Formulating an IT Strategic Plan for Malaysian Construction Sector

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Abstract. Construction sector is recognised as one of the key components of Malaysia Gross Domestic Product (GDP). Its trends are trusted barometers of economic health and growth. Realising the importance of construction sector contribution, the government of Malaysia has mandated SIRIM Berhad to formulate an IT Strategic Plan that provide guidelines, proposals and recommendations for these communities: National Policy Makers; Construction Professional Bodies; Institutions of Higher Learning; Construction Enterprises. This paper highlights the strategies and processes adopted to formulate the IT Strategic Plan. Inputs and data are collected from workshops, questionnaire survey, semi-structured interviews and extensive literature survey to investigate the usage, initiatives, benefits and application of IT in construction sector. These data and feedback are critically analysed to report issues "AS-IS", future scenario "WILL-BE" (if current initiatives are successfully implemented to proponent-stated conclusion) and a "TO-BE" desired scenario based on strategic realignment as a possible consequence of implementing the recommendations.

1.0 Introduction

Construction, alongside with agriculture, mining and quarrying, manufacturing, and services sectors, are the main contributors to the Malaysia Gross Domestic Product (GDP). The Gross Domestic Product by industry origin (percentage change) for construction sector was 2.3% in 2002, estimated to be 2.5% in 2003 and forecasted to reach 2.6% in 2004 [1]. The factors affecting growth by construction sector are driven by the development of infrastructure projects and renewed interest in housing activity following the implementation of various incentives in the Stimulus Package. In the pace of recovering from world economic crisis and to sustain economic health and growth, increasing productivity and efficiency become eminent for construction sector. With the recent advances in Information Technology (IT), the technology could be deployed to enhance productivity and competitiveness.

However, due to the sector size, reach and uncontrollable evolution over time, the construction sector suffers from "a lack of ethics; a lack of data and information; fragmentation; and bureaucratic delays" [2]. The adoption of IT is inconsistent and dependent solely upon individual proponent inclination, education and means. If unchecked, this course will yield less benefit to the sector as a whole than a concerted plan of guidance for investment in IT to maximise possible gains for the sector stakeholders. In view of this, the government of Malaysia has mandated SIRIM Berhad to formulate an IT Strategic Plan that provides guidelines, proposals and recommendations for the sector.

In this study, IT is defined as Information Technology that is directly related to the construction sector, whether it is basic tools (word processing/communication), intermediate tools (scheduling, budgeting, design) or advanced integrated tools (ASP,

intranet, extranet, portals, etc). In this context, construction sector is defined as an all-encompassing entity that includes all project's supply chain partners such as contractors, developers, professional service providers, suppliers, government agencies and other regulatory government bodies.

This paper provides detailed information on the adapted methodology, the process of data collection, current findings and lays down the foundation for the intended framework.

2.0 Objectives and Scope of the Study

The overall objective of the study is to investigate and determine the current state of IT in the construction sector in an "AS-IS" condition, identify the pros and cons of IT adoption and develop a strategy for the holistic adoption of IT as an effective tool for the sector. Figure 1 shows the entire architecture of IT strategy plan development. It illustrates in details the coverage of current state of IT in construction sector, proposing a framework and constraints identification, and enhancement of export potential. The figure shows that the construction sector is being approached in a holistic manner which will lead to the intended initiation of the blueprint for an IT Strategy Plan for the sector.

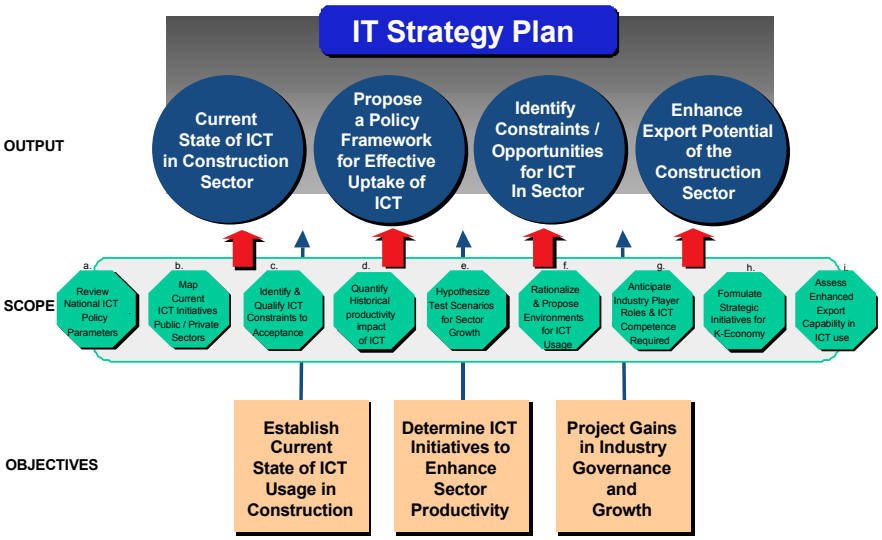

Figure 1: Architecture of IT Strategy Plan for Construction Sector

During the ongoing development of the study, the Study Team has established the current "AS-IS" state of IT within the Public & Private Sectors which has provided the basis from which a clear IT strategy can be established. The "AS-IS" state reveals the positive experiences of the Malaysian companies using IT tools and highlights the obstacles that have prevented the wide spread of IT in the sector.

3.0 Methodology of the Study

Figure 2 illustrates the methodology for formulating the IT strategy plan.

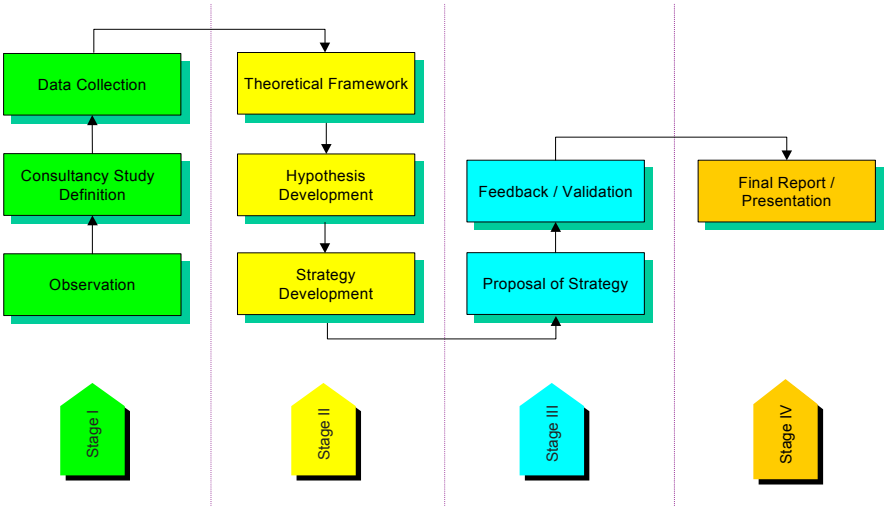

Figure 2: Methodology of formulating an IT Strategy Plan

Overall, the study is being conducted by using a number of data collection methods that include:

- Background literature and exploratory research, encompassing:
  - Interviews with various sector players: developers, contractors, professional services, governments, etc.
- Surveys and workshops, including:
  - Discussion group workshops with construction sector players.
  - A pilot survey of sector; and
  - In-depth one-to-one interviews.

It is recognised that the data and information collection, local as well as international would enhance the methodology being implemented. This approach of mapping local experience (as highlighted by the workshops and the survey) with international experience (as reported by the literature and other experts in this field) has provided the Study Team with the background and valuable comparative overview. This type of "benchmarking" has given the team the confidence to proceed further with the study and imputes to work towards achieving an effective IT strategy for the Malaysia construction sector.

4.0 Collection of Data

The following sub-sections provide an insight to the approach followed by the study.

4.1 Literature Reviews

Primary & Secondary data was researched to cover the following:

- Background information on the type and level of IT implementations in the construction sector and their associated patterns, nationally and internationally.
- Identification of management philosophies in the field of IT, IT implementation models, maturity concepts and models.
- Data and information on the perception, attitude and behaviour of construction organisations with respect to IT implementation, strategies, and investments.

Examples of the international surveys and/or documents that have been identified and investigated as pertinent to the study are as follows:

- A Survey of Computer Use in the New Zealand Building and Construction Industry [3]
- A Survey on the Impact of Information Technology on the Canadian Architecture, Engineering and Construction Industry [4]
- IT Barometer 2000 - The Use of IT in the Nordic Construction Industry [5]
- Surveys of IT in the Construction Industry and Experience of the IT Barometer in Scandinavia [6]
- Architectural Practices and their Use in IT in the Western Cape Province, South Africa [7]
- A Survey of IT Use in the Turkish Construction Industry [8]
- Benchmarking – implementation of an instrument available to economic actors and public authorities. "Benchmarking ICT-O Pilot Study" [9]
- GIS for Municipalities: A Manager's Guide, July 1997 [10]
- Information Technology Survey for the Construction Industry, NJ, USA [11]

Some of the documents that have been referred to locally from various agencies are:

- Construction Industry Development Board (CIDB) Master Plan
- The 8th Malaysian Plan
- Electronic Government Flagship Application, Blueprint for Electronic Government Implementation, MAMPU [12]
- NITC website
- Bank Negara
- 3rd Outlook Perspective Plan
- Banci Industry Pembinaan, Census of Construction Industry, Malaysia 2001 [13]
- The Treasury - Economic Report
- Strategic Initiative One of the 21st Century. The K-Economy [14]

The data and documentation that was collected is based upon the following:

- Abstracts, databases, similar studies, research paper, reports on IT development and bibliographies, both local and international were utilised throughout the study.
- The Study Team identified, reviewed and verified the variables affecting the study based upon findings from the various local and international studies reviewed.
- Secondary data research through the web and other sources were also carried out, which helped substantiate findings and legitimise the process adopted to suit the approach.

4.2 Sector Workshops

Two sector workshops are planned to be conducted during the entire study. Workshop I was an exercise of data and information collection, whereas Workshop II (to be held) aimed to verify and validate the final findings of the study. The purpose of Workshop I was to extract and identify the "AS-IS" condition of IT use within the construction sector and to provide the Study Team with an initial template for the following stages of the analysis i.e. questionnaires and interviews. The essence of the workshop I was to provide an opportunity by which sector players could voice their concerns as to the present state of IT in their sector as well as where they felt it should go.

Since the objective of the study is to provide a holistic approach to the usage of IT in the construction sector, Workshop I attempted to include all sector participants, which included:

- Developer (Various types of developers)
- Contractor (G1 - G7)
- Professional Services ((Architects, Engineers,), Associations (PAM, ISM, ACEM, MBAM, BMDAM), IT Service Providers, etc.)
- Suppliers
- Government Agencies (CIDB, MBA, etc.)
- Government Bodies (Local Authorities, NITC, MAMPU, etc.)

The following are some of the subjects identified and discussed:

- Construction sector attitude for adoption of IT.
- Perception of the construction sector and its present state of IT use.
- Knowledge base of IT users and non-users.
- Understanding of effects of IT usage versus global competition.
- Government initiatives (understanding and/or awareness of such initiatives).
- Present state of IT use within their own business operations.
- Issues of existing skill levels and skill development.
- Cost and overall effects on the construction sector players.
- Perception of IT adoption versus the IT sector structure and Infrastructure.

4.3 Sector Pilot Survey

The intention of the Sector Pilot Survey was to clarify, expand and generalise the findings of the Workshop I thus enabling the Study Team to establishing valid scenarios regarding the "AS-IS" condition of the construction sector.

The Sector Pilot Survey was designed to provide the Study Team with the information related to the following:

- A psychological profile of the sector players.
- Current attitudes and perceptions of the sector on the implementation, impact and investment in IT.
- Type and nature of the IT systems being implemented in sector at all levels i.e. operational, managerial and strategic.
- Attitudes and perceptions toward the induction of IT regulations and standards.
- The type and availability of the human resources required by the sector to effectively implement IT tools.
- Catalysts and obstacles to the wide scale up-take of IT in the construction sector.
- Future perceptions towards IT and competitiveness of the sector.

The questionnaires were structured under 5 sections, i.e., Organisation, Current usage of IT, IT initiatives, IT benefits, Non-user. The Study Team took their participant list from the Construction Industry Development Board (CIDB) list of contractors, the SIRIM Berhad list of construction related service providers, the various professional associations for the private side and government listings for the public side. The selection of respondents thus including the entire construction community and represented all construction sub-sectors, geographical regions, governmental agencies and firm sizes.

For the development of the survey, a benchmark of 1% of the sector has been adopted in order to get a better representation and more holistic response from the construction sector. This benchmark of preparatory pilot survey is suggested to be carried out before an actual survey should be done. The total number of selected participants for the Sector Pilot Survey was set at 2,200. The questionnaire forms were sent to participants by mail with return postage paid envelopes.

4.4 In-depth one-to-one Interviews

After Workshop I and the Sector Pilot Survey were completed, in-depth semi-structured interview sessions were held with specifically targeted sector players. These on-to-one interview sessions of "AS-IS" business practices in the sector were carried out to expand upon and validate the findings of the Pilot Survey. Further to this, the Study Team extracted more in-depth information during these interviews related to issues that could not have been covered by Pilot Survey as a result of the rigidity of the survey.

The selection process was based upon the following:

- Familiarity with the participants to enable the interviews to be conducted comfortably and openly.
- The need to get a wide range of IT users in order to reflect the profile of the sector, based upon the findings of the Pilot Survey. In this context, all participants should:
  - have implemented some IT solutions which can give constructive input into furthering the development of the study and developing a holistic IT Strategy Plan for the Construction Sector.
  - have an existing IT Component within their organisations.
- The need to address the IT maturity levels across a wide range of organisations with respect to the number of years of IT usage.

The visits included 46 organisations (13 from public sector, 33 from private sector) covering developer, contractor, professional services, associations, suppliers, government agencies and government bodies.

5.0 Findings

During the course of preparing this paper, the Study Team is in the process of moving from stage 2 to stage 3 (referring to Figure 2). The findings are discussed as in the following sub-sections.

5.1 Literature Reviews Findings

Based upon the outcome and analysis of the literature review, certain assumptions were made with regard to the type, content, scope and duration of the pilot survey, the workshops and the various interviews.

5.2 Workshop Findings

The data collected during this workshop provided the Study Team with information such as impressions, interpretations, and opinions as well as recommendations:

- As to the "AS-IS", or present state of IT use in the construction sector
- For the implementation of the proposed IT Strategy Plan

The data collected from this exercise permitted the Study Team to identify the following:

- Make generalisations based upon the collected data. This is a key step towards the production of the questionnaires and the templates, which were used, in the semi-structured interviews.
- Adjust the overall methodology of the study based upon this input which has established a better foundation for future findings.

The main findings of this workshop were:

- The "AS-IS" condition of the use of IT in the construction sector, from the sector players' perceptions.
- Current view of the sector on the type and level of the current usage of IT.
- How the implementation of IT tools have impacted construction organisations' performance and productivity (negatively & positively).
- The attitude of construction organisations to investment in IT.
- The main concerns that construction organisations foresee towards the adoption of IT in their businesses.
- A template for the sector based pilot survey/questionnaire.

5.3 Pilot Study Findings

A total of 2200 surveys were sent out to the construction sector players on both the public and private sectors. 436 responses were received. Figure 3 and Table 1 show the breakdown of respondents' (IT user and non-user) business sector.

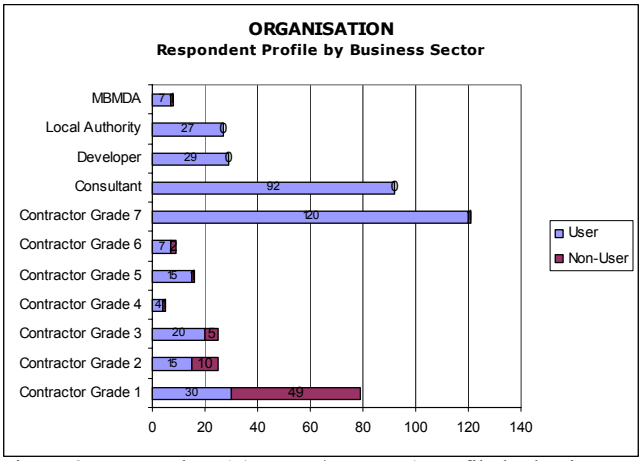

Figure 3: Respondents' (IT user/non-user) profile by business sector

Business	No	%	Yes	%	Total
Contractor Grade 1	49	62.03	30	37.97	79
Contractor Grade 2	10	40.00	15	60.00	25

Contractor Grade 3	5	20.00	20	80.00	25
Contractor Grade 4	1	20.00	4	80.00	5
Contractor Grade 5	1	6.25	15	93.75	16
Contractor Grade 6	2	22.22	7	77.78	9
Contractor Grade 7	1	0.83	120	99.17	121
Consultant	0	0.00	92	100.00	92
Developer	0	0.00	29	100.00	29
Local Authority	0	0.00	27	100.00	27
MBMD	1	12.50	7	87.50	8
Total	70		366		436

Table 1: Respondents' (IT user/non-user) profile by business sector

5.4 In-depth one-to-one Interviews Findings

The selected sample of the organisations have proved to reflect a good representation of the majority of the Malaysian companies which have some IT tools such as word and data processing (MS word and MS Excel) or advanced IT tools (CAD and planning tools).

All organisations felt that IT had significantly contributed to improving their productivity. However, they could not identify specifically why, but they recognised that the following improvements were noticed:

- Reduction of time in producing drawings and other related documents.
- Reduction of time in repeated processes that could be automated.
- Reduction of time in analysing data and information for costing.

Moreover, all the visited organisations have expressed high hopes that the survey will lead to an IT master plan for the construction sector that would assist them in the implementation and adoption of IT, especially in terms of technical and financial aspects.

5.5 Specific Findings

It has been identified through "AS-IS" analysis that certain findings are repeated whether they have been identified within the Sector Pilot Survey or the one-to-one interviews. These repeated elements become the foundation for this study.

This section summarises these findings in an “obstacles” list which have prevented IT from being used on a wide scale in the Malaysian construction sector:

1. Awareness and cost of IT

- Lack of knowledge and understanding of IT along with its benefits and actual threats.
- Cost of implementing IT solutions, (hardware, software, adoption of tools, etc.).
- Most companies stated that the high cost of IT adoption and maintenance, especially software licensing as one of their major concerns.

2. Human factors (resistance to change)

- Fear of the associated benefits of IT which are perceived as promoting “total” transparency against accepted local practices.
- Fear of not being able to protect ones data, information and privacy from competitors.
- Fear of technology leads to resisting adoption, retraining and/or upgrading.
- Fear of having to change the entire business flow processes, affecting the daily operation of the organisation.

- Fear of constantly having to spend money to keep up to competition.

3. Systems' security and support

- Some organisations expressed concern regarding timely and quality maintenance of their systems. Some are maintaining their own IT systems internally, while others are dependent on external vendor for maintenance and support.
- Vendors lack understanding of the construction sector which have affected their continuous support to organisations.
- IT solutions are not compatible with the sector practices and processes.
- Concerns were expressed regarding security over networks e.g. who actually gets access to the information at the bidding processes.
- Lack of understanding of cross-organisational processes (over the supply chain) has led to "mistrust" in an already cut throat environment.
- Although laws (Cyber Laws, Copyright, etc) do exist, they have been challenged in the courts and therefore have led to raising issues like "What guarantees are there for protection of our rights from piracy, hackers, etc."

4. Access to IT Infrastructure

- Perceptions on the lack of efficient and cost effective infrastructure that enables effective implementation of IT.
- The lack of access to high quality and reliable IT infrastructure i.e. broadband, standard lines, etc.
- The concern of losing information and/or time due to unreliable networks/connections.

5. Cultural and perceptions

- The sector culture is "government dependant" – always hoping the driving force / direction / assistance is from the government.
- Perceiving the government as the only source of materialising the initiative of implementation of IT in the sector.
    - All the companies felt the Government had not played a significant role in their procurement, installation, setting up and operation of current IT systems.
    - They are not aware of Government incentives, initiatives or benefits in order to encourage the use of IT.
    - They generally agreed that the government should have some sort of subsidy and/or grant for them to implement more IT adoption.
    - Concern over the legal repercussions with open platforms.
- SMEs are dependent upon the filtering down of work from the larger organisations and therefore perceived IT as a tool to satisfy the main "contractors".
- Perception that technology changes too rapidly, hence no point being early investors (let others try first attitude).
- Early adopters do not expect that a new generation of technology (integrated systems, extranets, etc) would enable improved changes or lead to significant monetary or productivity gains.
- Even among the early adopters, benefits of early adoption are considered substantial and seem sufficient at the time of adoption.

6. Role of government agencies (Construction Industry Development Board - CIDB)

- Most companies did not understand the project-based levy/ fee imposed by CIDB.
    - Lack of understanding that CIDB does initiate programs for their members (i.e. SME web based site for member use).
    - Master Plan Studies that help the construction sector in understanding the market.

- They voiced their wish to obtain IT benefits from the payment of this levy, but were not clear as to what this should be.

7. Corporate Issues

- An IT investment is not perceived as a continuous corporate business development decision that would lead to crucial business improvements.
- An IT investment is not perceived as increasing or improving internal competence.
- Malaysia corporate in the construction sector does not perceive the adoption of IT as operating in their best interest, but more as a constraint on their work flow processes - they do not see the quality improvement and efficiency in running their business functions as result of implementing IT.

6.0 Conclusions

The study revealed two extreme groups of users. At the high end, there are the professional and knowledgeable users who have used IT to gain strategic advantage while at the lower end there are the totally ignorance and unaware users. The former group of users is mainly represented by consultants' organisations while the later group is represented by the small and medium contracting organisations. In between these two groups of users there is a wide range of users who are engaged with different levels of IT applications.

At large, the study has highlighted the main obstacles for the successful up-take of the technology such as those related to human factors, management of change, costs, availability of infrastructure, lack of knowledge and investments. Although the initial findings of the study are in line with other international studies in this field, the outcome has provided information on the local Malaysian organisations, which will help this study to produce effective and relevant blueprint strategy for the Malaysian construction sector.

The Study Team has conducted a detailed analysis on the collected data. The results were mapped onto a number of IT implementation models and benchmarked to other results. It was found that it is necessary to carry out Workshop II and further analysis on the data to enable the team to successfully meet the objectives of this study and to produce an innovative but practical tool to assist and motivate the construction sector to successfully implement IT.

7.0 Acknowledgements

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