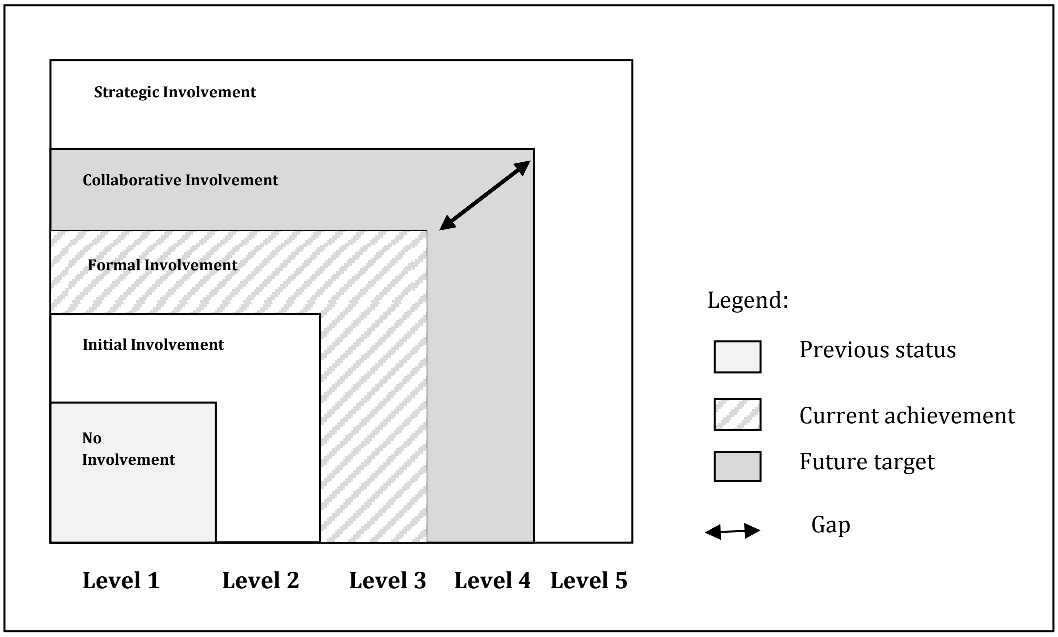
- Past experience has made Alpha recognize the importance of user involvement in the system development. In early 2004, the senior management issued a circular to enforce user involvement in any IT system development. A minimum of two (2) users were needed to be involved throughout the system development, where one of the user must be a senior member of Alpha who understands organisational procedure and process; and another junior member who would use the system. In the context of system V, the user involved were a Maintenance Engineer from the Maintenance and Operations Department, a Project Manager from the Projects Department, and a Quantity Surveyor from the Contract and Procurement Department. They have became the main reference for system development, especially during the creation of the system's requirement, and post-development that includes reviewing the prototype system, testing and reporting the enhancement needed.
- The above scenario shows that the level of user involvement in Alpha is currently identified as in level 3, where they are formally involved with the system development.

c) Organisation's future planning

- Alpha plans to have user involvement in every phase of the system's development, starting from the initiation phase until the implementation of the system *[Level 4: Collaborative Involvement]*, as stated in Alpha's future planning in the '*IT Department Annual Report'*.

- There are no plans to have a permanent steering committee, as Alpha believe that it is not necessary. The steering committee will only be created when necessary.

The analysis of Alpha's status for user involvement is as follows:



5) <u>Willingness to process change</u>

a) Organisation's previous achievement

- Alpha was formed in 1988 and all work was done manually *[Level 1: Unwilling]*.
- The application of MS Access at that time was task oriented. Only some tasks, such as the list of products and inventory were prepared using MS Access *[Level 2: Transition]*.

b) Organisation's current status

- Since the existence of system V, every project is managed using the system *[Level 3: Acceptance]*. System V is used to store and manage all information regarding the project such as Construction Drawings, Monthly Interim Payment, Architect's Instructions and others.
- Information between the similar construction projects can be shared which helps Alpha to monitor and control construction processes. Information concerning costs helps Alpha to conduct cost and profit analysis *[Level 4: Integration]*. System V is also being used for inventory control, production scheduling and others. Figure 7.5 below shows the example of the production scheduling form used in Alpha.

Production Scheduling							Mon			Tue			Wed			Thurs		
No	Machine	Parts	Qty	Start Date	End Date	Adv/Late	A	B	C	A	B	C	A	B	C	A	B	C
WC-0X Work Centre No. X: Run X Shift/Day (A:X Hr, C: X Hr)						Hrs/shift: Loaded Hrs: Avail. Hrs: OT Assigned:												
WC-0X Work Centre No. X: Run X Shift/Day (A:X Hr, B: X Hr, C: X Hr)						Hrs/shift: Loaded Hrs: Avail. Hrs: OT Assigned:												
WC-0X Work Centre No. 3: Run X Shift/Day (A:X Hr)						Hrs/shift: Loaded Hrs: Avail. Hrs: OT Assigned:												

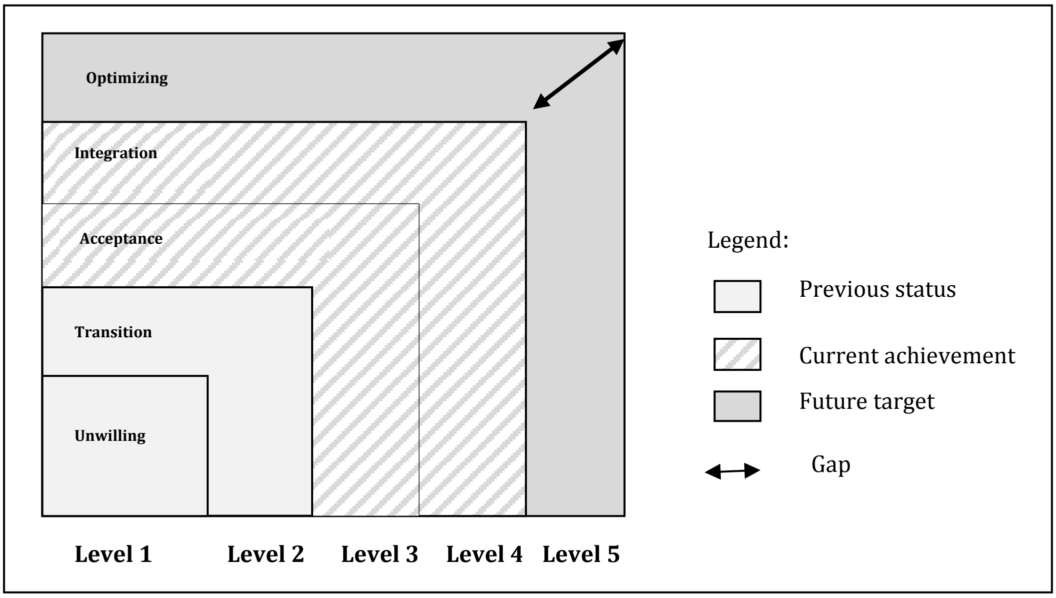
Figure 7.5: Production Scheduling Form in Alpha

c) Organisation's future planning

- Alpha is looking forward to use IT/IS to support their long term planning activities. According to the IT Manager, they have started to create a dashboard in the second quarter of 2012, which incorporates all data such as financial data that is necessary for the management for future planning.

- Alpha is moving towards achieving level 5, where they will use a strategic level system.

The analysis of Alpha's status for willingness to process change is as follows:



6) <u>Training/skills</u>

a) Organisation's previous achievement

- When Alpha started to use Office Automation System (such as MS Office), no specific training was given to the users *[Level 1: Training]*. Learning was based on individual efforts.
- When MS Access was introduced, the system vendor only provided basic training *[Level 2: Informal Training]*. The user then had basic skills on how to use MS Access.
- After one year of implementing MS Access, Alpha put a cap on the training budget, where training was only given to users to acquire selected skills that were significance to MS Access implementation. For

example, several users were sent to attend advanced level training in order to obtain skills required to create forms and prepare reports.

- Alpha had achieved level 3, where training is only provided for specific skills.

b) Organisation’s current status

- With the implementation of system V, Alpha established an ‘*Annual Training Plan*’ to incorporate user needs from every level in the organisation.
- It is compulsory for all staff to attend two (2) training courses a year, which were then evaluated in Annual Appraisals. Among the training modules provided were Structured Query Languages (SQL), database and information system security, data warehouse and others. The training involved showing staff how to use the system based on real working situations. This type of training managed to increase the level of understanding on how to use the system correctly.
- The above description shows that Alpha is currently identified in level 4, where structured training is provided to the staff.

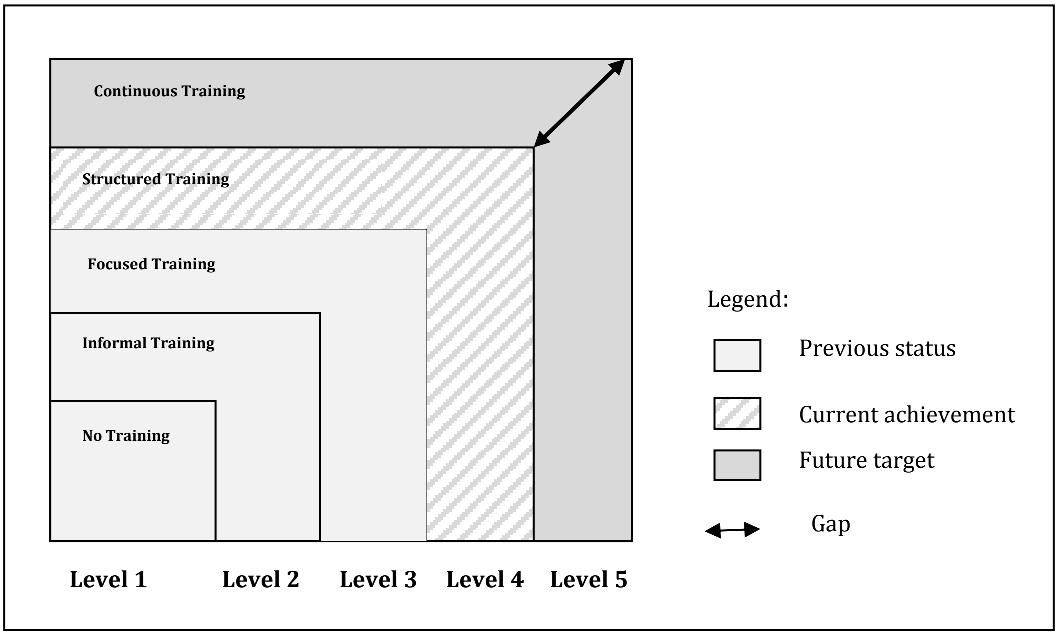
c) Organisation’s future planning

- Alpha is anticipating that main user of system V would become a certified trainer in the future. As stated in the organisation’s 2013 Budget, they have increased the budget for training to encourage staff to obtain professional qualifications.
- Alpha will be requiring staff to achieve a minimum of six (6) continuous professional development (CPD) points annually in order to equip and

update staff with latest knowledge, information and skills related to their profession.

- This shows that Alpha is moving towards level 5, where they continuously provide training to staff.

The analysis of Alpha's status for training/skills is as follows:



7) <u>Motivation</u>

a) Organisation's previous achievement

- When Alpha started to use Office Automation System, no specific motivational method was used to encourage staff to use it *[Level 1: Top Down Approach]*. As a result, some staff did not use the Office Automation System in their daily work.
- Alpha started introducing the reward system *[Level 2: Reward System]*. The staff collect merit points whenever they use MS Access. These points were then converted into monetary terms at the end of the year.

This approach was only used for one (1) year as more staff were using the system.

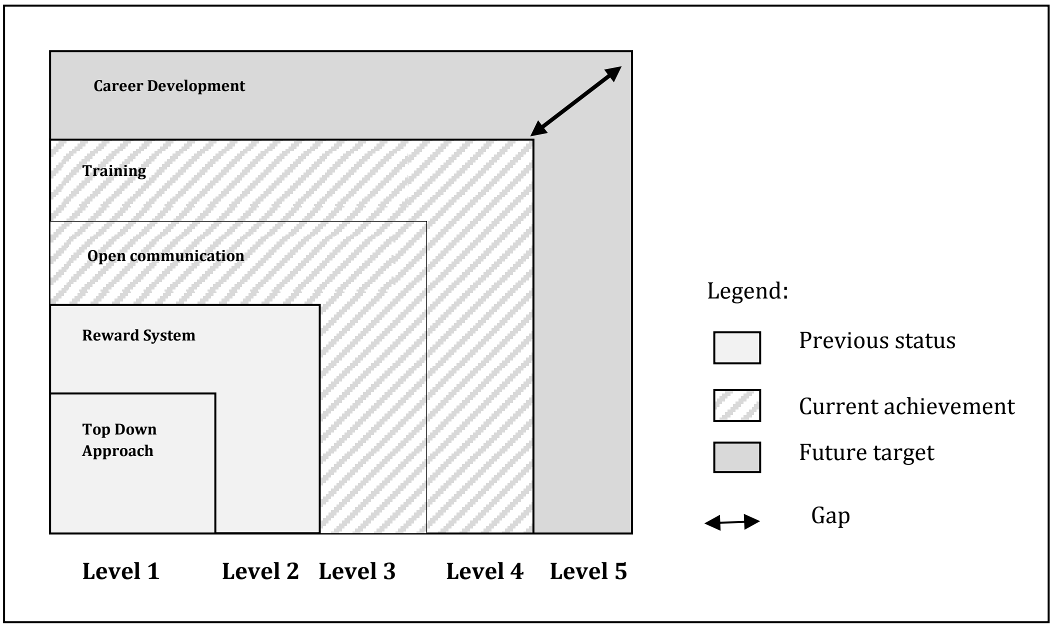
b) Organisation's current status

- A '*Proposal Meeting'* is introduced with the introduction of system V.7. This meeting is held once a month, where staff are given the opportunity to communicate and propose new ideas *[Level 3: Open Communication]*. System enhancements were made based on staffs' proposal such as adding the online POPR form.
- Alpha continuously motivates staff by providing hands-on training. This is clearly evident with the establishment of an '*Annual Training Plan*'. Staff are familiar with the system, hence feel confident when using it.
- Based on the above description, Alpha is currently identified to be in level 4, where training is used to motivate staff.

c) Organisation's future planning

- In Alpha's '*Five Years Strategic Planning'*, the application of system V.7 will be part of staff's KPI, where the system's application will affect their appraisal evaluation.
- This shows that this factor is moving towards level 5, where the application of system V will affect their career development.

The analysis of Alpha's status for motivation is illustrated as follows:



7.2.4 Summary

- The application of a database management system (MS Access) in Alpha was not properly defined in its early implementation. Many limitations of MS Access were encountered during its application, such as file corruption issue and limited database size. This became the main reason for the IT Department to propose a new system, namely system V. The development and implementation of system V in Alpha spanned an 8-year period. It began with the proposal in 2004 and was followed by system launch in the following year. The remaining six (6) years were spent on system development and implementation, which was necessary to generate a fully functional system.
- Four factors have reached level four of the preliminary maturity model. These are the senior management support and willingness to process change, motivation and training/skill.
- The senior management in Alpha continuously demonstrated their support by constantly evaluating and monitoring the IT/IS investments, to be aligned with

targets. Among the actions taken by senior management is the restructuring of the IT Department (more IT staff were recruited) to be aligned with the organisational objective in making IT a strategic partner.

- Based on Alpha's *Five Years Strategic Planning*, a new post of Chief Information Officer (CIO) at the senior management level will be created [*Senior Management Support: Level 5*]. This indicates that the organisation is moving towards the highest level for this factor. Appointing a CIO is necessary to ensure IT remains as a strategic partner in the organisation. According to Alpha's IT manager, having a visionary CIO is important as this quality will enable him to see where the organisation is headed, positioning the IT Department to help the organisation to achieve their target, forming a strong team that heading towards the organisations' directions and motivating the team to reach the goals as soon as possible.
- The organisation seems to be moving in the right direction in achieving their target which is to use IT/IS to support their long range planning activities. For this purpose, they have started to create a dashboard to incorporate all strategic information necessary for Alpha's future planning *[Willingness to Process Change: Level 5*]. Several important things should be considered in creating a useful dashboard, which include the audience, the added value to the organisation and the type of dashboard to be created (Juice 2009). Input from the CEO and the senior management is necessary to provide the right information needed in the dashboard.
- Alpha continuously motivates staff to use system V; its application will become part of staff's KPI, which affects their performance appraisal evaluation. [*Motivation: Level 5*]. Achieving the highest maturity level for this factor is not a problem for Alpha as the issue of making system V as part of their KPI had

been stated in the organisation '*Five Years Strategic Planning'*. In making system V.7 part of the staff KPI, organisation Alpha should introduce it properly to the staff by giving proper training to them as well as discussing the reason of introducing it and how they will be used. Staff also should be explained about the benefits of having the KPI, their opinion on the usage of system V application as their KPI and explanation on how it will affect their performance appraisal.

- Alpha also targeted the highest maturity level for the training/skills factor. For this purpose, the allocation for training had been increased in the organisation's 2013 Budget, by encouraging staff to attend professional training. On top of that, staff will also need to collect a minimum of six (6) CPD points every year by attending CPD courses and seminars [*Training/skills: Level 5*]. In encouraging staff to attend the CPD courses and programme, Alpha should make it compulsory for every staff to registered with the respective professional board/institution. Latest information concerning their profession can easily be obtained when staff are register with the respective professional board/institution (Ariffin and Torrance 2008). The board/institution would also continuously monitor their professional ethic, through the 'Code of the Professional Conduct' which has been described in every profession 'Acts' and 'Rules' such as '*The Architects Acts 1967 incorporating amendments up to April 2007*' and '*The Architects Rules 1996 incorporating amendments up to June 2011*'. This is important to ensure the professionalism of the staff is well managed.
- IT staff roles and responsibilities is currently in between level 3 and level 4, where staff roles are more than just providing technical support to the organisation. However, in terms of developing the system, they are not responsible to do so as according to Alpha's IT Manager, buying *off-the-shelf*

system provided more benefits to Alpha based on cost and expertise. These criteria were described in the level 4, which makes Alpha in between level 3 and level 4 of the preliminary maturity model. IT staff are currently involved in IT strategic analysis and formulation, which includes defining three (3) to five (5) years vision and mission, objectives and setting up strategies and policy. With the increasing roles and responsibilities, more IT staff were hired (senior programme analyst, programme analysts and computer support technicians) to meet with the current needs. According to Alpha's *'Five Years Strategic Planning'*, IT will become the strategic partner and the key driver of the organisation *[IT Staff Roles and Responsibilities: Level 5*]. The Human Resource Department is preparing the CIO's job scope in establishing the position. New responsibility will be given to the Administration and Management Unit under the IT Department in formulating a long term IT business plan, which identifies how IT can be used to support business objectives and measure the IT performance against the organisation strategic objectives. In making IT/IS the pillar of the organisation, it is recommended that the Human Resource Department prepare a vast job description, which integrates the organisation's business functions, the IT/IS function and also the technical aspects (Brodar *et. al.,* 2009). It is also recommended to change the organisation's structure to accommodate the CIO's position (Saldanha and Krishnan, 2011) (refer to Figure 7.6).

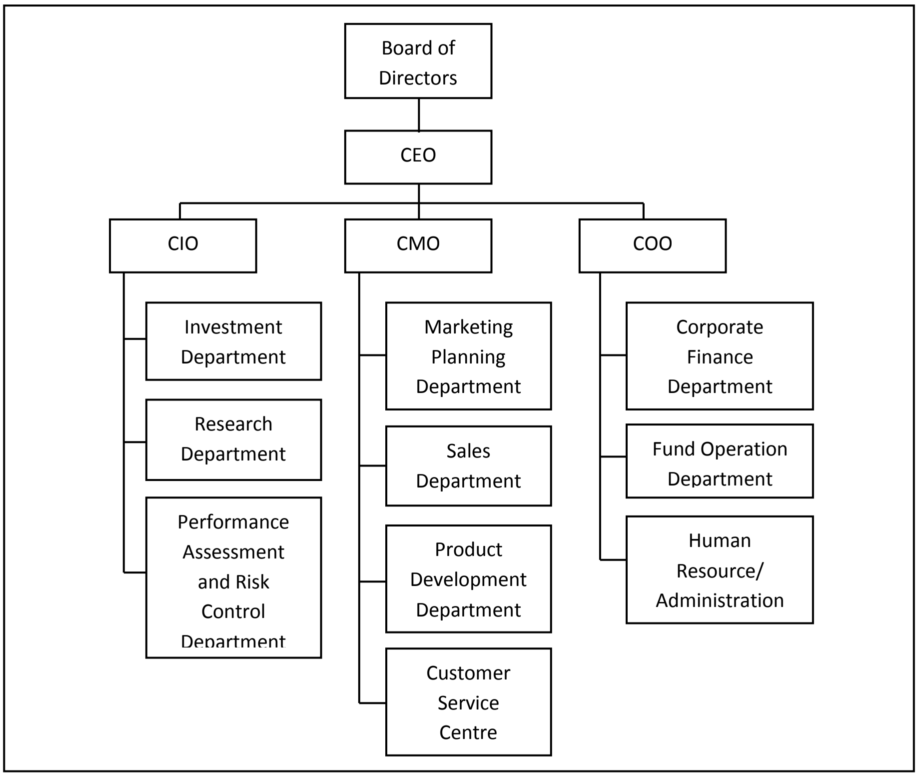


Figure 7.6: Typical CIO Organisational Structure
Source: Saldanha & Krishnan, 2011

There are 2 factors that have reached level 3 of the preliminary maturity model. These are management style and staff involvement.

- Alpha is expected to practise a delegating management style in the near future, where authority and power will be passed to the sub-unit [*Management Style: Level 4*], such as the Administration and Management Unit under the IT Department, whom will be responsible to formulate the *IT business plan as* stated in the latest '*Five Years Strategic Planning*'. Formulating a comprehensive business plan is necessary to achieve Alpha's target. The business plan should be realistic, specific, flexible, and clearly define responsibilities for implementation (Mullins and Komisar, 2010). It shall include tasks, datelines, forecasts, budgets and should be measureable (Bryson *et. al.*, 2009).
- User involvement, falls at level 3 of the preliminary maturity model. Full involvement from user started from the initiation phase until the implementation

was expected, as the IT Department highlighted this matter in the '*IT Department Annual Report'* [*User Involvement: Level 4*]. Alpha has no plans to set up a permanent steering committee [*User Involvement: Level 5*]. A highly integrated strategic approach is recommended to ensure the success of users' involvement in the process (Harris and Weistroffer, 2009). A complete strategy or guideline should be prepared with a clear allocation of responsibilities and relations between other roles (Harris and Weistroffer, 2009). According to Henfridsson and Lindgren (2010), other critical areas that should be considered to ensure the success of user involvement include the selection of user representative, support from other user from every level in the organisation and users' training.

Overall, this case study has validated six (6) out of the seven (7) factors, except for the user involvement factor. This factor was only validated up to level 4, since Alpha was satisfied with their targeted level (User involvement: Level 4), where they believe it will benefit the organisation in terms of costs. Forming a permanent steering committee as described in level 5 of the preliminary maturity model are not necessary for Alpha since IT/IS is not their major business. Another factor that needs to be highlighted here is the management style. Eventhough Alpha only targeted level 4 for this factor, the whole level of this factor has been validated since the organisation had reached level 5 for this factor before. Based on their experience, laissez-faire management style which was described in the level 5 of this factor is not suitable. Alpha's previous achievement and their e-readiness gaps were illustrated in Figure 7.7. The majority of the factors are currently one level behind their targeted level. Based on Alphas' future planning, it is not impossible to achieve their targeted level as a comprehensive five years strategic plan is already in place. Therefore, equal attention should be given to all factors in achieving their targeted e-readiness level. The usage of the preliminary model is proven to be a comprehensive evaluation tool to assist Alpha in identifying their current e-readiness level and their e-readiness gap. The identified e-readiness gap indirectly will inspire Alpha to find solution to fill it. Alpha also can prioritize the sequence of activities for further improvement in achieving their targeted level.

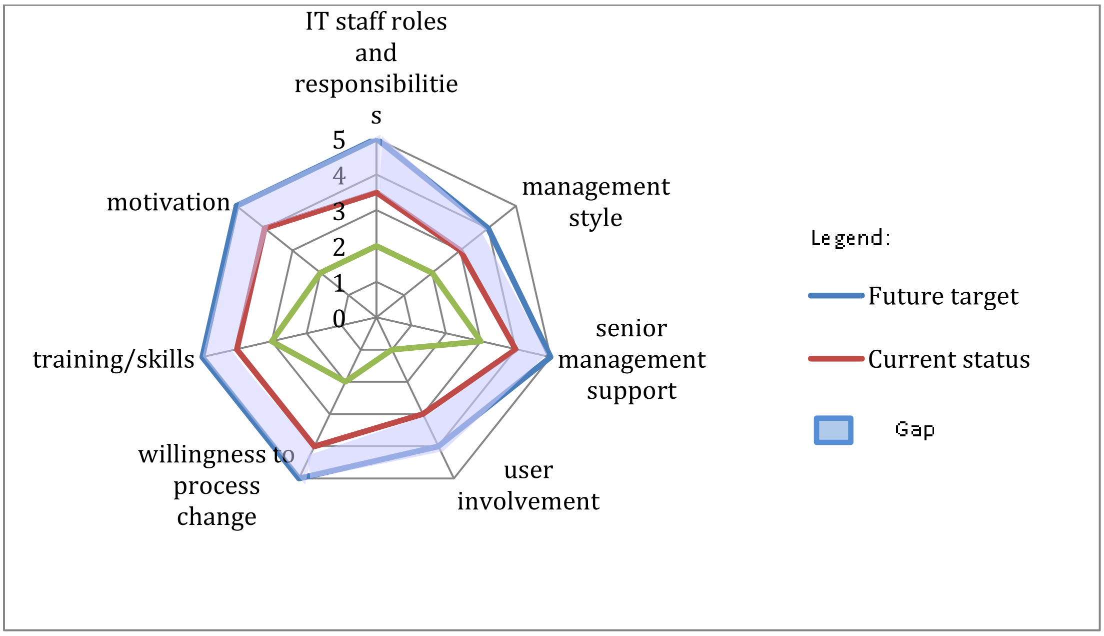


Figure 7.7: Organisation Alpha e-readiness levels and gaps

7.3 Organisation Beta's case study

7.3.1 Organisation background

Organisation Beta was established in 1976 and has four (4) main offices situated in Kuala Lumpur, Penang, Johor Bahru and Kota Kinabalu. As an established local Quantity Surveying firm in Malaysia, they were involved in many construction projects and had been practising Value and Risk Management, Cost, Time and Quality Management and Asset Management of capital projects. Beta has approximately 200 staff at the headquarters level. Beta is separated into five (5) departments - information technology department, project management department, quality assurance department, operations departments and account and human resource departments. Beta's organisational chart is illustrated in Figure 7.8.

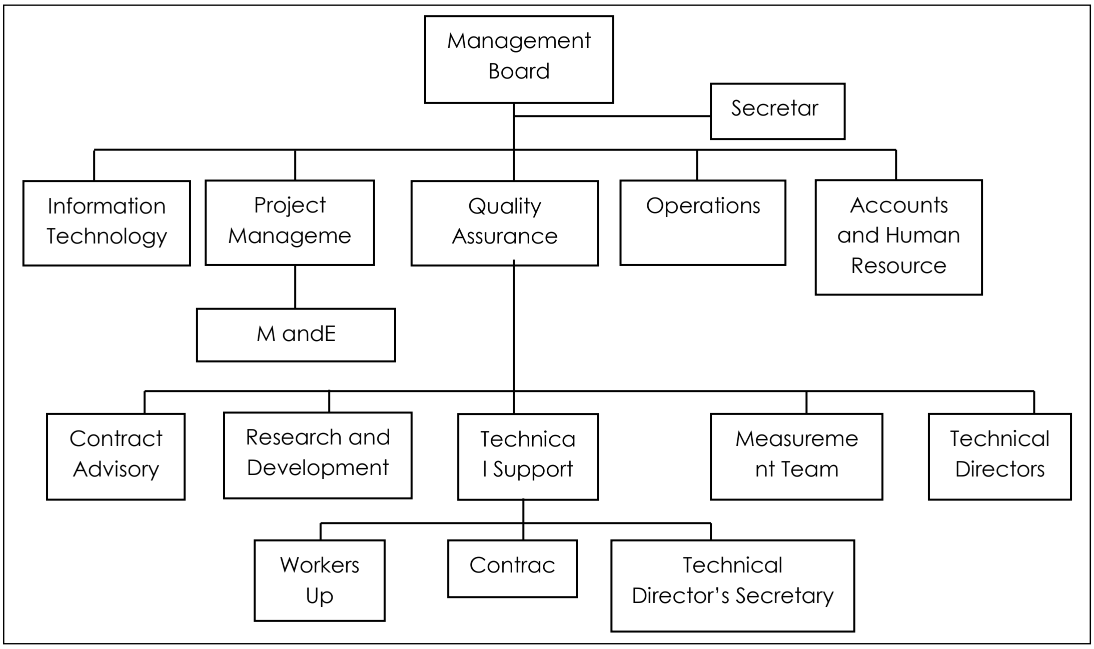


Figure 7.8: Organisational chart of Beta

7.3.2 History of system adoption

Beta started to experience problems in controlling project information as they were involved in many types of projects from infrastructure work to industrial, residential and others. Security of information also became a major issue where staff from any seniority level can view, edit or delete information. This scenario led Beta to find solutions with the help of technology, with the main aim of being able to control, keep track and provide security of project information.

Beta's IT Department was responsible in finding possible solutions to the problems faced. In 2000, the IT Department proposed to the senior management to develop system W, an enterprise collaboration system. The first version of system W was launched in 2001. There are 20 modules in system W - memo, calendar, staff profile, resource scheduler, task manager, time sheet, claims, news, over time, project email, wiki's, knowledge base and others (refer Figure 7.9).

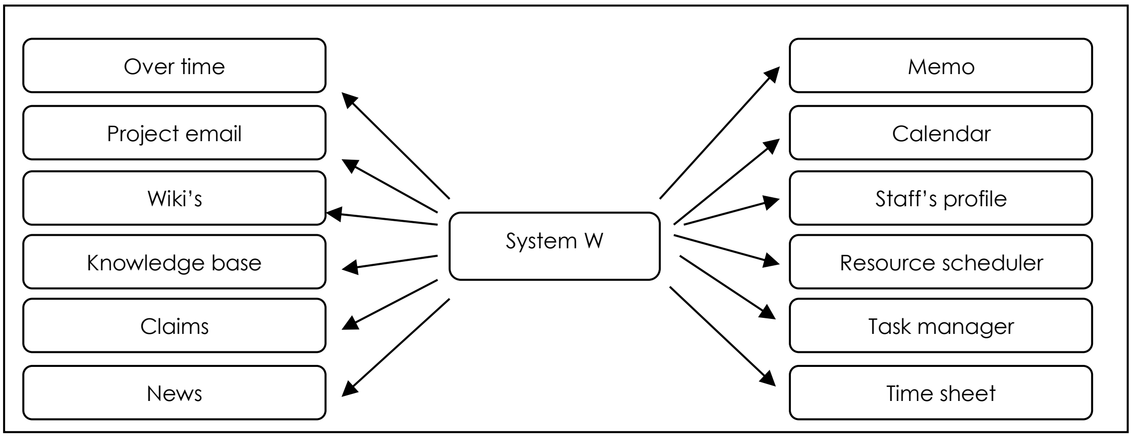


Figure 7.9: Some of the modules in System W

System W has managed to solve many problems faced by Beta, but the first version of the system had various downfalls - the system is slow and limited to 200 staff only. The proposal to improve the system was made by staff and supported by the management in 2004. However, it was only in 2006 that the second version of system W was fully launched in the organisation.

The main difference between the first version and the second version would be in terms of its written language. The second version of system W (W.2) was written in Java, while the first version (W.1) was written in ColdFusion Markup Language. The database was also changed from MS SQL to Post-GRESQL (open source), which helped to optimise performance with its ability to store advanced database features, like store procedures in many different languages and different transaction isolation levels.

In 2007, another customisation was made to the system W. 2 due to the limited database fields that the system has. The customisation was proposed by the staff and agreed by the management to optimise the performance. Customisations made by adding more database fields to key in relevant information about the project, which was unable to be saved in the system before. Furthermore, customisation made for system W.2 also allowed plug and play (PnP) interfaces. This customisation was suggested by the IT Department to give the advantage of mobility to staff. Hot docking system that supported PnP enabled staff to remove a portable system while it is running and bring the system in the docking station without having to turn off the system. According to Beta’s IT Manager, it also saved costs in terms of technical support results from the installation and configuration problems as the operations become easier and automatic.

The latest customisation was made in 2012, with the addition of a workflow engine for every module. This is to facilitate the flow of information, tasks and events. This engine also allows verification (stop and check process) of the current status of every work process, to be able to determine the authority of staff and evaluate the works that have been done. If any error is flagged up, notifications will be sent to staff and action will be taken accordingly. This was again proposed by the staff and supported by senior management. System W.2 has been used until today. The timeline development of system W is illustrated in Figure 7.10.

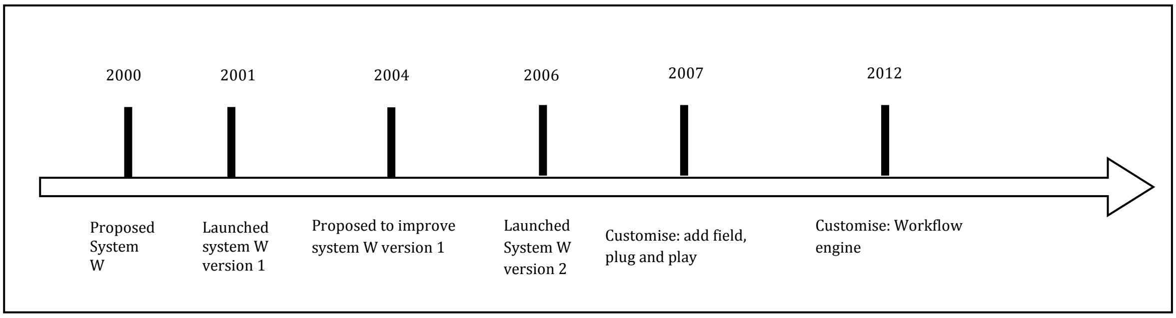


Figure 7.10: Development timeline of System W

7.3.3 Analysis and discussion

1) <u>IT staff roles and responsibilities</u>

   a) Organisation's previous achievement

      - In the early years of the IT Department, their roles and responsibilities leaned more towards technical support, such as software installation and simple software maintenance *[Level 2: Minimal Responsibilities]*. Beta also used *off-the-shelf* IT/IS application such as MS Office.
      - Few years after the establishment of the IT Department, a *'System Maintenance Work Structure'* was developed - IT staff were responsible to maintain all existing systems in Beta. On top of that, the IT staff also needed to find solution for data security in Beta, but *off-the-shelf* systems do not offer data access security, which was the main issue for Beta.
      - The responsibilities of IT staff described above shows that Beta was previously in level 3, where IT staff were responsible to maintain and handle all IT/IS related activities in the organisation.

   b) Organisation's current status

      - System W was developed by the IT Department as they have the Software Development Team (SDT) (refer to Figure 7.11). Among the responsibilities of the SDT includes designing system W, programming, installation, data migration, configuration, integration, customisation and others.
      - During the post-development of system W, customisations were made by the SDT to enhance the system. For example, SDT changed the database in version 1 from MS SQL to Post-GRESQL in version 2.

- Apart from the technical responsibility, IT staff were also involved in setting up the '*IT Strategic Development Plan'*. For this purpose, a group of representatives from the IT staff were involved in the meeting, led by the IT manager. The strategic plan was outlined for three (3) to five (5) years time frame.
- With the implementation of system W, the roles and responsibilities of the IT staff had increased. They were not only responsible to develop a system, but also involved in managing IT/IS within the organisation. This shows that the roles and responsibilities of IT staff in Beta is currently at level 4.

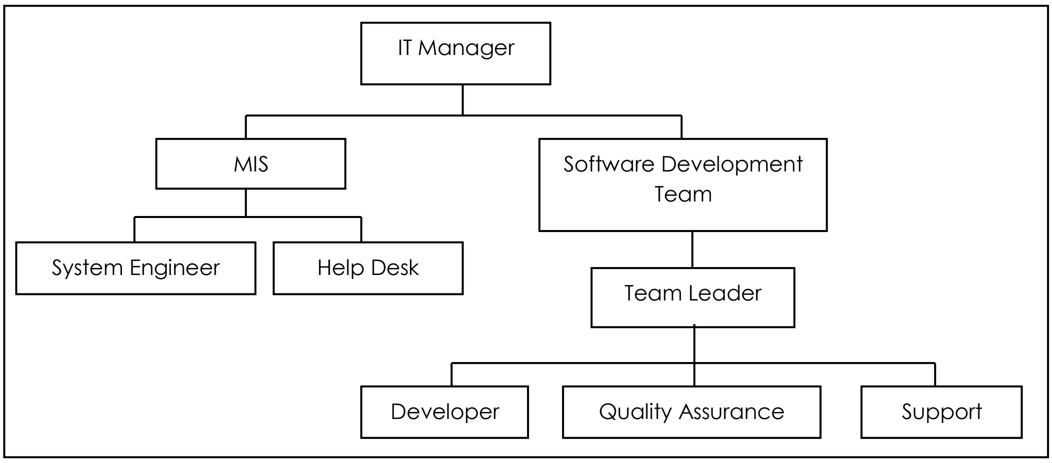


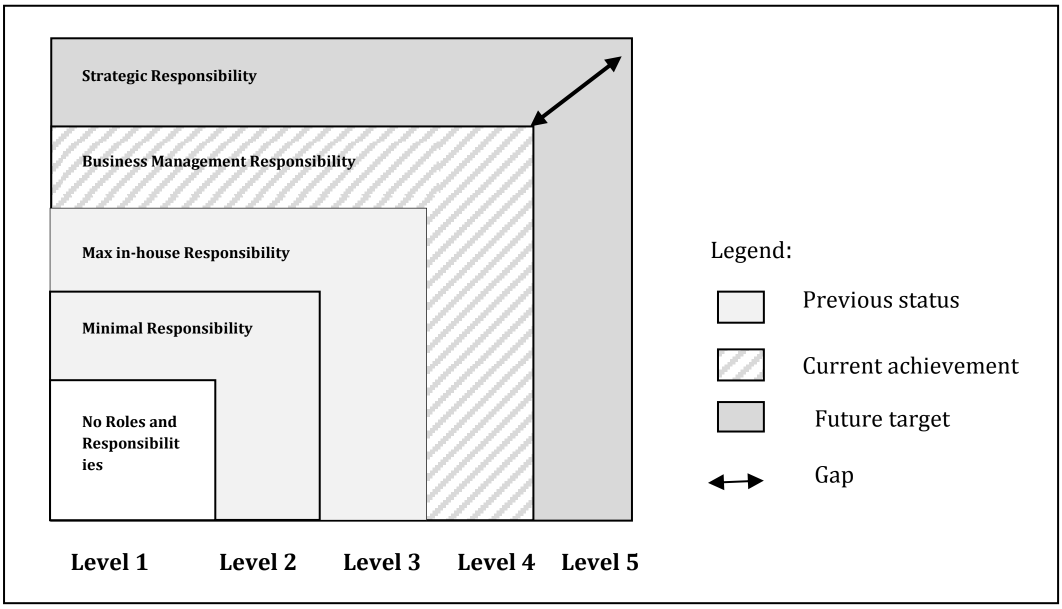
Figure 7.11: IT Department in Beta

c) Organisation's future planning

- According to Beta's '*Strategic Plan 2012-2015'*, the responsibilities of IT staff had been extended, with the position of aligning the IT/IS and business strategy. Beta is planning to develop IT strategic maps to measure and manage performance of the organisation against the strategic objectives.

- Beta is moving towards the highest maturity level, where they are putting IT/IS as their strategic direction in the organisation *[Level 5: Strategic Responsibilities]*.

The analysis of Beta's status for IT staff roles and responsibilities is as follows:



2) <u>Management style</u>

a) Organisation's previous achievement

- According to Beta's IT Manager, every decision made by the IT Department was required to get documented approval from senior management (this includes e-mail correspondences). This management style was practiced due to problems faced by Beta, where staff mistakenly sent out information to the third parties.
- The above description shows that previously Beta practiced paternalistic management style, where senior management has full control with only little tolerance and flexibility *[Level 2: Paternalistic]*.

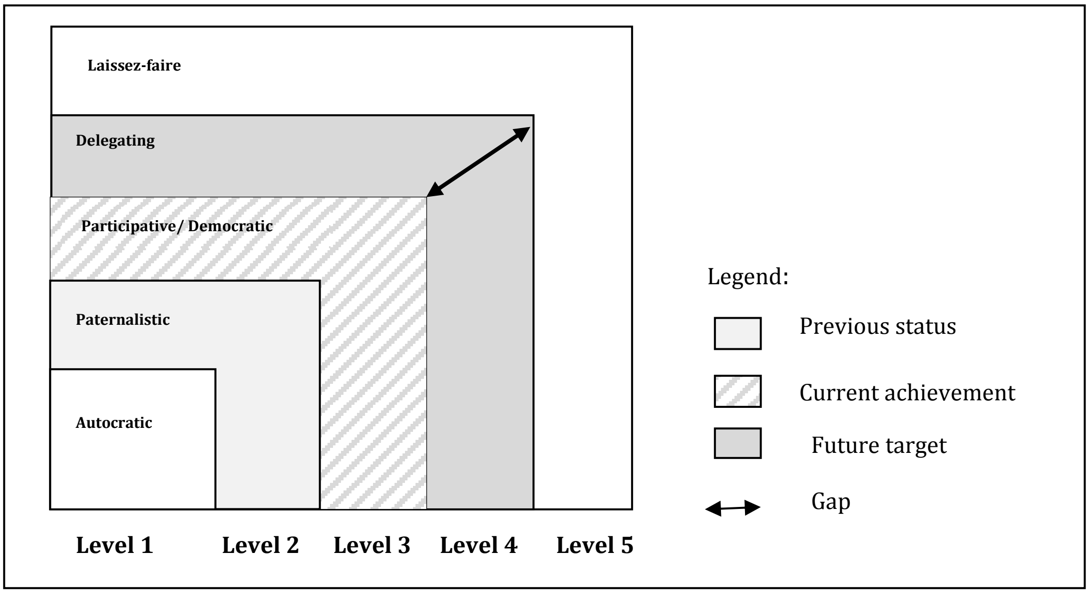
b) Organisation’s current status

- With the implementation of system W, any issues and problems concerning the system are discussed during the monthly meeting. For example, the customisation to add the workflow engine in 2012 was made based on staff’s proposal during the monthly meeting. Senior management then supported the proposal as the customisation will facilitate the flow of information, tasks and events.
- Currently, it is evident that Beta practises democratic management style where feedback and information from staff are welcomed *[Level 3: Democratic]*.

c) Organisation’s future planning

- Based on the draft of Beta’s ‘*Strategic Plan 2012-2015’*, a new sub-unit to the IT Department, the Management IT Strategy Unit will be formed with the responsibility to prepare Beta’s IT strategy.
- This indicated that the delegating management style will be practiced in the future, where more authority and power will be passed down to the lower level of management *[Level 4: Delegating]*.

The analysis of Beta's status for management styles is as follows:



3) <u>Senior management support</u>

a) Organisation's previous achievement

- Prior to the implementation of system W, only sufficient resources were allocated for IT/IS investment. This is reflected with the establishment of the IT Department. Without the resources, it is impossible for Beta to establish the IT Department *[Level 2: Resources Support]*.
- Senior management was well informed about the current status or issues in relation to IT/IS in the organisation. The security issues that Beta faced in late 1999 made the senior management urge the IT Department to find solutions to the problems. A weekly meeting was scheduled between the IT Department and the senior management to discuss about the possible solutions.
- The above description shows that the senior management showed their support by frequently interacting with the IT Department in the past *[Level 3: Frequent Interaction]*.

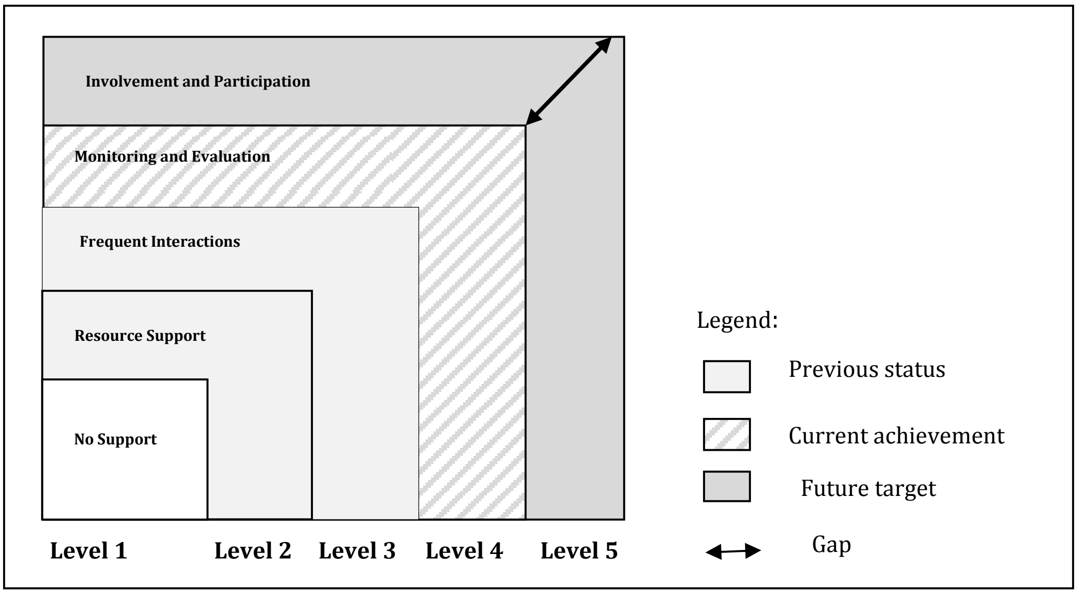
b) Organisation’s current status

- With the development of system W, the senior management actively monitor and evaluate the system using a specific plan known as ‘*The Monitoring and Evaluation (M&E) System Plan’*. Among the activities involved in the monitoring process are continuous tracking of activities and reviewing the flow and services provided by system W. The evaluation process looked at the performance of system W against its goal. There were 2 types of evaluations; formative evaluation and summative evaluation. Formative evaluation is carried out during the development of the system to find out how the application of system W will meets the target objectives. Summative evaluation, in contrast, is performed to identify the effectiveness of system W and whether its application had met the intended objectives.
- This shows that this factor is currently at level 4, where the senior management actively monitor and evaluate the system W *[Level 4: Monitoring and Evaluation]*.

c) Organisation’s future planning

- Based on the Beta’s draft ‘*Strategic Plan 2012-2015’*, a permanent steering committee will be formed in the future where the senior management will lead the steering committee.
- Organisation Beta is expected to move towards level 5 where the senior management will be directly involved with IT/IS related activities.

The analysis of Beta’s status for senior management support is as follows:



4) <u>User involvement</u>

a) Organisation’s previous achievement

- Prior to the implementation of system W, only MS Office was used. The decision to use MS Office was made by the management without consulting with users.
- This indicates that Beta was in level 1 in the past, where users were not involved at all in IT/IS decision-making.

b) Organisation’s current status

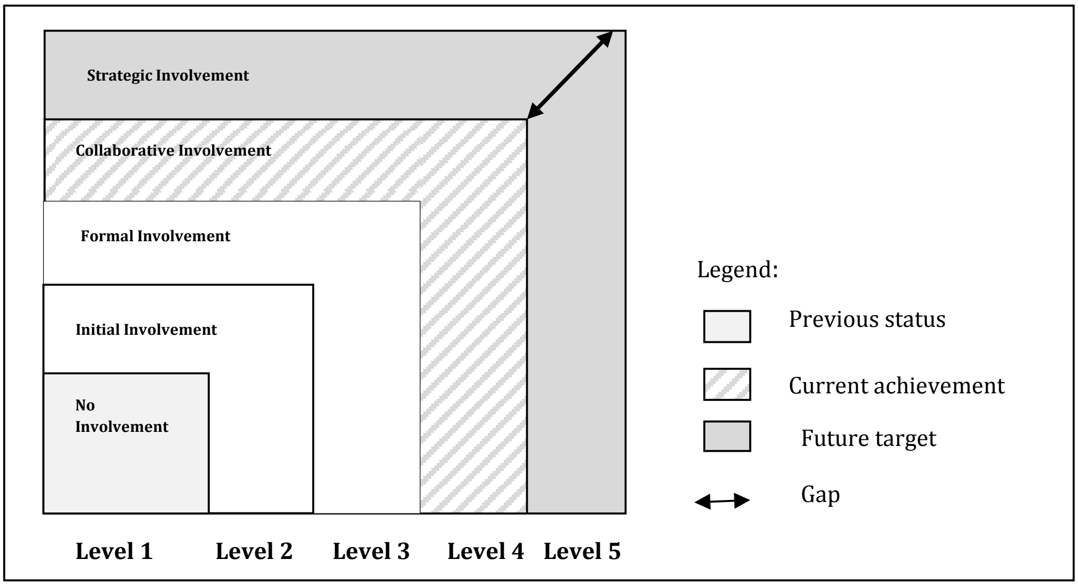
- During the development of system W, users were required to complete feedback forms for every phase of system development that they were involved in. The surveys became the guideline for the technical team to produce a system that meets users’ expectation. User were involved in feasibility study, requirement analysis, design, development and also prototype testing.

- Users were not involved in the decision-making process but they were allowed to make suggestions. The final decision came from the senior management.
- In developing system W, it is evident that users were fully involved with the system development and continuously collaborated with the IT Department. Beta has been developing the be-spoke systems in more than 10 years, where they have already realised and recognized the importance of user involvement through their experience in other systems that they have developed. As a result, they have achieved level 4 of the preliminary maturity model at the early stage of system W's development.

c) Organisation's future planning

- Beta is planning to form a permanent steering committee, which will be responsible to review current and future technologies and to identify opportunities in increasing efficiency of the system. This plan is already stated in their '*IT Strategic Development Plan' [Level 5: Strategic Involvement]*.

The analysis of Beta's status for user involvement is as follows:



5) <u>Willingness to Process Change</u>

a) Organisation's previous achievement

- Previously, Beta used MS Office to handle all IT/IS activities in the organisation.
- This shows that the organisation was limited to the basic operation business process as described in level 2.

b) Organisation's current status

- The first application of system W is limited for projects that have high priority. During that time, only projects valued at RM200 million or more were managed using system W *[Level 3: Acceptance]*. The application of the system helped staff to easily retrieve and store documents such as 'Practice and Quantity Manuals', 'Time Sheet', 'Job Costing' and others.
- According to the IT Manager, system W was used for monitoring and controlling process in year 2008. Annual budgeting and inventory

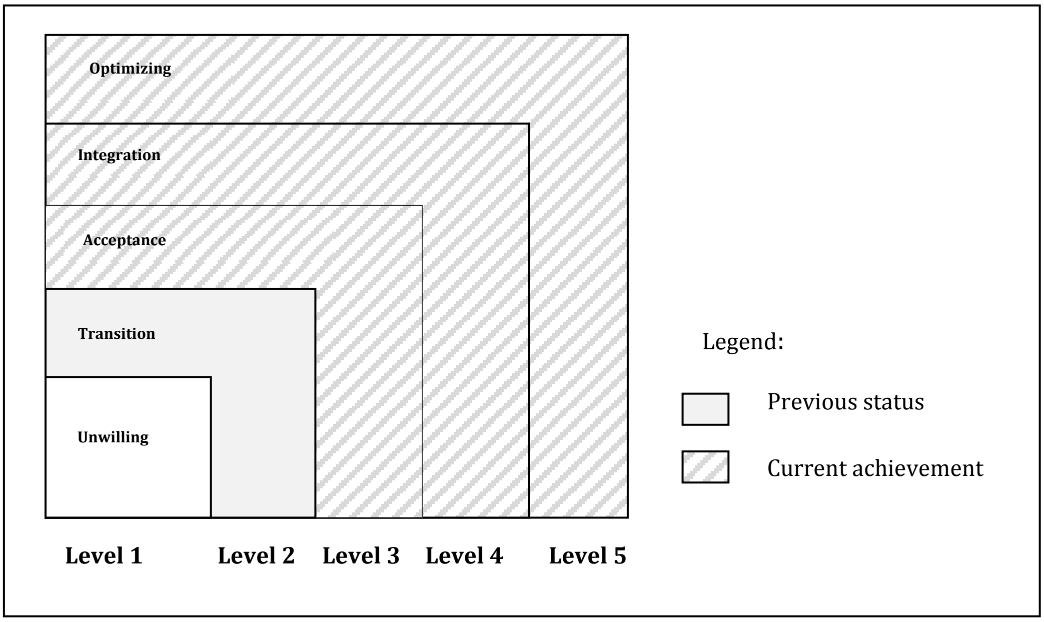
control analysis were among the usage of system W by that time. *[Level 4: Integration]*.

- The senior management uses System W for forecasting and planning activities. The system has an exclusive authorisation level that only allows the senior management and authorised personnel to edit the organisations' operational development plan, budget forecasting, profitability plans and a manpower planning. Other staff can only view the information.
- This shows that Beta has achieved level 5, where system W is used for planning and forecasting *[Level 5: Optimizing]*.
- Full support from senior management is among the factors that contributed to the high maturity level of Beta.
- Beta has emphasized the application of IT/IS since their establishment.

c) Organisation's future planning

- Based on Beta's '*Strategic Plan 2012-2015'*, mobile technology will be added to their work process.

The analysis of Beta’s status for willingness to process change is as follows:



6) <u>Training/skills</u>

a) Organisation’s previous achievement

- According to the IT Manager, training was based on individual efforts as majority of staff have the basic skills on how to use MS Office *[Level 1: No Training]*.
- Basic training on MS Office was given to staff only upon request; and most of the requests were from new staff *[Level 2: Basic Training]*.

b) Organisation’s current status

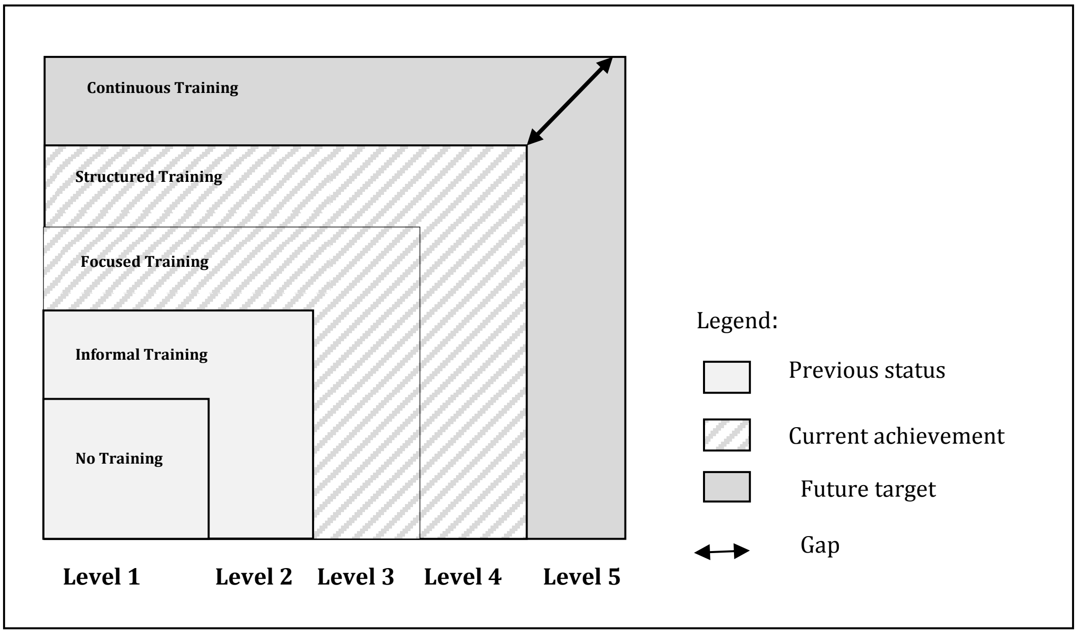
- Training for specific skills were given to the staff by the IT Department. For example, training for the integration of CAD Measurement and system W was given when this new feature was introduced *[Level 3: Focused Training]*.
- ‘*The Training and Development Programme’* in Beta was designed to benefit the staff and the organisation. Training by the IT Department was

conducted based on the planned annual schedule. Staff were also encouraged to create a personal development plan based on their training needs. The senior management will then provide the necessary resources and support to realize these plans. This scenario demonstrated that on-the-job training is given to staff in Beta *[Level 4: Structured Training]*.

c) Organisation's future planning

- According to Beta's '*Training and Development Programme',* they are planning to ensure that staff attend at least two (2) professional training programmes or the continuing professional development (CPD) courses annually *(level 5).* This requirement will come into force in 2013. According to Beta's IT Manager, these training programmes are anticipated to expose staff to the current knowledge and skills, which could help them to become more productive and would help staff to develop and perform to their full potential. He furthermore adds that staff will then have a job satisfaction that would increase organisational productivity and enhance their career opportunities.
- On top of that, Beta also conducts training programmes for third parties, especially for the contractors who have projects with Beta. The contractors are trained on how to use system W (since this system was fully developed by Beta).

The analysis of Beta’s status for training/skills is as follows:



7) <u>Motivation</u>

a) Organisation’s previous achievement

- Prior to the implementation of system W, no specific motivation method was used as Beta only used MS Office *[Level 1: Top Down Approach]*.

b) Organisation’s current status

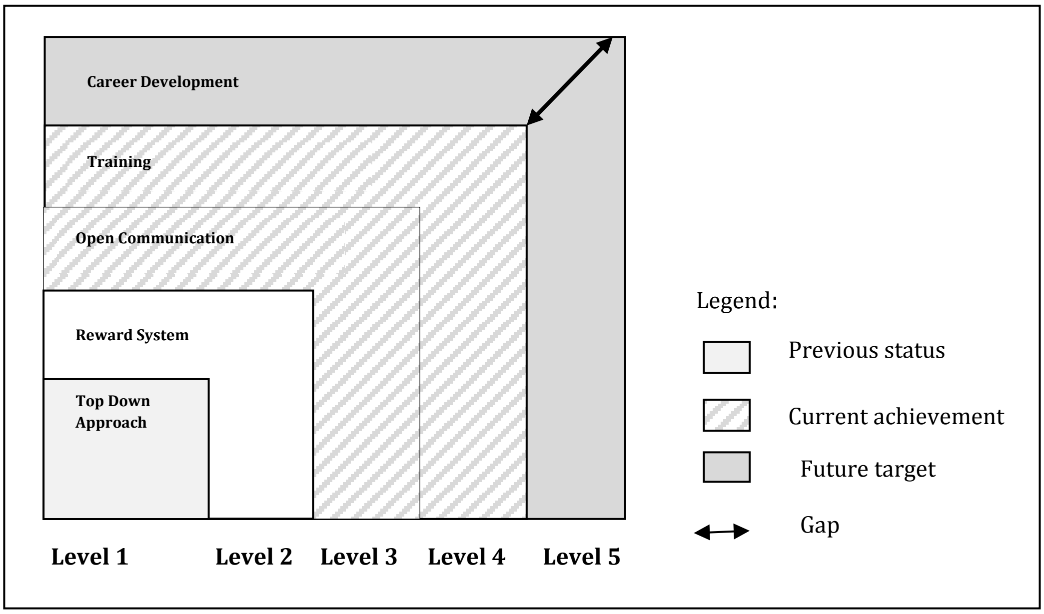
- Beta’s monthly meeting was used as a platform to communicate with the staff *[Level 3: Open communication]*. Staff were encouraged to raise any issues relating to system W implementation, technical problem, psychological issues and others. Any problems mentioned during this meeting are discussed and the senior management and the middle management will try to find solutions for the problems. The limited number of staff became the main issue in the first version of system W, which was discussed in the monthly meeting. According to Beta’s IT Manager, this issue was discussed in detail as it may jeopardise the organisation. Changes to the system were suggested by the staff in early 2004 to improve system W. The IT Department in the same year then proposed the solutions to the problems.

- Beta has a yearly '*Training and Development Programme'* that is designed to improve staff skills and capabilities. According to Beta's IT Manager, this training programme helped to increase staff confidence level, thus they are more comfortable in using system W.
- The above scenario shows that Beta falls at level 4 of the preliminary maturity model.

c) Organisation's future planning

- Based on Beta's '*Strategic Plan 2012-2015'* system W will be used as part of the staff KPI, which will affect their performance appraisal evaluation. There will be ways that allow the senior management to monitor whether their staff are using system W to perform their work *[Level 5: Career Development]*. Staff will then be rewarded with bonuses or promotion depending on their performance.

The analysis of Beta's status for motivation is as follows:



7.3.4 Summary

- Only MS Office was used to run the routine business process before the application of system W. Security of the information became a major concern when everyone from the organisation can view and edit sensitive information. The new system must have the ability to control, keep track and secure the information. System W was proposed and developed by the IT Department to overcome the situation. The first version of system W was launched in 2001 with 20 modules. Several customisations and upgrading of the system were made until 2012 in creating a fully functional system.
- Beta has reached the highest maturity level for the willingness to process change. The introduction of system W since 2001 demonstrated matured e-readiness levels for this factor as the organisation is currently targeting mobile technology as their future plan. Technology mobility is not described in any level of the preliminary maturity model. The 'mobile technology' is expected to provide a new platform for applications that could connect construction team members together no matter where they are. The mobile

technology exists with the introduction of smart phone and tablet computers, which has changed the way people access and share information. Furthermore, the usage of this technology provides opportunities for innovation, agility and flexibility in the workplace (Digital Services Advisory Group 2012). Selecting the right technology at the right time will increase Beta's productivity, save costs and indirectly increase staff morale (SAGE 2012). Reviewing the staffs' roles and responsibilities are important before Beta decides to adopt mobile technology. Adopting this technology will result in a more flexible working schedule, but will require support and involvement from the Human Resource Department (Brewer and Dourish 2008). Effective strategy for mobile technology should be prepared which shall include creating awareness among the staff, training and others.

- There are four (4) factors that have reached level 4 of the preliminary maturity model; IT staff roles and responsibilities, senior management support, user involvement and training/skills.
- Beta targeted the highest maturity level for IT staff roles and responsibility. They are moving forward in making IT/IS the organisations' strategic enabler [*IT Staff Roles and Responsibilities: Level 5*]. The roles and responsibilities of the IT staff will increase - aligning the IT/IS strategy with the business strategy will become part of their responsibilities. For this, IT strategy maps or framework should be prepared and ensure that it is on track with the strategic objectives. Measuring and managing IT/IS performance will become part of the process.
- Beta is moving towards the highest maturity level for the senior management support factor [*Senior Management Support: Level 5*]. Full involvement from the senior management is expected as the organisation has plans to

form a permanent steering committee to be led by them. This has been documented in Beta's '*Strategic Plan 2012-2015'*. According to Beta's IT Manager, the senior management leading the steering committee should be technically savvy and know how to leverage technologies in helping the organisation to move forward.

- Another factor that reached level 4 of the preliminary maturity model is user involvement. Achieving the highest maturity level for this factor is Beta's next target. This is documented in their '*IT Strategic Development Plan'*, where forming a permanent steering committee is one of their future plans *[User Involvement: Level 5]*. To form a permanent steering committee, it is recommended that Beta establishes some rules, expectations and guideline that will describe the type of the committee's participation, task, or activities that they will involved in, during the system development process (Prasad, Heales et al. 2010). A lot of benefits can be obtained by having a permanent steering committee, such as having a systematic monitoring and evaluation of IT/IS projects (NSW 2011). With the latest knowledge and skill that is contained in the committee, they are able to give a good recommendations and advice to senior management concerning any IT/IS related issues.
- Another factor that falls at level 4 of the preliminary maturity model is training/skills. According to Beta's '*Training and Development Programme',* staff will be required to attend at least two (2) professional training programme or the continuing professional development (CPD) courses every year starting 2013 [*Training/skills: Level 5*]. In making this compulsory, it is suggested that Beta makes CPD programme attendance as part of the staffs' KPIs. According to APEG (2011), attending the CPD

programme enables professionals to continuously upgrade their skills and knowledge.

- There are two (2) factors that are currently at level 3 of the preliminary maturity model - motivation and management style.
- To continuously motivate staff to use system W, Beta plans to make the system as part of the staff KPI as stated in their *'Strategic Plan 2012-2015'*. Their yearly performance appraisal evaluation will be affected if they do not use system W in their daily work. The senior management is advised to thoroughly discuss this matter with their staff before implementing it. Staff opinion regarding using the system W application as part of the KPI should be considered as it will affect their career development.
- Beta does not target the highest maturity level for the management style; they are only targeting level 4, which is the delegating management style *[Management Style: Level 5]*. This is already stated in Beta's '*Strategic Plan 2012-2015'.* Power and authority will be passed down to the lower level of management, which is reflected in their plan to form a Management IT Strategy Unit. This unit will be responsible to prepare Beta's IT strategy. According to Thornton (2008), to successfully apply the delegating management style, Beta is advised to delegate authority gradually. The level of complexity of the task delegated to the staff should increase gradually to avoid de-motivation if they failed to complete it.

Findings from this case study shows that IT/IS in Beta is matured by having a long track record of 36 years of incorporating IT/IS into the construction business process. Beta did not go through the first level of maturity for most factors as IT/IS was recognized as a business enabler since Beta was established. Training /skills is the only factor that experienced every level of maturity. Description for the Level 1 in the preliminary maturity model for IT staff roles and responsibilities, senior management support and willingness to process change were not validated as organisation Beta started off at level 2 as they already had an IT Department when the organisation was established.

For the management style, this factor was only validated from level 2 to level 4. Beta never practiced an autocratic management style as they believe this will de-motivate staff. Furthermore, this management style will create fear and a tense environment that may lead to a high staff turnover, which may hinder Beta's progress. At the moment, Beta is targeting the delegating management style as they believe that their staff are not experienced enough to accept the laissez-faire management style.

Beta did not experience level 2 and 3 of the preliminary maturity model for user involvement, as Beta has been incorporating IT/IS into their business process for more than 36 years and have experience in system development for more than 10 years. Their vast experience in this area has made them aware of the importance of involving users in the development of system W.

Beta has not introduced a reward system as described in level 2 of the motivation factor. This might be reflected by staff whom do not have problems in incorporating IT in their daily works.

The e-readiness gaps for Beta are illustrated in Figure 7.12. Majority of the factors are at the high level of the maturity (level 4) and is currently only one (1) level behind their future target. Priority should be given to the management style and motivation as these factors are behind the other factors (level 3). Beta is expected to achieve their targeted level without major problems since they have a conclusive 3 years strategic plan, known as '*Strategic Plan 2012-2015'*.

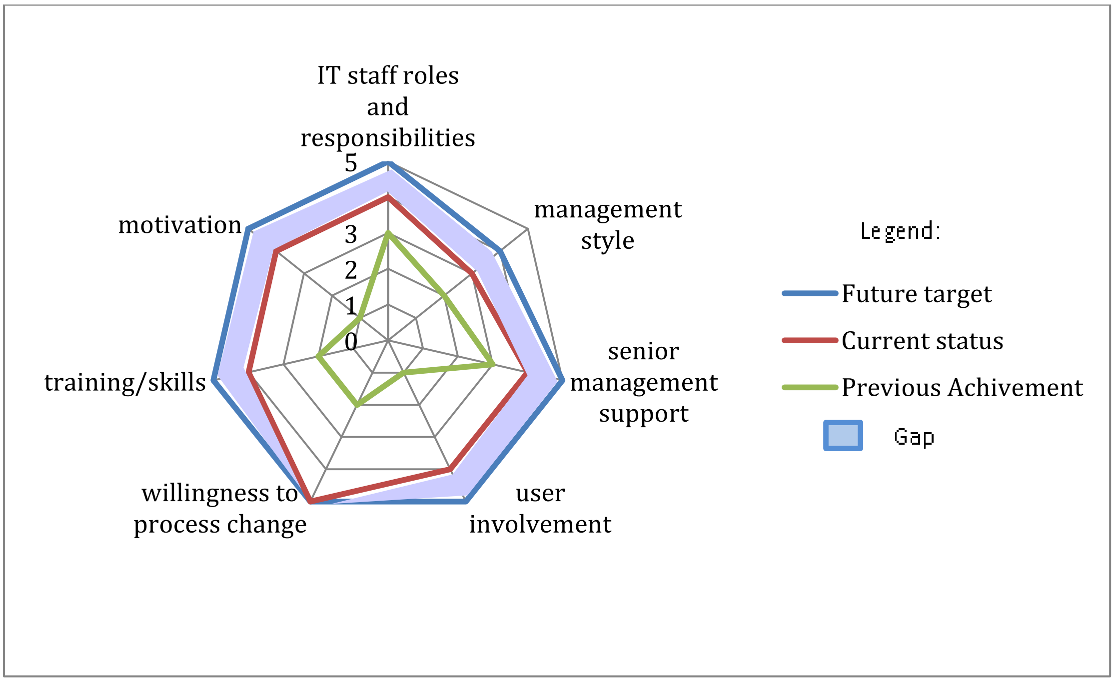


Figure 7.12: Organisation Beta e-readiness levels and gaps.

Identifying the e-readiness gap becomes Beta's main concern in strategising their next step in achieving their target. The preliminary maturity model is proven to be helpful in identifying Beta's strength, areas of improvement and action plan for the future. However, further case study is needed in validating the preliminary maturity model since organisation Beta did not experience most of the lowest maturity level of the model.

7.4 Organisation Gamma’s case study

7.4.1 Organisation background

Organisation Gamma was incorporated in 1976 with the core business in areas of engineering and construction. The organisation was involved in many projects such as major transportation, infrastructure, buildings and facilities projects in highways, urban transit, rail, airport, stadium, hospitals, commercial buildings and residential development. Gamma also has a strong presence in India, Qatar, Saudi Arabia, UAE, Indonesia, Singapore and Brunei.

Gamma employs approximately 2300 staff and is separated into eight (8) departments - Finance Department, Human Resource and Administration, Health and Safety and ISO Department, Legal/Commercial Department, QA and Business Processes Department, Chief Operating Department, Infrastructure Maintenance and Facility Management Department, Toll Concession Department (refer to Figure 7.13)

7.4.2 History of system adoption

Gamma experienced problems in retrieving the incoming and outgoing projects documents due to the large number of projects they have. Therefore, they started to find systematic ways of recording the incoming and outgoing documents.

At the early establishment of Gamma, they record all the documents manually using a log book. During the early 1990’s, Gamma used Lotus 123 to help manage the documents. The popularity of MS Excel in early 1990’s made Gamma switch to use it in 1993. The use of MS Excel in the long run has caused problems due to difficulty of maintaining data accuracy and consistency as more information was added every day.

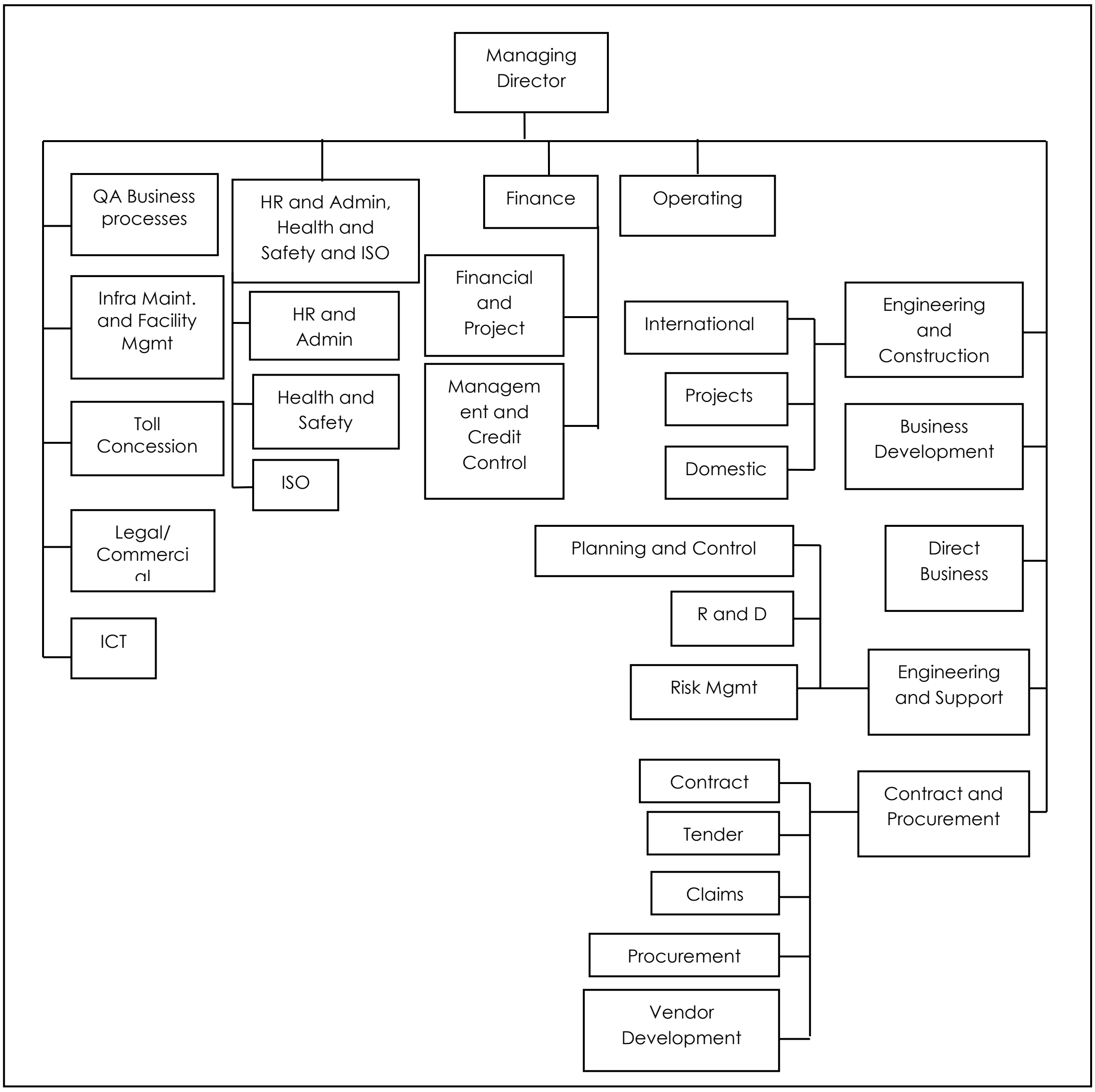


Figure 7.13: Organisation chart of Gamma

In addition, staff also experienced problems in retrieving information as there was no searching navigation. This limitation made Gamma opt for MS Access in 1997. The MS Access software is more robust than MS Excel, where a large volume of information can be maintained without any problem and information can also be retrieved easily (with MS Access). MS Access was used for data storage only, where all documents were properly recorded and stored in the database A copy of the documents were then duplicated and put in the ‘float file’. The ‘float file’ was firstly handed over to the managing director, followed by other staff whom were involved in that particular project. Major issues arose such as missing or misplaced ‘float file’ and delays (it may take up to five days before the float file reached the person who is responsible to take action). Lots of time and paper had been wasted through this system. In 2003, MS Access was customised by the IT Department to enable the attachment of PDF imaging to ease the retrieving of the documents. The customisation was proposed by the IT Department to resolve complaints from staff during that time. The MS Access software was used to manage data in Gamma until year 2007.

MS Access is a standalone system where its application is limited to the particular office only. Since Gamma had several offices and site offices, it became difficult for the management to monitor the incoming and outgoing documents from the other offices. Previously, Gamma needed to send a representative to collect or view the documents located at the branch offices and site offices when necessary. This wasted too much time and money. Full responsibility and authority were given to the IT Department to find another system that can defeat this limitation. As a result, the IT Department proposed the development of system X.

In 2007, System X was proposed by the IT Department and fully launched in 2008. System X is an Electronic Document Management System (EDMS), which was used to manage and record the incoming and outgoing documents in Gamma. This application enables easy tracking of all documents from a single system. Details and the attachments of the documents can be retrieved from the system from any branch office or the headquarters. The system was developed by the IT Department and was written using the dot net platform; and this development saved a lot of time and cost. No customisation was made to system X since its first usage in Gamma as the IT Department had done a detailed feasibility study before they developed system X. System X development is illustrated in Figure 7.9.

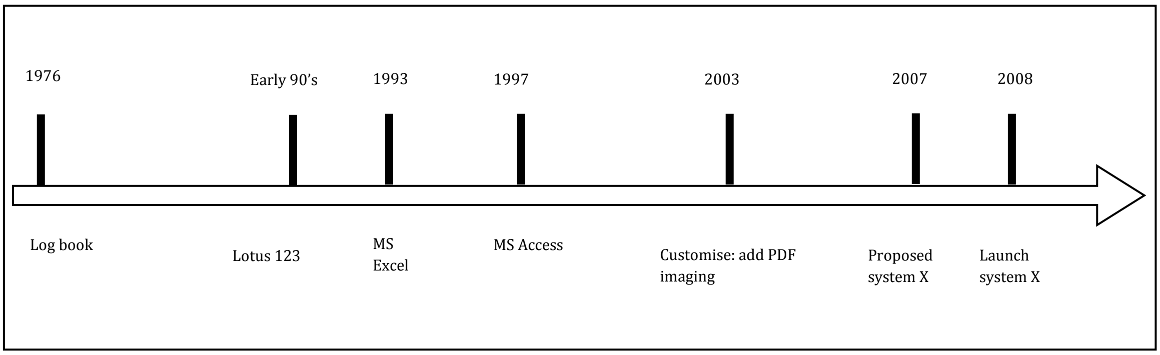


Figure 7.14: Development timeline of System X

7.4.3 Analysis and discussion

This section will analyse and discuss the interview findings of the people e-readiness model within Gamma. These factors will be discussed separately starting with identifying organisation Gamma's previous achievement, current status and future planning.

1) <u>IT staff roles and responsibilities</u>

   a) Organisation's previous achievement

      - During the early establishment of Gamma, the IT Department did not exist *[Level 1: No Roles and Responsibilities]*.
      - In early 1990's, the IT Department was formed to assist Gamma in IT/IS technical issues and was placed under the Financial and Corporate Planning Division. Majority of IT/IS works were also outsourced to vendors and the IT Department only assisted in giving technical advice and solve simple technical problems *[Level 2: Minimal Responsibilities]*.

- In 2003, in-house customisation of MS Access was made based on the advice and recommendation from the IT Department to enable the PDF imaging attachment and for easy retrieving of documents.
- IT staff were also responsible to give technical advice, such as proposing a new system to overcome the limitation of MS Access.
- Previously, the IT staff in Gamma was in level 3, where they were responsible to give technical advice, maintain and customize MS Access.

b) Organisation’s current status

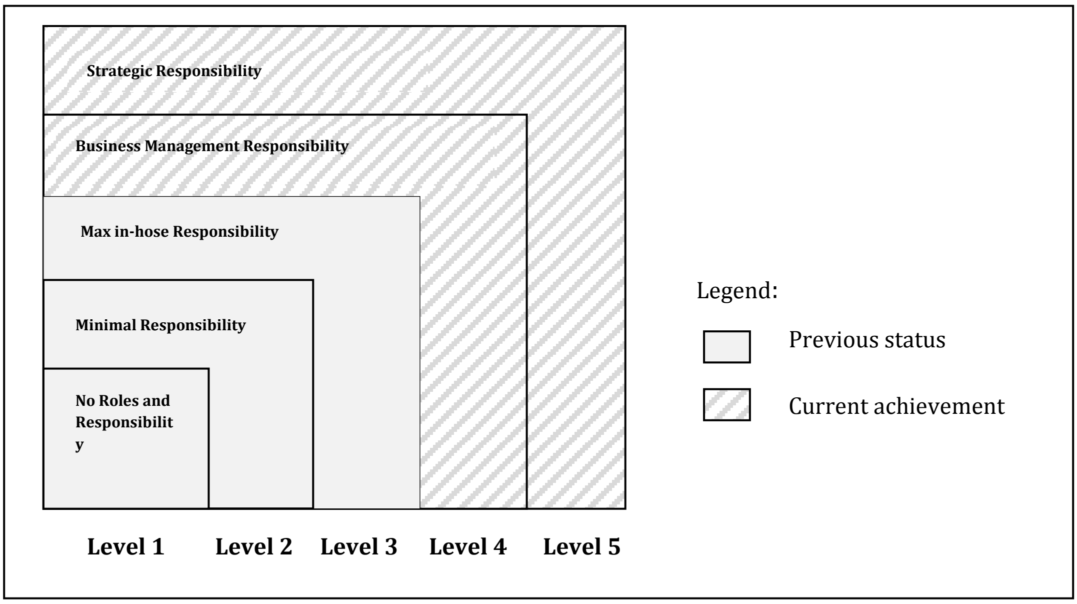
- System X has extended the responsibilities of IT staff in Gamma. Currently the IT staff are required to measure and manage system X’s performance against organisational objectives, which are measured through the organisation’s ‘*ICT Balance Scorecard’* and ‘*Return on Investment*’ (ROI). ‘*ICT Balance Scorecard’* is used to measure system X performance qualitatively, while ROI is use to measure IT/IS performance quantitatively.
- The IT Manager and the senior IT staff, representing the IT Department are also involved in creating Gamma’s vision, mission and value statement.
- Senior IT officers are involved in formulating ‘*The Annual IT Budget and Business Plan*’ to support the overall organisational strategies and programme.
- This indicates that roles and responsibilities of the IT staff are moving towards the management and strategic responsibility. However, the IT staff are not responsible to align the IT strategy and business strategies as

described in level 5, and therefore this factor is currently identified to be falls in between level 4 and level 5.

c) Organisation's future planning

- According to the Gamma's latest annual report, the '*Annual Report 2011*', IT will become the key driver of the organisation in the future. Therefore, aligning the organisation's business strategy with the IT strategy become the main agenda for the organisation.
- This shows that this factor will reach level 5 in the future.

The analysis of Gamma's status for IT staff roles and responsibilities are as follows:



2) <u>Management style</u>

a) Organisation's previous achievement

- When Gamma was first established, an autocratic management style was practiced. This type of management style only involves one-way communication, where senior management give instructions and the staff receives them *[Level 1: Autocratic]*. This management style was practiced only for the first 3 years as the organisation experienced high staff turnover.

- A softer approach was then introduced, where senior management still had control of everything, but starting to consider staffs' interest *[Level 2: Paternalistic]*. This was reflected when Gamma considered the staff's need when adopting MS Excel and MS Access; and funds were allocated for IT/IS investment in their '*Annual Budget'*. The funds were allocated for providing necessary resources and training to guide staff on how to use MS Access.
- '*Focus Group Discussion*' involving all levels of staff was conducted to give opportunity to staff to raise their views and suggestions in an open manner. During these discussions, the staff raised the issue of MS Access problems in retrieving documents. This issue was thoroughly discussed and resulted to the customisation of MS Access made in 2003 to enable the attachment of PDF imaging for easy retrieval of documents.
- This indicates that participative/democratic management was practised, where staffs' complaints, feedback and opinion were considered *[Level 3: Participative/Democratic]*.

b) Organisation's current status

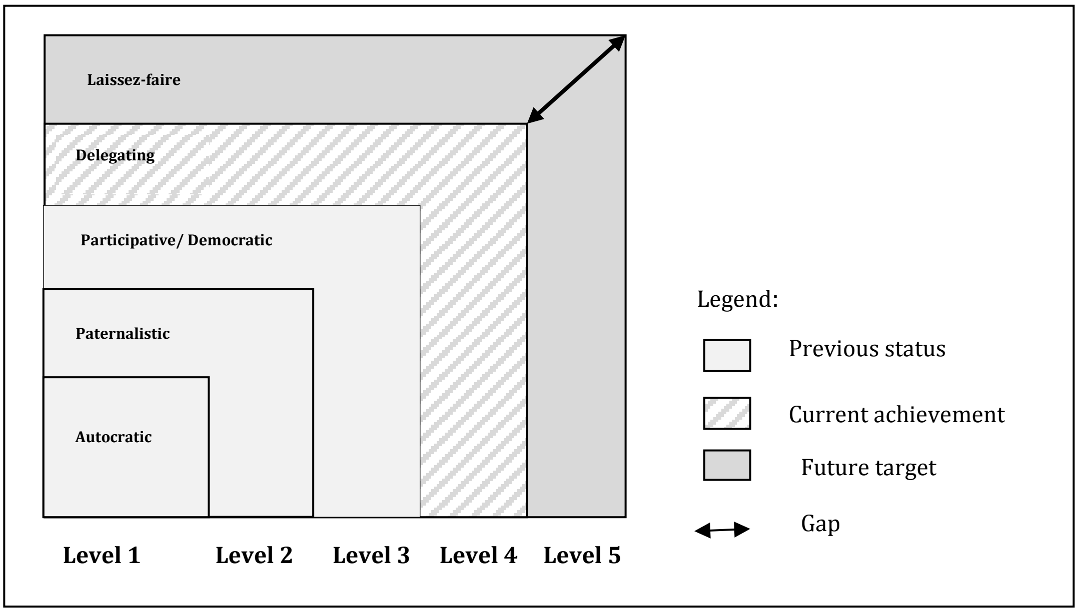
- In finding the solution for MS Access, the senior management gave full responsibility to the IT Department to either find an off-the-shelf system or to develop a new system. The IT Department proposed the development system X. The IT Department was given the authority to manage all matters and decision-making pertaining to system X, which included the system analysis, requirement definition, system design, development, testing and maintenance.

- Based on the description above, the delegating management style (*level 4*) was proven to be practised at this stage as the authority is given to the IT Department without interference from the senior management.

c) Organisation's future planning

- According to Gamma's latest 'Annual *IT Budget and Business Plan'*, the IT Department will be given full responsibility in making decisions concerning system X.
- This shows that laissez-faire management is expected to be practised (*level 5*).

The analysis of Gamma's status for management style is as follows:



3) <u>Senior management support</u>

a) Organisation’s previous achievement

- Before the IT Department was set-up, ad-hoc IT/IS investment was made *[Level 1: No Support]*.
- When the IT Department was established, specific funds were allocated for IT/IS investment as reported in their ‘*Annual Budget’ [Level 2: Resources Support]*.
- Prior to the implementation of system X, active support from the senior management can be seen when weekly meetings were held between the senior management and the IT Department to discuss IT/IS related matters. These discussions included current issues on IT/IS, training programme, IT staff planning, problems with IT/IS systems and others. Suggestion to find a replacement to the MS Access was raised by the senior management during this meeting.
- This shows that this factor was previously in level 3, where the senior management in organisation Gamma frequently interacted with the IT Department.

b) Organisation’s current status

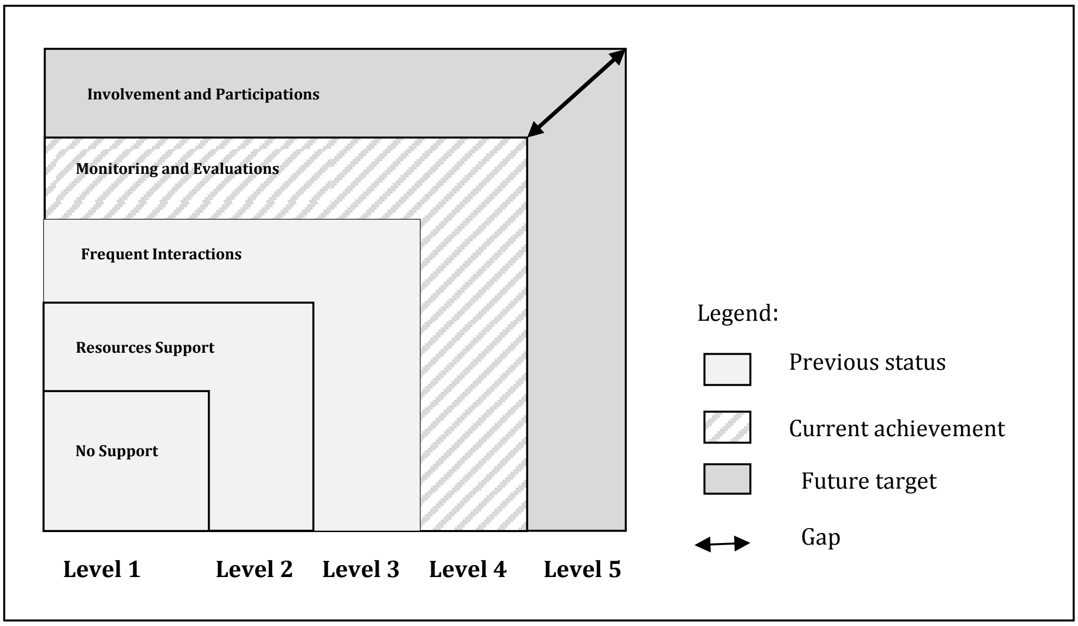
- With the implementation of system X, formal system monitoring and evaluation involved the senior management to ensure the targeted objectives were achieved; this process is known as the ‘*Information Technology Investment Management (ITIM) Standard*’. This standard helped the senior management to identify, control and evaluate investment needs of the system X across its lifecycle. This also helped to minimise risks, maximise return on investment and improve the system investment.

- The above demonstrated that this factor is identified to be in level 4, where senior management support the implementation of system X by involving in the monitoring and evaluation activities.

c) Organisation's future planning

- Direct involvement from senior management is expected as Gamma had planned to form a permanent steering committee, which will be led by the senior management as stated in Gamma's *'Annual IT Budget and Business Plan' [Level 5: Involvement and Participation]*.

The analysis of Gamma's status for the senior management support is as follows:



4) <u>User involvement</u>

a) Organisation's previous achievement

- Gamma has full control in deciding the type of system to be used, as this is reflected with the decision to use Lotus 123 without consultation with users *[Level 1: No Involvements]*.

- Before implementing system X, *off-the-shelf* systems such as MS Access were used. Before the selection was made, an ad-hoc user requirement analysis was made and involved discussion between users' representative and the IT Department. The requirements were then documented as a reference for the IT Department for system selection.
- This indicates that this factor was in level 2, where users were involved in an ad-hoc approach.

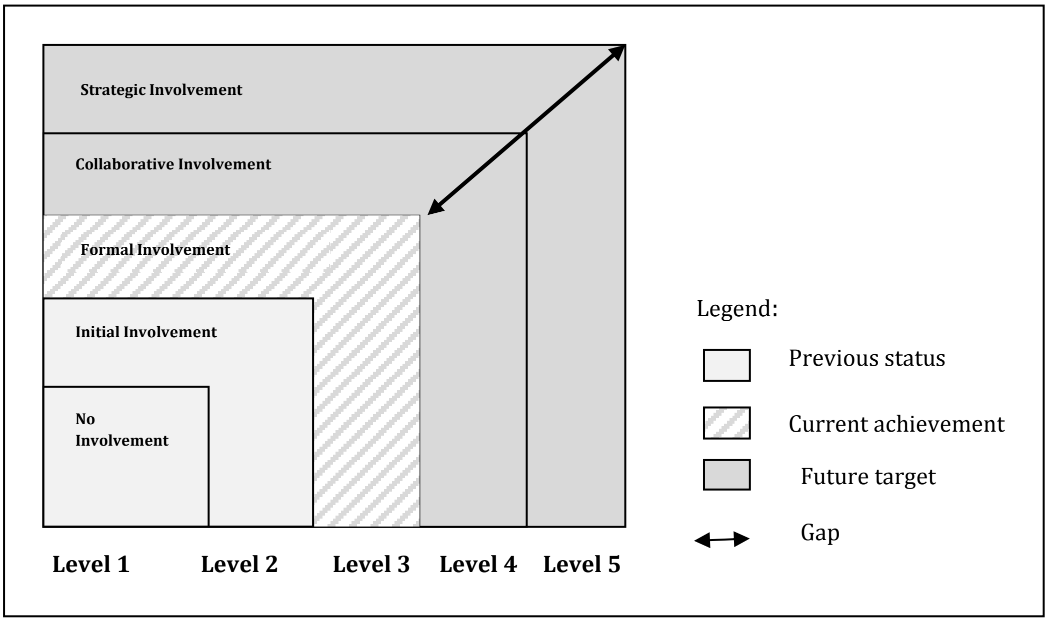
b) Organisation's current status

- The development of system X saw formal involvement from users through their involvement in the User Requirement Study (URS), Hosting and Infrastructure Assessment and User Acceptance Test, before system X was introduced in Gamma.
- The above description shows that users were involved in many phases of system development, which places this factor at level 3.

c) Organisation's future planning

- According to Gamma's IT Manager, the users will be fully involved with system developments in the near future, even before the organisation forms a permanent steering committee.
- A permanent steering committee for system development will be formed in the future, as stated in the Gamma's latest '*Annual IT Budget and Business Plan'*.
- This shows that Gamma is moving towards the highest maturity level (level 5).

The analysis of Gamma's status for the user involvement is as follows:



5) <u>Willingness to process change</u>

a) Organisation's previous achievement

- When Gamma was formed, no IT/IS application was used *[Level 1: Unwilling]*.
- Gamma then started to adopt Lotus 123 and MS Excel but only certain tasks were carried out using these application. For example, MS Excel was used by the Finance Department in payroll *[Level 2: Transition]*.
- According to Gamma's IT Manager, MS Access was used to record all project related information, such as Performance Guarantee Sum, List of Drawings, and Preliminaries Items *[Level 3: Acceptance]*. However, all documents such as drawing were kept manually in the '*float file*'.

b) Organisation's current status

- At present, system X has helped professional staff such as the engineers to complete their work effectively and efficiently. The system was able to manage applications files such as CAD, Word, Excel, PDF, images, audio, video and others in a more flexible manner - as it has the capability to add, modify or delete the information from the system database. Documents such as Bills of quantities (BQ) and drawings can be easily retrieved with the system search navigation. System X also has security controls that only allow authorised staff to access selected documents. System X also allows easy retrieval of documents from any computer with any internet browser. Drawings and documents that are urgently required at construction sites can be shared among the staff and project team regardless of geography in an instant. Figure 7.15 below shows the search form available in system X.
- The above description shows that Gamma is currently at level 4.

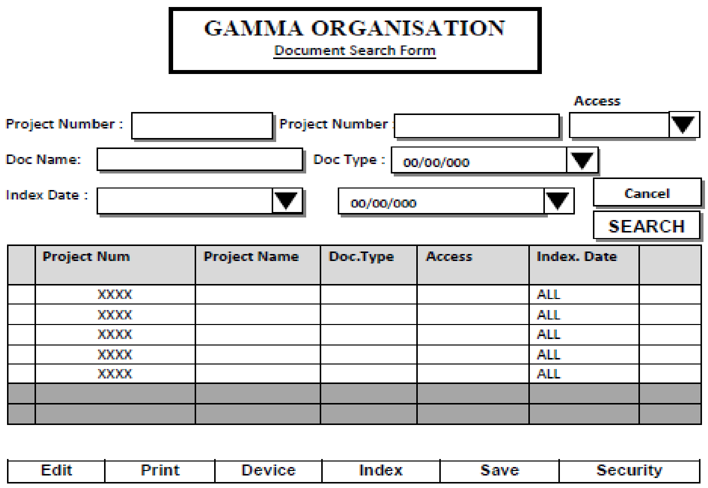
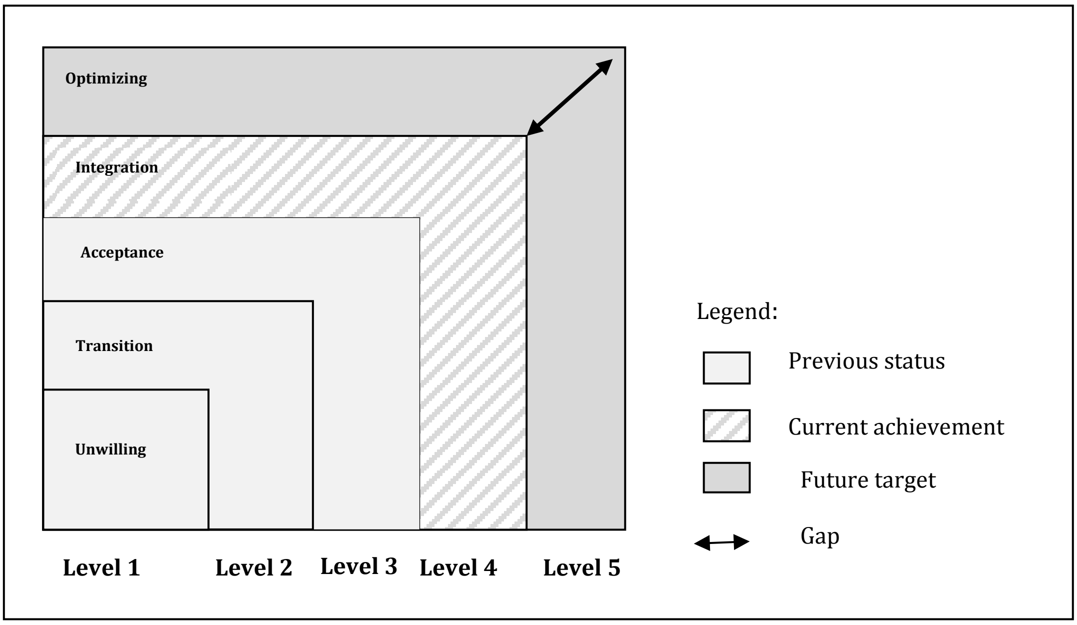


Figure 7.15: Search form in System X

c) Organisation’s future planning

- In mid-2012, the IT Department proposed the development of a system to support the long range planning activities in Gamma. The system is expected to be launched at the end of 2013.
- This indicates that the future target of Gamma is level 5, where the organisation is optimizing the usage of IT/IS for the future.

The analysis of Gamma’s status for willingness to process change is as follows:



6) Training/skills

a) Organisation’s previous achievement

- No IT/IS training was provided at the early establishment of Gamma (since no IT/IS applications were used) *[Level 1: No Training]*.
- When Gamma started to use Lotus 123 and MS Excel, basic ‘how to use’ training was given to the staff. This was evident when Gamma allocated fund for IT/IS training when the IT Department was formed *[Level 1: Basic Training]*.

- According to Gamma's IT Manager, specific staff training was given to staff when MS Access was introduced. Training provided are based on the staff's needed knowledge, skills and abilities to manage the particular projects.
- Therefore, this factor is identified to be in level 3, where Gamma provides focused training for specific skills.

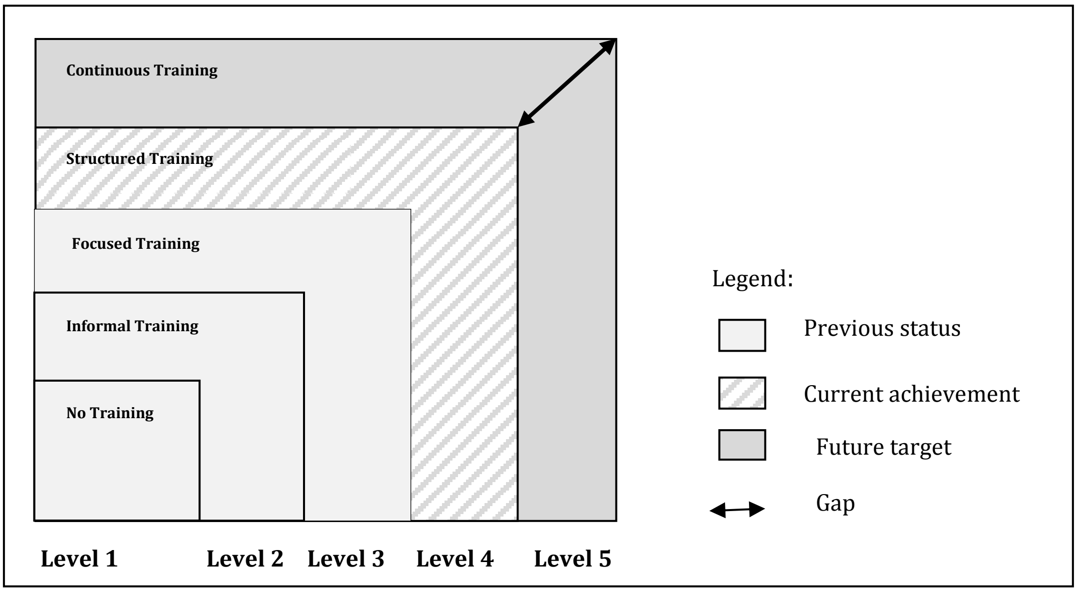
b) Organisation's current status

- With system X, Gamma formed a learning centre known as '*XLC*', that was responsible to analyse and identify capability gaps that needed to be addressed. The '*Information Technology Training Plan*' (ITTP) was proposed based on the XLC analysis. Staff were required to attend the training programme to fill the gaps and improve their performance at work.
- In 2012, a total of 138 training sessions were conducted by Gamma, with half of the training focused on improving IT skills. Gamma had spent more than RM 900 million for IT training in 2012 alone.
- The above description shows that this factor is currently at level 4, where structured training is provided.

c) Organisation's future planning

- Based on Gamma's recent monthly meeting minutes, the senior management continually encourage staff to complete professional development programmes to equip themselves with latest IT/IS knowledge and skills towards strategic management in the organisation (*level 5*).

The analysis of Gamma's status for training/skills is as follows:



7) <u>Motivation</u>

a) Organisation's previous achievement

- According to Gamma's IT Manager, during the use of MS Access, staff received direct instructions from the senior management to use the system *[Level 1: Top Down Approach]*.

b) Organisation's current status

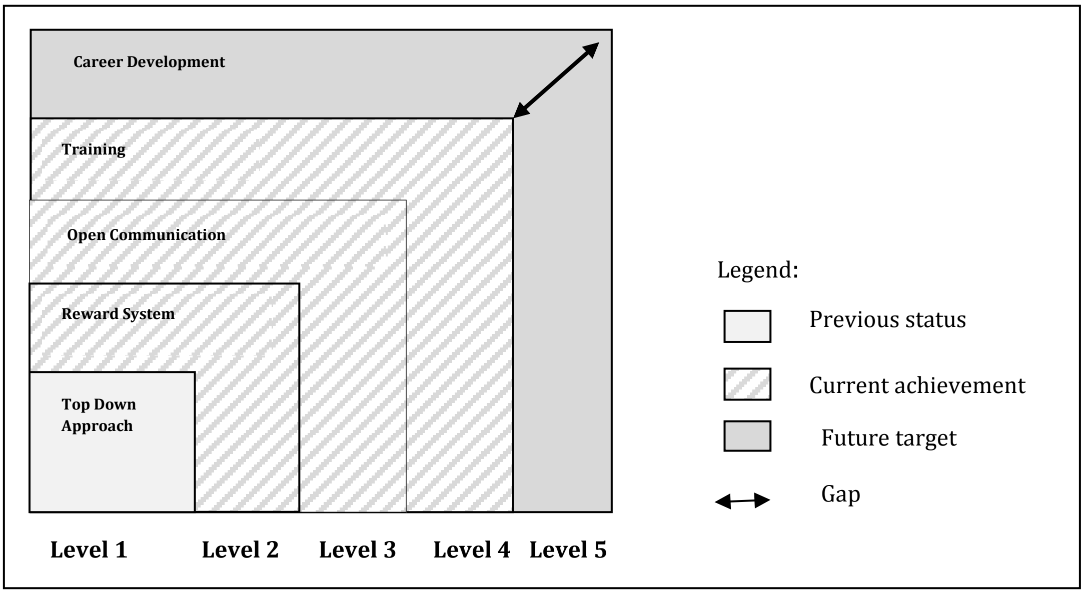
- During the early introduction of system X, a reward system was introduced. Rewards such as digital cameras and video recorders were given to the staff who frequently used system X. This method was used for about one (1) year *[Level 2: Reward System]*.
- Currently, a monthly programme known as the '*Knowledge Sharing Programme*' is held to give the opportunity to staff to communicate freely with senior management. Issues concerning system X and feedback from staff can be obtained directly during this programme *[Level 3: Open Communication]*.

- Specific training was given to selected staff, as stated in the '*Information Technology Training Plan*' (ITTP), which was proposed by Gamma's training centre *[Level 4: Training]*.

c) Organisation's future planning

- As stated in Gamma's latest '*Annual IT Budget and Business Plan'*, a strategic performance management approach via KPI will be adopted using the Balance Scorecard Method. Staff will be evaluated based on how well they perform in utilising system X *[Level 5: Career Development]*.

The analysis of Gamma's status for motivation is as follows:



7.4.4 Summary

- The history of data management in Gamma began with manual recordings using a log book, followed by the Lotus 123 application in the early 1990's, MS Excel in 1993 and MS Access in 1997. As a standalone system, MS Access caused difficulty for senior management to monitor documents in branch offices and site offices. The introduction of system X in 2008 gave a new perspective for Gamma to properly manage and monitor their data. Detailed studies were made by the IT Department in developing system X, which resulted in no customisation after the system is launched. The myriad of systems used to manage Gamma's documents was not clearly defined until the introduction of system X.
- The highest maturity level reached by Gamma is in between level 5 and level 4 for the IT staff roles and responsibilities. Some of the IT staff strategic responsibilities described in level 5 are currently being carried out by the IT staff such as formulating Gamma's vision, mission and value statement. However, current IT staff were not responsible to align the business strategy with the IT strategy which is the main strategic responsibility of the IT staff [*IT Staff Roles and Responsibilities: in between level 4 and level 5*]. To successfully align business strategy with the IT strategy, it is recommended that the IT staff and the management collaborate to develop a technology roadmap which will describe in detail the technology changes to be implemented with respect to system, time scales and priorities.
- Another four factors fall at level 4 of the preliminary maturity model; they were management style and senior management support, training/skills and motivation.

- As stated in the latest Gamma's '*Annual IT Budget and Business Plan'*, the organisation is heading towards the laissez-faire management style [*Management Style: Level 5*]. To successfully achieve the next level, it is necessary for Gamma to have a reliable IT Department that does not require hands-on supervision in managing system X. Senior management will take the back-seat and only provide assistances, such as organisation vision and strategy. Senior management will also need to have full trust in the IT Department to accomplish their goals.
- Direct involvement and participation from senior management is expected as a permanent steering committee will be formed and led by them as stated in the latest Gamma's '*Annual IT Budget and Business Plan'* [*Senior Management Support: Level 5*]. Senior management leading the steering committee should be well versed about technology and management to maximise the full potential of IT/IS for the benefit of the organisation.
- Gamma is moving towards the highest maturity level for training/skills factor as they are currently planning to require all staff to attend Continuing Professional Development (CPD) courses or professional training programmes [*Training/skills: Level 5*]. Gamma needs to find ways to motivate staff to attend these courses and programmes. Creating awareness about the importance of the continuous training/skills is critical and can be done by highlighting the benefits of the programme, which would increase staffs' knowledge and skills, improve their job satisfaction level, increased self-confidence level, increase chances for promotion and others (APEG 2011).

- To continuously motivate staff to use system X, its application will become part of staff KPI [*Motivation: Level 5*]. It is not impossible for Gamma to achieve the highest maturity level for this factor as it is stated in the latest '*Annual IT Budget and Business Plan'*. It is critical for Gamma to develop KPI with consultation with the staff and it is important to ensure staffs are satisfied and continuously motivated. Constant monitoring is also necessary to make sure the KPI meets the targeted objective.
- Staff involvement and willingness to process change falls at level 3 of the preliminary maturity model.
- Gamma is heading towards the highest maturity level for user involvement as they plan to form a permanent steering committee, which is documented in their latest '*Annual IT Budget and Business Plan'* [User *Involvement: Level 5*]. A steering committee should comprise of users from every level in the organisation, as their needs and requirement might be different. The size of the committee also should be taken into consideration, as a small steering committee might not represent various experience and perspective (NSW 2011).
- For the willingness to process change factor, Gamma does not target the highest maturity level. They are expected to reach level 4 of maturity as the IT Department is currently developing a system for monitoring and controlling activities. The system is expected to be launched by the end of 2013. According to Gamma's IT Manager, the usage of the strategic level system will help the organisation have proper long range planning activities (level 5). This is important for the organisation to gain

competitive advantage by supporting the organisation competitive strategies (Mundbrod *et. al.*, 2012).

All factors had been validated by this case study. Gamma's achievement and their e-readiness gaps are illustrated in Figure 7.16.

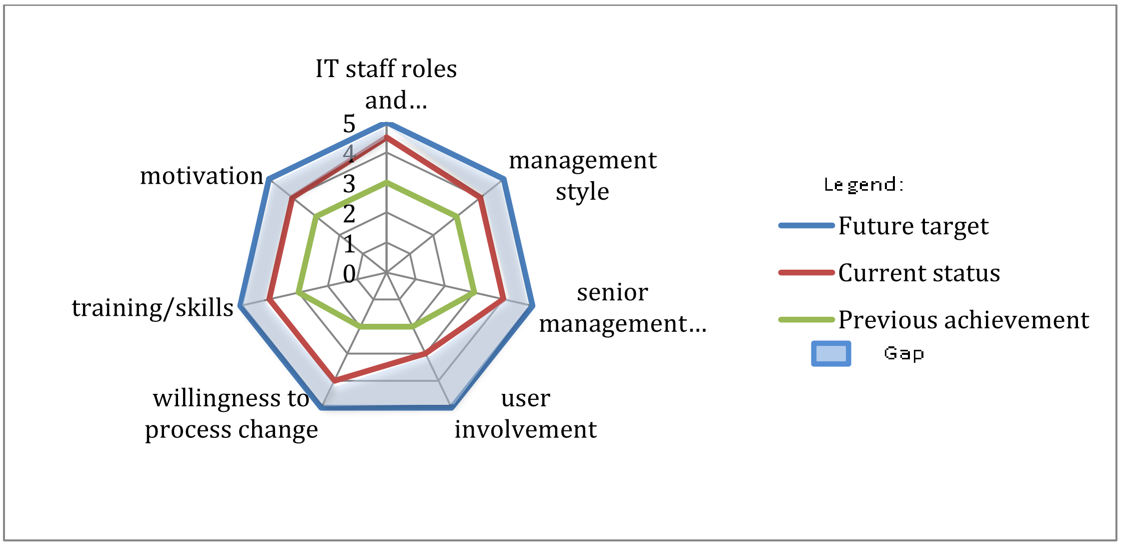


Figure 7.16: Organisation Gamma e-readiness levels and gaps

Gaps identified from the figure above shows that more attention should be given to the staff involvement factor (currently 2 levels behind the targeted level), while other factors are currently only one (1) level behind their targeted level. The use of this preliminary maturity model has proven to be beneficial to Gamma as their e-readiness gaps can be clearly identified.

7.5 Organisation Delta's case study

7.5.1 Organisation background

Organisation Delta was formed in 1872 as a technical department in the national infrastructure development. It provides multidisciplinary expertise that ensures best practice in technical consultancy, project management and asset/facilities maintenance management. It has an extensive and accessible network of offices from the headquarters, to the branch offices and site offices. Delta has more than 30,000 staff which comprised of the technical and non-technical staff. The organisation is separated into 3 main sectors; business sector, management sector and specialist sector, which is illustrated in Figure 7.17.

Delta currently has 7000 active projects nationwide, which make it difficult for the headquarters to closely monitor each project. More difficulties arise when the branch offices and site office were required to frequently report and update project status; and Delta started to find ways to solve this issue with IT/IS applications. Delta is finding ways to monitor construction projects and to generate information for reporting project status. To achieve this, Delta needs a system to integrate all construction information and to present them in reports.

Initially, Delta explored and evaluated the available *off-the-shelf* software in the market but there was nothing to suit the needs of the organisation. Therefore, Delta decided to develop their own system.

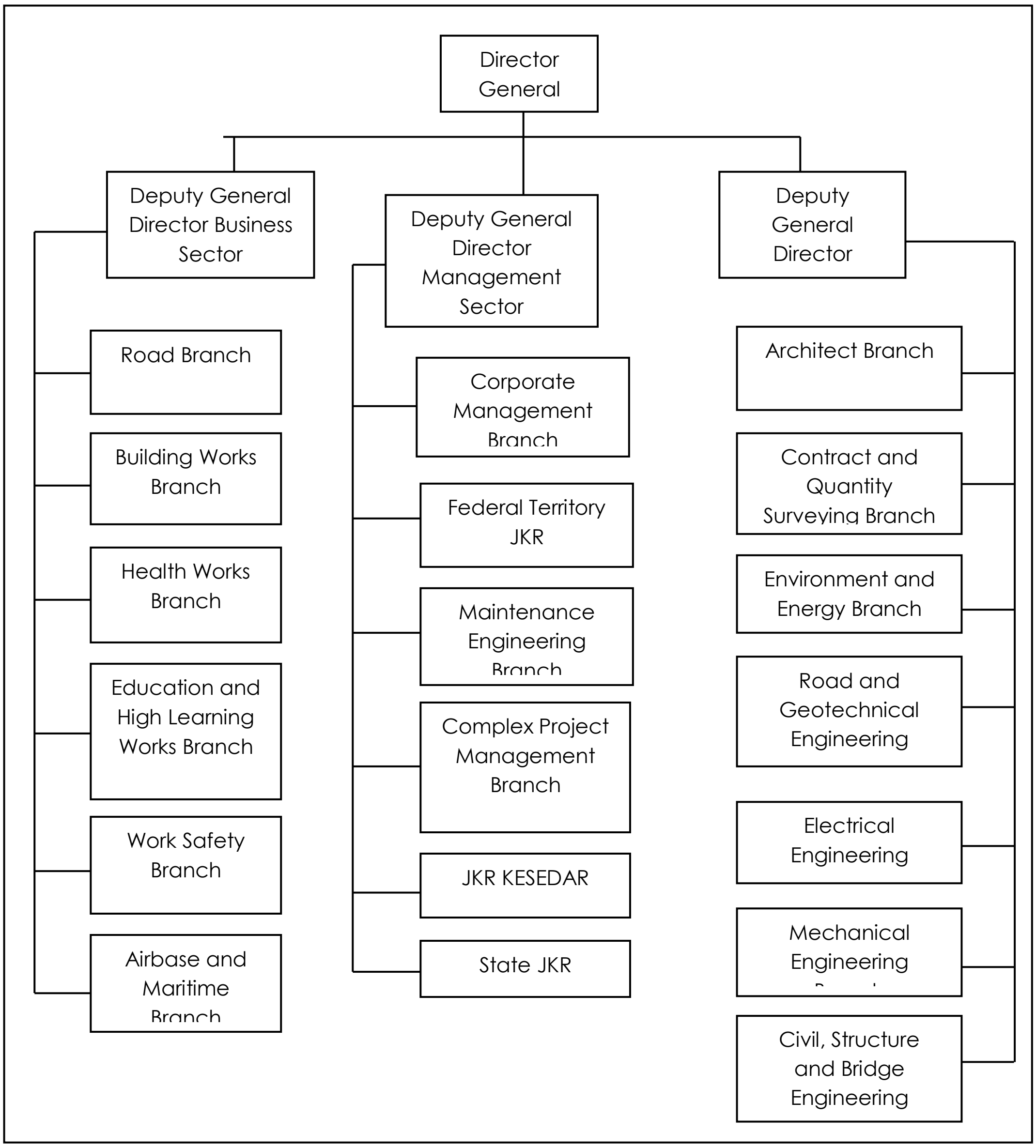


Figure 7.17: Organisation chart of Delta

7.5.2 History of system adoption

Delta experienced various problems in monitoring their projects around the country - branch offices and site offices are required to report and update current project status to the headquarters. Difficulties arose when incorrect reports are sent; reports are required to be submitted to selected managers for approval before submission to HQ. Therefore, Delta requires a system that is able to monitor current construction project activities, collate information and prepare reports. Before IT/IS systems were introduced, branch and site offices completed reports manually.

In 1985, system Y was introduced. The system was proposed by the senior management and developed by the IT Department to overcome problems in monitoring projects that they handled. However, the application of system Y was limited to the headquarters only, while branch and site offices still complete reports and project status manually – project leaders and senior management of the brand or site offices will first approve the reports before sending them over to the HQ to be updated in system Y. This lengthy process can take up to three (3) months. During this time, project status might have changed and information in system Y did not reflect the current situation of the projects.

In 1991, Delta completed a major customisation for system Y which saw manual forms removed from work process. All data were typed using computers and sent to the HQ via diskette for compilation. Another customisation started in 1999 by the IT Department, which allowed every staff from branch and site offices to update the current project status through system Y. This customisation was proposed by senior management and completed in 2000. In early 2003, system Y was upgraded to a centralised database system. This upgrade was made based on staff whom requested an online reporting system since end of 2001. Factors such as changes in work process, resources needed and financial capabilities are among the factors that need to be considered by the senior management before the upgrading of system Y can be made. The introduction of system Y's centralised database system enabled data to be produced through the online system. The branch and site offices enjoyed the benefits of preparing their report online. Figure 7.18 illustrates the timeline development of system Y.

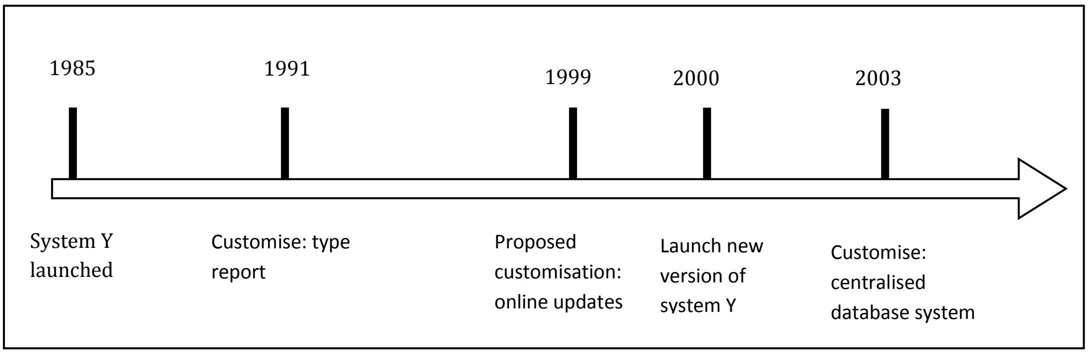


Figure 7.18: Development timeline of System Y

Currently, there are five (5) main modules in system Y. They are planning, designs, procurement, construction and handing over (refer Figure 7.19).

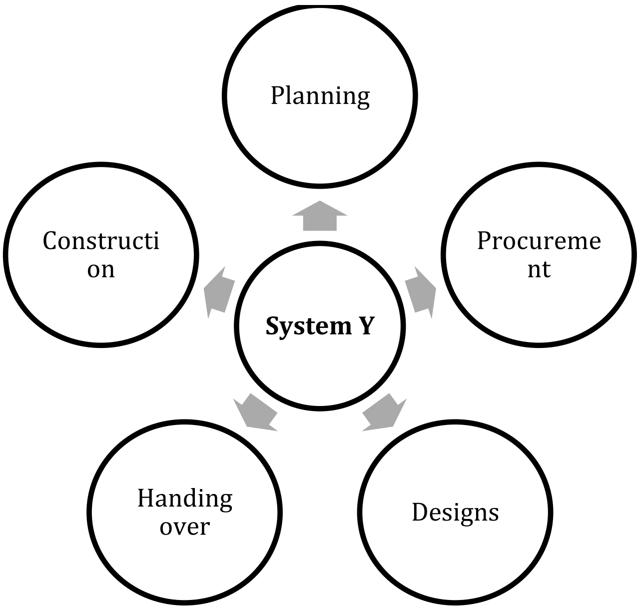


Figure 7.19: Modules in System Y.

7.5.2 Analysis and discussion

These factors will be discussed separately starting with identifying Delta's previous achievement, current status and future planning.

1) <u>IT staff roles and responsibilities</u>

a) Organisation's previous achievement

- Delta was formed in 1872 and did not use any technology to run the business. Forms were completed manually and information regarding project status was kept in files for records.
- IT Department did not exist before the introduction of system Y *[Level 1: No Roles and Responsibilities]*.

b) Organisation's current status

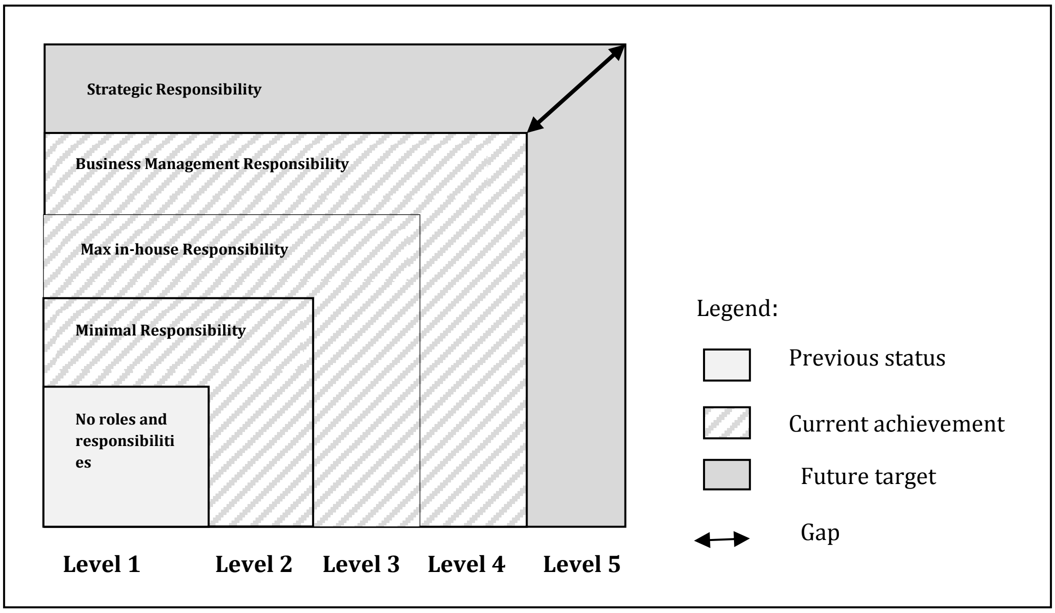
- IT Department was formed in to incorporate the technology in Delta's work processes. The department was then placed under the Corporate Management Branch (refer to Figure 7.12). When the IT Department was first established, it consisted of the IT leader and several technical staff. Only common IT/IS application such as MS Office was used in the past. According to Delta's IT Manager, during that time, majority of IT/IS work were outsourced to third parties and IT staff provided simple technical assistance, such as resolving username or password problems, uninstalling/reinstalling basic software application, verification of proper hardware and software set up and assistance with navigating around applications *[Level 2: Minimal Responsibilities]*. Few years later, more IT staff were employed. IT/IS outsourcing was minimal as internal staff were responsible to maintain and customise other system used in Delta such as Centralised Management Information System (CMIS), Centralised Road Management Information System (CRMIS) and also Human Resource Management Information System (HRMIS). *[Level 3: Maximum in-house Responsibilities]*. The IT Department was responsible for the IT infrastructure to ensure system application is secure and stable, apply updates and provide training to staff.

- The IT Department kept expanding year-to-year and now has more professional staff (eg. includes system developer, system administrator, programmer and others). Therefore, IT staff is responsible to develop, maintain and customised system Y. On top of that, the IT staff is also responsible to plan, organise and coordinate IT needs in compliance with the *'The 2012 ICT Planning Programme [Level 4: Business Management Responsibilities]*.

c) Organisation's future planning

- Based on Delta's '*Strategic Framework 2012-2015'*, IT will become a key partner in the future. IT staff will be expecting strategic responsibilities, where they will be responsible to align the IT strategy with organisational business strategy.
- This shows that roles and responsibilities of IT staff in Delta is moving towards the strategic responsibilities, as described in level 5.

The analysis of Delta's status for IT staff roles and responsibilities is as follows:



2) <u>Management style</u>

a) Organisation's previous achievement

- Previously, every activity carried out in Delta requires approval from senior management. For example, manual forms were used to record current project status that needs to be approved by the project leader and senior management of the branch office before the form can be sent to the headquarters for further action and to be kept in the '*Project File*'. This indicates direct supervision from senior management in Delta *[Level 1: Autocratic]*.
- Senior management suggested the development of system Y to overcome the hassle of manual reporting by brand and site office staff. This shows that paternalistic management style was practiced *[Level 2: Paternalistic]*.

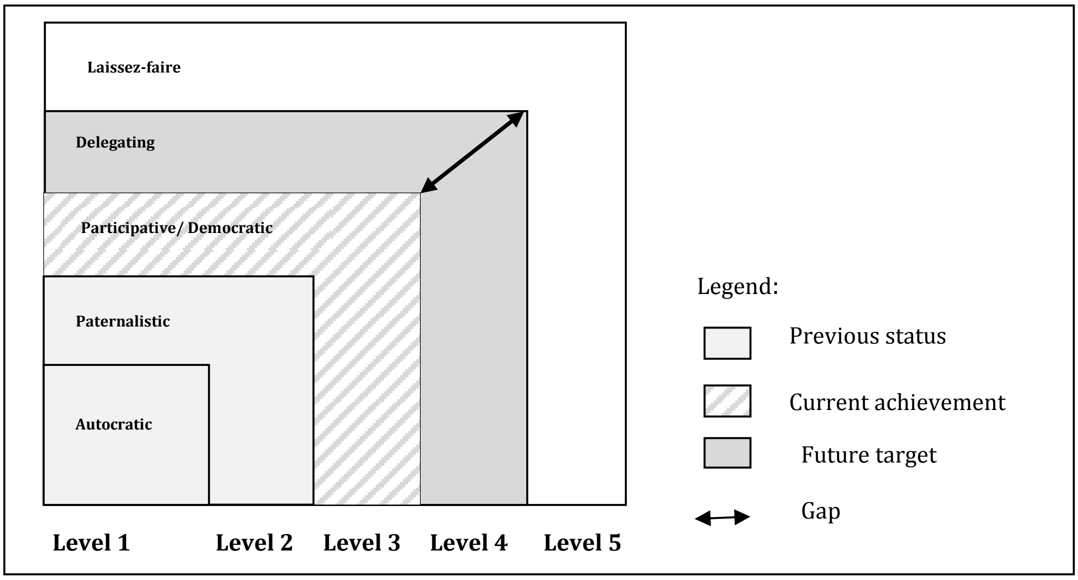
b) Organisation’s current status

- Due to a large number of staff, Delta established a web-based portal known as ‘*Rakan 1*’, which allowed staff from all over country to share their knowledge or feedback about everything, including system Y. For example, the upgrade of system Y to a centralised database system was first made based on staffs’ suggestion to have an online reporting system. This issue had been discussed at ‘*Rakan 1’* for few months before it was brought to Delta’s monthly meeting for further action.
- The above description shows that Delta is currently at level 3, where democratic management style is being practised.

c) Organisation’s future planning

- All matters pertaining to system Y will become the responsibility of the IT Department as stated in Delta’s IT future plans in their ‘*2012 ICT Planning Programme*’. This will include maintaining optimal system performance, reporting and future capabilities of the system. IT staff will also be responsible to identify and implement process improvement, workflow development, improve indexing capabilities and automate retention.
- This shows the organisation is moving towards the delegating management style as described in level 4, where more power and authority will be given to the IT Department in relation to system Y.

The analysis of Delta's status for management style is as follows:



3) <u>Senior management support</u>

a) Organisation's previous achievement

- Before the implementation of system Y, IT/IS investment in Delta was done on an ad-hoc basis, as there was no IT Department during that time *[Level 1: No Support]*.

b) Organisation's current status

- During the development of system Y, the senior management provided only necessary resources for the system development. Finances were allocated for system development and new professional IT staff were hired,(eg. system developer, system administrator, programmer and others) *[Level 2: Resources Support]*.
- Since the implementation of system Y, meetings between the IT Department and senior management were held every month to discuss issues concerning the system, IT Department's current activities, reviewing the department's action plan, training plan, as well as their

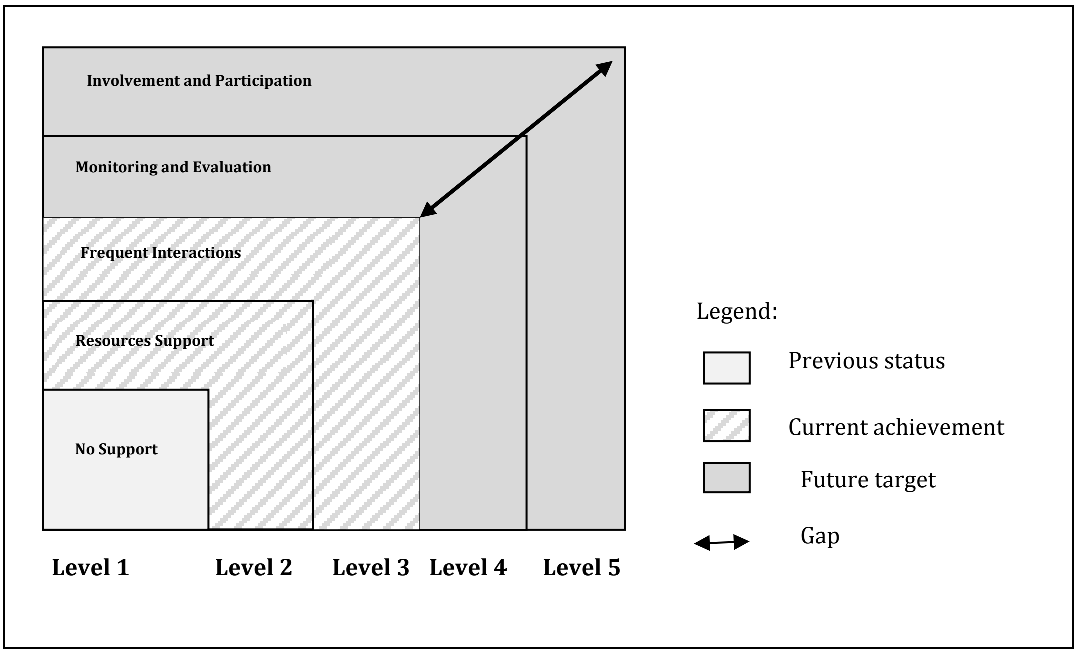
future planning. Senior management usually gave advice for project planning and training requirements. The '*2012 ICT Planning Programme*' is one of the results from this meeting.

- Frequent interaction between the IT Department and senior management is evident in Delta, indicating that this factor is currently at level 3.

c) Organisation's future planning

- Based on Delta's '*Strategic Framework 2012-2015'*, a permanent steering committee known as the 'Technology and Investment Committee' (TIC) will be set up to monitor and evaluate system Y's investment and activities. For the first step, the senior management will become part of the TIC *[Level 4: Monitoring and Evaluation]*, only then they could lead the committee in the future. Direct involvement from the senior management is important to ensure that activities are aligned with organisational target.
- The description above shows that Delta is moving towards level 5 of monitoring and evaluation.

The analysis of Delta's status for senior management support is as follows:



4) <u>User involvement</u>

a) Organisation's previous achievement

- Prior to the implementation of system Y, there was no involvement from staff since there is no specific system used in Delta *[Level 1: No Involvement]*.

b) Organisation's current status

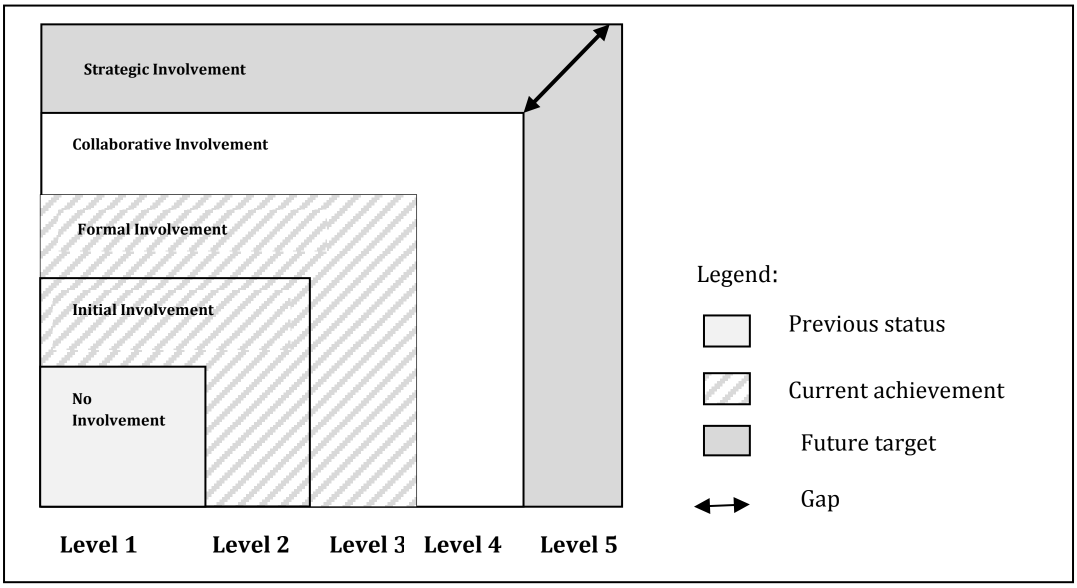
- During the early stage of system Y development, ad-hoc meetings were held between the IT Department and user representatives to identify users' requirement *[Level 2: Initial Involvement]*. After the prototype of system Y was produced, users were invited to test the system and this identified several systems weakness, such as poor interface, not user friendly and did not meet users' requirement. A system redesign was made and this time it involved the user. Users from all levels (from the senior management to the operational staff) participated in the design, development, testing, implementation and customisation of system Y. They actively participated in most development activities, apart from programming and technical aspects of the system development. Questionnaire survey forms were distributed to users and the feedback obtained was used as a guideline for the development and further enhancement of system Y.

- The above description shows that Delta is currently at level 3, where users become the reference in the development of system Y.

c) Organisation's future planning

- As stated in Delta's '*Strategic Framework 2012-2015'*, a permanent steering committee will be formed to help the development team with a core group of users for further requirement analysis, system verification and ensure the system will meet users' expectations.
- This indicates that Delta is moving towards level 5, where a permanent steering committee will be formed which involves the users.

The analysis of Delta's status for user involvement is as follows:



a) Organisation's previous achievement

- There was no IT/IS application used in Delta in the past *[Level 1: Unwilling]*.

b) Organisation's current status

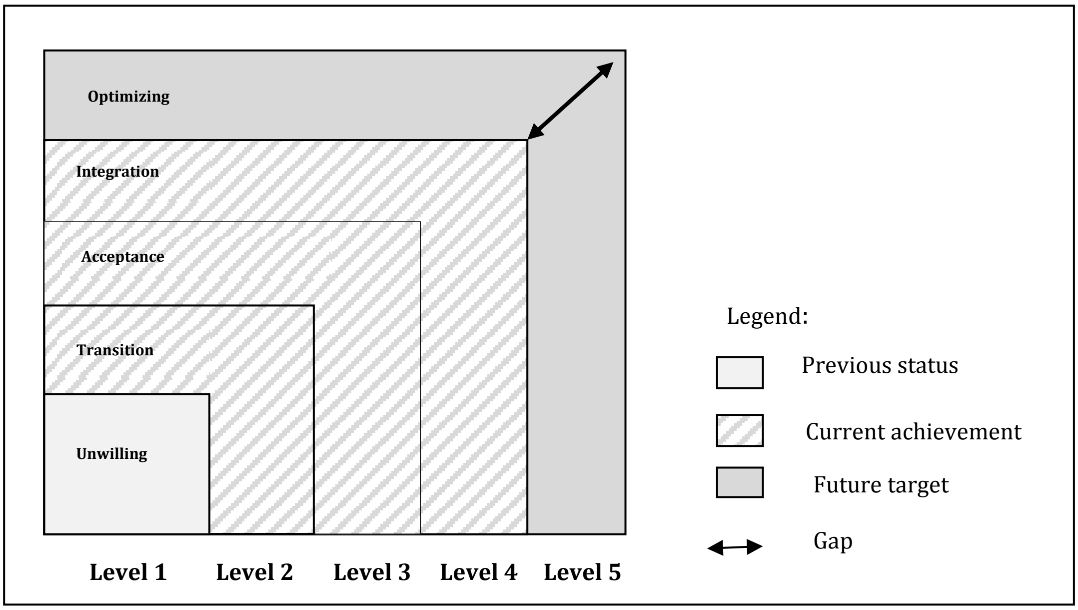
- According to Delta's IT Manager, system Y was first used for recording the status of construction projects *[Level 2: Transition]*.
- System Y became more stable after the customisations in 2000, it was being used to manage the entirety of the construction project (eg. planning, procurement, design, construction and handing over) *[Level 3: Acceptance]*.
- System Y is now used for monitoring and controlling of construction projects. Real-time monitoring of the construction activity is now possible with the help of the Internet. Web-based cameras were placed at strategic locations of the construction site to capture the latest image of the site, and this would be automatically send to Delta's web server. In addition to this, system Y also eased a lot of work such as project cost analysis, construction site inventory control and profitability analysis.
- This shows that this factor is currently at level 4, where system Y is used for monitoring activities.

c) Organisation's future planning

- During the monthly meeting between the IT Department and senior management, the IT Department proposed to the senior management to develop a forecasting system, which will help in manpower planning and operation development plans. This proposal is still in the discussion stage.

- This shows that Delta is moving towards level 5.

The analysis of Delta's status for willingness to process change is as follows:



6) <u>Training/skills</u>

a) Organisation's previous achievement

- Before the introduction of system Y, IT training was not provided since the IT Department did not exist *[Level 1: No Training]*.

b) Organisation's current status

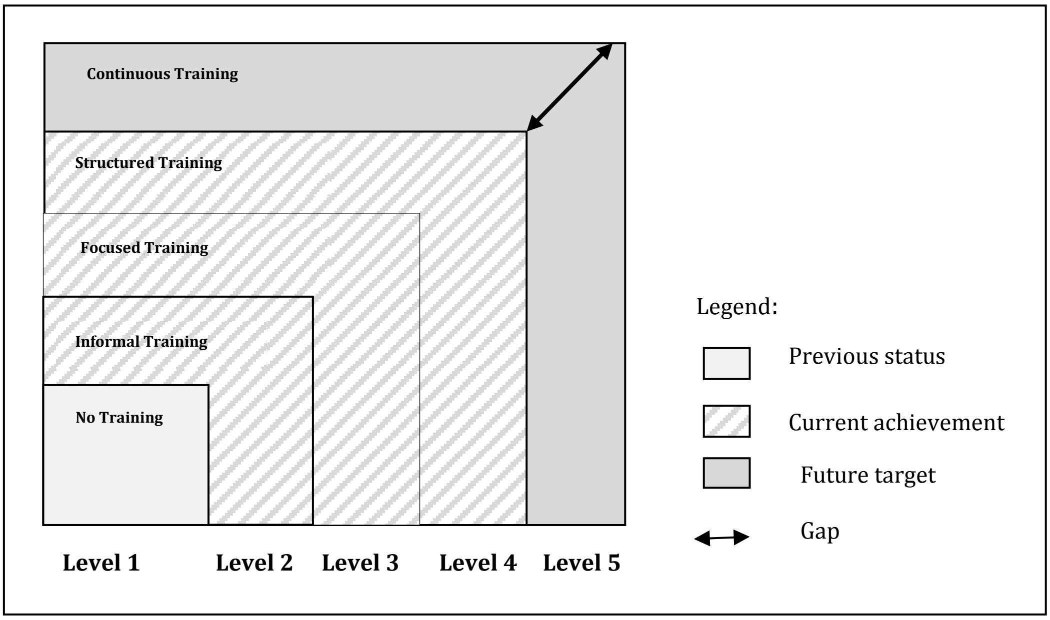
- According to Delta's IT Manager, basic training on how to use system Y was provided during the early implementation of the system *[Level 2: Informal Training]*. Training was given informally by the IT Department to staff, based on request. During this time, the application of system Y was limited to the headquarters level only.

- In 1999, formal training programmes were conducted due to the increasing number of staff (as staff from branch and site offices were able to use system Y to update project information). Staff obtained specific skills on how to use system Y in terms of updating and retrieving information *[Level 3: Focused Training]*.
- The IT Department introduced a '*Three Phase Training Programme'*; starting with the '*Introduction Phase', 'On-Site Training*' and '*Advanced Level Training'*. There are several training sessions in each phase of the training programme and the in-house IT Department conducts it. The training programmes are prepared by the IT Department annually. Trainings are compulsory for every staff and they are required to serve seven (7) days of formal training every year.
- This above description shows that Delta is currently at level 4, where staff are given structured training.

c) Organisation's future planning

- One of the strategy in Delta's '*Strategic Framework 2012-2015'* is to produce more technical experts. In doing so, Delta requires its staff to be registered with the professional bodies or institutions and are required to attend the Continuous Professional Development (CPD) programme to fulfil the professional bodies or institutions training requirements. By having many professional staff, Delta is hoping to fulfil its intention to become the technical reference of the country.
- The above description shows that Delta is moving towards level 5, where staff are continuously trained and obtain professional skills.

The analysis of Delta's status for training/skills is as follows:



7) <u>Motivation</u>

a) Organisation's previous achievement

- Prior to the implementation of system Y, no specific motivation method was used since majority of the works were performed manually.

b) Organisation's current status

- According to Delta's IT Manager, the top down approach was used to force staff to use the system during the early introduction of system Y *[Level 1: Top Down Approach]*. This approach did not produce positive results since the majority of staff were still reluctant to use the system. Staff found it difficult to change from manual reporting as they were more familiar to the existing process for a long time.
- Currently, Delta has frequent interactions with staff to help inspire and motivate them to use the system. Delta introduced a web based portal known as '*Rakan 1*' as a communication method; opinions, problems or issues regarding system Y can be discussed in this portal. Important

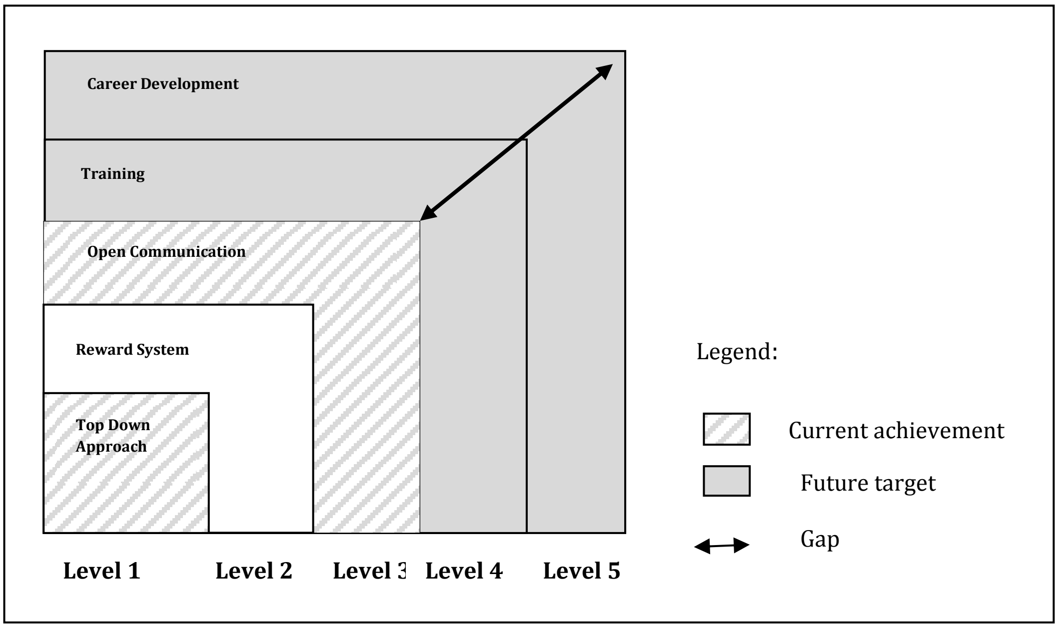
issues raised in this portal will be discussed in the organisation's monthly meeting, which is held between the senior management and staff for further actions. For example in 2001, staff were actively discussing to have an online reporting system. This issue attracted the attention of the senior management and further discussions were held with the IT Department. As a result, system Y was upgraded into the centralised database system that enabled online reporting to be made.

- This indicates that this factor is currently at level 3, where Delta, openly communicates with staff.

c) Organisation's future planning

- Based on Delta's '*2012 ICT Planning Programme*', personal training will be given to staff who are still experiencing difficulties using system Y *[Level 4: Training]*.
- Delta also planned to use system Y as part of staff KPI starting 2014, which will affect their performance appraisal evaluation as stated in Delta's '*Strategic Framework 2012-2015'*.
- This shows that Delta is moving towards level 4 and targeting level 5.

The analysis of Delta's status for motivation is as follows:



7.5.4 Summary

- Before the implementation of system Y, there was no IT/IS to automate business process and all work was performed manually. The introduction of system Y in 1985 transformed Delta's business process and manual work was reduced in stages. The system has facilitated Delta to perform business process more effectively.
- Three factors has reached level 4 of the preliminary maturity model. The factors are IT staff roles and responsibilities, willingness to process change and training/skills.
- IT staff in Delta are currently at level 4 for the development of system Y. They achieved the high maturity level as their roles and responsibilities increased gradually with the expansion of the IT Department. IT staff is expected to have strategic responsibilities as Delta has plans to make IT as its key partner, as stated in their '*Strategic Framework 2012-2015'.* The roles and responsibilities of IT staff will increase, as they need to find out how technology can contribute

towards the growth of the organisation. This will include formulating organisational IT strategy and aligning it with Delta's business strategy [*IT Staff Roles and Responsibilities: Level 5*].

- Delta also targeted the highest maturity level for the willingness to process change factor. They are currently in discussion to develop a forecasting system that could assist them in manpower planning and operation plan development [*Willingness to Change: Level 5*]. Before developing this system, Delta should consider how the system would fit into the organisation, current IT strategy and current business processes. In addition, Delta also should foresee changes such as changes in work process that might take place and whether they need to plan for different needs or working practices.
- Delta is targeting to be the technical reference for the country as stated in their '*Strategic Framework 2012-2015'*. Therefore, it is necessary for Delta to have as many professional staff as possible. Thus, staff are encouraged to register with professional bodies or institutions; and to continuously remain as registered member, Delta is assisting staff to collect CPD points on an annual basis [*Training/skills: Level 5*]. Delta needs to encourage their staff to register with the professional bodies to achieve their target; and. this can be done by making it compulsory for every staff to register with their respective professional bodies or institutions.
- The other four factors are currently at level 3 of the preliminary maturity model. The factors are management style, senior management support, staff involvement and motivation.
- For management style, Delta only targets up to level 4, where delegating management style will be practised. In relation to system Y, IT Department will be given full authority and responsibility in managing the system, as stated in

Delta's '*2012 ICT Planning Programme*'. Delta is a public organisation governed by the central government; therefore, it is impossible for Delta to practice a laissez-faire management style. To successfully implement 'delegating management' of system Y, Delta is encouraged to establish a culture of clear and transparent communication between the senior management and IT Department (Hodgkinson 2009). They also should provide necessary resources needed by the IT Department, such as adequate support functions and establish a framework of accountability for appropriate monitoring procedure (Nwadukwe and Timinepere, 2012). Adequate support is necessary to enable the IT Department to accomplish tasks (Morake *et. al.*, 2012).

- The highest maturity level is Delta's target for the senior management support. The senior management is expected to lead the steering committee known as 'Technology and Investment Committee' (TIC), which will be formed soon based on Delta's '*Strategic Framework 2012-2015'*. Before they could lead TIC, they will first become part of the committee and be involved in monitoring and evaluating system Y investments and activities. According to Delta's IT Manager, it is important to include the senior management in the steering committee as some decisions can only be made by the senior management. He furthermore adds that, having the senior management as part of the committee will ease a lot of problems as they will understand the situation perfectly.
- Delta is targeting the highest maturity level for user involvement but they are now at level 3. As stated in Delta's '*Strategic Framework 2012-2015'* a TIC will be formed soon. To ensure the success of TIC, Delta has established a guideline that defines the committee structure, their roles and responsibilities.
- In motivating staff to use system Y, Delta does not give any reward as stated in level 2 of the model. Delta is a public organisation and do not have any budget

allocation for rewarding staff for using system Y. Delta is moving towards level 4 and level 5 of the preliminary maturity model where personal training will be provided to staff who still have difficulties using system Y. The application of system Y will be part of the staff KPI starting from 2014 (level 5). It is necessary for Delta to ensure that all staff have the ability to use the system before making system Y as part of staffs' KPIs. Delta should also find the strategic KPIs associated with system Y such as its usage, confidence level in using system Y, information security, efficiency and others.

Overall, five (5) out of seven (7) factors had been validated in this case study. The validated factors are IT staff roles and responsibilities, senior management support, motivation, training/skills, and willingness to process change. The management style factor, however, was validated up to level 4 only as the organisation does not plan to use the laissez-faire management style as described in level 5 of the preliminary maturity model. On the other hand, level 4 described in the user involvement factor were not validated as the Delta is planning to from a permanent steering committee, where the committee will be fully involved in the system development as described in level 5.

Another factor that should be raised here is the motivation, where the reward system which was described in level 2, is not experienced in Delta. Therefore, Delta cannot simply reward their staff to encourage them to use system Y. Delta's previous achievement and their e-readiness gaps are illustrated in Figure 7.20.

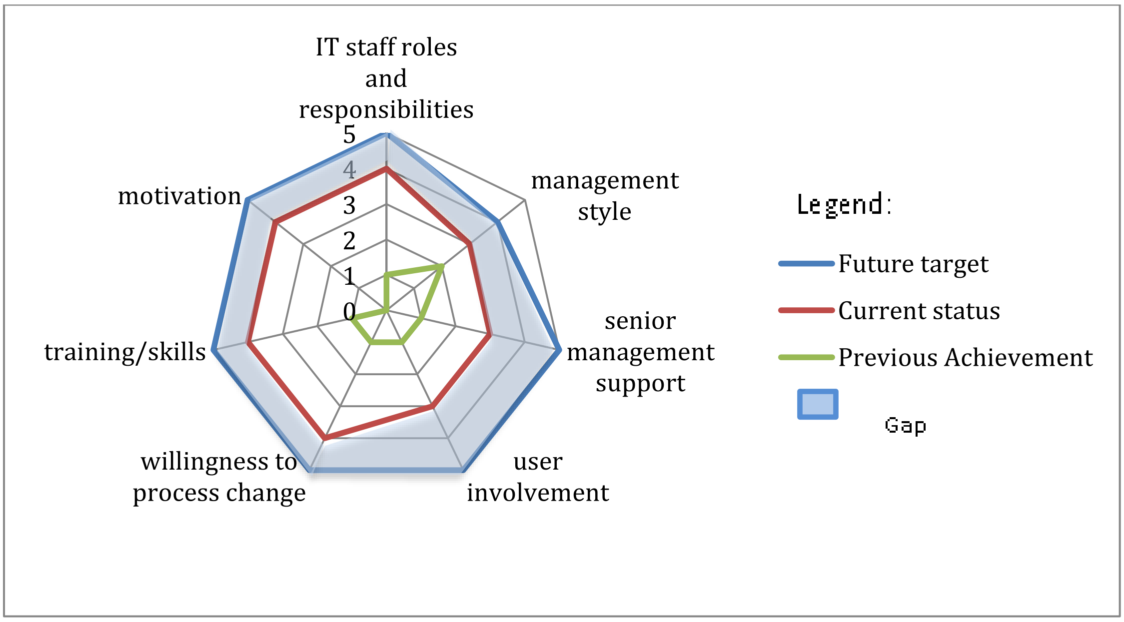


Figure 7.20: Organisation Delta e-readiness levels and gaps.

The usage of this preliminary maturity model has helped Delta to identify their current e-readiness level and their future targets. The e-readiness gap can be clearly identified from Figure 7.16 above. Three from the seven factors are currently one level behind their targeted level. More attention should be given to motivation, staff involvement and senior management support as they are currently 2 levels behind their intended target. With a Delta's '*Strategic Framework 2012-2015'* and *2012 ICT Planning Programme*', it is not impossible for Delta to achieve their targeted level. To start filling in the gap, Delta is encouraged to prioritize their activities according to their targets.

7.5 Organisation Epsilon's case study

7.6.1 Organisation background

Organisation Epsilon was established in August 1997 with the objective of providing quality affordable homes for every family in Malaysia, in accordance with the National Housing Objective. This organisation is dedicated to provide housing for the less fortunate and poverty stricken families by contributing a portion of the organisation's annual profits towards welfare works, such as repairing or reconstructing dilapidated houses under the Special Housing Projects (Mohamad Sukeri 2010). To ensure efficiency, Epsilon has five (5) branches around the country to ensure its operational efficiency, which are in Pulau Pinang, Pahang, Johor, Sabah and Sarawak respectively.

Epsilon employs over 2000 staff, were separated into 4 main sections; project, execution, rehabilitation and marketing and credit. These four (4) sections were supported by the group support sections that consist of finance; administration, human resource, business development, information technology and planning (refer to Figure 7.21).

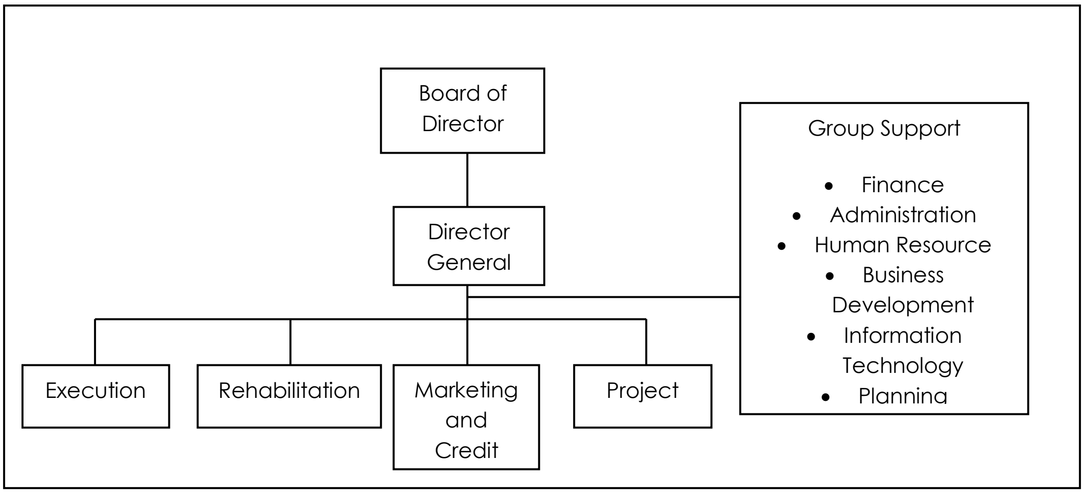


Figure 7.21: Organisation chart of Epsilon

7.6.2 History of system adoption

The organisation manages many housing projects throughout Malaysia and has started to encounter problems in managing their data. Report preparation became a problem as raw data is difficult to retrieve. Epsilon started to find solutions for these issues with the help of technology. The improvement was focus on findings effective ways to manage data and generate intelligent report. To achieve this, Epsilon needed to find a system to suit their needs.

Epsilon's IT Department explored *off-the-shelf* systems and found a system that suits their needs, but some modifications was required to suit Epsilon's current work process. The system was an enterprise resource planning system (ERP), known as system Z, which was proposed in late 1999.

There are ten (10) main modules in the system. They are master file, office automation, financial accounting, product management, property development, property sales, property management, customer relation management, construction and project cost management and transfer utility (refer Figure 7.22). The entire modules in this system are used by the staff. However, there are authorization levels depending on their duties.

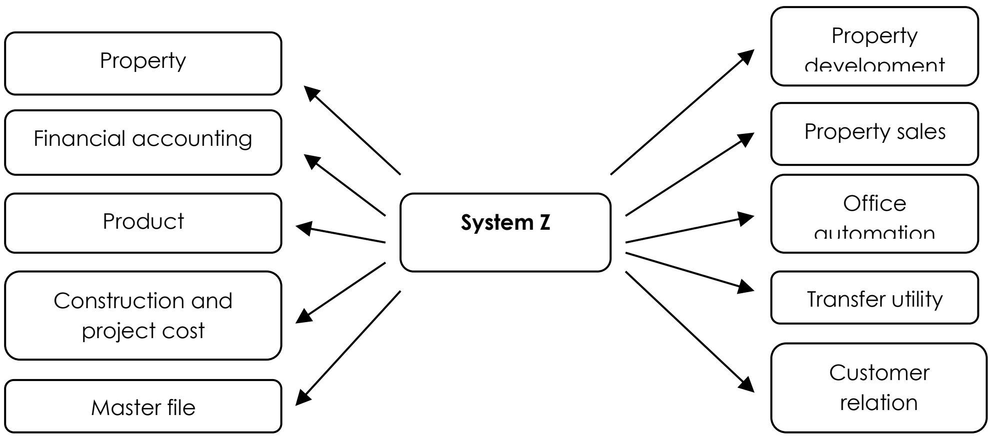


Figure 7.22: Modules in System Z

The adoption of the system Z began in 2000 with the aim to have robust data management system that would improve work efficiency and performance. Systems upgrading was done throughout the year to suit current needs. The first change was made in 2007, to change from the system Z property plus 1.0 version to the system Z property plus version 3.0. In 2009, 2 new additional modules (Purchase Order Module and Contractor Module) were bought to support the current needs of Epsilon. These modules were bought based on the recommendations made by staff requirring a system that will ease their work. In 2010, another module (Property Management Module) was purchased, as requested by staff. Figure 7.23 illustrates the timeline of system Z.

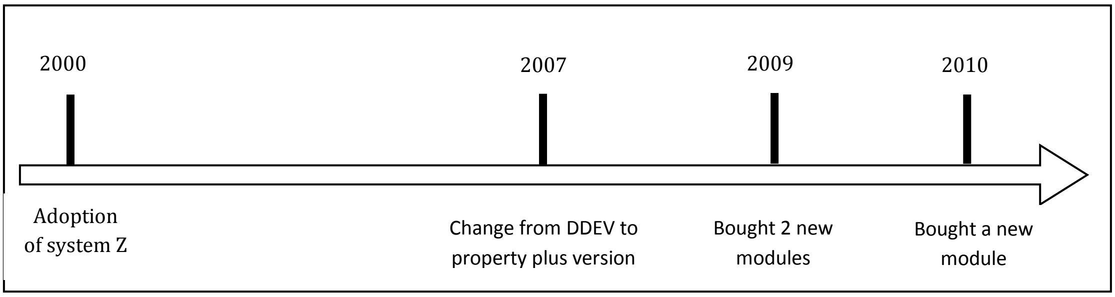


Figure 7.23: Development timeline of System 'Z'

7.6.3 Analysis and discussion

These factors will be discussed separately starting with identifying Epsilon's previous achievement, current status and future planning.

1) <u>IT staff roles and responsibilities</u>

a) Organisation's previous achievement

- Prior to the implementation of system Z, IT Department does not exist *[Level 1: No Roles and Responsibilities]*.

b) Organisation's current status

- Epsilon realised the importance of incorporating IT/IS into their work process when they first experienced difficulty to retrieving data due to the large number of projects they had. Since then, the IT Department was formed to help Epsilon to find the solutions for the problems.
- When the IT Department was first formed, their roles leaned more towards technical advisory, where they explored and evaluated *off-the-shelf* systems that may suit Epsilon's needs. As a result, system Z was proposed and bought. Majority of system Z's maintenance work became the responsibility of the vendor *[Level 2: Minimal Responsibilities]*.
- The roles of the IT Department kept increasing when more IT staff were hired. The department currently has twelve (12) staff including the Head of ICT, and separated into 3 sub-units (refer figure 7.19). With the increase of capabilities, the outsourcing of system Z was reduced. The IT Department now has the ability to customise and maintain system Z.
- This scenario shows that Epsilon is currently at level 3, where majority of IT/IS works are the responsibility of IT staff.

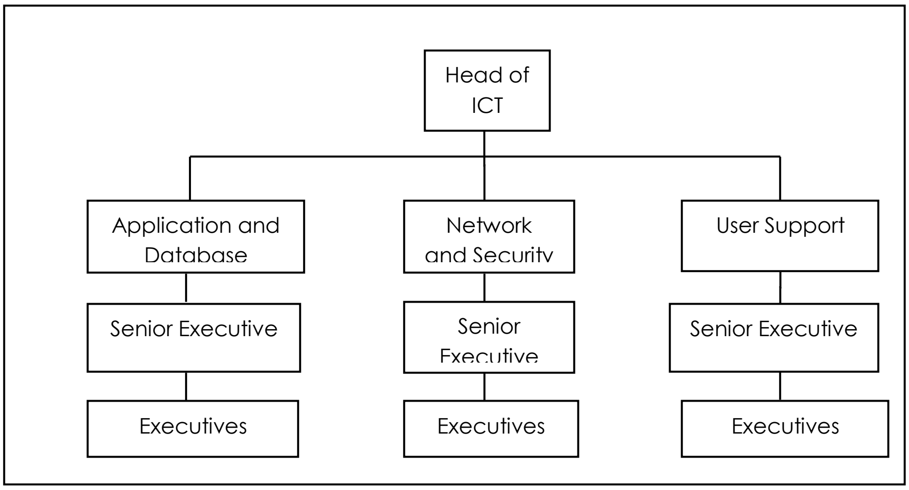
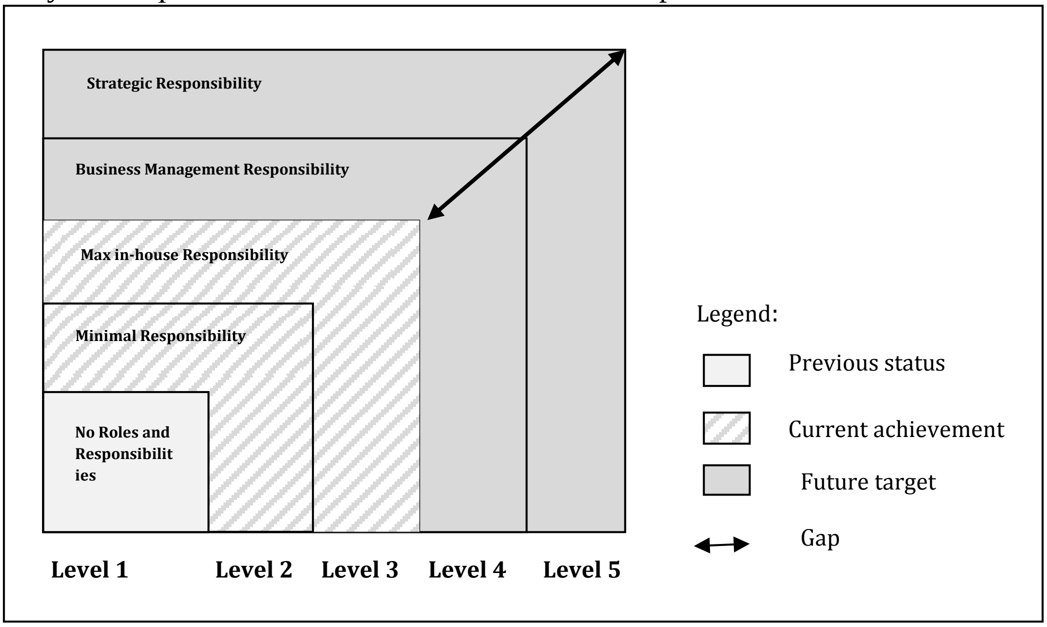


Figure 7.24: IT Department structure in Epsilon

c) Organisation's future planning

- According to Epsilons' IT Manager, IT staff were expected to develop a '*IT Roadmap'* to be discussed in Epsilon's monthly meeting *[Level 4: Business Management Responsibilities]*. This roadmap will consist of several strategies that would become Epsilon's guideline for future technology implementation and investment. This is to align Epsilon's future strategic direction in making IT as their key driver for the organisation. Subsequently, they will also be responsible to align IT/IS strategy with the organisational business strategy.
- This shows that Epsilon is moving towards level 5, where IT staff will have strategic responsibilities.

The analysis of Epsilon's status for IT staff roles and responsibilities is as follows:



2) <u>Management style</u>

a) Organisation's previous achievement

- The decision to deploy system Z was made by the senior management (without consulting with the staff) due to the problems faced by staff to retrieve information on construction projects. The decision was made based on recommendations by the IT Department to make existing work process more efficient by incorporating IT/IS in Epsilon's daily business process.
- This shows that the paternalistic management style was used, where senior management made decisions in the best interest of the staff (level 2).

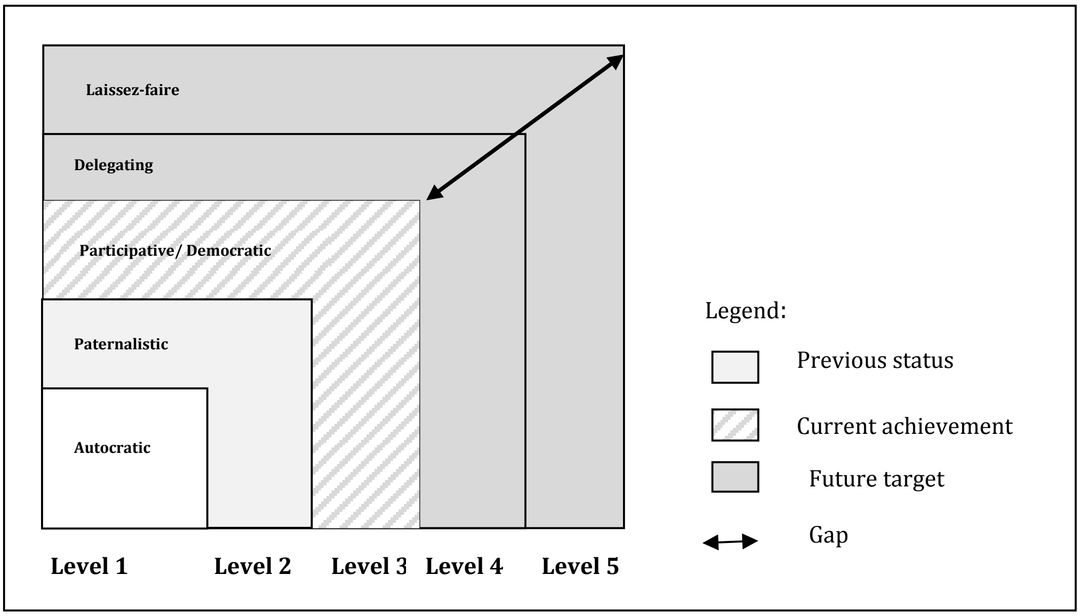
b) Organisation’s current status

- With the implementation of system Z, a new fixed agenda was introduced in Epsilon’s monthly meeting. This was to discuss any issues about IT/IS, which includes the adoption of system Z such as system capabilities, current updates, training and others.
- The purchase of the Purchase Order Module and Contractor Module in 2009 were largely based on staff suggestions, which was then brought to the monthly meeting. Several factors such as price, the necessity to purchase the system were considered before the senior management made the final decision to purchase the modules.
- The above scenario demonstrates that Epsilon is currently at level 3, where participative/democratic management style is used.

c) Organisation’s future planning

- According to Epsilon’s IT Manager, more power and authority is expected to be transferred to the IT Department by extending their roles and responsibilities. This is reflected when the IT Department was given the responsibility to develop the ‘*IT Roadmap’* as discussed in Epsilon’s monthly meeting *[Level 4: Delegating]*. The IT Manager also adds, “it is possible that the management of system Z will be given solely to the IT Department when the department become more established in the future” *[Level 5: Laissez-faire]*.

The analysis of Epsilon's status for management style is as follows:



3) <u>Senior management support</u>

a) Organisation's previous achievement

- Prior to the implementation of system Z, IT/IS investment was on an ad-hoc basis, as the IT Department did not exist *[Level 1: No Support]*.

b) Organisation's current status

- Certain amount of money was allocated for the purchasing of system Z in year 2000 *[Level 2: Resources Support]*.
- After using system Z for more than 12 years, it was only until recently that the senior management frequently interact with the IT Department. Discussions between both took place with a specific agenda concerning IT/IS in the organisation. For example, thorough discussion between IT Department and senior management was made when the staff requested the Purchase Order Module and Contractor Module. Factors such as costs, necessity of buying the modules, problems or bugs in relation to

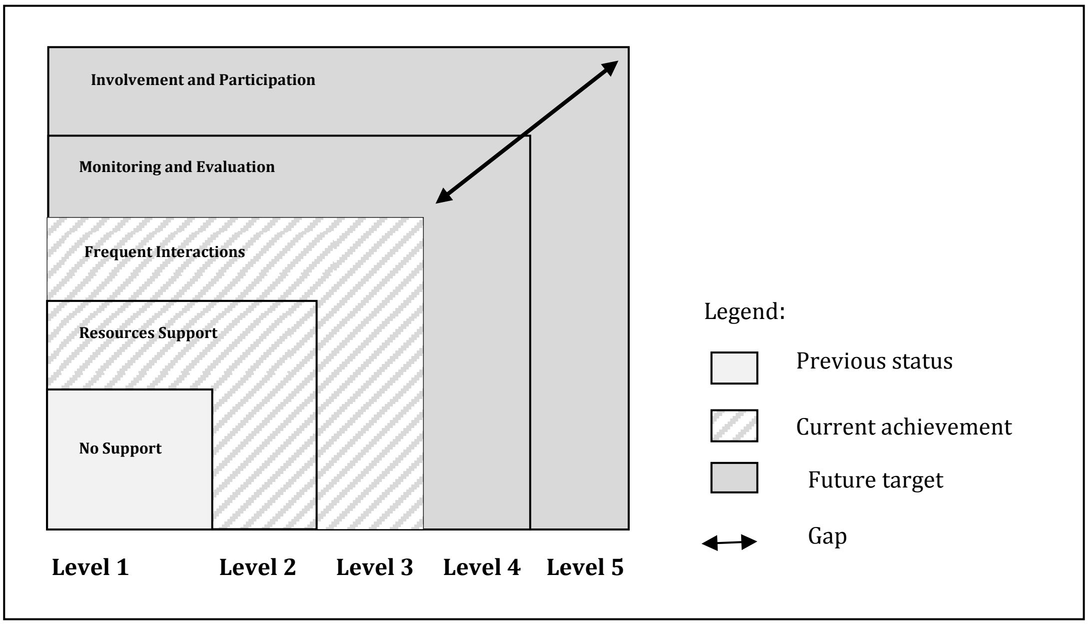
these modules that may affect the use of system Z were discussed before the modules were purchased.

- This shows that the senior management frequently interact with the IT Department as described in level 3.

c) Organisation's future planning

- According to Epsilon's IT Manager, a permanent steering committee known as '*IT Advice Committee*' will be formed in the near future. The members of the committee will comprise of staff representatives from all levels in the organisation and senior management *[Level 4: Monitoring and Evaluation]*. This committee will also have the task to identify opportunities to increase the efficiency of IT/IS applications, continuously monitor and evaluate IT/IS achievements, give advice and make recommendations in relation to IT/IS issues.
- The IT Manager also commented that it is possible for senior management to lead this committee in the future, *[Level 5: Involvement and Participation]*.

The analysis of Epsilon's status for senior management support is as follows:



4) <u>User involvement</u>

a) Organisation's previous achievement

- Before system Z, no specific system was used in managing the information in Epsilon. Thus, this factor was at level 1.

b) Organisation's current status

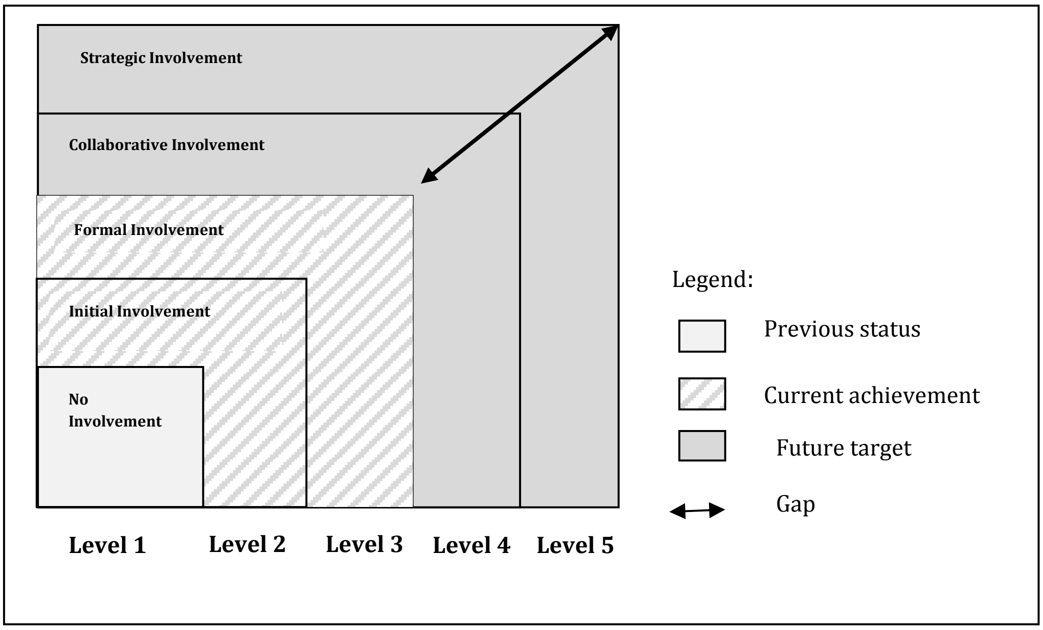
- Prior to purchasing system Z, users from every level (senior management to operational staff) were required to identify their needs before the decision to purchase was made *[Level 2: Initial Involvement]*.
- Currently, users are also involved in the system Z development process, such as testing and commenting on the new version of system Z (eg. the change from the DDEV Version to the Property Plus Version). Formal discussions between IT Department and user representatives were made after the testing process to obtain feedback from the user. All comments were recordered to be used as a guideline for further system enhancement.

- This scenario indicates that users become the main reference for the development of system Z as described in level 3.

c) Organisation’s future planning

- Epsilon’s IT Manager mentioned that users will be fully involved in future planning *[Level 4: Collaborative Involvement]*. An ‘IT *Advice Committee*’ (a permanent steering committee) will be formed in the future, which comprises of users’ representatives, senior management and the IT Department.
- This clearly shows that Epsilon is moving towards the highest maturity level (level 5).

The analysis of Epsilon’s status for the user involvement is as follows:



5) <u>Willingness to process change</u>

a) Organisation's previous achievement

- Common IT/IS application (eg. MS Office) was previously used to assist the business processes even though Epsilon does not have a IT Department.
- This shows that Epsilon was previously in level 2.

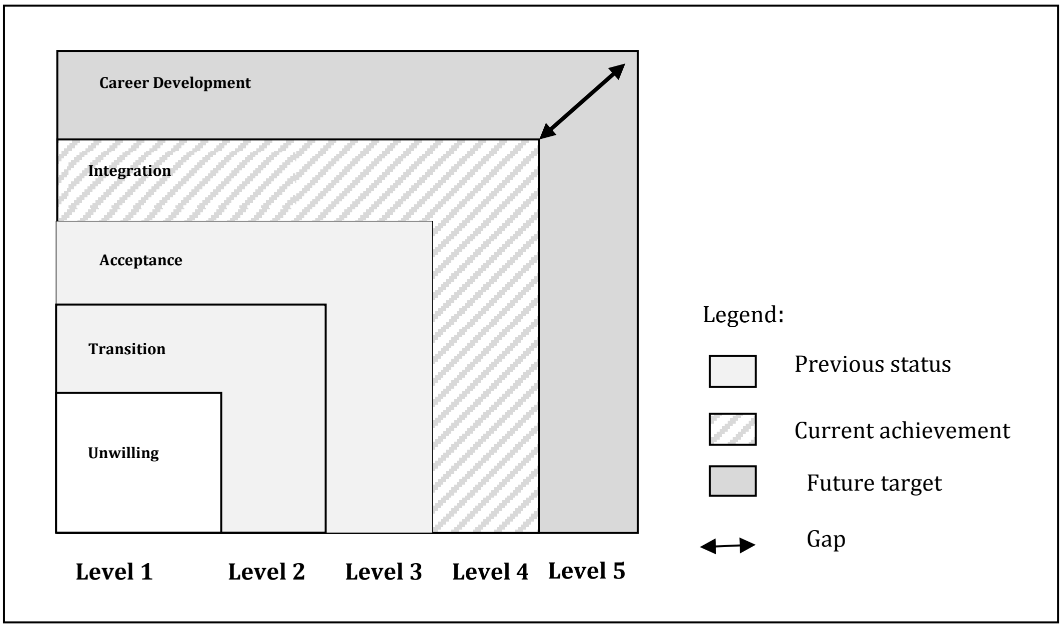
b) Organisation's current status

- Every project was managed using system Z, which eased daily work process for data entry and reports generation. According to Epsilon's senior IT executive, reports and paperwork were completed without hassle *[Level 3: Acceptance]*.
- The Property Management Module that was bought in 2010 enabled Epsilon to easily track and monitor every project by project group or region (geography). This module interfaced with the Financial Accounting Module where the project account records are visible but not editable.
- The above scenario shows that this factor is currently at level 4, where there is integration among departments that enables monitoring and controlling of activities (level 4).

c) Organisation's future planning

- According to Epsilon's IT Manager, they were looking forward to a system that could enable them to support long-term planning activities, such as sales trend and forecasting, as described in level 5 of preliminary maturity model. This system will benefit Epsilon and improve the organisational effectiveness.

The analysis of Epsilon's status for the Willingness to process change is as follows:



6) <u>Training/skills</u>

a) Organisation's previous achievement

- No formal training was provided by the organisation in the past. Staff who used office automation system are left on their own (level 1).

b) Organisation's current status

- Basic training programme on 'how to use' system Z was introduced during the early application of the system. The system vendor conducted the training, as it is part of the purchase package *[Level 2: Informal Training]*.
- Special training to obtain specific skills was then given by the IT Department based on the modules used by the staff. This is to ensure

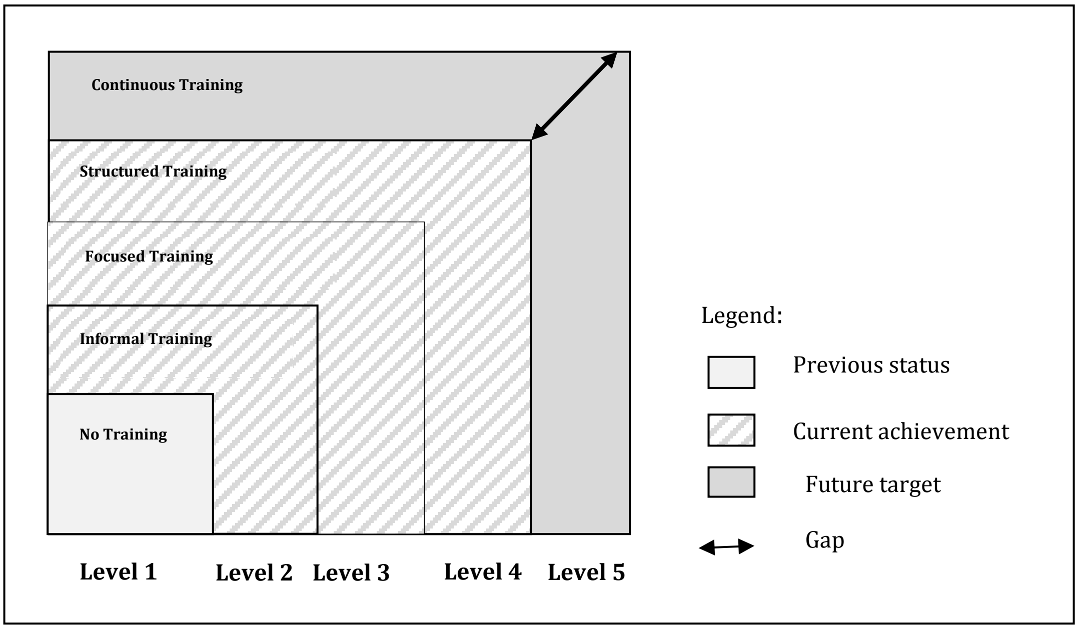
staff have the required skills to enable them to use all the modules effectively. This specific and specialised training was provided after the issues was raised by users during Epsilon's monthly meeting. Senior management then asked the IT Department to provide the training required by users *[Level 3: Focus Training]*.

- Based on the above experience, the IT Manager felt that there was a need to provide a formal and structured training programme to users. Therefore the '*Training and Implementation Work Plan'* is prepared, where different level of training skills for every module is provided. The IT Department provided hand-on and situation-based training to expose users on how to use the system and targeted real working situations.
- This above scenario indicates that this factor is currently at level 4, where structured training programme is provided to help users to use system Z effectively.

c) Organisation's future planning

- According to Epsilons' IT Manager, they are currently drafting the *'Continuous Training and Development Programme'*, which will be enforced by mid-2013. This programme is created to encourage staff to learn new knowledge and skills in relation to their profession for their career advancement *[Level 5: Continuous Training]*. This will also give opportunities to staff to obtain professional certification and become a qualified trainer. There are several rules in the *'Continuous Training and Development Programme'*, such as the type of programme and the total training hours to be fulfilled by staff.

The analysis of Epsilon's status for training/skills is as follows:



7) <u>Motivation</u>

a) Organisation's previous achievement

- Prior to implementing system Z, there was no specific motivational method used (level 1).

b) Organisation's current status

- A group-based reward system was introduced in mid-2000, which was during the early adoption of system Z *[Level 2: Reward System]*. Rewards such as group bonuses, social trips and gatherings were given based on departmental performance. This method was discontinued after a year since most of the staff were committed to the system Z since.
- Epsilon introduced a fixed agenda concerning IT/IS in their monthly meeting to provide staff with the opportunity to raise any issues and concerns relating to system Z *[Level 3: Open Communication]*.
- With the '*Training and Implementation Work Plan'* in practice, personal training was given to staff who have problems utilizing system Z.

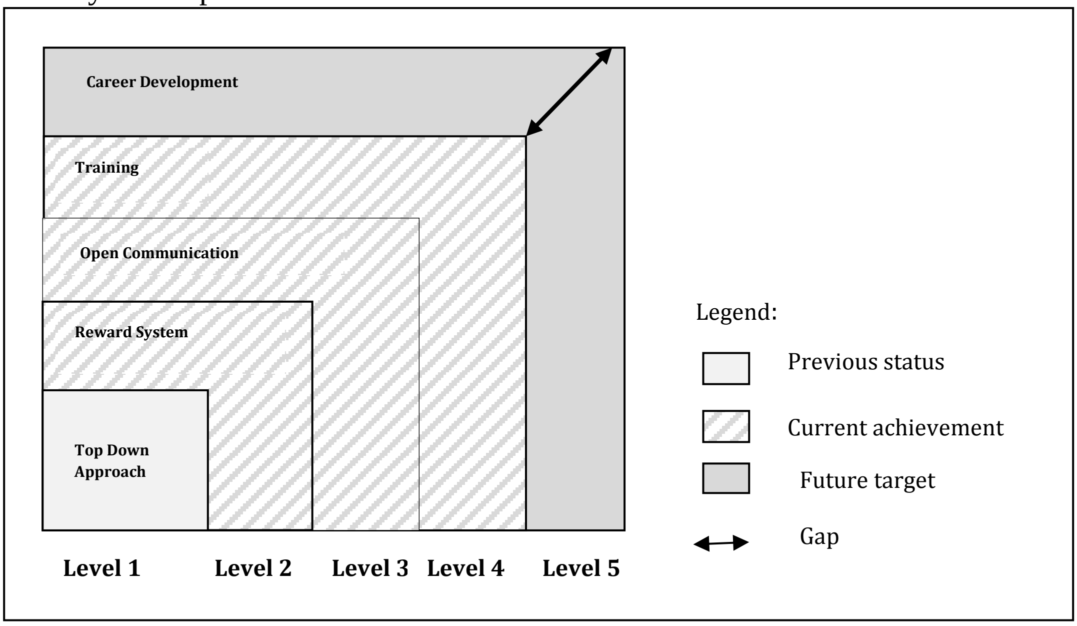
Customised training sessions were also given to suit with staff skills and needs.

- This indicates that this factor is currently at level 4, where one-to-one training is given to needed staff.

c) Organisation's future planning

- According to Epsilon's IT Manager, the *'Continuous Training and Development Programme'*, which is currently in the drafting stage, will be part of staff KPIs – to be effective by mid-2013. This shows that Epsilon is moving towards level 5.

The analysis of Epsilon's status for motivation is as follows:



7.6.4 Summary

- Business operations were performed manually before the adoption of system Z. Managing and retrieving data became the major issue for Epsilon due to the large number of projects throughout the country. The introduction of system Z with some modification has eased Epsilon's initial problems.

- Three (3) out of seven (7) factors have reached maturity level 4. These factors are motivation, training/skills and willingness to process change.
- To continuously motivate staff to use system Z, Epsilon is currently drafting the *'Continuous Training and Development Programme'*, which is expected to come into force by mid-2013. This training programme will become part of staff KPIs that will effect the staffs' annual appraisal [*Motivation: Level 5*]. With this programme coming into place, it is necessary for Epsilon to start raising staffs' awareness on this programme. This is important to bring positive attitudinal change towards continuous learning (APEG 2011), as it will affect their performance evaluation.
- Continuous training will become Epsilon future target [*Training/skills: Level 5]*. The organisation has already taken action by drafting the '*Continuous Training and Development Programme'. T*o develop a good training and development programme, organisation Epsilon is advised to create a training matrix – this should include current available training, current staffs' skills and future skills to be acquired by staff – need to be considered in developing the training matrix. According to Mikre (2011), good training programme shall specify training resources such as the trainers, venue, training duration and others.
- Epsilon is looking forward to use a system that can support their long-term planning activity [*Willingness to Process Change: Level 5*]. Finding the right system for Epsilon's current and future needs are important. The application of this system will help the senior management to plan,

monitor and control business process. Its application also helps the senior management in developing options and action plan for future strategy (Kamaruddin *et. al.,* 2011).

- The other four (4) factors fall at level 3 of the preliminary maturity model. The factors are IT staff roles and responsibilities, management style, senior management support and user involvement.
- IT staff is expected to have strategic responsibilities in the future. The first step was to entrust the IT staff to develop the '*IT Roadmap'*, which will consist of several IT strategies, which will describe how IT/IS will be used to support organisation mission, goals and overall direction [*IT Staff Roles and Responsibilities: Level 5*]. According to Epsilon's IT Manager, holistic consideration of the organisation's function and abilities should be considered in developing a good IT roadmap. Identifying current IT/IS capabilities, opportunities for further improvement, prioritizing the opportunities are among the steps involved in developing an IT roadmap (European Comission 2012).
- The delegating management style is expected to be practised in the near future [*Management Style: Level 4*]. According to Epsilon's IT Manager, the laissez-faire management might be practiced in the future when the IT Department become more established [*Management Style: Level 5*]. Epsilon is advised to use laissez-faire management when their staff are self-directed, highly skilled and motivated; without these attributes in staff, this management style will fail (Nwadukwe and Timinepere, 2012). This type of management style is recommended as staff will perform best when given the autonomy (Chaudhry and Javed, 2012).

- A permanent steering committee known as the '*IT Advice Committee*' will be formed in the near future. Epsilon is strongly advised to include senior management as part of the committee. Gaining the senior management 'buy-in' and participation will improve the effectiveness of steering committee as they have the necessary authority to make decision (NSW 2011). Senior management is expected to lead the steering committee when the committee is established [*Senior Management Support: Level 5*].
- The '*IT Advice Committee'* will comprise of user representative from every level of the organisation as well as senior management. This is necessary in order to get feedback and information from different levels within the organisation and the committee will involve in every stage of system development [*User Involvement: Level 5*]. Therefore, it is important to establish a clear guideline for the committee to clarify their roles and responsibilities.

Generally, five (5) out of seven (7) factors were validated through this case study, except for the management style and the willingness to process change. For the management style, level 1 (autocratic management) was not validated as Epsilon does not practice this style. Epsilon's IT Manager believes that this type of management style is not suitable with the local work culture. They started with the paternalistic management, where the senior management have control on everything but consider staffs' best interest. Another factor that needs to be highlighted here is the willingness to process change. In this factor, level 1 was not validated as the organisation started to adopt IT/IS from the start. Epsilon's previous achievement and their e-readiness gaps are illustrated in Figure 7.25.

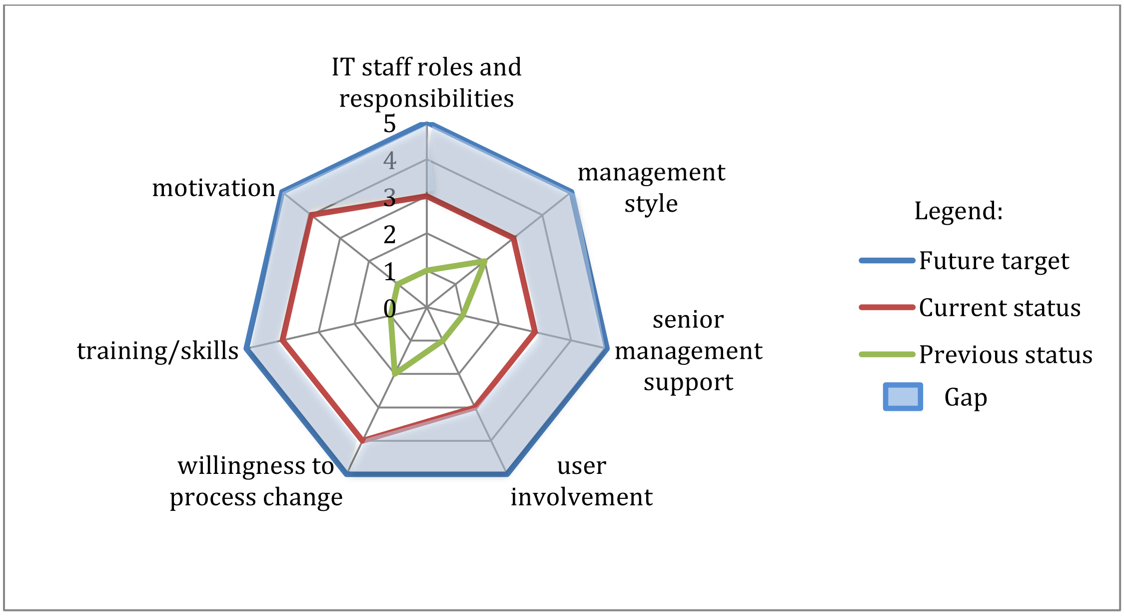
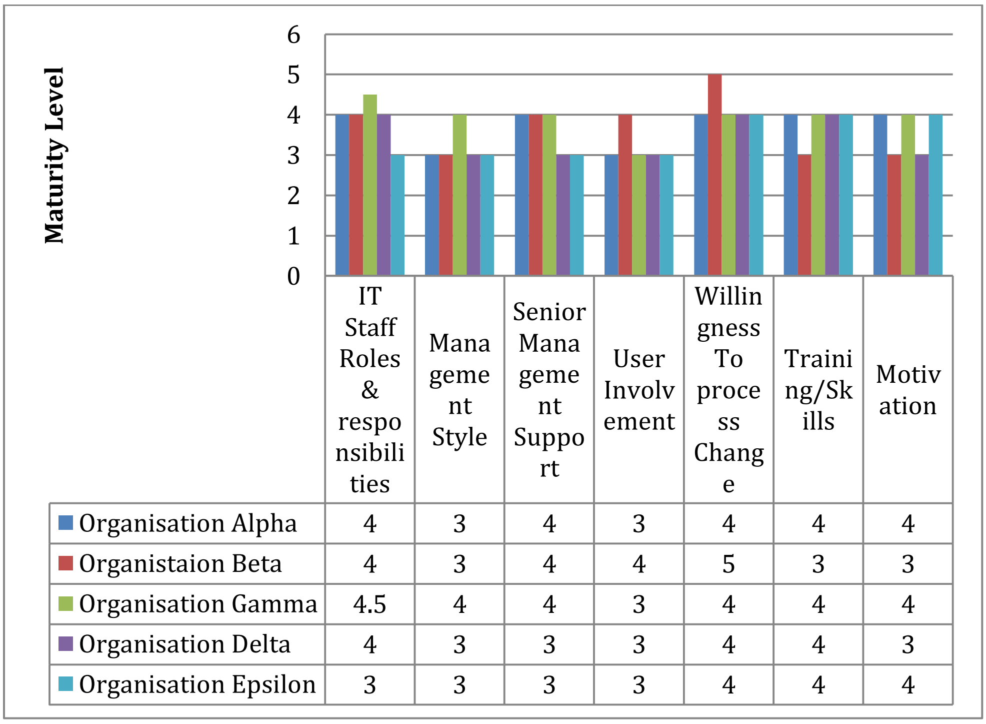


Figure 7.25: Organisation Epsilon e-readiness levels and gaps

The use of the preliminary maturity model clearly identified Epsilon's e-readiness gaps. Majority of the factor are two (2) levels behind their targeted level. Much attention should be given to the roles and responsibilities of IT staff, management style, senior management support and user involvement factors. The preliminary maturity model provided a systematic framework for carrying out benchmarking and performance improvement. The higher level (level 4 and 5) described in the preliminary maturity model can serve as a guideline for Epsilon's further improvement. Prioritizing the factors will help the organisation achieve success.

7.7 Overall organisations e-readiness levels

Findings from the five (5) case studies show that Beta, Gamma and Delta showed a positive response towards the implementation of IT/IS. This was proven as the three (3) organisations have the ability to develop their own IT/IS system even though they are construction organisations. The organisations currently have the required IT experts in developing the system, such as system programmer and system developer. When taking Alpha and Epsilon into consideration, they used the *off-the-shelf* systems, but it does not mean that they have lower people e-readiness level. This is reflected when both organisations were currently at level 4 for the willingness to process change factor. Both organisations can be considered as fortunate enough to found systems that suit them, with some modifications made from time to time.



	IT Staff Roles & responsibilities	Management Style	Senior Management Support	User Involvement	Willingness To process Change	Training/Skills	Motivation
Organisation Alpha	4	3	4	3	4	4	4
Organistaion Beta	4	3	4	4	5	3	3
Organisation Gamma	4.5	4	4	3	4	4	4
Organisation Delta	4	3	3	3	4	4	3
Organisation Epsilon	3	3	3	3	4	4	4

Figure 7.26: Overall organisations e-readiness level

Based on Figure 7.26, results for each organisation can be compared to determine the patterns that emerge from the five (5) case studies. There is only a slight difference in the current e-readiness levels for the five (5) organisations; the gap was in between one (1) to two (2) maturity levels.

Considering the type of organisation, there are differences in the e-readiness gaps between the private organisation (Alpha, Beta and Gamma) and the public and semi-public organisation (Delta and Epsilon). Figure 7.26 revealed that organisation

Delta and Epsilon have larger e-readiness gaps compared to organisation Alpha, Beta and Gamma. This occurs because four (4) out of the seven (7) factors in organisation Delta and Epsilon falls at level 3 of the preliminary maturity model. This might be due to the lack of support from the senior management in both organisations, where this factor is currently at level 3, compared to the other three organisations which are at level 4.

Nevertheless, the application of the system types either developed or *off-the-shelf* does not determine the high level of organisation readiness. This is reflected when Alpha, which is using the *off-the-shelf* system have a higher e-readiness level compared to Delta which is using their own developed system. The higher readiness level is determined when majority of Alpha's readiness level is at level 4, and only two (2) factors are at level 3, while majority of Delta's readiness levels are in level 3 and only three (3) factors are in level 4. Furthermore, Gamma who developed their own system, also has a high readiness level, with majority of the factors in level 4 except for one factor in level 3. On the other hand, Delta's readiness level can be consider low as compared to Gamma as majority of their factors are in level 3 and only three (3) factors are in level 4.

The size of an organisation does not determine high readiness levels. This is reflected when Delta (the largest organisation in this case study) has the same readiness level as Epsilon. The same readiness level is determined when majority of the factors are in level 3 and only three (3) factors are in level 4 for both of the organisations.

7.8 Conclusion

This chapter discussed the case studies conducted to validate the preliminary people e-readiness maturity model in the real-life context. Five (5) organisations were involved in the validation process, namely organisation Alpha, organisation Beta, organisation Gamma, organisation Delta and organisation Epsilon.

In Alpha, the highest maturity level achieved is level 4, for IT staff roles and responsibilities, senior management support, willingness to process change, training/skills and motivation. For all of these factors, they are targeting the highest maturity level, which is level 5. Alpha however, is only targeting level 4 of the preliminary maturity model for the other two (2) factors; user involvement and management style. Having a '*Five Years Strategic Planning*' Alpha will achieve their desired level without problems. For the user involvement factor, Alpha believes that it is not important to have a permanent steering committee, they will only form the committee when necessary. In term of management style, the next target for Alpha is the delegating management style, which is reflected in their current restructuring of the departments.

With 30 years of experience, Beta achieved the highest maturity level (level 5) for willingness to process change. Their experience is an excellent example of where the progressive level presented in the preliminary maturity model is validated, except for level 1. Beta is also targeting the highest maturity level for IT staff roles and responsibilities, motivation, training/skills, user involvement and senior management support. It is not impossible for Beta to achieve their target as they have a strong planning strategies through their '*Strategic Planning 2012-2015', 'IT Strategic Development Plan' and also 'Training and Development Programme'.* However, for the management style, Beta is only targeting level 4, which is the delegating management style as stated in their '*Strategic Planning 2012-2015*'.

Gamma achieved the highest maturity level for IT staff roles and responsibilities, which is in between level 4 and level 5. The other factors are currently at level 4 except for the user involvement (level 3); which they also target the highest maturity level. With a proper '*Annual IT Budget and Business Plan*', there is no doubt that Gamma will achieve their targeted level.

The highest maturity factor in Delta is level 4 for IT staff roles and responsibilities, willingness to process change and training/skills. Delta has targeted the highest maturity level for all these factors. Other factors such as management style, senior management support, user involvement, and motivation which is currently at level 3, also targeting the highest maturity level. With the presence of Delta's '*Strategic Framework 2012-2015'* and '*2012 ICT Planning',* they too can achieve the highest maturity level, as these documents will serve as their roadmaps in achieving their targets. Similar to Alpha, Delta also targeted level 4 as the highest maturity level for the management style (delegating management style). It is impossible for organisation Delta to practise the laissez-faire management style (level 5) since the organisation is a public organisation.

Motivation, training/skills and willingness to process change are the factors that achieved the highest maturity level, which is level 4 in Epsilon. Epsilon is targeting the highest maturity level for all the factors. With the establishment of Epsilon's '*Continuous Training and Development Programme'*, '*IT Roadmap'* and '*IT Advice Committee*', they will soon reach their desired level (level 5).

Chapter 8

People e-Readiness Maturity Model (PeRMM)

8.1 Introduction

This chapter will discuss on the enhancements made to the preliminary maturity model based on the case studies recommendations and suggestions from the five (5) organisations; organisation Alpha, organisation Beta, organisation Gamma, organisation Delta and organisation Epsilon– that were involved in the validation process as discussed in chapter 7 previously.

8.2 Improved People e-Readiness Maturity Model

Validation and improvement suggested by the participating organisations for each level are discussed in this section. Each factor is discussed separately by the highlighting experience of each organisation in every level.

8.2.1 Organisation Alpha

Organisation 'Alpha' was formed in 1988 as a highways maintenance provider with currently more than 900 staff. The usage of computerised maintenance management system, system V, has helped Alpha to perform their work effectively. Alpha's experience of more than 11 years with the usage of system V, were used to validate the preliminary maturity model as described in Table 8.1.

Table 8.1: Validation process in organisation Alpha

IT STAFF ROLES AND RESPONSIBILITIES		
Levels	**Scenario in Case study**	**Improvement Suggested**
Level 5: Strategic Responsibility	IT/IS will become the strategic partner and the key driver for the organisation, as stated in their '*Five Years Strategic Planning*'. A Chief Information Officer (CIO) will become a member of the board of directors in Alpha.	*Add:* IT/IS provides strategic direction for the organisation
Level 4: Business Management Responsibility	IT staff will be involved in developing the organisation's IT strategic analysis and formulation	-agreed as proposed-
Level 3: Max in-house Responsibility	Increased roles of IT staff but have collaboration with vendor. Staff were trained by vendor on how to maintain system and give training to staff	*Add:* collaboration with vendor
Level 2: Minimal Responsibility	IT Department was formed consisting of Head of ICT and technical assistant. Most of IT/IS works were outsourced to the vendor	-agreed as proposed-
Level 1: No Roles and Responsibilities	IT Department does not exist	-agreed as proposed-
MANAGEMENT STYLE		
Levels	**Scenario in Case study**	**Improvement Suggested**
Level 5: Laissez-faire	Alpha had previously practiced laissez-faire management style. The IT Department were given complete freedom to find a system that was able to help Alpha manage their data. Decision to use MS Access was made without consulting with the senior management or staff	-agreed as proposed-
Level 4: Delegating	More responsibility will be given to the Administration and Management Unit under the IT Department. This unit will be responsible to formulate Alpha's a long-term IT business plan.	-agreed as proposed-
Level 3: Participative/ Democratic	A '*Proposal Meeting'* is held once a month to give opportunities to staff to propose new ideas or suggestions.	-agreed as proposed-

Table 8.1: Validation process in organisation Alpha (Cont'd)

MANAGEMENT STYLE		
Levels	**Scenario in Case study**	**Improvement Suggested**
Level 2: Paternalistic	Senior management made the decision to use system V based on IT Department's proposal. The decision was made in the best interest of the organisation and staff.	Need to differentiate the level of tolerance and flexibility exist in the participative/democratic management style
Level 1: Autocratic	Six months time frame was given to the IT Department to propose a strategic plan in finding a practical solution for the organisation	-agreed as proposed-
SENIOR MANAGEMENT SUPPORT		
Levels	**Scenario in Case study**	**Improvement Suggested**
Level 5: Involvement and Participation	The CIO position (with a senior management status) will be created. The Human Resource and Administration Department is now preparing its job description.	-agreed as proposed-
Level 4: Monitoring and Evaluation	Senior management is involved in continuous evaluation for system V's investment, progress tracking and corrective action. Among actions taken includes revising the '*Standards and Procedure*', revising the strategies, revising the activity and revising the structure, system or support	-agreed as proposed-
Level 3: Frequent Interactions	A weekly meeting between senior management and IT Department was scheduled since several weaknesses of MS Access were encountered	-agreed as proposed-
Level 2: Resources Support	Specific resources for IT/IS investment in terms of financial and workforce were allocated when IT Department was formed	-agreed as proposed-
Level 1: No Support	IT/IS investment were made on ad-hoc basis due to the non-existence of IT Department	-agreed as proposed-
USER INVOLVEMENT		
Levels	**Scenario in Case study**	**Improvement Suggested**
Level 5: Strategic Involvement	A permanent steering committee will not be formed as Alpha believes that it is not necessary. The steering committee will only form when there is a need to develop, upgrade or enhance the system.	
Level 4: Collaborative Involvement	As stated in the '*IT Department Annual Report*', users will be fully involvement in every phase of the system development; starting from the initiation phase until the implementation	-agreed as proposed-
Level 3: Formal Involvement	In early 2004, a circular was issued to enforce user involvement in any IT system development. A minimum of two user were needed to be involved throughout the system development.	-agreed as proposed-

Table 8.1: Validation process in organisation Alpha (Cont'd)

USER INVOLVEMENT		
Levels	**Scenario in Case study**	**Improvement Suggested**
Level 2: Initial Involvement	No initial involvement from user in Alpha during the adoption of MS Access	
Level 1: No Involvement	The decision to use MS Access was purely made by the IT Department without consulting with users.	-agreed as proposed-
WILLINGNESS TO PROCESS CHANGE		
Levels	**Scenario in Case study**	**Improvement Suggested**
Level 5: Optimizing	According to the IT Manager, they started to create a dashboard (second quarter of 2012) that incorporated all essential and essential data necessary for the management of future planning.	-agreed as proposed-
Level 4: Integration	System V was used for inventory control, cost and profit analysis and also production scheduling.	-agreed as proposed-
Level 3: Acceptance	System V was used to store and manage all information regarding the project such as Construction Drawings, Monthly Interim Payment, Architect's Instructions, etc.	-a-agreed as proposed-
Level 2: Transition	The early application of MS Access was used for selected task, such as list of products and inventory list.	-agreed as proposed-
Level 1: Unwilling	All work was done manually during the early establishment of Alpha.	-agreed as proposed-
TRAINING/ SKILLS		
Levels	**Scenario in Case study**	**Improvement Suggested**
Level 5: Continuous Training	The organisation increased their training expenditure budget in their 2013 Budget to encourage staff to obtain professional qualifications.	-agreed as proposed-
Level 4: Structured Training	An '*Annual Training Plan*' had been established.	-agreed as proposed-
Level 3: Focused Training	Several staff were sent to attend the advanced level training for MS Access in order to obtain skills required to create forms and prepare reports, which were necessary for projects that were managed by MS Access.	*Rephrase description:* The organisation provides training for targeted competencies
Level 2: Informal Training	Basic training on how to use MS Access was given by system vendor when the software was purchased.	-agreed as proposed-
Level 1: No Training	Learning was based on individual efforts when common application like MS Office was used	-agreed as proposed-

Table 8.1: Validation process in organisation Alpha (Cont'd)

MOTIVATION		
Levels	**Scenario in Case study**	**Improvement Suggested**
Level 5: Career Development	In Alpha's latest '*Five Years Strategic Planning*', system V will be used as one of the staffs' KPI, which will affect their appraisal evaluation.	*Change the terms:* Career advancement
Level 4: Training	'*Annual Training Plan*' were prepared to train staff and make them familiar with the system.	-agreed as proposed-
Level 3: Open Communication	A '*Proposal Meeting*' was introduced with the introduction of System V. This meeting was held once a month, where staff were given the opportunity to communicate and propose new ideas.	-agreed as proposed-
Level 2: Reward System	A reward system was introduced, where staff would collect merit points whenever they use the system. These points were then converted into monetary rewards at the end of the year.	-agreed as proposed-
Level 1: Top Down Approach	No specific motivational method was used to encourage staff to use the Office Automation System.	-agreed as proposed-

8.2.2 Organisation Beta

Organisation Beta was established in 1976 as a Quantity Surveying firm with approximately 200 staff. System W, an Enterprise Collaboration System has been used for about 11 years to help Beta to control their project information. Beta's experience of using system W were used to validate the preliminary maturity model as described in Table 8.2.

Table 8.2: Validation process in organisation Beta

IT STAFF ROLES AND RESPONSIBILITIES		
Levels	**Scenario in Case study**	**Improvement Suggested**
Level 5: Strategic Responsibility	Beta is now drafting the '*Strategic Plan 2012-2015*'. They are planning to extend IT staff responsibilities to be in a position to align IT/IS and business strategy.	-agreed as proposed-
Level 4: Business Management Responsibility	IT staff will be involved in setting up the '*IT Strategic Development Plan*'.	-agreed as proposed-

Table 8.2: Validation process in organisation Beta (Cont'd)

IT STAFF ROLES AND RESPONSIBILITIES		
Levels	**Scenario in Case study**	**Improvement Suggested**
Level 3: Max in-house Responsibility	The '*System Maintenance Work Structure*' was developed and IT staff were responsible to maintain all existing systems in the organisation based on that schedule.	-agreed as proposed-
Level 2: Minimal Responsibility	Their early responsibilities were towards technical support, such as installing the software and simple software maintenance.	*Suggestion:* Combine level 1 and level 2
Level 1: No Roles and Responsibilities	Beta did not experience this stage as they had an IT Department when they were established.	
MANAGEMENT STYLE		
Levels	**Scenario in Case study**	**Improvement Suggested**
Level 5: Laissez-faire	Beta is targeting the delegating management style but they believe that their staff are not experienced enough to endure the laissez-faire management style.	
Level 4: Delegating	Based on the Beta's draft '*Strategic Plan 2012-2015*', a new sub-unit to the IT Department, Management IT Strategy Unit will be formed; where they will be responsible to prepare the organisations' IT strategy.	-agreed as proposed-
Level 3: Participative/ Democratic	Issues and problems encountered were discussed during the monthly meeting. The customisation made to add the workflow engine in 2012 was made based on staffs' proposal.	-agreed as proposed-
Level 2: Paternalistic	Every activity in Beta required approval from senior management, such as sending out drawings.	-agreed as proposed-
Level 1: Autocratic	Beta did not practice autocratic management style as they believe this will de-motivate staff. Furthermore, this management style will create fear and a tense environment that may further lead to high staff turnover; which inturn would hinder organisational progress.	
SENIOR MANAGEMENT SUPPORT		
Levels	**Scenario in Case study**	**Improvement Suggested**
Level 5: Involvement and Participation	Based on Beta's '*Strategic Plan 2012-2015*', a permanent steering committee will be formed in the future; where the senior management will lead the steering committee.	-agreed as proposed-
Level 4: Monitoring and Evaluation	Senior management actively monitor and evaluate the system using '*The Monitoring and Evaluation (M&E) System Plan*'.	-agreed as proposed-

Table 8.2: Validation process in organisation Beta (Cont'd)

SENIOR MANAGEMENT SUPPORT		
Levels	**Scenario in Case study**	**Improvement Suggested**
Level 3: Frequent Interactions	Security issues (late 1999) made senior management more actively interact with the IT Department in finding the solutions to the problem.	-agreed as proposed- *Suggestion:* Combine level 1 and level 2, since Beta already had an IT Department when they were established.
Level 2: Resources Support	Sufficient resources were allocated for IT/IS investment to support the IT Department .	
Level 1: No Support	Beta did not experienced this stage as they had an IT Department when they were established.	
USER INVOLVEMENT		
Levels	**Scenario in Case study**	**Improvement Suggested**
Level 5: Strategic Involvement	A permanent steering committee will be formed as stated in their '*IT Strategic Development Plan*'.	-agreed as proposed-
Level 4: Collaborative Involvement	Users to be involved in feasibility study, followed by the requirement analysis, design, and development and also prototype testing. Users were not involved in the decision-making process but are allowed to make suggestions.	-agreed as proposed-
Level 3: Formal Involvement	Beta did not experience these 2 levels – with more than 10 years experience in systems development made them realize and recognize the importance of userinvolvement in system development.	
Level 2: Initial Involvement		
Level 1: No Involvement	The decision to use MS Office was made by the management without consulting with staff.	-agreed as proposed-
WILLINGNESS TO PROCESS CHANGE		
Levels	**Scenario in Case study**	**Improvement Suggested**
Level 5: Optimizing	The system is currently being used for operational development plan, budget forecasting, profitability plans and manpower planning.	-agreed as proposed-
Level 4: Integration	Since 2008, the annual budgeting and inventory control analysis were completed with the system.	-agreed as proposed-
Level 3: Acceptance	System W was introduced in stages - only projects valued more RM200 million were managed using the system at the beginning.	-agreed as proposed-
Level 2: Transition	Common MS Office was used to handle all IT/IS activities in the organisation.	*Suggestion:* Combine level 1 and level 2, since Beta already had an IT Department when they were established.
Level 1: Unwilling	Beta did not experience this stage as they had an IT Department when they were established.	

Table 8.2: Validation process in organisation Beta (Cont'd)

TRAINING SKILLS		
Levels	**Scenario in Case study**	**Improvement Suggested**
Level 5: Continuous Training	According to Beta's '*Training and Development Programme',* they are planning to enforce staff to attend at least two (2) professional training programmes or the continuing professional development (CPD) courses every year, effective from 2013.	-agreed as proposed-
Level 4: Structured Training	Beta prepared '*The Training and Development Programme'* consisting of on-the-job training.	-agreed as proposed-
Level 3: Focused Training	Focus training was given new features in the system were introduced (e.g. integration of CAD Measurement and system W).	-agreed as proposed-
Level 2: Informal Training	Basic training was given to staff upon request, which usually originates from newly recruited staff.	-agreed as proposed-
Level 1: No Training	Training was based on individuals, since majority of staff have the basic skills in using MS Office.	-agreed as proposed-
MOTIVATION		
Levels	**Scenario in Case study**	**Improvement Suggested**
Level 5: Career Development	Based on Beta's *Strategic Plan 2012-2015'*, System W will be used as part of the staff KPIs. Bonuses or promotions will be rewarded depending on their performance.	-agreed as proposed-
Level 4: Training	Yearly '*Training and Development Programme'* is designed to improve staffs' skills and capabilities.	-agreed as proposed-
Level 3: Open Communication	Beta's monthly meetings were used as a communication platform between staff and senior management. Any problems/issues raised were discussed thoroughly and brought to the attention of senior management for solutions.	-agreed as proposed-
Level 2: Reward System	Beta did not experienced this stage as most of the staff did not have much problems to adopt IT/IS.	
Level 1: Top Down Approach	No specific motivation method was used, since IT/IS during then was limited to MS Office only.	-agreed as proposed-

8.2.3 Organisation Gamma

Organisation Gamma was incorporated in 1976 with the core business in areas of engineering and construction and currently has approximately 2300 staff. The four (4) years of experience using system X (document management system) are used to validate the preliminary maturity model as described in Table 8.3.

Table 8.3: Validation process in organisation Gamma

IT STAFF ROLES AND RESPONSIBILITIES		
Levels	**Scenario in Case study**	**Improvement Suggested**
Level 5: Strategic Responsibility	According to the latest Gamma's '*Annual Report 2011*'. IT will become the key driver of the organisation in the future. Senior IT officers were involved in formulating the '*The Annual IT Budget and Business Plan*' to support the overall organisational strategies and programme.	-agreed as proposed-
Level 4: Business Management Responsibility	Currently IT staff are required to measure and manage the performance of system X against organisational objectives, which are measured through the Beta's '*ICT Balance Scorecard*' and 'Return on Investment' (ROI). IT staff representatives were also involved in creating Betas' vision, mission and value statement.	-agreed as proposed-
Level 3: Max in-house Responsibility	In 2003, in-house customisation to MS Access was made based on the advice and recommendation from the IT Department. This is to enable the PDF imaging attachment and for easy retrieving of documents. IT staff were also responsible to provide technical advice, such as proposing a new system which can overcome the limitations of MS Access.	*Change the terms and description:* The IT Department acts as the influencer; this department has the ability to give advice and/or influence senior management in decision-making.
Level 2: Minimal Responsibility	In early 1990's, the IT Department was formed. Majority of IT/IS works were outsourced to the vendor. IT Department only assisted in giving technical advice and solve simple technical problems.	*Suggestion:* Change the term to technical responsibilities
Level 1: No Roles and Responsibilities	During the early establishment of Gamma, the IT Department did not exist	-agreed as proposed-

Table 8.3: Validation process in organisation Gamma (Cont'd)

MANAGEMENT STYLE		
Levels	**Scenario in Case study**	**Improvement Suggested**
Level 5: Laissez-faire	According to the latest Gamma's '*Annual IT Budget and Business Plan*', the IT Department will be independent and will make decisions on system X within the department.	-agreed as proposed-
Level 4: Delegating	Full responsibility was given to the IT Department either to find *off-the-shelf* system or to develop a new system to replace MS Access.	-agreed as proposed-
Level 3: Participative/ Democratic	'*Focus Group Discussion*' involving all levels of staff were conducted to give opportunity to all to raise their views and suggestion in an open manner. The customisation of MS Access in 2003 was based on this discussion.	-agreed as proposed-
Level 2: Paternalistic	Funds were allocated for IT/IS investment in Gamma's '*Annual Budget*' to provide necessary resources and training to assist staff on how to use MS Access.	-agreed as proposed-
Level 1: Autocratic	One-way communication was practiced (in the past) where senior management gave instructions to staff. This management style was practiced for only 3 years as the organisation experienced high staff turn-over.	-agreed as proposed-
SENIOR MANAGEMENT SUPPORT		
Levels	**Scenario in Case study**	**Improvement Suggested**
Level 5: Involvement and Participation	Gamma is planning to form a permanent steering committee that will be led by the senior management, as stated in their latest '*Annual IT Budget and Business Plan*'.	-agreed as proposed-
Level 4: Monitoring and Evaluation	Senior management used the '*Information Technology Investment Management (ITIM) Standard*' to identify, control and evaluate the needs of the system X investment across its lifecycle.	-agreed as proposed-
Level 3: Frequent Interactions	Weekly meetings were held between the senior management and the IT Department to discuss current issues on IT/IS, training programme, IT staff planning, as well as any problems faced with the implementation of MS Access.	-agreed as proposed-
Level 2: Resources Support	With the establishment of IT Department, specific funds were allocated for IT/IS investment as stated in their '*Annual Budget*'.	-agreed as proposed-
Level 1: No Support	Before the existence of IT Department, ad-hoc IT/IS investment was made.	-agreed as proposed-

Table 8.3: Validation process in organisation Gamma (Cont'd)

USER INVOLVEMENT		
Levels	**Scenario in Case study**	**Improvement Suggested**
Level 5: Strategic Involvement	A permanent steering committee for system development will be formed in the future as stated in Gamma's latest '*Annual IT Budget and Business Plan*'.	-agreed as proposed-
Level 4: Collaborative Involvement	According to Gamma's IT Manager, staff will be fully involved in system development in the near future.	-agreed as proposed-
Level 3: Formal Involvement	Users are currently involved in the User Requirement Study (URS), Hosting and Infrastructure Assessment and User Acceptance Test, before system X was introduced.	-agreed as proposed-
Level 2: Initial Involvement	Ad-hoc user requirement analysis was made, which involved detailed discussions between users' representative and the IT Department before the selection of MS Access.	-agreed as proposed-
Level 1: No Involvement	The decision to use Lotus 123 was made without consultation with users.	-agreed as proposed-
WILLINGNESS TO PROCESS CHANGE		
Levels	**Scenario in Case study**	**Improvement Suggested**
Level 5: Optimizing	In the mid-2012, the IT Department proposed to develop a system to support the long range planning activities in Gamma. The system is expected to be launched in 2013. Currently, the system is still under the development by the IT Department	-agreed as proposed-
Level 4: Integration	System X is able to manage all applications files such as CAD, Word, Excel, PDF, images, audio, video and others in a more flexible manner. It has the capacity to add, modify or delete the information from the database. Documents can easily be retrieved with the search navigation. System X has the facility to monitor and control projects.	-agreed as proposed-
Level 3: Acceptance	Information such as Performance Guarantee Sum, List of Drawings, and Preliminaries Item of a project can be obtained from MS Access.	-agreed as proposed-
Level 2: Transition	Beta started to adopt Lotus 123, then MS Excel. During this time, only selected tasks were carried out using the application. MS Excel were used by the Finance Department in preparing payroll.	-agreed as proposed-
Level 1: Unwilling	When Gamma was formed, no IT/IS application was used.	-agreed as proposed-

Table 8.3: Validation process in organisation Gamma (Cont'd)

TRAINING/ SKILLS		
Levels	**Scenario in Case study**	**Improvement Suggested**
Level 5: Continuous Training	Based on Gamma's recent monthly meeting minutes, senior management will continually encourage staff to attend professional development programmes to equip themselves with latest knowledge and skills.	-agreed as proposed-
Level 4: Structured Training	A learning centre known as '*XLC*' was formed and the centre is responsible to prepare the '*Information Technology Training Plan*' (ITTP).	-agreed as proposed-
Level 3: Focused Training	Training to use MS Access was only provided when requested by the staff based on the needed knowledge, skills and abilities to manage particular projects.	-agreed as proposed-
Level 2: Informal Training	Funds were allocated for IT/IS training when Gamma started to use Lotus 123 and MS Excel.	-agreed as proposed-
Level 1: No Training	No training was provided at the early establishment of Gamma as they did not use any IT/IS application.	-agreed as proposed-
MOTIVATION		
Levels	**Scenario in Case study**	**Improvement Suggested**
Level 5: Career Development	As stated in the latest Gamma's '*Annual IT Budget and Business Plan'*, a strategic performance management approach via KPI will be adopted using a Balance Scorecard Method.	*Change term:* Career development to career advancement.
Level 4: Training	Specific training will be given to staff (when required) as stated in the '*Information Technology Training Plan*' (ITTP), which is proposed by Gamma's training centre.	-agreed as proposed-
Level 3: Open Communication	'*Knowledge Sharing Programme*' was held to give the opportunity to staff to communicate freely with senior management.	-agreed as proposed-
Level 2: Reward System	At the early introduction of system X, a reward system was introduced. Rewards such as digital cameras and video recorders were given to the staff who frequently use the system. This method was used for about one year.	-agreed as proposed-
Level 1: Top Down Approach	According to Gamma's IT Manager, staff will receive direct instructions from the senior management to use MS Access in the past.	-agreed as proposed-

8.2.4 Organisation Delta

Organisation Delta was formed in 1872 as a technical department in the national infrastructure development and has more than 30,000 staff. Delta has been using a database management system, System Y for more than 26 years in assisting them to monitor projects that they handled. Their experience in using the system was used to validate the preliminary maturity model as described in Table 8.4.

Table 8.4: Validation process in organisation Delta

IT STAFF ROLES AND RESPONSIBILITIES		
Levels	**Scenario in Case study**	**Improvement Suggested**
Level 5: Strategic Responsibility	Based on Delta's '*Strategic Framework 2012-2015*', IT will become the organisational key partner in the future. Therefore, IT staff are expected to have strategic responsibilities - responsible to align the IT strategy with organisation business strategy.	*Add Description:* IT Department involved in preparing the organisation for future direction, as in aligning IT/IS strategy, it involves preparing the organisation for future direction
Level 4: Business Management Responsibility	More professional staff were recruited (e.g. system developer, system administrator, programmer and others) and IT staff have more responsibilities; from developing, maintaining, and customising system Y. They are also responsible to plan, organise and coordinate IT needs in compliance with the '*The 2012 ICT Planning*'.	-agreed as proposed-
Level 3: Max in-house Responsibility	Outsourcing of IT/IS works was minimal, as the internal IT Department were responsible to maintain and customise other system used in organisation Delta. IT staff were also responsible ensure the system is secure and stable, constantly updates and to provide training to staff.	-agreed as proposed-
Level 2: Minimal Responsibility	Majority of IT/IS work were outsourced to a third party; IT staff only provide a simple technical assistance to the organisation, such as provide direct operating assistant when necessary and interact with the software company to resolve technical issues.	-agreed as proposed-
Level 1: No Roles and Responsibilities	IT Department did not exist before the introduction of system Y	-agreed as proposed-

Table 8.4: Validation process in organisation Delta (Cont'd)

MANAGEMENT STYLE		
Levels	**Scenario in Case study**	**Improvement Suggested**
Level 5: Laissez-faire	It is impossible for Delta to implement laissez-faire management style, as they are a public organisation that is subject to the central government rules and policies.	
Level 4: Delegating	All matters pertaining to system Y is the responsibility of the IT Department as stated in their future planning in their '*2012 ICT Planning*'.	-agreed as proposed-
Level 3: Participative/ Democratic	'*Rakan 1*' - this web-based portal allowed staff all over the country to share their knowledge or feedback about everything, including system Y.	-agreed as proposed-
Level 2: Paternalistic	The development of system Y was suggested by senior management to overcome the hassle of manual reporting experienced by the staff. The decision was made for the benefit of staff and the organisation.	The interviewee believed that it is important to identify the level of tolerance and flexibility to differentiate it with the democratic management style where it has maximum tolerance and flexibility.
Level 1: Autocratic	Manual forms were used to record the current status of the project – these forms will need to be approved by the project leader and senior management of the branch office before it is sent to the headquarters for further action and to be stored in the '*Project File*'.	-agreed as proposed-
SENIOR MANAGEMENT SUPPORT		
Levels	**Scenario in Case study**	**Improvement Suggested**
Level 5: Involvement and Participation	The '*Technology and Investment Committee*' (TIC) will be led by the senior management in the future.	-agreed as proposed-
Level 4: Monitoring and Evaluation	Based on Delta's '*Strategic Framework 2012-2015*', a permanent steering committee known as the 'Technology and Investment Committee' (TIC) will be set up to monitor and evaluate system Y's investment and activities. Senior management will become part of the TIC.	-agreed as proposed-
Level 3: Frequent Interactions	Specific meeting between the IT Department and senior management are held every month, where they discuss about issues concerning system Y, IT Department current activities, reviewing the department action plan, training plan, as well as their future planning. Senior management gives advice to the department. The '*2012 ICT Planning*' is one of the examples resulting from this meeting.	-agreed as proposed-
Level 2: Resources Support	Necessary resources for system development (financial and manpower) were provided. New IT professional staff were recruited, which included system developers, system administrators, programmers and others.	-agreed as proposed-

Table 8.4: Validation process in organisation Delta (Cont'd)

SENIOR MANAGEMENT SUPPORT		
Levels	**Scenario in Case study**	**Improvement Suggested**
Level 1: No Support	IT/IS investment was on an ad-hoc basis as the IT Department did not exist during that time.	-agreed as proposed-
USER INVOLVEMENT		
Levels	**Scenario in Case study**	**Improvement Suggested**
Level 5: Strategic Involvement	As stated in Delta's '*Strategic Framework 2012-2015*', a permanent steering committee will be formed to provide the development team with a core group of staff for further requirement analysis, to verify and ensure the developed system will meet staffs' expectations.	-agreed as proposed-
Level 4: Collaborative Involvement	Delta did not experience this level as they planned to form a permanent steering committee that will be fully involved in the system development.	
Level 3: Formal Involvement	Users at all levels participate in the design, development, testing, implementation and customisation of system Y. Questionnaire survey forms are used to obtain feedback from the users.	-agreed as proposed-
Level 2: Initial Involvement	Ad-hoc meetings were held between the IT Department and staffs' representatives to identify users' requirement before system Y was developed.	-agreed as proposed-
Level 1: No Involvement	Prior to the implementation of system Y, there was no involvement from users as there was no specific system used in Delta.	-agreed as proposed-
WILLINGNESS TO PROCESS CHANGE		
Levels	**Scenario in Case study**	**Improvement Suggested**
Level 5: Optimizing	The IT Department proposed to senior management to develop a forecasting system, which will help them in manpower planning and operation plan development. The proposal is still in discussion stage.	-agreed as proposed-
Level 4: Integration	Real-time monitoring of the construction activity is currently used with the help of the web based application	-agreed as proposed-
Level 3: Acceptance	In 2000, system Y had been used to manage whole construction projects, which include planning, procurement, design, construction and handing over.	-agreed as proposed-
Level 2: Transition	The early application of system Y was for recording the status of construction projects.	-agreed as proposed-
Level 1: Unwilling	Previously, there was no IT/IS application used in Delta.	-agreed as proposed-

Table 8.4: Validation process in organisation Delta (Cont'd)

Levels	Scenario in Case study	Improvement Suggested
TRAINING/ SKILLS		
Level 5: Continuous Training	One of the agendas stated in Delta's '*Strategic Framework 2012-2015'* is to produce more technical experts. In doing so, Delta requires their staff to be registered with professional bodies or institutions accordingly. Attending the Continuous Professional Development (CPD) programme is a part of the process.	-agreed as proposed-
Level 4: Structured Training	Training programmes - '*Three Phase Training Programme'* starting with the '*Introduction Phase', 'On-Site Training*' and '*Advanced Level Training'* were introduced.	-agreed as proposed-
Level 3: Focused Training	In 1999, a formal training programme was conducted due to the increasing number of staff; since every staff from branch and site offices were able to update construction project status using system Y.	-agreed as proposed-
Level 2: Informal Training	Informal training was given by the IT Department based on request from staff.	-agreed as proposed-
Level 1: No Training	Before the introduction of system Y, IT training was not provided since IT Department did not exist.	-agreed as proposed-
MOTIVATION		
Level 5: Career Development	Delta is planning to make the application of system Y as part of staff KPI starting 2014, which will affect their performance appraisals and evaluation as stated in Delta's '*Strategic Framework 2012-2015*'.	-agreed as proposed-
Level 4: Training	Based on Delta's '*2012 ICT Planning*', personal training will be given to staff who are still experiencing difficulties in using system Y.	*Change the term:* From training to coaching. Interviewee believe that the term should be change to differentiate it with the training/skills factor.
Level 3: Open Communication	'*Rakan 1*' - a web-based portal is used as the major communication platform, where opinions, problems or issues regarding system Y are discussed.	-agreed as proposed-
Level 2: Reward System	Delta cannot use the reward system to their staff as they are a public organisation and their expenditure is governed by the central government.	
Level 1: Top Down Approach	At the early introduction of system Y, the top down approach was used to force staff to use the system.	-agreed as proposed-

8.2.5 Organisation Epsilon

Organisation Epsilon was established in August 1997 with the objective of providing quality affordable homes for every family in Malaysia. They have employed approximately 2000 staff. Enterprise resource planning, system Z was used to help them in managing data. Their experience in using system Z for about 11 years was used to validate the preliminary maturity model as described in Table 8.5.

Table 8.5: Validation process in organisation Epsilon

IT STAFF ROLES AND RESPONSIBILITIES		
Levels	**Scenario in Case study**	**Improvement Suggested**
Level 5: Strategic Responsibility	IT staff will be responsible to align IT/IS strategy with the organisation business strategy in the future.	-agreed as proposed-
Level 4: Business Management Responsibility	According to Epsilon's IT Manager, IT staff was expected to develop the '*IT Roadmap*', which will consist of several strategies as a guideline for the organisation's future technology advancement.	-agreed as proposed-
Level 3: Max in-house Responsibility	The IT Department currently has 12 staff and they are separated into 3 sub-units. Outsourcing of system Z is now reduced. The IT Department now has the ability to customise and maintain system Z.	-agreed as proposed-
Level 2: Minimal Responsibility	Their roles are more towards technical advisory to the organisation, where they explored and evaluated *off-the-shelf* system that would suit Epsilon's needs. As a result, system Z was proposed and bought; majority of the maintenance work became the responsibility of the vendor.	-agreed as proposed-
Level 1: No Roles and Responsibilities	Prior to the implementation of system Z, the IT Department did not exist.	-agreed as proposed-
MANAGEMENT STYLE		
Levels	**Scenario in Case study**	**Improvement Suggested**
Level 5: Laissez-faire	According to the IT Manager, it is possible that the management of system Z will be given solely to the IT Department when the department becomes more established in the future.	-agreed as proposed-

Table 8.5: Validation process in organisation Epsilon (Cont'd)

MANAGEMENT STYLE		
Levels	**Scenario in Case study**	**Improvement Suggested**
Level 4: Delegating	IT Department will be given the responsibility to develop the '*IT Roadmap*', as discussed in Epsilon's monthly meeting.	-agreed as proposed-
Level 3: Participative/ Democratic	A new fixed agenda is introduced in Epsilon's monthly meeting to discuss about issues about IT/IS, which includes system Z adoption, capabilities, current updates, training and others. e.g.: In year 2009, the Purchase Order Module and Contractor Module were bought based on staffs' suggestion which was discussed during the monthly meeting.	-agreed as proposed-
Level 2: Paternalistic	The decision to use system Z was made by senior management in the best interests of the staff to ease their work.	-agreed as proposed-
Level 1: Autocratic	The organisation did not practice this style, as it is not suitable with the organisation culture.	
SENIOR MANAGEMENT SUPPORT		
Levels	**Scenario in Case study**	**Improvement Suggested**
Level 5: Involvement and Participation	The IT Manager said that it is not impossible that in the future, the steering committee will be led by the senior management	-agreed as proposed-
Level 4: Monitoring and Evaluation	A permanent steering committee known as '*IT Advice Committee*' will be formed in the near future. Senior management will be part of it and will be responsible to increase the efficiency of IT/IS application, continuously monitor and evaluate IT/IS achievement, give advice and recommendation in relation to IT/IS issues.	-agreed as proposed-
Level 3: Frequent Interactions	Thorough discussion between IT Department and senior management was made due to staff request to buy the Purchase Order Module and Contractor Module. Factors such as costs, necessity, problems or bugs in relation to those modules which may affect the use of system Z were discussed before the decision was made to buy the modules.	-agreed as proposed-
Level 2: Resources Support	Funds were allocated for the purchase of system Z in 2000.	-agreed as proposed-
Level 1: No Support	Prior to the implementation of system Z, IT/IS investment was on an ad-hoc basis as the IT Department did not exist.	-agreed as proposed-

Table 8.5: Table 8.5: Validation process in organisation Epsilon (Cont'd)

USER INVOLVEMENT		
Levels	**Scenario in Case study**	**Improvement Suggested**
Level 5: Strategic Involvement	An 'IT *Advice Committee*' - a permanent steering committee will be formed, comprising of users' representatives and the senior management.	-agreed as proposed-
Level 4: Collaborative Involvement	Full involvement from users is expected in the future.	-agreed as proposed-
Level 3: Formal Involvement	User were involved in the system Z development process such as testing and commenting on the new version of system Z (when it was changed from the DDEV Version to the Property Plus Version). All comments were recorded and were used as a guideline and for further system enhancement.	-agreed as proposed-
Level 2: Initial Involvement	Users from every level were required to identify their needs before decision to purchase system Z.	-agreed as proposed-
Level 1: No Involvement	Users were not involved as no specific system was used in managing the information in the Epsilon.	-agreed as proposed-
WILLINGNESS TO PROCESS CHANGE		
Levels	**Scenario in Case study**	**Improvement Suggested**
Level 5: Optimizing	According to Epsilon's IT Manager, they are looking forward to a system which could enable them to support long range planning activities such as sales trend and forecasting.	-agreed as proposed-
Level 4: Integration	The Property Management module which was bought in 2010, enabled Epsilon to easily track and monitor every project which was grouped according to its region. This module also interfaced with the Financial Accounting Module where the account records were visible but not editable.	-agreed as proposed-
Level 3: Acceptance	According to Epsilon's senior IT executive, every project is managed by system Z. Reports and paper work can be completed without any problems in retrieving information.	-agreed as proposed-
Level 2: Transition	Common IT/IS application such as MS Office was used previously to run the business process, even though Epsilon did not have an IT Department then	-agreed as proposed-
Level 1: Unwilling	Epsilon started to adopt IT/IS since its establishment, even though they did not have an IT Department at that time.	

Table 8.5: Table 8.5: Validation process in organisation Epsilon (Cont'd)

TRAINING/ SKILLS		
Levels	**Scenario in Case study**	**Improvement Suggested**
Level 5: Continuous Training	According to Epsilons' IT Manager, they are currently drafting the *'Continuous Training and Development Programme'* which will be enforced by the mid-2013. This programme was created to encourage staff to learn new skills for their career advancement.	-agreed as proposed-
Level 4: Structured Training	'*Training and Implementation Work Plan'* is prepared, where different levels of training for every module is provided. The hands-on situational-based training programme prepare the staff on how to use the system based on the real working situations.	-agreed as proposed-
Level 3: Focused Training	Special training to obtain specific skills was then given by the IT Department based on the modules used by the staff.	-agreed as proposed-
Level 2: Informal Training	Basic training programme was conducted by the vendor on how to use system Z, and was introduced during the early application of the system.	-agreed as proposed-
Level 1: No Training	Previously, no formal training was provided by Epsilon. Staff who use the Office Automation System went through a self-taught process.	-agreed as proposed-
MOTIVATION		
Levels	**Scenario in Case study**	**Improvement Suggested**
Level 5: Career Development	According to Epsilons' IT Manager, the *'Continuous Training and Development Programme'* (currently in the draf) will be part of staff KPIs. Staff will be required to fulfil the requirement of the programme which will be effective by mid-2013	-agreed as proposed-
Level 4: Training	With the '*Training and Implementation Work Plan*', personal training is given to staff who have problems using system Z. A customised training session will be given to suit staff skills and needs.	*Change the terms:* From training to personal guidance - The term personal guidance is more appropriate than training since the organisation already provide training courses for their staff
Level 3: Open Communication	Staff are given the opportunity to raise any issues and concern relating to system Z when organisation Epsilon introduced a fixed agenda concerning IT/IS in their monthly meeting	-agreed as proposed-
Level 2: Reward System	A group-based reward system was introduced in mid-2000. Rewards such as group bonuses, group bowling trip and dinner were given based on the department performance. This method was used for only a year, since most of the staff were committed to use system Z.	-agreed as proposed-

Table 8.5: Table 8.5: Validation process in organisation Epsilon (Cont'd)

MOTIVATION		
Levels	**Scenario in Case study**	**Improvement Suggested**
Level 1: Top Down Approach	No specific motivational method was used.	-agreed as proposed-

Summary of the validated levels are illustrated in the Table 8.6.

Table 8.6: Validated levels

FACTORS	LEVELS	ALPHA	BETA	GAMMA	DELTA	EPSILON	OVERALL
IT Staff Roles and Responsibilities	Level 5: Strategic Responsibility	✓	✓	✓	✓	✓	**Validated**
	Level 4: Business Management Responsibility	✓	✓	✓	✓	✓	**Validated**
	Level 3: Max in-house Responsibility	✓	✓	✓	✓	✓	**Validated**
	Level 2: Minimal Responsibility	✓	✓	✓	✓	✓	**Validated**
	Level 1: No Roles and Responsibilities	✓	×	✓	✓	✓	**Validated**
Management Style	Level 5: Laissez-faire	✓	×	✓	×	✓	**Validated**
	Level 4: Delegating	✓	✓	✓	✓	✓	**Validated**
	Level 3: Participative/ Democratic	✓	✓	✓	✓	✓	**Validated**
	Level 2: Paternalistic	✓	✓	✓	✓	✓	**Validated**
	Level 1: Autocratic	✓	×	✓	✓	×	**Validated**

Table 8.6: Validated levels (Cont'd)

Factors	LEVELS	ALPHA	BETA	GAMMA	DELTA	EPSILON	OVERALL
Senior management support	Level 5: Involvement and Participation	✓	✓	✓	✓	✓	**Validated**
	Level 4: Monitoring and Evaluation	✓	✓	✓	✓	✓	**Validated**
	Level 3: Frequent Interactions	✓	✓	✓	✓	✓	**Validated**
	Level 2: Resources Support	✓	✓	✓	✓	✓	**Validated**
	Level 1: No Support	✓	×	✓	✓	✓	**Validated**
User Involvement	Level 5: Strategic Involvement	×	✓	✓	✓	✓	**Validated**
	Level 4: Collaborative Involvement	✓	✓	✓	✓	✓	**Validated**
	Level 3: Formal Involvement	✓	×	✓	✓	✓	**Validated**
	Level 2:Initial Involvement	×	×	✓	✓	✓	**Validated**
	Level 1: No Involvement	✓	✓	✓	✓	✓	**Validated**
Willingness to Process Change	Level 5: Optimizing	✓	✓	✓	✓	✓	**Validated**
	Level 4: Integration	✓	✓	✓	✓	✓	**Validated**
	Level 3: Acceptance	✓	✓	✓	✓	✓	**Validated**
	Level 2: Transition	✓	✓	✓	✓	✓	**Validated**
	Level 1: Unwilling	✓	×	✓	✓	×	**Validated**
Training/skills	Level 5: Continuous Training	✓	✓	✓	✓	✓	**Validated**
	Level 4: Structured Training	✓	✓	✓	✓	✓	**Validated**
	Level 3: Focused Training	✓	✓	✓	✓	✓	**Validated**
	Level 2: Informal Training	✓	✓	✓	✓	✓	**Validated**
	Level 1: No Training	✓	✓	✓	✓	✓	**Validated**

Table 8.6: Validated levels (Cont'd)

Factors	LEVELS	ALPHA	BETA	GAMMA	DELTA	EPSILON	OVERALL
Motivation	Level 5: Career Development	✓	✓	✓	✓	✓	**Validated**
	Level 4: Training	✓	✓	✓	✓	✓	**Validated**
	Level 3: Open Communication	✓	✓	✓	✓	✓	**Validated**
	Level 2: Reward System	✓	×	✓	×	✓	**Validated**
	Level 1: Top Down Approach	✓	✓	✓	✓	✓	**Validated**

From the above table, it shows that all the 5 levels described in every factor were validated. The validation is made based on the majority of experience encountered during the case study. However, further improvements for the preliminary maturity model were also made. The improvements were made based on recommendations given by the organisations in the case study. The improvement is necessary to adjust the model to suit with the current practise. Refer to Table 8.7 for the new improved People e-Readiness Maturity Model (PeRMM).

Table 8.7: People e-Readiness Maturity Model

Improvements made:

1. IT Staff Roles and Responsibilities

    - Level 5 (Strategic Responsibility): IT Department provides strategic direction for the organisation and are responsible to align the IT/IS strategy with construction business strategy.

2. Management Style

    - Level 2 (Paternalistic): The senior management still have control in all activities but with minimal tolerance and flexibility.

3. Training/skills

    - Level 3 (Focused Training): Organisation provides training for targeted competencies.

4. Motivation

    - Level 5 (Career Development): Change the term into Career Advancement.
    - Level 3 (Training): Change the term into Coaching.

8.3 Conclusion

This chapter discussed the changes made to the preliminary maturity model based on the findings from the five (5) case studies, in order to validate the model.

Each level of the preliminary maturity model had been validated with the past experience, current work processes and organisational future direction. Suggestions and comments from the 5 case studies were used to enhance the preliminary maturity model.

Improvements were made on level 5 of the IT staff roles and responsibilities, where the description is now changed. Description of level 2 management style factor was changed based on the comments received to differentiate between level 2 and level 3. Description used in level 3 for training/skills were changed to clearly describe the actual situation. The terms used in level 3 and level 5 of the motivation factor was changed according to the comments received. However, factors like the senior management support, staff involvement and willingness to process change remained as proposed.

It can be conclude that the maturity model is ready to be used by organisations in the Malaysian CI. The maturity model is proven to be simple and easy to understand. The identified levels gave better understanding to the participating organisations on their current ability and helps to develop better and improved ideas. This shows that the usage of the maturity model is proven to be effective in improving the people e-readiness level.

Chapter 9

Conclusion and Recommendations

9.1 Introduction

This chapter presents the summary and conclusion generated throughout this research. This chapter begins with a summary of chapters, research objectives, main conclusion and findings, and continues by discussing the resulting contributions for theory and practical use. It will further describe the limitations and the future potential research directions.

9.2 Overall Chapters Summary

The revolution of IT/IS has changed current business processes. This transformation made the traditional business processes to be simpler, effective and to be completed in the shortest time possible in an inexpensive manner. A lot of IT/IS benefits reported around the world has encouraged the CI to adopt it. This is reflected with the large investments on IT/IS by organisations around the world. Despite the huge reported investments, the success achieved in the real business environment is very poor. Further investigations were then carried out by researchers from the industry and academics in finding the reasons behind this situation. Early findings showed that the failures were related to technical issues. However, recent findings shows that IT/IS failure is not related to the technical aspects. Evidence showed that people is one of the barriers in implementing IT/IS especially in the CI. Recent research also highlighted the direct influence of people on the successful implementation of IT/IS in CI. It is people - who design, work with and leverage the technology. Thus, understanding technology and how best to use it is very important.

The implementation of IT/IS is unlikely to succeed when people are not ready. Preparing people to be e-ready is not an easy task. Effective effort and long term strategic plans are required for this kind of improvement. It is important for the organisation to know and measure their readiness level to reduce the failure rates. Several e-readiness model and were reviewed and compared in finding the most suitable models to be used in the CI. Majority of the developed models evaluate several factors in relation to the IT/IS implementation such as technology, process, environment and people. There are models found to be developed specifically to evaluate the people readiness level, such as the People Capability Maturity Model (P-CMM) and Technology Readiness Index (TRI). However, factors or elements assessed in both models were not tested in the CI. The different nature of the CI might be the application of these two (2) models inappropriate without necessary adjustment. Models developed specifically for the CI such as BEACON, VERDICT and SPICE FM on the other hand, evaluate more than one element such as process, people, project and technology. Among the limitation of these models identified is the lack of broad evaluation on the people issue. This has resulted in the need to develop a new People e-Readiness Maturity Model (PeRMM) to fill the gap. The PeRMM is intended to be used prior to the IT/IS implementation. The model focuses specifically on the people issue in the CI. Several studies have been conducted in identifying the people CSFs that contribute towards the successful implementation of IT/IS in CI. Seven (7) CSFs were then shortlisted to be included in the PeRMM.

The concept of maturity models was adopted as its application enables organisations to verify their previous achievement, current status and act as a framework to guide their future improvement initiatives. The difference between the current status and the expected status is known as the readiness gap. The probability of success will increase when organisation know their readiness gap by focusing on specific CSFs that need more attention prior to IT/IS implementation.

Quantitative and qualitative methods were adopted in developing the PeRMM. Pilot tests involved seven (7) construction organisations were carried out to determine the existence of the gathered CSFs from the literature. All the twenty one (21) CSFs obtained from the literature were confirmed to be in existence within the CI, with additional two (2) CSFs discovered; independent and personal management competencies. The 23 CSFs were then tested to find the most important factors that contribute to the successful implementation of IT/IS in Malaysian CI. A questionnaire survey was designed and distributed to one thousand (1000) Malaysian construction organisations and a total of 31.1% responses were received. The statistical tool SPSS version 20 was used to analyse the data obtained. Several tests were performed on the normality and reliability of the data using Skewness and Cronbach's Alpha Coefficient respectively. The CSFs were then ranked using RII and mean. Results from the ranking revealed seven (7) CSFs to be the most influential factors in IT/IS implementation in CI. The seven (7) identified CSFs are IT staff roles and responsibilities, user involvement, management style, motivation, training/skills, senior management support and willingness to process change. The seven (7) CSFs were then tested using Spearman Correlation Coefficient to identify the strength of the linear relationship among the factors and the full detail of the test performed can be found in chapter 5. Spearman

Correlation Coefficient was chosen as the data collected were ordinal data based on the rank ordered scales (refer appendix: questionnaire). The seven (7) CSFs were then used to develop the preliminary people e-readiness maturity model.

The preliminary model was then tested for its practicality and for organisation to validate it. Five (5) construction-based organisations were selected to participate in the case study, where their experience was used as evidence to verify the progressive level proposed in the people e-readiness maturity model. All of the chosen organisations were based in the Klang Valley, Malaysia: organisation Alpha, organisation Beta, organisation Gamma, organisation Delta and organisation Epsilon. There were 3 different business sectors involved in the case studies - government, semi-government and private sector organisations. The selected organisations also have different business type ranging from a housing developer, infrastructure maintenance provider, quantity surveying practice, technical consultancy and property developer. The different types of construction organisation were selected to represent the overall CI. The system used in Alpha (system V) and Epsilon (system Z) were off-the-shelf systems that was customised by the vendor. Beta (system W), Gamma (system X) and Delta (system Y) utilised their in-house expertise to develop and customise the system to suit their needs.

The case studies were conducted by gathering the history of the organisation and their experience during the implementation of the selected system. Their experience and opinions were then compared with the preliminary maturity model to validate the progressive level presented in the model. Findings from the case study show that all the 5 levels described in every factor were validated. The validation is made based on the majority of experience encountered during the case study.

During the validation process, several recommendations and suggestions were made by the participating organisations in order to suit with the CI. The improvements made were then explained in chapter 8 and the new People e-Readiness Maturity Model (PeRMM) was proposed.

9.3 Main research findings

- 80 % to 90% of IT/IS failures reported are not related to technical issues (Ahuja, Yang et al. 2009), but more towards the people issues.
- Despite the continuous high investment, IT/IS failures remain because organisations focus more on the technology and neglect the people issue.
- Most of the e-readiness evaluation models found focus on technology, environment, process, which failed to solely focus on the people issue.
- It is found that, there is a need to produce a new people e-readiness maturity model to overcome the lack of available IT/IS measures in CI.
- Before adopting a new IT/IS, organisations should take initiatives and prepare themselves by identifying their current capabilities and predict the required level for the particular IT/IS.
- In developing the new e-readiness maturity model, literature on the people CSFs in implementing IT/IS had been reviewed and revealed twenty one (21) people CSFs. A pilot study was then performed to confirm the existence of the list obtained from the literature, and discovered another two (2) people CSFs, making a total of twenty three (23) people CSFs in implementing IT/IS in CI.
- Seven (7) CSFs; IT staff's roles and responsibilities, management style, senior management support, user involvement, willingness to process change, training/skills and motivation were short listed using the RII, mean and also Spearman Correlation Coefficient test. The short listing is necessary in selecting

several factors to be included in the development of the preliminary maturity model. The using of RII and mean shows the same ranking position for each factor. This is reflected in the small variations of standard deviations and skewness, which shows strong consensus for all factors among the respondents.

- The use of hypothesis in interpreting the Spearman Correlation Coefficients results shows that all factors are strongly correlated to each other, where any changes made to motivation, training/skills, senior management support, willingness to process change, IT staff roles and responsibilities, user involvement and management style may have significant effects on the success of IT/IS implementation.
- The laissez-faire management style as described in the highest maturity level are found not to be applicable for organisations under the influence of the central government.
- The willingness to process change is almost matured in every organisation, as they have been incorporating IT/IS into their business process for more than ten (10) years.
- All organisations gave serious attention to the training/skills factors due to the application of the training plan that they had prepared, and this is reflected with the high maturity that the organisations achieved.
- Democratic management style is employed in majority of the organisations as it suits the current organisational culture.
- Formal user involvement can be found in majority of organisations as they had realised the importance of involving user during the system development.
- The PeRMM is anticipated to serve as a road map to guide the organisation in improving their IT/IS development programme.

9.4 Meeting the research objectives

The achievement of research objectives (RO) is described as follows:

RO1: To explore the people critical success factors of IT/IS implementation for multi industries.

Literature from various industries were reviewed and it revealed twenty one (21) people critical success factors, which was explained in chapter 3.

RO 2: To classify the people critical success factors (CSFs) of IT/IS implementation for the CI.

People critical success factors found in literatures were then confirmed to exist in Malaysian CI by conducting a pilot study. Seven (7) construction organisations involved in the pilot study, where semi-structured interviews were conducted with the IT/IS Managers. Two (2) additional people critical success factors were found during the pilot study, making a total of 23 people CSFs. Findings for the pilot study were described in chapter 5.

RO 3: To construct a preliminary people e-readiness maturity model

A total of twenty three (23) people critical success factors were then used as the basis in developing a questionnaire survey in determining the most influential people critical success factors in implementing IT/IS in Malaysian CI. One thousand (1000) questionnaires were sent out to the Malaysian CI. Before the questionnaire were sent out, content validity was performed involving five (5) experts in research methodology, two (2) academics experts in IT/IS and four (4) expert practitioners in IT/IS (chapter 4). The questionnaires returned 31.1% responses. Cronbach’s Alpha Coefficient was performed to determine the reliability of the response received. Skewness analysis was used to determine whether the collected data was normally distributed. The CSFs were then ranked using the mean and Relative Importance Index (RII). Seven (7) CSFs were then selected based on the ranking. Spearman Correlation Coefficient was then performed to identify the strength of linear relationship among the selected CSFs (chapter 5).

The development of the preliminary people e-readiness model was described in chapter 6 of the thesis. The model has five (5) incremental stages; starting with level 1 to level 5. The levels indicate the readiness level of the organisation starting from the lowest maturity level to the highest maturity level. The factors used in developing the models are IT staffs roles and responsibility, management style, senior management support, user involvement, willingness to process change, training/skills and motivation. The levels illustrates how the people e-readiness level should look like at each maturity level.

RO 4: To establish a People e-Readiness Maturity Model (PeRMM) for the CI context

The model was then tested in the CI, involving participation of five (5) construction organisations, Organisation Alpha, Organisation Beta, Organisation Gamma, Organisation Delta and Organisation Epsilon. Case study methods were employed which involved interviewing and reviewing of documents as described in chapter 7. Several improvements were then made to the model based on the organisations' experience and recommendations as described in chapter 8.

9.5 Guideline for People e-Readiness Maturity Model

Several improvements were made after conducting the case studies. The new improved People e-Readiness Maturity Model (PeRMM) can be found in chapter 7. Guidelines on how to use the model are described below:

- This model can be used by construction organisations that are considering or already adopting any IT/IS project.
- Prior to the usage of this model, a meeting with IT/IS Department is essential to first explain the concept of the model and secondly to identify a specific system that had been used within the organisation.
- Then, it is necessary to identify which unit in the organisation is the target of the study. Evaluation will then begin by obtaining overall information of the unit such as the structure, type of work, number of department s and employees, etc.
- Evaluation was then carried out using various means, depending on the availability of the information; interviews, collecting and reviewing documents to obtain information on the previous achievement, current status and future targets of the system. It is recommended that interviews should be carried out with staff that know the history of the system development to obtain the required information. The gradual progress of the project should be strictly tracked to identify problems during the implementation.
- From the evaluation, it is not compulsory for every factor to have the same maturity level. This is due to the different nature and requirement of every organisation and sometimes, different factors require different readiness levels.

9.6 Research limitation

Several limitations were encountered while conducting this research, which may influence the result of this research. They are:

- Researcher faced difficulty in determining the sample size of the construction organisation that have IT Departments due to the non-existence of the database. Therefore, the survey coverage was limited to the contacted construction organisations only. Phone calls to the construction organisations were made to confirm about the existence of IT Department in their organisation. One thousand (1000) construction organisations that have IT Departments were identified through this method.
- Difficulties arose when some of the interviewees involved in the case study did not know the detailed history of the system adoption such as the details on the customisation made to the selected system. Therefore, the interview sessions were carried out involving several staff.
- The validity of the information obtained during this research solely depends on the interviewee/ respondents due to the lack of document and information obtained. Information obtain from them may be based on their assumption or personal views, which might be due to the lack of experience. Therefore, the interview session were carried out involving several staff to confirm the information obtained from the previous interviewee.
- The development of the model does not consider the synchronisation between the vertical levels and horizontal requirement for each of the factors.

9.7 Future research

Further work on the PeRMM are recommended as follows:

- The PeRMM was developed specifically for the CI. Further enhancement of the model can be made according to the specific system used by CI such as for Enterprise Resource Planning (ERP), Database Management System (DBMS), Building Information Modelling (BIM) and others.
- The development of the model solely focuses on the vertical levels of maturity. Synchronisation between the vertical levels and horizontal requirement for each factor can be conducted to further enhance the model.
- Further research can also be carried out in identifying the correlation between each level for all the seven (7) factors.
- Experience on the application of PeRMM can be made to test the practicability of this model in other industries. The result could then be compared with this research to further enhance the model.

9.8 Closure

This chapter presented the overall research findings as well as revisiting the research objectives. A guideline to use the PeRMM was also presented in guiding the organisation to use the model effectively. Furthermore, the contributions of this research were presented, followed by research limitation and suggestion for future research.

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Appendix A: Questionnaire Form

University of Malaya | Faculty of Built Environment

Questionnaire Survey Form

Doctor of Philosophy project for the award of the degree in

PhD (Information Technology in Construction)

Title:

Identifying Critical Success Factors in Implementing Information Technology/ Information System (IT/IS) in Construction Industry in Malaysia

Supervisor:

Dr. Hafez Salleh

Prepared by:

Nur Mardhiyah Aziz | BHA 090006

This research is mainly conducted for academic purposes only. All data obtained will be kept strictly confidential. This questionnaire is divided into two (2) sections and each section may represent an objective. Please respond and complete all sections.

Section A

Job Title:

- ☐ General Manager
- ☐ Senior IT/IS Management
- ☐ Head of IT/IS department
- ☐ IT/IS Executives

Years of Experience in IT/IS:

- ☐ Less than 5 years
- ☐ More than 10 years
- ☐ 5 to 10 years

Organisation background:

- ☐ Surveying
- ☐ Architect Consultancy
- ☐ Civil & Structural
- ☐ Mechanical & Electrical
- ☐ Contractors
- ☐ Sub-contractors
- ☐ Supplier
- ☐ Construction Developer
- ☐ Integrated Services
- ☐ Others ________________________

Section B

Following are the critical success factors (relating to people issues) contributing to the successful implementation of Information Technology/ Information system (IT/IS) in organisations. Please indicate your selection by circling in the appropriate box according to your agreement.

	Critical Success Factors	Not Important	Quite Important	Important	Very Important	Extremely Important
1	Motivation	1	2	3	4	5
2	Training/ skills	1	2	3	4	5
3	Top Management Support	1	2	3	4	5
4	Team work/ Collaboration	1	2	3	4	5
5	Independent	1	2	3	4	5
6	knowledge & experience	1	2	3	4	5
7	Willingness to Process change	1	2	3	4	5
8	Leadership/IT leader	1	2	3	4	5
9	Communication	1	2	3	4	5
10	Organizational culture	1	2	3	4	5
11	IT Staff Roles and Responsibilities	1	2	3	4	5
12	Users Involvement	1	2	3	4	5
13	Trust	1	2	3	4	5
14	Interpersonal relationship	1	2	3	4	5
15	Personal management competencies	1	2	3	4	5
16	Commitment	1	2	3	4	5
17	Attitude	1	2	3	4	5
18	Interest in IT	1	2	3	4	5
19	Employee behaviour towards IT/IS	1	2	3	4	5
20	Awareness	1	2	3	4	5
21	Focus & vision	1	2	3	4	5
22	Management style	1	2	3	4	5
23	Satisfaction	1	2	3	4	5

Thank you very much for your participation.