

CHAPTER 1

INTRODUCTION

1.1 Introduction

Construction¹ industry plays a big role in economic growth and has become one of the largest economic activities in the world (The Choice, 2012), and it has become the main sector that led the economic growth in Malaysia (Foon, 2012). The construction sector worldwide currently accounts for more than 11% of global Gross Domestic Product (GDP) (Lian, 2012). In the current economic climate, information has become the fourth production factor after labour, equity, and raw materials (KPMG, 2010). Information technology (IT) in the construction industry is perceived as a driver for many of the construction business and operational processes (Underwood & Khosrowshahi, 2012). This is because the construction industry is extremely information-intensive and knowledge-based. Therefore, to remain competitive, the construction organizations need to fully embrace IT. IT has continued to receive significant levels of investment (Underwood & Khosrowshahi, 2012). Kennet (2010) recently reported that the construction industry's spending on IT stands at £2,556 (USD3,870) per head and this make up a total annual spending on IT in this industry in

¹ Construction refers to the whole construction value chain defined as being the UK Standard Industrial Classification of Economic Activities – construction, architectural and engineering activities, and the construction products sector (Office for National Statistics, 2007).

2009 was £1.2 billion (USD1.82 billion), compared with £600 million (USD908 million) 20 years ago. The trend of IT spending in the construction industry recently was found grows of more than 5% annually, worldwide (Compass Intelligent, 2011).

In a broader scope, Gartner (2010b) accounted that the worldwide enterprise IT spending rose 3% from year 2011 spending of USD3.5 trillion. Fast growing IT investment can be seen from many countries around the world. For instance, the United States spent USD534 billion in 2011 for IT investment (Business Monitor International, 2011c). An amount of £18 billion (approximately USD28.6 billion) was spent by United Kingdom public sector in 2012 (UK Trade & Investment, 2012). On the other part of the world, China spent USD104.5 billion in 2011 (Business Monitor International, 2011a). In the same year, India spent approximately USD60 billion for IT spending (Agarwal & Kumar, 2011). Malaysia spent USD4.9 billion on public sector IT spending in 2011, a 9% increase from 2010 (Business Monitor International, 2011b). These figures reflect that the huge amount of money is always invested for IT.

A common trend shows that organizations spends 70% to 80% of IT budgets on infrastructure (Forrester Research, 2009; Gartner, 2010b; Gray, 2009). IT infrastructure includes the physical IT assets and to the software (Akintoye, Goulding, & Zawdie, 2012). With this large sum of investment spent on IT infrastructure, there are still many cases of IT failure being reported. The CHAOS Report 2009 published by Standish Group (2009), shows a staggering 44% of IT projects were challenged in terms of late delivery, over budget and/or with less than required features and functions, and 24% failed, which means the IT projects were cancelled prior to completion and never used. Additionally, KPMG found 49% of IT projects failed (KPMG IT Advisory, 2008).

In a Malaysian context, Samah, et.al (2010) reported that rapid technology, policy, and management changes have become a major contribution to the IT projects failure. In literature, IT project failures are subject to a few reasons. *Firstly* is because of ‘change’ is becoming the new normal (the new normal is a state of digital revolution) (Hinssen, 2011), therefore continual changing demand for upgrading the IT infrastructure is needed (KPMG, 2010; Rivard, 2000). Once an IT application has been developed or packaged for commercialization, it will not only have to be further maintained but it will also have to be enhanced, extended, and adapted to new or changing platforms (Al-Ahmad, et al., 2009). Change affects all levels of the technology stack that comprises the layers of components used to provide IT applications (Forrester, 2011). Secondly, in facing this situation, the IT infrastructure was not design to support new functions due to rapid technological change, as agreed by 53% of IT professionals in the United Kingdom (NetApp, 2011a). In addition to this, a Forrester survey (2011) that was conducted with 200 IT decision makers in United States found that, IT implementers know change is coming, but fail to keep up. In the survey, the 30% of respondents agreed that the frequency of their IT system needs changes was quarterly, and 25% said semi-annually. The third reason is due to lengthy duration of IT acquisition and implementation processes that make many IT become outdated before ever actually contributing to its intended function. The reason is that the overall process depends on existing knowledge, ongoing organizational learning, project management and leadership, political prioritization, the complexity of the design and technology being employed (Ojiako, Greenwood, & Johansen, 2005). As a result, the IT system faces with long-term limitations, aggravation, and cost increment.

1.1.1 Coping with IT Change

New technologies and inventions are developed and produced everyday (Jurvetson, 2010; Mezo, 2010). The pace of current IT innovation is much faster than it was only seven years ago (Brynjolfsson & Schrage, 2009). The rapidity of IT change becomes a burden to any organizations, including construction, if the changes are not well managed (Jafari, Yusuff, & Tang, 2006). Currently, there are three approaches practiced by Malaysian construction organizations to manage IT change. Malaysian construction experts revealed that the most convenient approach is through ad-hoc decision-making, however, this approach has limited benefits (Björk, 1999). Outsourcing, on the other hand, offers expertise for construction organisations and at the same time allows construction organisations to catch up with the latest IT inventions, but the service provided is expensive where construction organizations have difficulties to bear the costs (Natovich, 2003; Soliman & Chen, 2003). Besides that, the Malaysian construction organizations are using product benchmarking to find out the best IT solutions for them to develop or to buy the software (Brewer, et al., 2003). Undesirably, they just follow the trends in other companies or other countries; with no standard product benchmarking that has been established for the construction industry.

Some other models that is aimed to help organizations in managing technological changes have been published in academic literature and industry-based, such as the Model of Change Management, the Change, Adaptation and Learning Model (CALM), Cultural Theory, and the Gartner's Hype Cycle's Priority Matrix. These models, however, only focus at assisting the organizations in choosing the right technology and managing people resistance towards technology change.

1.1.2 Towards Flexible IT Infrastructure

KPMG IT Advisory's worldwide survey (2010) pointed out that IT need to have the ability to react to changes. It has become a number one priority among Chief Information Officers and IT Directors around the world (Gartner, 2011a; Pratt, 2009; Roberts & Stephenson, 2008). The Malaysians scholars have agreed that IT projects in this country should be geared towards adaptation to respond to changing needs (Jafari, et. al, 2006; Salman, 2009). In this situation, the flexible IT infrastructure solution is a key to keeping pace with ever-expanding and changing technologies to support increased demands for anytime and anywhere access (White, 2012). Duncan (1995) first summarized the concept of IT infrastructure flexibility (ITIF) – an approach that promotes an ability of IT infrastructure to cope with the technology change. Components of flexibility was first found in the historical manufacturing sector (Turner & Lankford, 2005). Many researchers have proven that ITIF becomes a critical impact on the organization's ability to use IT competitively in changing environments (Byrd & Turner, 2000; Duncan, 1995; Masrek & Jusoff, 2009; Ness, 2005).

1.2 Problem Statement

Flexible IT infrastructure will deliver benefits for the construction organizations in several ways; (1) lower overall acquisition and management costs, (2) faster and more scalable IT services, (3) improved architectural flexibility and responsiveness, (4) improved business and IT priority alignment, and (4) easier IT priority alignment (NetApp, 2011b). ITIF deals with the interconnectedness of IT devices by establishing

flexibility and responsiveness in the networks that the construction organisations use. Cloud and managed hosting are example tools that make this flexibility a reality.

In align to this, the Ministry of Works Malaysia has taken an initiative to promote and implement flexible IT infrastructure for new IT projects in the construction industry, which was formally publicized in year 2010 through the launching of Application System Directory 2011 (Ministry of Works Malaysia, 2011). The directory states that the flexibility is a vital element for IT infrastructure to support ever-changing technologies, operation processes, and management. This shows ITIF in Malaysia is only at a beginning stage. The directory however, does not provide a mechanism to help construction organizations achieving flexibility of their IT infrastructure. In this context, the Malaysian construction industry is lacking of appropriate and adequate framework to develop flexible IT infrastructure (CIDB Malaysia, 2011a). Therefore, a need to understand ITIF in a context of construction industry is significance since only little effort have addressed in this issue within Malaysia.

The current ITIF evaluation models are unable to evaluate the capabilities of the organizations prior to flexible IT implementation. Thus, in order to measure current and expected organization capabilities for a particular IT project, the maturity-level techniques should be adopted to measure the level of readiness (Galliers, et al., 2005). The critical success factors (CSF) were presented in a form of maturity model, **as a combination of a concept of CSF in gauging the maturity assessment provides better understanding about the type of the most important information that is near to real life experience (Khandenwal & Furgeson, 1999; Niazi, et al, 2003)**. This will complement existing research as there is no maturity model to assess the success factors of ITIF in construction industry (Ness, 2005). The maturity model is a framework that describes

for a specific area of interest, a number of levels of classifications at which activities in the area can be carried out. In context of technology change, this model can assist construction organizations assessing their IT infrastructure performance in coping with the technological change by considering flexibility issue. It can be used as a readiness guidance to indicate which area and how the construction organisations should carry out towards flexibility of IT infrastructure. The maturity model will provide an indication of the extent to which construction organisations are ready to make use of the value generating potential of IT.

In ITIF literature, researchers investigated ITIF by assessing it across industries, but little of attention given to examine the ITIF focusing at construction industry level (Fink, 2009; Masrek & Jusoff, 2009). Therefore, the understanding of ITIF in construction industry remains poorly understood, especially in Malaysia. There is a need to extend the assessment of ITIF to construction organisations. This research brings multi-dimensional analysis into the construction industry perspective, as a continuation of Fink's (2009) work. It is certainly important as that would further deepen the understanding on factors that would contribute towards the success of the ITIF in construction industry, considering that construction has a unique feature which distinguish it from other industries; where every construction project has a different roster of players and systems.

1.3 Aim and Objectives

This study aim *to develop a preliminary IT infrastructure flexibility maturity model (ITIF Maturity Model) for the Malaysian construction industry*, that can act as a tool to assess the advancement of IT development, or as a standard basis for the construction organizations to select and acquire IT that is not easily obsolete and is able to be responsive to changes.

In response to the problem statement, the following research questions derived to be examined:

- i. What are the most importance ITIF factors in a successful ITIF delivery?
- ii. How the ITIF factors effect each other?
- iii. How do the ITIF factors progress from the initial maturity level to the highest maturity level?
- iv. Does the preliminary model exhibit the genuine setting of ITIF delivery from a context of construction industry in Malaysia?

In order to achieve the aim, objectives are being delineated into three phases of tasks, as shown in the following Figure 1.1:

- i. To identify the importance of the ITIF factors from the construction industry perspective.
- ii. To define the relationship between ITIF factors to be measured in the maturity model development.
- iii. To develop an initial maturity model by determining the ITIF maturity levels.
- iv. To establish the ITIF Maturity Model that suits with its practicality in the Malaysian construction industry.

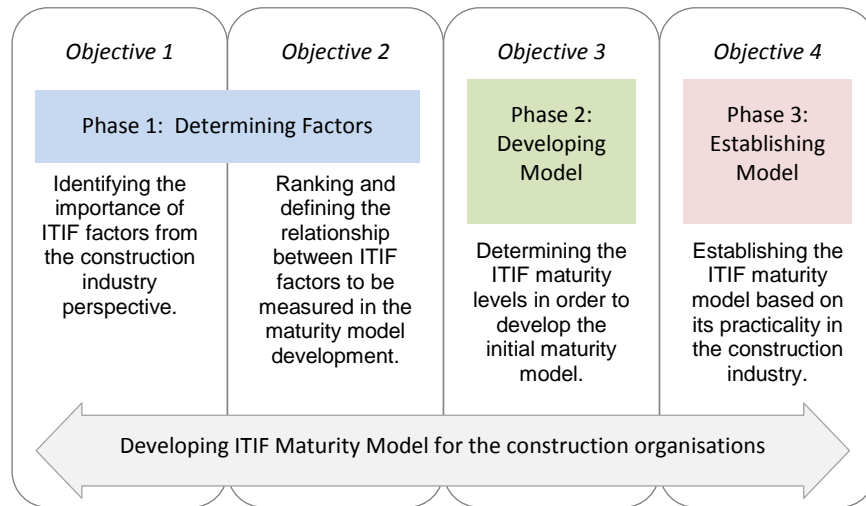


Figure 1.1: Research aim and objectives

1.4 Research Methodology

There are two distinct-but-related tasks undertaken in this research that involves a quantitative approach in the first task, and qualitative approach in the later task. The first task was to discover the ITIF factors, and the second task was to develop the maturity model. The research methodology flow chart adopted for this research is presented in Figure 1.2.

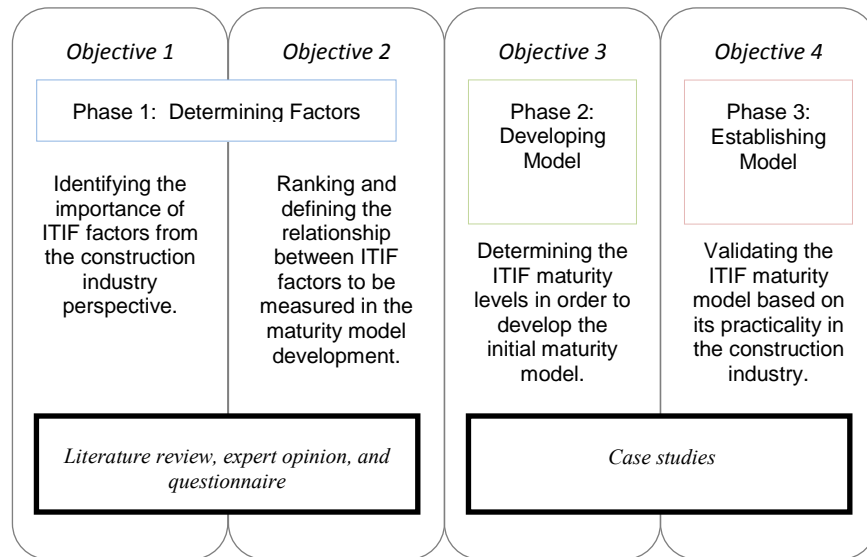


Figure 1.2: Summary of approached methods

i. Literature review and expert consultations

The early phase involves literature reviews of texts, published articles, and reports to scope the relevant parameters to the research. This research covers the topic on IT change trend in a broader scope, and narrowed to the construction industry and how construction organizations cope with technological change, followed by discussion about ITIF and the concept lies on it. Apart from this, current industry practice and approaches were identified through discussion and brainstorming sessions with experienced IT experts. Further research directs to the factors that have been used by other researchers to measure ITIF. Subsequently the ITIF factors were subjected to a selection process through a pilot study.

ii. Pilot study

The objective of conducting a pilot study was to ascertain that the factors of ITIF gathered from literature are relevant for the construction industry practices. Data collected during the pilot study focussed on the CSF of ITIF from three dimensions; technical, people, and management based on the success and failure experience of

each organization. Organizations from different market segments were selected to reflect a holistic view of the construction industry.

iii. Questionnaire

The purpose of running the questionnaire approach is to find the most important success factors of ITIF from the construction industry perspective. This approach was adopted from Byrd & Turner (2000) and Fink (2009). Through the questionnaire, respondents were asked to answer 38 items in 5-point Likert scales, ranging from “1-strongly disagree” to “5-strongly agree”. Before the questionnaire was sent out, a content validation process was carried out through seven discussion sessions with IT experts from the construction industry and other construction-related industries, as well as with IT academicians. The targeted respondents were IT managers of each organization through the posting of questionnaires. The results were analyzed using SPSS and Microsoft Excel to rank and find the correlations between factors. The selected factors forms part of the measurement elements for the maturity model development.

iv. Case study

Case study was conducted to validate and establish the ITIF Maturity Model. This method was proposed by Yin (2009) where case study allow researchers to retain the holistic and meaningful characteristics of the studied events. The significance of each factor against the maturity levels were explored with a sample of three IT projects in the construction industry within the same/or different construction organisations. The validated ITIF Maturity Model was proposed, and the overall

conclusions and implications of the research were presented in this thesis at the later chapters.

1.5 Research Contributions

This research contributes to knowledge by complementing existing research ITIF frameworks. This research was participated by both industry practitioners and academic respondents with a wide range of experience and expertise in the construction industry and IT. The context is different; previous studies tested the factors of ITIF across industries, but this research only looked into the construction industry. Thus, it contributes to the gap on how construction organisations can improve their IT infrastructure performance by considering flexibility issue.

From the practical point of view, ITIF Maturity Model will contribute to the construction industry due to the lack of research in this particular subject area. The ITIF Maturity Model delivers a roadmap for construction organizations to develop a long-term strategic plan for promoting flexible IT infrastructure. The model will be useful for construction organizations to identify their current capability in terms of ITIF especially in facing rapid technology change, and it offers a benchmark for assessing different construction organizations for equivalent comparison. As construction organizations have to continually improve their IT to remain competitive, the model can helps them to take into account the organization's internal situation, their competitor's strategies, and the evolution of the economic context.

1.6 Research Scope

The research focuses on IT infrastructure that is defined as a combination of technology components and human factors, including resource planning and management factors (Byrd & Turner, 2000; Duncan, 1995).

The questionnaire respondents were selected from various databases in order to ensure the diversity of views about ITIF success factors in the Malaysian construction industry. This includes developers, contractor organizations, Architect organizations, Surveyor organizations, Engineer organizations, and construction manufacturers in Malaysia. The respondents include General Manager, IT Directors, IT Managers, IT professionals and construction professionals that hold IT-related management-level positions. For the case studies, participated organizations were ranging from medium sized companies to very large multi-national companies that have employed a partial success or a full success, by means that only few or the entire IT project have met of its intended business objectives. They are all based in Malaysia. The selected IT projects was implemented in more than one version that represents rigidity in the early version and flexible in the latest version.

The proposed model focused mainly on IT infrastructure issues during the development of IT projects embedded within construction organisations. This model does not address any costing or financial implications for IT investment. The respondents were limited to the Malaysian construction industry.

1.7 Thesis Layout Summary

This thesis is reported in nine chapters in order to answer the delineated objectives, which is structured as shown in Figure 1.3.

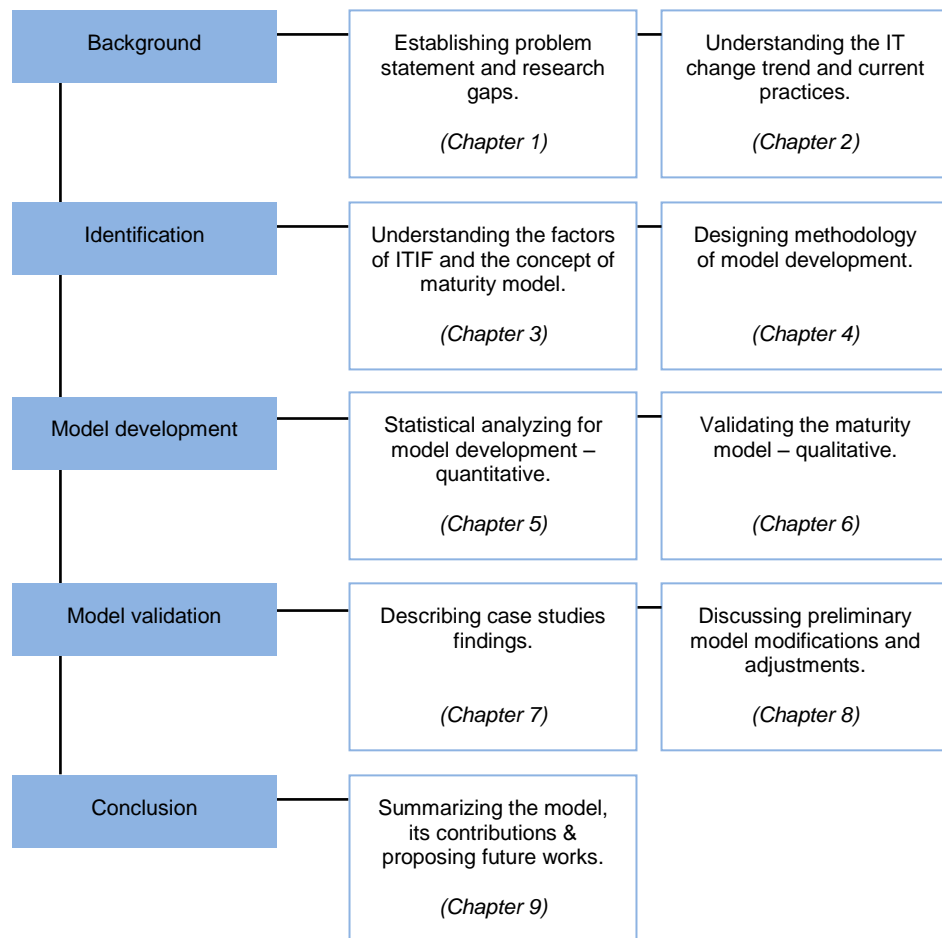


Figure 1.3: Outline of the thesis chapters.

Chapter 1 This chapter highlights the general problem area, definition of research question, explanation of why topic is important, research approach of dissertation, limitations and key assumptions, and contributions made by research;

Chapter 2 The chapter highlights current approaches in coping technological change. A study on the trend of IT changes from the construction industry perspective, its implications and how does the industry cope with such situation.

Chapter 3 The chapter provides a review of prior research provides background to this study, documents value of research, and to review the relevant theoretical foundation of the IT infrastructure flexibility in IT implementation in construction industry. In addition, this chapter compiled infrastructure maturity models that have been introduced and discusses how they have been developed. The analysis provides information towards right methodology to be used in order to develop ITIF maturity model.

Chapter 4 This chapter contains a description of the research method used in this study including the research design, strategy, and access to the information, data collection, and analysis methods.

Chapter 5 This chapter presents quantitative data from questionnaire and establishes CSF of ITIF that is measured in the maturity model.

Chapter 6 Based on the CSF identified from the statistical analysis, the development of the ITIF maturity model is described in this chapter by analysing findings from undertaken case studies.

Chapter 7 Case studies were reported and analyzed in this chapter. The organization's progress towards each factors in each level were described in details.

Chapter 8 The modification and adjustments were made to the initial ITIF Maturity Model based on results from the case studies analysis. The findings were presented in chapter.

Chapter 9 Dissertation summarised with emphasis on results obtained, contribution made by results, re-visiting the research objectives, and suggestions for further research.

1.8 Conclusion

The chapter introduced the background to the research topic by describing the past and current IT expenditure in the organization, summary of technological change, and the introduction of ITIF as a tool to cope IT investment and avoid IT failure. A few facts and figures in relation to the issue have been quoted from numerous authors and researchers to reflect and support the significance of the research topic to the practice. The chapter emphasizes that the ITIF is a significant tool in managing ever-changing technologies in Malaysian construction industry context. Hence, in promoting the current IT towards flexibility, this research attempt to develop a framework, which provides a road map, which organizations can implement for improving their IT investment development programs. The chapter also briefly explains the approach used to develop the model, limitations and contributions to the researchers and practitioners. A summary of the thesis structure was also included to give a holistic overview of the whole thesis.

REFERENCES

- Agarwal, S., & Kumar, J. S. (2011, 22 November). US market saturating, but IT spending seen growing in India. *Livemint*. Retrieved from <http://www.livemint.com/articles/2011/11/21222832/US-market-saturating-but-IT-s.html?atype=tp>
- Akintoye, A., Goulding, J., & Zawdie, G. (2012). *Construction Innovation and Process Improvement*. West Sussex: Wiley-Blackwell.
- Al-Ahmad, W., Al-Fagih, K., Khanfar, K., Alsamara, K., Abuleil, S., & Abu-Salem, H. (2009). A Taxonomy of an IT Project Failure: Root Causes. *International Management Review*.
- Björk, B. C. (1999). Information technology in construction: domain definition and research issues. *International Journal of Computer Intergrated Design and Construction*, 1(1), 1-16.
- Brynjolfsson, E., & Schrage, M. (2009). The new, faster face of innovation. 2011(1 March). Retrieved from <http://sloanreview.mit.edu/executive-adviser/articles/2009/3/5139/the-new-faster-face-of-innovation/>
- Business Monitor International. (2011a, 28 October). China Information Technology Report Q4 2011. Retrieved 10 January, 2011, from <http://www.marketresearch.com/Business-Monitor-International-v304/China-Information-Technology-Q4-6657593/>
- Business Monitor International. (2011b, 28 November). Malaysia Information Technology Report Q4 2011. Retrieved 10 January, 2011, from <http://www.marketresearch.com/Business-Monitor-International-v304/Malaysia-Information-Technology-Q4-6657639/>
- Business Monitor International. (2011c, 28 October). United States Information Technology Report Q4 2011. Retrieved 10 January, 2011, from <http://www.marketresearch.com/Business-Monitor-International-v304/United-States-Information-Technology-Q4-6657712/>
- Byrd, T. A., & Turner, D. E. (2000). Measuring the flexibility of information technology infrastructure: Exploratory analysis of a construct. *Journal of Management Information Systems*, 17(1), 167-208.
- CIDB Malaysia. (2011). *A Case Study of BIM Implementation in Malaysia*.
- Compass Intelligent. (2011, 1 February). Construction Business IT Applications Expenditure 2010-2015. Retrieved 10 January, 2011, from <https://bloombergmart.com/products/LK9K6X3PWT1D/US-Construction-Business-IT-Applications-Expenditures-2010-2015?nuts%5B%5D=WIRE%3ACIL>
- Duncan, N. B. (1995). Capturing flexibility of information technology infrastructure: A study of resource characteristics and their measure. *Journal of Management Information Systems*, 12, 37-58.
- Fink, L. (2009). *Towards a flexible information technology infrastructure: A multidimensional analysis*. Saarbrücken: Verlag Dr. Müller.
- Foon, H. W. (2012, August 15). Malaysia 2Q GDP grows 5.4%, spurred by construction. *The Edge*.
- Forrester Research. (2009, 29 June). US and global IT market outlook: Q2 2009. Retrieved 9 November 2009, from <http://www.forrester.com/Research/Document/Excerpt/0.7211.48356.00.html>
- Forrester Research. (2011). The Value of IT Flexibility when Change is the New Normal - Can your Organisation Adapt to Change? Retrieved April 19, 2012, from <http://media.netapp.com/documents/thought-leadership-flexible-it-paper.pdf>
- Gartner. (2010, 18 May). IT spending to rise 4.1% in 2010, Gartner says. Retrieved 19 July, 2010, from <http://www.networkworld.com/news/2010/051910-gartner-it-spending-rise.html>
- Gartner. (2011). 2011 CIO Agenda Findings. Retrieved November 24, 2011, from http://www.gartner.com/technology/cio/cioagenda_findings.jsp
- Gartner Group. (2010, 18 May). IT spending to rise 4.1% in 2010, Gartner says. Retrieved 19 July, 2010, from <http://www.networkworld.com/news/2010/051910-gartner-it-spending-rise.html>
- Gray, M. (2009). The NHS Infrastructure Maturity Model (NIMM).

- Hinssen, P. (2011). *The New Normal: Explore the limits of the digital world*. United States: Lannoo Publishers.
- Jafari, S. M., Yusuff, R. M., & Tang, S. H. (2006). ERP Systems Implementation in Malaysia: The Importance of Critical Success Factors. *International Journal of Engineering and Technology*, 3(1), 125-131.
- Jurvetson, S. (2010). The pace of innovation never falters. *Technology Review by MIT*. Retrieved from <http://www.technologyreview.com/business/24562/>
- Kennet, S. (2010, 30 April). Construction is second worst in IT. Retrieved 19 July 2010, from <http://www.building.co.uk/news/construction-is-second-worst-investor-in-it/3162596.article>
- KPMG. (2010). Improved flexibility with XBRL. Retrieved 4 March 2010: <http://www.kpmg.com/Global/en/WhatWeDo/Special-Interests/XBRL/Pages/Improved-flexibility-with-XBRL.aspx>
- KPMG IT Advisory. (2010). From cost to value: 2010 global survey on CIOs agenda: KPMG International.
- Lian, O. S. (2012, September 25-26). *Responding to Global Challenges - The Need for Professional Standards*. Paper presented at the Quantity Surveying International Convention 2012, Kuala Lumpur.
- Masrek, M. N., & Jusoff, K. (2009). The effect of information technology infrastructure flexibility on intranet effectiveness. *Computer and Information Science*, 2(2), 57-67.
- Mezo. (2010). Amazing technology: New amazing technologies. Retrieved 1 March, 2011, from <http://hubpages.com/hub/Amazing-technology>
- Ministry of Works Malaysia. (2011). *Application System Directory* (Vol. 2). Kuala Lumpur: Ministry of Works Malaysia,.
- Natovich, J. (2003). Vendor related risks in IT development: A chronology of an outsourced project failure. *Technology Analysis & Strategic Management*, 15(4), 409-419.
- Ness, L. R. (2005). Assessing the Relationships among IT Flexibility, Strategic Alignment, and IT Effectiveness: Study Overview and Findings. *Journal of Information technology management*, 16(2), 1-17.
- NetApp. (2011a, September 26). 53% of IT professionals say infrastructure is not flexible. *News@NetApp*. Retrieved from <http://www.netapp.com/uk/company/news/news-rel-20110926-113474-uk.html>
- NetApp. (2011b). Make your IT future ready today by building a shared IT infrastructure. Retrieved November 24, 2011, from <http://www.netapp.com/us/company/leadership/flexible-it/feature-story-shared-it-infrastructure.html>
- Office for National Statistics. (2007). *UK Standard Industrial Classification of Economic Activities 2007*. United Kingdom: Palgrave Macmillan.
- Ojiako, G. U., Greenwood, D. J., & Johansen, D. E. (2005). Modelling new success criteris for projects in the ICT industry. *Journal of ICT*, 4, 17-36.
- Pratt, M. K. (2009, May 18). Keeping pace with evolving technologies. Retrieved Sept 27, 2009, from http://www.cio.com/article/492866/Keeping_Pace_with_Evolving_Technologies?page=2&taxonomyId=3166
- Rivard, H. (2000). A Survey on the Impact of Information Technology in the Canadian Architecture, Engineering and Construction Industry. *ITcon*, 5, 37-56.
- Roberts, R., & Stephenson, T. (2008). Managing IT to support rapid growth: An interview with the CIO of NetApp. *The McKinsey Quarterly*, June.
- Salman, A. (2009). ICT, the new media (internet) and development: Malaysian experience. *The Innovation Journal: The Public Sector Innovation Journal*, 15(1), Article 5.
- Samah, B. A., Shaffril, H. A. M., D'Silva, J. L., & Hassan, M. A. (2010). Information communication technology, village development and security committee and village vision movement: a recipe for rural success in Malaysia. *Asian Social Science*, 6(4), 136-144.
- Soliman, K. S., & Chen, L. D. (2003). APS: Do they work? *Information Systems Management*, 20(4), 50-58.

- The Choice. (2012, September 28). Construction Industry Plays Major Role in Spurring Economic Development. *TheChoice*. Retrieved from <http://www.thechoice.my/featured-articles/59832-construction-industry-plays-major-role-in-spurring-economic-development>
- Turner, D. E., & Lankford, W. M. (2005). Information Technology Infrastructure Flexibility: A Historical Perspective of Flexibility. *Journal of Information Technology Management*, XVI(2), 37-47.
- UK Trade & Investment. (2012, October 30). The UK ICT Market. Retrieved November 13, 2012, from <http://www.ukti.gov.uk/investintheuk/sectoropportunities/ict.html>
- Underwood, J., & Khosrowshahi, F. (2012). ICT Expenditure and Trends in the UK Construction Industry in Facing the Challenges of the Global Economic Crisis. *ITcon*, 17, 26-42.
- White, C. (2012, March 11). Survey: Telcommuting becoming more prevalent [infographic]. Retrieved 2012, October 18, from <http://mashable.com/2012/03/11/telecommuting-infographic/>
- Yin, R. K. (2009). *Case study research: design and methods* (4th ed.). California: Sage Publications.