

DEVELOPING A CONCEPTUAL FRAMEWORK RELATED TO MANAGERIAL DECISION MAKING CAPABILITY FACTORS IN ADOPTING TECHNOLOGICAL INNOVATION WITHIN MALAYSIAN CONSTRUCTION SMES: RESEARCH METHODOLOGY

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Abstract

The motivation for one's organisation to adopt any new technologies might differ across size, fields and countries. The adoption of any technologies has been largely influenced by managerial decision making capability. Realizing the importance of having sound and agile decision making and its effects towards one's organisation when deciding to adopt any new technology, the exploration of managerial decision making capability (e.g skills, attitude, behavior etc) has become a main concern of the researcher, especially within the context of Small and Medium Enterprises (SMEs) in the Malaysian construction industry. This paper aims to describe the research methodology in developing a conceptual framework related to managers' decision making capability factors that could help them understanding the influential factors that affects their behavioural decision making. Thus, to achieve this, this study need to fulfil the following objectives (i) to examine an appropriate research methodology that suits with this research context (ii) to critically justify the flow of research methodology as summarized in the methodological framework. The development of the framework adopts a qualitative methodology to gain better information from managers using a case study research design from multiple SMEs specifically within the Malaysian construction industry. The research techniques adopted will be further elaborated, including the process of triangulating the research findings with other various sources of evidences. This paper also describes the process in reviewing the data via cross case analysis before validating the framework that have been theorised based on technological innovation and managerial-based researches. It is hoped that the development of this framework would lead managers to understand their level of adoption capability with respect to technological innovation, so that they can improve their capability adoption decision by planning an appropriate strategy.

Keywords: *Malaysian construction SMEs, managerial decision making capability , technological innovation adoption , research methodology*

1.0 Introduction

Technological innovation adoption contains various benefits for SMEs within construction organisation. The adoption of technologies might enable them to compete with other organisations and improve the fragmentation among construction parties. Given these benefits, the involvement of managers

in SMEs remains an important role to understand the advantages and barriers of any new technological adoption. This is due to the reasons that they have become a decision maker of top management level (Junaidah Hashim, 2007) and also the key players that will push forward the operational activities; and who utilize very scarce resources to make progress in the interstices of normal business (Barret and Sexton, 2006). This is consistent with Nur Mardhiyah Aziz, Hafez Salleh, and Nur Khairul Faizah Mustafa (2012), which believed that in every organisation, managers become part of the parties that have powerful force in influencing the successful of Information Technology (IT) implementation.

The managerial motivation for one's organisation to adopt any new technologies might differs across (i) size, (Ghobakhloo , Tang, Mohammad Sadegh Sabouri and Norzima Zulkifli , 2012); (ii) fields (e.g Olatunji, 2010) and (iii) countries (e.g Junaidah Hashim, 2007). In fact, the adoption of any technologies has been largely influenced by managerial decision making capability (e.g Awa, et al., 2011). Realizing the importance of having sound and agile decision making (Kenzie, Winkelen and Grewal, 2011) and its effects towards the robustness of one's organisation to adopt any new technology, the exploration of managerial decision making capability (e.g skills, attitude, behavior etc) has become a main concern of researcher, especially within the context of SMEs in the Malaysian construction industry. Nevertheless, to obtain the extensive factors among managers it requires an appropriate methodological framework to be adopted. Thus, this paper was conducted to fulfill two (2) objectives as follow:

- i. to examine an appropriate research methodology that suits with this research context;
- ii. to critically justify the flow of the research methodology as summarized in Figure 3.0

With an aim to develop a managerial decision making capability factors framework, the research methodology and its process flow is designed, so that it could help managers to understand the influential factors that affects their behavioural decision making.

2.0 Literature review

2.1 Definition of managerial capability

Within this research context, managerial capability can be widely referred as managerial teams demographic characteristics (e.g Awa et al., 2011), cognition (e.g Helfat and Peteraf , 2014), human capital (e.g Nur Mardhiyah Aziz and Hafez Salleh (2011), social capital (e.g Kor and Mesko, 2013), and related behavior (e.g Sarros, Cooper and Santora, 2008); that might affects their decision making in adopting any new technology.

2.2 Definition of technological innovation adoption

An innovation is defined as a new idea that is implemented in a construction project which can be referred to new design, technology, material component or construction method deployed in a project (Ling, 2003). Meanwhile, Kissi, Dainty and Liu (2012) viewed innovation as the generation or adoption of ideas; design concepts or delivery processes, new to the adopting organisation, which when implemented will yield a reduction in cost and/or time associated with project delivery and improve the quality of outcomes. The new idea in this context might be associated with adoption of new technology

or system which can bring benefits towards construction organisation (Hua and Chan 2013). This is consistent with the work of Hardie et al., (2005) who believed with this improvement as “new to the organisation”, “new to the industry’ and “new to the world”. Meanwhile, Palmberg (2004) defined this term as the developments of process technology or innovative use of existing technologies or processes to meet new demand or need (Mohammed Dulaimi, 1995). Sexton and Barret (2003) further viewed that innovation would only success as the effective generation and implementation of a new idea, if it enhances the overall organisational performance. Adoption, is another term which can be defined as to take and use as one’s own (Soanes and Stevenson, 2004).. From construction perspective, the technological innovation adoption refers to any technologies that is planned to be adopted and used among construction organisation once they decide to invest (Russell and Hoag, 2004).

2.3 Significance of developing a conceptual framework for managerial decision making capability factors

This study intends to develop a conceptual framework related to managerial aspects since typically the innovations of SMEs are closely depends on top management factors (Barrett and Sexton,2006). This was supported by Awa et al., (2011) which stressed on their education backgrounds, age, gender and experience influences upon success in technological adoption. Not even that, leadership styles of managers also has been investigated as a critical factors that could influence employees innovativeness or behaviour (Jong and Hartog, 2003; Matzler et al., 2008 and García-Morales et al., 2012).

As such, it is believed that if this study is not undertaken, managers could not innovate massively due to not knowing the appropriate capabilities that should be posed in adopting any new technologies. In the event of they choose to remain comfortable with existing technology, the level of competitiveness of their organisation would be low.

For long term planning, this uncompetitive practices by organisation might affect employees innovativeness (e.g Jong and Hartog, 2003), which cannot be explored and sharpened, thus creating passive working environment (discourage efficient knowledge sharing via technology). In addition to that, the roles of technology itself could not be exploited fully by SMEs organisation due to failure to improve their capabilities and other managerial factors.

This phenomenon will indirectly affect the credibility of managerial teams since as a leader; they should provide inspiration by motivating their followers, largely through communication. Furthermore, they also have been identified as a key player to promote intellectual stimulation by promoting employees’ intelligence, knowledge and learning so that employees can be innovative in their approach to problem solving and solutions (Morales, Barrionuevo and Gutiérrez, 2012).

3.0 Research Methodology

There are two (2) common strategies available in research methodology; quantitative and qualitative. For quantitative approaches, it provide ‘snapshots’ and so, are used to address questions such as what, how much, how many? Thus, the data, and results, are instantaneous or cross-sectional (Fellows and Liu, 2008). In qualitative research on the other hand , an exploration of the subject is undertaken without prior formulations, the object is to gain understanding and collect information and data such that theories will emerge. Thus, qualitative research is a precursor to quantitative research. Qualitative

approaches seek to find out why things happen as they do; to determine the meanings which people attribute to events, processes and structures (Fellows and Liu, 2008).

Given these characteristics, this research paper has adopted qualitative method due to realizing the benefits of qualitative research in providing better exploration of the subject matter compared to quantitative methodology. This is consistent with the characteristics of qualitative strategy claimed by Fellows and Liu (2008) which stated the primary purposes as follow: (i) to investigate aspects of their social world; (ii) to determine their impacts on behaviour and, hence, (organisational/project) performance (iii) to gain insights and to understand people's perceptions of 'the world', whether as individuals or groups (iv) to investigate the beliefs, understandings, opinions, views etc. of people in details, and hence 'rich' in content and scope.

The qualitative methodology also has been employed due to limited discussion on capability factors involving managers in previous data that have been collected quantitatively. Parallel to this, the empirical studies from previous researchers would only able to cover limited factors related to manager's capability (Afzaal, Mohd Noah and Awg Yussof, 2007; Nguyen, Newby and Macaulay, 2013); such as leadership skills (Chan, Liu and Fellows, 2014) or so called strategic leadership (Aslan, Diken and Sendogdu (2011), managerial skills (Junaidah Hashim, 2007), gender, age, educational level of managers (Mastura Jaafar et al., 2007) and managers commitment, skills and support (Nikas, Poulymenakou and Kriaris, 2006).

The distinctive results can be seen apparently in qualitative strategy as the adoption might encourage managers to better explain their potential capability in relation to technological innovation adoption unlimitedly and informatively. This is supported by research studies conducted by Nor Hazana, Eta Wahab and Alina Shamsuddin (2013); Zahrizan et al. (2013); Ozorhon (2013); Pellicer et al., (2014) and Ozorhon, Abbott and Aouad, (2014), which have made an explorative study to identify various influential factors that influence managers decision to adopt technological innovation. These includes external and internal factors such as resistance to change, inexperience, unavailability of advanced products among several construction professionals, commitment, reluctance, inexperience and owner-manager characteristics.

Despite this qualitative methodology manages to yield better results based on those previous studies, the research paper acknowledged the weaknesses of this strategy to be generalised in Malaysian SMEs due to distinctive factors incorporated across countries, size of organisation and types of organisation especially within Malaysian construction industry context particularly in SMEs organisation.

The research paper therefore, tries to explain each of the following research flow (see section 4.0 to section 4.5) before summarizing the explanation in Figure 4.0 below:

4.0 Research design

4.1 Stage one : Conducting literature review

Yin (2009) has characterise the advantages of this techniques as stable, unobtrusive, exact and broad coverage-long span of time, many events and many settings. This advantages has brought researcher's attention to review a considerable amount of literature from multiple sources involving strategic management literature, small business literature, technological based literature, human resoure

management literature and construction literature itself. These sources were collected in the forms of e-book, listed journals and other web-based sources, and ranges from 1970s to 2014. First is managerial motivation to adopt new technology. Second is the factors influencing managerial decision making, it has been organised into several themes so called category related to factors influencing managerial decision making. Overall, the theme can be clustered into five (5) major categories. There are managerial demographic characteristics, managerial cognition, managerial social capital, managerial human capital and managerial behaviour. Each theme comprises of sub themes or known as sub category that positively affects managerial decision making capability. The studies gathered from non-construction based on the other hand reflects the insufficiency of literature in construction which has been gathered across diverse sources and diverse background of research area. Based on the information conducted worldwide, a set of managerial decision making capability factors are identified prior to fit it within Malaysian context.

4.2 Stage two : Conducting pilot case study

For this research, the organisation 'X' and 'Y' have been chosen via convenience sampling due to the population members who are easily located and willing to participate (Saunders et al, 2005). In essence, there are two (2) quantity surveying organisations were chosen using the database obtained from registered BQSM. The application is initiated by preparing a formal letter before made a phone call for verification purpose. Despite the business operation is only focus on one (1) field, the criteria of the organisation is quite sufficient enough to get an early managerial responses towards their understanding of the capability questions that have been drafted. In doing so, any refinement of the questions can be done if necessary, which indirectly develop researcher's confidence. Moreover, it is consistent with the requirement of pilot test in selecting the organisation which is, as close as the real types of organisation. This organisation also is chosen from SMEs types, which are quite small in size and numbers. The justification of choosing this types of organisation is that they are still at infancy level of adopting advanced technology. This means that, they have whether employed any basic technological innovation or have the intention to place a greater emphasis on technology as main driver for better competitiveness. The main reason of conducting a pilot interview is to get better insights pertaining to managers' view or perception towards motivation to adopt any advanced technological innovation. Besides that, their initial feedback remains important to ensure the validity and reliability of the questions (via checking the terms and language used). All necessary questions later is refined before issuing to the targeted interviewee of this research; refers to managerial position that involves in decision making process.

4.3 Stage three : Designing case study method

The selection of case study design is due to the following reasons (i) to describe the phenomenon or situation of what influence managerial decision making capability in construction via various sources of evidence. The exploration of data is not confined on explaining the situation, but also justifying the reasons behind all this relationships. (ii) There are some questions related to the importances of influential factors that requires some evaluation from manager's point of view, thus case study remains the best method as has been claimed by Yin (2009). (iii) to obtain outcomes from diverse fields, thus the data obtained is normally more than expected theoretical data (Yin 2009).

4.3.1. Justification of the unit of analysis and smaller sample use

The unit of analysis for this research are managers or managerial team of SMEs via purposive sampling. Their view remains the most important aspect to be examined, since they are the one who decide to employ any technological innovations. This involves manager or managerial team members, who involve in construction for at least 8 years and above. They also should participate directly in deciding whether to adopt or not the technology. The involvement of experience and knowledgeable managers via 'information rich' (Creswell, 2008; Bryman, 2004) method remains crucial to ensure better insights with regards to this issue. As stressed by Meriam (2001), the respondents obtained should be taken from the the most reliable or the one that can be learned most. The representative of respondents therefore are derived from three (3) specializations as stated in section 4.3.3. Based on this selection, the face-to-face interviews will be conducted seperately involving owner managers or managerial teams of the organisation. Each case might contains different numbers of managers, depending on their own profile, which will then help to increase the understanding the factors influencing their decisions.

For sample use, no specific numbers and rigid rules has been set out to select them within qualitative studies context (Yin, 2001; Tzortzopoulos, 2004; Daymon and Holloway, 2011) as it is quite relative in nature. Thus, Sandelowski (1995) believed that the measurement always refers to the complexity of the phenomenon. Similar notion has been shared by Fellows and Liu (2008), by adding that the adequacy of the sample not only depends on the nature of the case studies undertaken (e.g types of the information) but also the purpose of the research. This research context intends to seek manager's view with regards to possible reasons that influence their decision making in adopting technology. The subjective results would then being more appropriate to be obtained from smaller number of cases. This is consistent with Morgan (2008) and Daymon and Holloway (2011) which stated that among the advantages pertaining to small samples are, more holistic, in depth investigation and interpretation of information could be specifically explored, which in turns provides rich information compared to single unit of case (Yin, 2009). As for the sampling frame, this research prefers purposive sampling in obtaining an appropriate respondents.

4.3.2 Justification of the types of SMEs, multiple case study and types of technological innovation use

The multiple case design in this regards focuses on studying one of the types of SMEs namely small construction professional services organisation (SCPS) or so called small construction knowledge-intensive professional service firms (SCKIPSFs) by some of the researchers (e.g Shu-Ling and Sexton, 2006). The justification lies on three (3) reasons (i) First, the distinctive features between small and large construction organisation (Fink, 1998; Acar et al., 2005; Sexton, Barrett and Aouad , 2006; Allocca and Kessler, 2006; Mastura Jaafar et al., 2007; Barba-Sánchez et al., 2007; Lee and Lee, 2007; Ramdani, Kawalek and Lorenzo, 2009; Ghobakhloo et al., 2012; Ernawati and Flanagan, 2012; Azam Abdollahzadehgan et al., 2013; Seyed, 2014). (ii) Second, due to difference sectors (e.g manufacturing) (Reichstein , Salter and Gann, 2005), 'managerial decision making capability' (e.g attitudes and behaviour) to adopt any new technologies might be difference as well. Third, (ii) SCPS offers intangibility of the services and their reliance on knowledge as a knowledge intensive business service (Fenton and Pettigrew, 2006; Jewell, 2010; Jewell, Flanagan and Weisheng, 2014), which refers to those organisation that have an annual sales turnover sales turnover from RM300,000 to less than RM3 million and from 5 to less than 30 employees for the number of full- time employees.

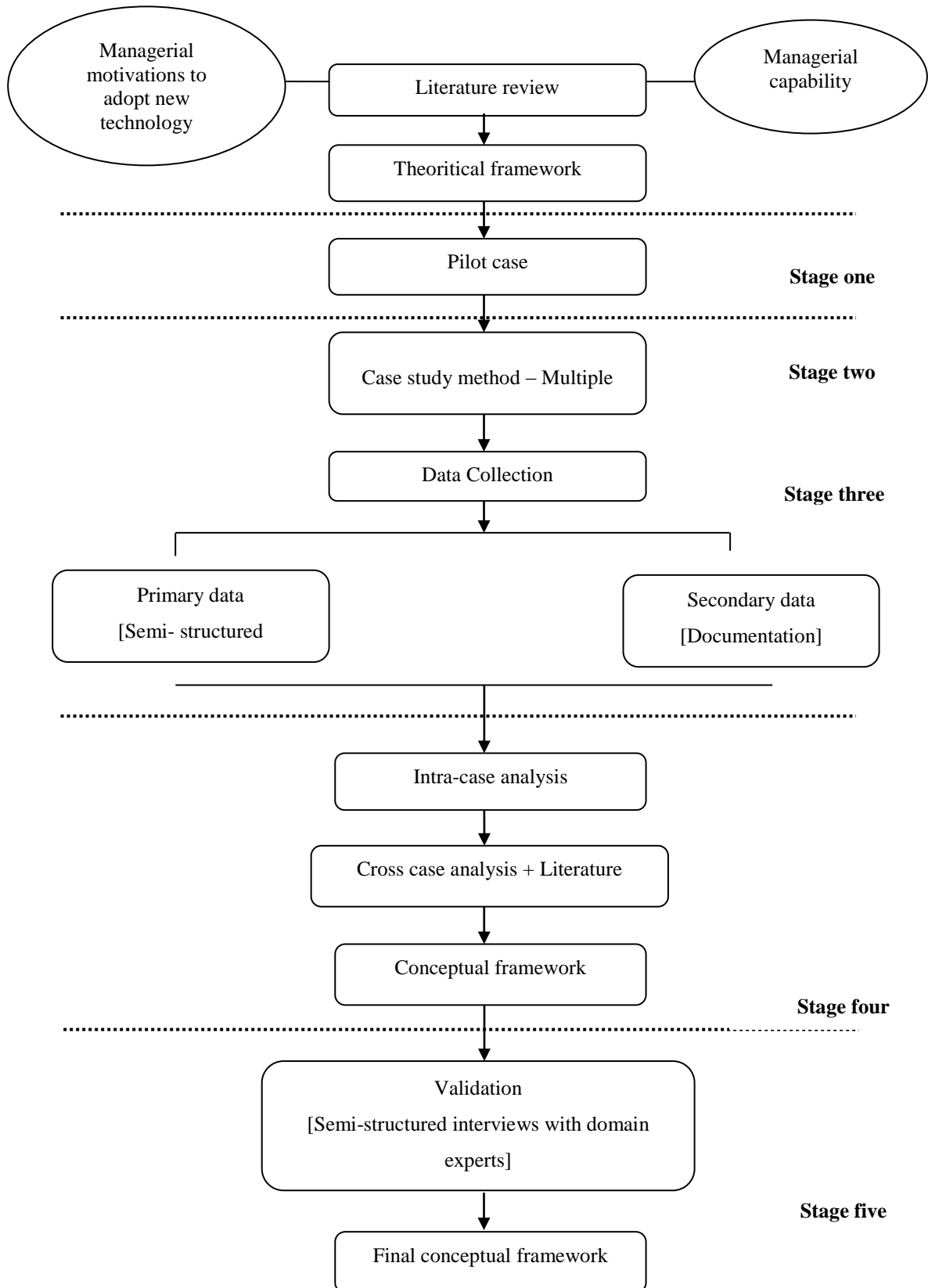


Figure 4.3 : Summary of the flow of research methodology

In general, the selection of SCPS organisation is based on realizing the importance of this types of organisation as an economic agent (Weisheng et al., 2013) specifically agents of innovation within the construction industry (Shu-Ling and Sexton, 2006). The roles not only apparent in Malaysia, but SCPS also has been recognised as contributing towards economic output as what have been experienced in Malaysia (Mohd Khairuddin Hashim, 2007) and other countries such as UK (Mohyin, Dainty and Carrillo, 2009).

Realizing this significant, SCPS organisation will cover six (6) cases or organisations. However, SCPS specifically contains with variety of specializations as have been claimed by Jewell, Flanagan and Weisheng (2014). Therefore, this study chooses among the most prominent field, from three (3) main specializations of small SCPS; namely architecture, engineering and surveying since these groups are the main driver for innovation (Hardie et al., 2005) and the key players of the scps and construction industry. Moreover, the multiple cases provides in depth investigation of different views of managers from the various fields, which reduces the elements of biasness. This means that it is relevant and sufficient to explore the relevant fields pertaining to this research. These includes one (1) from architectural services, three (3) from engineering services (one from civil, one from structural, one from mechanical) and one (1) from quantity surveying services and one (1) from project management services.

SCPS organisation has been geographically selected in Peninsular Malaysia specifically in Klang Valley. The general reason of selecting this types of SCPS within Klang Valley area are due the following reasons: First, due to its accessibility and confidentiality basis (difficulties for some organisation to give corporation and and they do not want to expose their weaknesses). Second, the focus of this research is more on their capability as a manager (e.g personality or behavioural-based) and resources they possessed (e.g technology adoption) rather than the location of organisation. The organisations must have an experience of adopting any technologies or have the intention to adopt any technological innovation.

Within this context also, the technological innovation employed refers to any types of technologies, either designed as tools (e.g BIM), new systems (e.g software), processes, as long as it one forms technology that might give benefits towards organisational capability to innovate as agreed by Khalil (2002). This is consistent with the benefits offers towards one of the organisation as stressed by Niraj Thurairajah and Goucher (2013). They acknowledged the opportunity of technological innovation adoption offers towards profession like surveying profession particularly cost consultants. These includes, a new perspectives of working and thinking, expansion of knowledge, usage and awareness of technology as well as accuracy of quantification of works related to cost estimation. Thus, location has not become the primary concern of research selection.

The generalisation of study could be made at least , at a profession level rather than industry level due to small sample chosen over population. It is relevant since they have become a representative of the professions that they hold within the construction industry despite some differences were found regarding the disciplines of cases (different fields of organisation) and types and level of technology employed.

4.3.3 Main data collection techniques (i) : Semi- structured interview

With reference to these types of interview, the preferable types used in collecting the main data is semi-structured interview. This selection is parallel with Esterby-Smith et al., (2008), claimed this technique as the most fundamental of qualitative methods. Guided by case study protocol (e.g contains several open and close ended questions), the exploration of manager's view pertaining to their capability in influencing the adoption of new technology is conducted. The session in particular comprises of two (2) parts which was held in the forms of face-to-face interview. Both parts involve semi-structured interview among managerial position that have an authority to decide in organisation. The numbers of managerial teams involves in SMEs organisation in Malaysian construction industry depends on the uniqueness of each organisation. The open-ended questions are drafted concisely by following the systematic literature reviewed previously.

The second part involves similar method, which is semi-structured interview but the questions are derived from the combination of open and closed ended. The questions have been guided with theoretical framework that has been drafted based on concise literature from previous researchers. This session is conducted to obtain better insights of managerial views pertaining to their stand in relation to the significant of each factors and other factors proposed previously. The interview session is flexibly and comfortably being conducted with six (6) types of organisation and two (2) pilot cases. The session is recorded via tape recorder and aided with note taking to ensure the accuracy of data and to make the interviewer alert with the information given by interviewee.

For effective session, the case study protocol has been emailed couple of weeks before conducting the session. The purpose is to give an ample time and ease the interviewee in answering the questions in advance. In addition, for formality, the interviewees have been briefly informed the procedures of conducting this session (e.g recording process). The interview session incorporated in case study is believed to provide more insights in explaining the causal relationships and inferences compared to questionnaire survey which is more rigids and contains limited structure. Despite some arguments were received from Yin (2009) with regards to some weaknesses of interview technique (such as response bias and reflexivity), this research still choosing this technique as it offers more advantages rather than disadvantages. In addition, to avoid bias, a careful selection of organisation is done.

As for validation purposes, the closed and open ended questionnaire were drafted to several domain experts during the semi-structured interview session. To cross check the refine framework from case study design, the data is validated from managers or managerial teams of another six (6) fields or organisations, namely one (1) from architectural organisation, three (3) from engineering organisations (one from civil, one from structural, one from mechanical) and two (2) from surveying organisations (one from quantity surveying and one from project management organisation). The interview session takes about 40 – 45 min and all discussion have been taped prior to transcribed.

4.3.4 Main data collection techniques (ii) : Documentation

Another main data collection of this research is documentation, where external and internal documents, such as memos, electronic mails, annual reports, financial statements, newspaper articles, websites, may be used to cast further insight into the phenomenon of interest or to corroborate other forms of evidence (Bhattacharjee, 2012). The organisational data remains important to critically review their

profile such as list of projects involved, list of organisational employees, vision, organisational plans, standard operating procedures (SOP) and others. This is consistent with Yin (2009) which has characterised this techniques as stable, unobtrusive (exact-contains exact names, references and details of an event) and contains broad coverage (long span of time, many events and many settings).

4.4 Stage four : Main data analysis

Qualitative analysis is chosen for analysing the relevant data in the case study method as it contains great advantages. Economical benefit and allow the study processes to be reviewed over long periods of time have become among the advantages of this analysis. This is parallel to this research study that have made an analysis from 1980s to the present date (Babbie, 2007). The content analysis involved in this case study might consists of two stages, first is intra analysis, and second is cross-case analysis. These two stages also have been synonymous as comparative analysis by Miller and Brewer (2003) and most likely they associate the first stage as internal comparison and second stage as external comparison. The scarcity of analysis made in these two stages has inspired this research to adopt this types of analysis. The preference of researchers were more focus on adopting other method of analysis such as thematic analysis (e.g Jupp, 2014), descriptive analysis (e.g Egbu, 2004) and document analysis independently (e.g Ozorhon, Abbott and Aouad, 2014). Not even in case study, but this single analysis like regression/Pearson were found in conducting questionnaire survey over top management position (e.g Runeson, 2009).

Due to these reasons, the adoption of these analysis remains significant for studying research involving SMEs organisations. Moreover, it remains suitable to be used in collecting data from case study method. This is due to the reason that via interview session conducting among managers of SMEs, a lot of information and data need to be collected and organised, across different level of analysis and across different exemplar (e.g profile of organisation). Thus this situation requires a proper coding to be done and as a result content analysis fits this criteria most.

The analysis starts with analysing the information and data obtained within each related cases. A particular phenomenon or in this case refers to organisations are compared across time, culture and space in order to identify its variations. These variations will disclose patterns of difference and similarity (Miller and Brewer, 2003). Cross-case analysis on the other hand, is described as a stage whereby it is conducted to make some comparative analysis between each organisation according to the main groups. From the results, the qualitative data and information are gathered, prepared and compared with. This has been supported by Miller and Brewer (2003) which believed that two or more different phenomena are compared against each other in order to identify the pattern of difference and similarity between the phenomena. Using analysis made from intra and cross case analysis, the refinement of data is prepared and conceptualised prior to draft new conceptual framework. The qualitative analysis has been analysed using ATLAS.ti due to its benefits such as speed, consistency and rigor (Dowling, 2008).

4.5 Stage five : Conducting semi-structured interviews with domain experts

Once the refinement of the case study data is finished, the following step is to validate the managerial capability factors among domain experts using purposive sampling. The numbers of expertise involved six (6) organisations, which the respondents had more than 10 years experience in managing their organisation and construction specifically. The interview session was conducted among the

professions ranging from registered architects, registered engineers (structural, civil and mechanical) and registered surveyors (quantity surveyors and project managers), which will takes about one hour. The interview is recorded via audiotape and transcribed before the main points has been sent back to the interviewees for validation. In doing so, the accuracy of the data is obtained.

5.0 Conclusion

Earlier discussion have incorporated the purpose of conducting this research and provides the flow of how the research is going to be conducted and why such methods, techniques and strategies were chosen. A preliminary study starts with reviewing two (2) types of research methodologies, before planning to collect information and data. The advantages of each method were identified and based on the characteristics given, it can be clearly seen that a qualitative methodology remains the most suitable methodology to be used, due to weaknesses discussion on capability factors in qualitative manner. Each of the research flow would then being identified and justified critically as stated above. With an appropriate research methodological flow, the capability factors among managers can be widely explored, which in turn leads them to prepare an appropriate adoption capabilities, for better decision making ability in Malaysian construction SMEs organisation.

6.0 References

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