

Managing Organisation/ Business Readiness towards IT/IS Implementation: A Model Comparison

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Abstract: Phenomenal growth of the internet has revolutionized business processes, leading to the development of IT-based technologies such as e-commerce. Proven benefits of the applications of e-commerce tools in industries including construction had encouraged organizations to invest in IT/IS. However, there is also ample evidence that showed failure of IT/IS to deliver the expected return. The main attributes of the high percentage of IT/IS failure was found to be the 'soft issues' that involves people and their readiness prior to the implementation of IT/IS in an organization. As such, failure of IT/IS implementation in current evaluation models may be due to its focus on the 'hard issues' aspect such as speed and profit instead of on the 'soft issues' aspect. It is therefore important to assess the readiness level of the organization prior to planning and adopting IT/IS. Hence, this paper will review and comment on the current available readiness model highlighting their suitability to the construction industry. It is anticipated that review and recommendation from this research will create awareness among the construction industry players on the importance of assessing their readiness level in order to successfully implement IT/IS in their organizations. Differences between the models/tools discussed in this paper are expected to enrich knowledge, thus broadening the area of readiness research in construction industry.

Key words: IT/IS, readiness model, construction

INTRODUCTION

Impact of the internet revolution is being felt by industries all around the world today. 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 beyond imagination are now possible with the application of internet. International transaction became common as the transaction can be done in shorter time and is inexpensive. Benefits of the technology in the business world are undeniable thus encouraging the business sectors to adopt it, including construction industry. This leads to the existence of the e-commerce tools. The application of these e-commerce tools 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 benefits of using these tools have been documented in several publications, among others Berning & Flanagan, 2003 and ITCF, 2004. Demands for the application of e-commerce tools have lead to the growth of IT/IS investment, which had been recorded by many researchers throughout the years. For example, in the U.S. IT capital investment has reached an estimated 50% of nominal business capital spending (Kasi, Keil, Mathiassen, & Pedersen, 2008) and despite the economic downturns, it was reported that IT/IS investment had kept on increasing in the year 2008 (Kanaracus, 2008; Petter, Delone, & McLean, 2008). In addition, Gartner Group had forecasted a 2.3 percent increase in IT/IS investment for the year 2010 (Franklin, 2009). In spite of the huge organisation investment in IT/IS and the commitment to adopt it, the limited success that had been achieved in real business environments is disappointing.

Over the past 30 years, estimates of the level of failure had stayed uncomfortably high (Ashurst, Doherty, & Peppard, 2008) which had motivated researchers to identify the key reasons of failures. Lyytinen and Hirschheim (1987) identified four major types of failures; that are correspondence failure, process failure, interaction failure and expectation failure. Lou & Alshawi (2009), on the other hand, stated that the main reasons for the high percentage of systems failure are related to the organisational "soft issues", which underpin the capability of the organisation to successfully absorb IT/IS into its work practices. Factors that contribute to failure of IT/IS implementation had been analysed in order to formulate successful strategies for planning, development

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and implementation. Findings from the analysis showed that it is important to assess the e-readiness capabilities prior to IT/IS implementation. Since the development of the first e-readiness tool, several e-readiness tools have emerged through efforts of development agencies, research organizations, academia, business enterprises and individuals (Ghavamifar, Beig, & Montazer, 2008). Proper planning which should include e-readiness capability assessment is essential to reduce the pitfalls and yield positive outcomes. As a result of the e-readiness capability assessments, areas that need more attention can be identified for a successful implementation of IT/IS. E-readiness assessments are meant to guide development efforts by providing benchmarks for comparison and gauging progress (Bridges.org, 2005b). It is therefore important to compare the most common e-readiness assessment models/tools and examine their appropriateness to be used in construction industry.

2. E-readiness Defines:

The concept of e-readiness originated as a result of an attempt to provide a unified framework to evaluate the breadth and depth of the digital divide between the developed and developing countries during the later part of the 1990s (Mutula & Brakel, 2006). Various definition of e-readiness could be found from literature on the subject. The first efforts in defining e-readiness were undertaken by the Computer Systems Policy Project (CSPP) in 1998, in which e-readiness was defined with respect to a community that had high-speed access in a competitive market; with constant access and application of IT in schools, government offices, businesses, healthcare facilities and homes; user privacy and online security; and government policies which are favourable to promote connectedness and use of the network (Beig, Montazer, & Ghavamifar, 2007). According to a definition provided by Economist Intelligence Unit (2009), e-readiness is the state of play of a country's information and communications technology (ICT) infrastructure and the ability of its consumers, businesses and governments to use ICT to their benefit. Dada (2006) on the other hand, defined e-readiness as the measure of the degree to which a country, nation or economy may be ready, willing or prepared to obtain benefits that arise from information and communication technologies (ICT). Harvard University Centre for International Development's (2000) defined the term e-readiness as the degree to which a community is prepared to participate in the Networked World - a world in which everyone, everywhere, has the potential to reap the benefits of connectivity to the network. McConnell International comes out with their own definition on e-readiness, which is the capacity of nations to participate in the digital economy (Budhiraja & Sachdeva, 2002). World Economic Forum Consultation Report on E-Readiness on the other hand, defines e-readiness as the ability of the ICT networks to effectively adapt to the social and economic advancement (Budhiraja & Sachdeva, 2002). From the above, it can be concluded that there is no accurate definition for the concept of e-readiness because e-readiness depends on the various contexts, different situations and different users. The different definitions for the concept of e-readiness is due to the different ways that are used to measure it, thus resulting in a variety of assessment, analysis and benchmarking reports at different levels of detail (Shareef, A., & Janowski, 2008). Generally, the term e-readiness is to measure the capability to adopt IT/IS prior to its implementation.

3. An Overview of Recent and Previous Readiness Model:

Briefly described below are some of the e-readiness models/tools that are being widely used.

1. *Readiness for the Networked World.* This model was developed by the Centre for International Development of Harvard University and IBM in 2001, to assess the e-readiness capability of the community in developing countries. There are 19 different categories of indicator 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 scale from 1 to 4 with a different criterion for each stage. The model seeks only to offer a starting point in an ICT planning process (Harvard Center for International Development, 2000).
2. *E-Readiness rankings.* 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. 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 (Weight in overall score: 20%), Business Environment (Weight in overall score: 15%), Social and Cultural Environment (Weight in overall score: 15%), Legal Environment (Weight in overall score: 10%), Government Policy and Vision (Weight in overall score: 15%) and Consumer and Business Adoption (Weight in overall score: 25%).

3. *E-commerce Readiness Assessment Guide*. This readiness tool was created in year 2000 to assess the e-readiness capability of the economies, cities and the communities in taking part in the digital economy. 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.
4. *Readiness Guide for Living in the Networked World*. There are hundreds of criteria that are being used to assess 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 town, city, county, state, country or any community.
5. *Ready? Net. Go!* The framework designed By McConnell International and Worlds Information Technology and Services Alliance (WITSA) in year 2001, was used to assess a country's e-readiness, or capacity to participate in the global digital economy (Dutta, Lanvin, & Paua, 2003). 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.
6. *TRI index*. The TRI index developed by Parasuraman & Rockbridge Associates in year 2000 was designed to assess people's readiness to interact with technology. TRI refers to people's propensity to embrace and use technologies for accomplishing goals in home life and at work (Parasuraman, 2000). Four dimensions were used; that are optimism, discomfort, innovativeness and insecurity.
7. *Global Diffusion of the Internet Project*. This model was developed in 1998 by the Mosaic group. The main purpose of this model is to indicate the phases of internet development focusing on six internet statistic. These are pervasiveness, geographic dispersion, sectoral absorption, connectivity infrastructure, organisational infrastructure and sophistication of use.
8. *International Survey of E-Commerce*. Developed by Worlds Information Technology and Services Alliance (WITSA) in year 2000, this model were used to find out business and consumer awareness on electronic commerce and to identify potential action areas using 7 main criteria of assessment: trust, technology, workforce issues, public policy, taxation, business process, costs and consumer attitude.
9. *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 assessment criteria are the environment for IT, the readiness of the community and the actual use of IT.
10. *Negotiating the Digital Divide*. Center for International Development and Conflict Management (CIDCM), University of Maryland, developed this model to describe the processes and outcomes of negotiations between key players over the phases of development. The framework measures four categories of information for each country: background and history, key players in Internet development, ICT policy over time and negotiations between players in developing the country's Internet.

4. Comparison of the Models/ tools:

Ten models/tools that are currently being used were chosen and compared (See table 1). Comparisons were made based on a few criteria, which include:

- Focus of the models/tools: identify the category of the models/tools, either e-economy or e-society. E-economy are those that focus on basic infrastructure or a nation's readiness for business or economic growth (Bridges.org, 2005a) while e-society are those that focus on the ability of the overall society to benefit from ICT (Bridges.org, 2005a).
- Purpose: describing the main aim of the models/tools.
- Assessment criteria: identifies categories to be assessed in each of the models/tools.
- Assessment method: identifies method used to collect data/information. The assessment methods were identified and grouped into four categories.
- Questionnaires: used to collect the primary data by asking the same set of direct questions regarding IT and policy in every assessment
- Statistical methods: analyzing prior data mathematically to test for the relationship between the individual factors for example, by looking for a casual relationship between Internet access and political democracy
- Best practices: direct comparison with other countries or using experiences learned from other countries
- Historical analysis: analysing economic, political and social events of a country to explain and forecast its information technology

Table 1: Comparison of E-Readiness Models/Tools

| Tools/Models | Developer | Focus | Purpose | Assessment Criteria | Assessment method | Assessment result | Strength | Weakness | Comment |
|--|--|-----------|---|---|---|------------------------|--|--|---|
| Readiness for the Networked World | Center for International development at Harvard University and IBM | e-society | assesses the e-readiness level of the community in the developing country | Network Access, Networked Learning, Networked Society, Networked Economy, Network Policy | Questionnaire Statistic | Diagnosis | A general tool that is applicable to various developing countries | Does not provide guideline in using the tools | Can be used in identifying the current level of e-(2001) readiness |
| E-Readiness rankings (2002) | The Economist Intelligence Unit and Pyramid Research | e-economy | measure country's ICT infrastructure as well as the capability of government, consumers and businesses | Connectivity & Technology Infrastructure Business Environment Social & Cultural Environment Legal environment Government Policy and Vision Consumer and Business Adoption | Statistic | Description | Provide useful comparison on the technology aspects among countries | No recommendation for improvement | Half of the assessment criteria in this model are relating to the capability of the government |
| E-commerce Readiness Assessment Guide (2000) | Asian Pacific Economic Cooperation (APEC) electronic Commerce Steering Group | e-economy | assess the readiness level of the economies, cities & the communities | basic infrastructure & technology; access to necessary services; current level and type of use of the Internet; promotion & facilitation activities; skill & human resources; positioning for the digital economy | Questionnaire Statistic | Diagnosis, proscripton | 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 business community |
| Readiness Guide for Living in the Networked World (1998) | Computer systems Policy Project (CSPP) | e-society | measure the level of readiness of town, city, county, state, country or community | Network Infrastructure Networked Places Access Networked Applications and Services Networked World Enablers | Questionnaire Statistic | Diagnosis | A self assessment tool that is applicable for any country and fairly easy to use | Only an approximate measurement on the technology usage | Suitable to identify either community/ country is ready for the implementation of ICT |
| Ready? Net. Go! (2001) | McConnell International's and World Information Technology and Services Alliance (WITSA) | e-economy | Assess a country's e-readiness to evaluate who is e-ready. | Connectivity E-leadership Information Security Human Capital E-business Climate | Statistic, best practices, historical analysis | Description, diagnosis | Focusing exclusively on e-business & e-government | No indication of overall assessment of a country's e-readiness | The model/tool can be used as a guide in comparing the e-readiness level of nations |
| TRI index (2000) | Parasuraman & Rockbridge Associates | e-society | assesses people's readiness to interact with technology | Optimism Discomfort Innovativeness Insecurity | Questionnaire | Description | Can be use as assessment tools to identify technology readiness of employee | Does not recommend ways for improvement | A model/tool that focus solely on the people readiness concerning the technology |
| Global Diffusion of the Internet Project (1998) | The Mosaic Group | e-economy | measure & analyzes the growth of internet throughout the world | Pervasiveness Geographic dispersion Sectoral absorption Connectivity infrastructure Organisational infrastructure Sophistication of use | Questionnaire, statistic, best practices, historical analysis | Description | Provide a detail analysis on economic, political & social factors in technology growth & usage | Only focus on Internet diffusion & not on ICT in general | A useful model/tool to study about community in developing the policy as it makes a comparative analysis of nations; complex with a balanced approach addressing individuals, government & business stakeholders. |
| International Survey of E-Commerce (2000) | Worlds Information Technology and Services Alliance (WITSA) | e-economy | To find out business & consumer awareness on electronic commerce & to identify potential action areas. | Trust Technology Workforce Issues Public Policy Taxation Business Process Costs Consumer Attitude | Questionnaire, statistic | Diagnosis Proscription | 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 assess in this model/tools are dealing with policy issue which are under the government's concern |
| Network Readiness Index (NRI) | Center for International Development (CID) at Harvard and the World Economic Forum | e-society | Designed to be used by communities of any size, to measure technological capabilities according to a four level scale | environment for IT readiness of the community' actual use of IT | Questionnaire Statistic | Diagnosis | Clearly shows the performance of the nations in relation to the ICT development | No recommendation for improvement | The model/tool that mainly focusing on the infrastructure |

Table 1: Continue

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|----------------------------------|--|-----------|---|---|--|------------------------|--|-------------------------------|---|
| Negotiating the Net Model (2001) | Center for International Development and Conflict Management (CIDCM), University of Maryland | e-society | analyze the development of internet in developing countries | background and history key players in internet development internet development and ICT policy negotiation between the players in developing the country's internet | Statistic, best practices, historical analysis | Description, Diagnosis | Able to identify major controversial issues likely to remain problematic in the future | Not a one-size-fits all tools | Describes the processes & outcomes of negotiations between key players over the phases of development |
|----------------------------------|--|-----------|---|---|--|------------------------|--|-------------------------------|---|

- Assessment result: indicating the types of results that can be obtained from the assessment. There are description, diagnosis and proscriptioin.
- Description: the results only explain or describe the situation
- Diagnosis: the results indicate the problematic area but did not suggest any solution
- Proscriptioin: give recommendation on action to be taken
- Strength: identify the strong points of the models/tools
- Weakness: identify the drawback of the models/tools

Discussion:

Even though there are many e-readiness models/tools developed, Steward and Mohamed (2003) found that compared to the other industries, the construction industry is still lagging behind in achieving comparable rates of IT implementation. The reasons might be due to the nature of the construction industry itself, such as having unique characteristics in terms of its product, complexity, size and also location of the project, where no two projects are exactly similar. A commonly cited problem that exist with e-readiness is the fact that there are many different types of measures available today and that there is no standardization of these measures (Dada, 2006).

The comparisons made showed that the models/tools can be categorized into two groups that are e-economy and e-society. Each of the developed models/tools has their own intended purpose, thus having their own different assessment criteria and assessment method in order to find the intended result. Results obtained from the assessment can be grouped into three different categories: description, diagnosis and proscriptioin. Most of the models/tools only describe the current situation and diagnose the problematic area. Only a few models/tools provide recommendations for improvements. Majority of the assessments are based on questionnaire, statistical analysis, best practices and historical analysis. Most of the studies did not have explanation on how the indices were constructed. Each model/tools have their own objective and thus have a different definition of e-readiness. From the table, it can be clearly seen that most of the models/tools are descriptive and diagnosis. Results from assessment carried out only explain the current situation and some of it able to identify areas of improvement. Only few models/tools however, provide recommendation to overcome the problems. Most of the listed models/tools in this paper are post-implementation; where the assessments were carried out after the implementation of IT/IS. According to Dutta et al., (2003) there are three main motivations for assessing the readiness level: first as policymaking and evaluation tool for countries, second; to measure state of internet acceptance (or e-readiness) in a country or community and finally to measure the growth of internet in the world.

In identifying the suitable models/tools to be used in construction industry, one should consider the models/tools e-readiness definition, areas to be assessed (either e-economy or e-society), the assessment criteria, methods of assessment, the availability of data and so forth. According to Ghavamifar et al., (2008) to select a suitable tool, the most important issue is that the chosen e-readiness assessment tool must fit the user's goal. All of the models/tools highlighted in this paper have their own drawbacks and require re-designing in order to produce comprehensive models/tools to be applied in the construction industry. Regardless, two models had been identified as suitable to be applied in the construction industry; Technology Readiness Index (TRI) developed by Parasuraman & Rockbridge Associates in year 2000 and Network Readiness Index (NRI) developed by Center for International Development (CID) at Harvard and the World Economic Forum. However, these two models address two different issues. While the TRI index is focusing on assessing people's readiness to interact with technology, the NRI is focusing on the infrastructure development. As previously mentioned, in order to choose the right models/tools, it has to suit the user's goal. The user should choose a tool that measures what they are looking for, and does it against a standard that fits their own view of an e-ready society (Bridges.org, 2005a).

The other models/tools studied were found to be not really suitable for implementation in the construction industry because most of them address issues relating to e-governance which are beyond the control of the industry. These assessment criteria were instead used in helping governments develop policy prior to the ICT implementation.

Conclusion:

Finding the best way of implementing IT/IS had become the major concern in most industries including construction industry. The e-readiness assessment model can be used as a mechanism to gauge the readiness of construction organisations to successfully implement IT/IS (Ruikar, Anumba, & Carrillo, 2005). Generally, IT is useful for construction firms to improve communication and prevent loss of information (Jaafar, Ramayah, Abdul-Aziz, & Saad, 2007). The industry players have to be 'e-ready in order to effectively implement the technology. Several e-readiness models/tools have been created and used by different groups, each looking at different angles of ICT, society, and the economy in order to identify the e-readiness capability. The main objective of this paper is to identify the suitable models/tools to be applied in construction industry. Factors such as the models/tools goal, assessment criteria, method of assessment and others need to be considered in identifying the suitable models/tools. Considering these criteria, two models were found to be suitable for the construction industry which are; Technology Readiness Index (TRI) and Network Readiness Index (NRI). It is believed that the construction industry may benefit from the adoption of these two models/tools in helping them assess two different elements involved in construction industry.

7. Future Research:

Finding shows that most of the models/tools are only able to assess the e-readiness capability and diagnose the problem without making any recommendation for improvement. One of the most important aspects in assessing the e-readiness capability is not only to identify the current capability but also to find ways of improvement. Therefore, the author feels that there is a need to develop a new maturity model to be applied in construction industry, where the model will not only be able to identify the current readiness level but can also suggest ways of improvement in order to maximize the full benefit of IT/IS prior to its applications.

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