

RATIONALIZED KNOWLEDGE-BASED SYSTEM (KBS) AND KNOWLEDGE-BASED NETWORK (KBN) IN SMEs OPERATIONS

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ABSTRACT

Knowledge management systems (KMS) such as knowledge based system (KBS) and knowledge based network (KBN) helped enhancing knowledge sharing and knowledge codification within the feasibility practices of knowledge management activities in ICT-based SMEs operations. This paper basically discussed on which KMS were used by ICT- based SMEs to support their knowledge management technological and investment initiatives. Whether or not these initiatives provide impact on ICT-based SMEs knowledge acquisition and sharing experience will be discussed further. The preliminary study was carried out by using a survey where the primary data was collected through structured scale type of measurements. Both closed and structured interview questionnaires were distributed among ICT-based SMEs operators or suppliers dealing directly with ICT-based products or services in Labuan and Sabah. The result indicated respective investment in the development of both KBS and KBN were indirectly provided a glimpse of innovative service culture within the correspondence ICT-based SMEs in this study, despite its budgets and expertise barrier. Thus, ICT-based SMEs especially those in short product and technological life cycle which mainly businesses focused on software development, e-content development and system integration or incubation, should emphasis on enhancing its existing knowledge know-how embedded in small business operations culture. Nonetheless, overall SME's operations able to offer mechanism on capture individual unique curiosity and creativity.

Keywords: ICT-based SMEs, knowledge-based system, knowledge-based networks

1. INTRODUCTION

In Malaysian economic scenarios, small and medium size enterprises (SMEs) stand tall as the national economy backbone. SMIDEC reported that in 2002, Malaysian SMEs accounted for 93.8 per cent of companies in the manufacturing sector which have contributed 27.3% of total manufacturing output, 25.8% to value-added production, own 27.6% of fixed assets, and employ 38.9% of the country's workforce. SMI Development Plan 2001-2005 outlined that by 2020, SMEs are expected to be the most significance sectors in boast domestics economy growth value-added products which expected worth is RM120 billion or 50% of total production in the manufacturing sector (SMIDEC, 2002). Whereas, statistics in 2013, OECD reported of the total business establishments in Malaysia, 99.2% are SMEs point out how SMEs are foremost contributors to the Malaysian economy, accounting for 32% of national GDP and remarkable 59% of employment and 19% of exports (OECD, 2013). Latest SMIDEC report shows that SMEs contribution to overall Gross Domestic Product (GDP) increased significantly to 35.9% in 2014 compares to only 32.2% in 2010 (SMIDEC, 2015).

In 2014, Small and Medium Industries Development Corporation (SMIDEC) redefining national's SMEs with the aspirations to provide a significant value-added growth of SMEs in all sectors of the economy as SMEs' synergy impact were higher than the overall sectorial economics performance. These adopted common definitions will remark critical privilege of Malaysian SMEs in domestic's economics reform. The new definition effective 1st January 2014 was based on the annual sales turnover or number of full-time employees as shown into two major categories based on sectors and subsectors. The new definition of Malaysian SMEs can

be summarize as an enterprise whereby in each of the respective sectors based on the Annual Sales Turnover or Number of Full-Time Employees as shown in the **Table 1** below:

Table 1: Malaysian SMEs definition by sector and size

Size	Sector	
	Manufacturing, manufacturing-related services and agro-based industries	Services, Primary Agriculture and Information & Communication Technology (ICT)
Micro-enterprise	Sales turnover of less than RM300,000 OR full time employees less than 5	Sales turnover of less than RM300,000 OR full time employees less than 5
Small-enterprise	Sales turnover between RM300,000 and less than RM15 million OR full time employees between 5 and 75	Sales turnover between RM300,000 and less than RM3 million OR full time employees between 5 and 30
Medium-enterprise	Sales turnover between RM15 million and RM50 million OR full time employees between 75 and 200	Sales turnover between RM3 million and RM20 million OR full time employees between 30 and 75

Source: www.smidec.gov.my (2014)

Despite the sectorial significant contribution to national economy, SMEs in Malaysia reported to be lack of access to financial resources, lower productivity, insufficient managerial capabilities, poor access to management and technology, for example low level of ICT utilization and heavy regulatory burdens (Ali and Ndubisi, 2006; Saleh and Ndubisi, 2006; Chin and Lim, 2012; Chong et al., 2014). Therefore, past studies on SMEs' development merely focus on the adoption of new technological such as advancement in ICT features as an innovation element in doing businesses amongst SMEs in Malaysia (Chong et al., 2011; Le and Koh., 2002). However, most of these researches focused on manufacturing-based businesses with little emphasis on the service industry, specifically in ICT-based industry. For instance, early work by Le and Koh (2002) on the development of Information and communication technology (ICT) and e-business applications across wide range of Malaysian SMEs have provide insight that there were intra-and-inter-firm business processes and transactions influence in how SMEs doing businesses. However, the prominent finding of this research only provide fundamental answers on how ICT applications improve information and cost reductions inside the SMEs operations which on the hand, focused on speed and transactions reliability of the electronic commerce scopes in SMEs.

Recent studies on the innovative characteristics, benefits, and barriers influencing SMEs' innovation and new technological adoption, such as internet-based information and communications technology (ICT) adoption found that many of the SMEs surveyed struggled in adopting ICT or new technology in their businesses due to four major weaknesses which are lack of skill and knowledge, incompetence ICT articulations in specific need for new technology and automation, inadequacy of marketing internationalization and financing challenges (Suhaiza et al., 2006; Tan et al., 2009; Chong et al., 2015).

A study by Muhammad et al (2011) suggested SMEs should invest in its know-how capabilities as its main strategy to overcome the survival as 50% of Malaysian SMEs regardless of size and industry likely to face fierce struggle and vulnerable survival prior to first five years of its establishment due to various issues. Chin and Lim (2012) employed a systematic literature and empirical research on how knowledge management systems (KMS) and techniques positively benefits Malaysian SMEs in three majors propositions namely, a) positively increased customer satisfactions in SMEs, b) enable SMEs addressed issues on knowledge creation and innovation in small businesses, last but not least, c) expanding SMEs' social capital concerning external stakeholders. Latest research by Cheng and Kuan (2015) realized that due to critical factors such as limited technical capabilities as well as financial resources, SMEs rarely invest in advance ICT technologies. The research found that injected KMS in SMEs indeed are challenging issues for the SMEs owners whereby most of the filing and storing knowledge still in traditional and manually nature that hindering its embedded KMS initiatives.

One insight of local study on Labuan SMEs level of technology capability done by Mohd Zulkifli et al., (2012) indicated that approximately 93% of the 29 companies surveyed have some form of Internet connections in the office whereby a proportion 34% of the companies do have company website. The same scenario present in the study by Fulantelli and Allegra (2003) whose studied focused on Italian SMEs introductory and use of

information technologies in Italian SMEs, found that a lot of cases SMEs used ICT only for basic functionalities, and not to improve internal and external communication, or to activate new information services. However, latest progress in modernized the Malaysian SMEs, government has shown tremendous support in development of ICT-based business model in Malaysian overall businesses scenario. The objectives were to provide an effective mechanism in improving external communications and quality as well as robust of ePayment services facilities promoting wider pools of new customers. Institutionally, Digital Malaysia project under The Multimedia Development Corporation (MDEC) indeed found that due to the cost constraint and complicated process of ePayment, small-enterprises and micro enterprises are facing difficulties in acquiring ePayment capability (SMIDEC, 2016). With the purpose of ensuring domestic SMEs remain competitive and innovative, it was crucial for SMEs managing their knowledge assets (Davenport and Prusak, 1998; Nonaka and Teece, 2001; Tan et al., 2009; Muhammad et al., 2011) through developing its own knowledge management system (KMS) initiatives.

Therefore, this study aims to grasp the feasibility of ICT-based SMEs in Sabah and Labuan in adopting its own knowledge management system (KMS) in its daily operations. In short, this study attempted to answer the following research questions:

- 1.1 What are the main streams of important business knowledge to the ICT-based SMEs in Sabah and Labuan in general? How these streams of knowledge being used, disseminates and shared in its operational areas?
- 1.2 Are there some kinds of integrating KMS (KBS and KBN) within the ICT-based SMEs to facilitate knowledge sharing and collaboration activities both internally and externally beyond their respective geographical boundary?
- 1.3 Is there any an initial investment initiative for innovations or embedding KMS among ICT-based SMEs operates in Sabah and Labuan?

Thus, the main idea of this study is to discuss on ICT- based SMEs technological investment initiative and technological venture so as its outcomes specifically in interrelated combinations of knowledge management system known as knowledge based system (KBS) and knowledge based network (KBN). These systems known to be embedded within strategic capabilities of Malaysian ICT industry market know-how and knowledge dissemination, whether or not these initiatives provide impact on ICT-based SMEs knowledge acquisition and sharing experience will be pondered within the context of geographical boundaries of Sabah and Labuan.

Our study focused on ICT-based SMEs as ICT-based industry stand out as one of the most resilient foundations of Malaysian science and technology agents to gauge Malaysian aspirations to achieved her very own Digital Malaysia campaign by 2020 (Basu, 2016). However, ICT-based SMEs in this study excludes mobile telecommunication operators or mobile phones market segments with merely focused on information technology savvy types of SMEs. On the other hand, we believe that this market segment of SMEs evolve directly with the current pace of dynamics changes within technological life cycle, as well as a major influential business segments that supports supply and demand of ICT-based technologies in Sabah and Labuan.

2. LITERATURE REVIEW

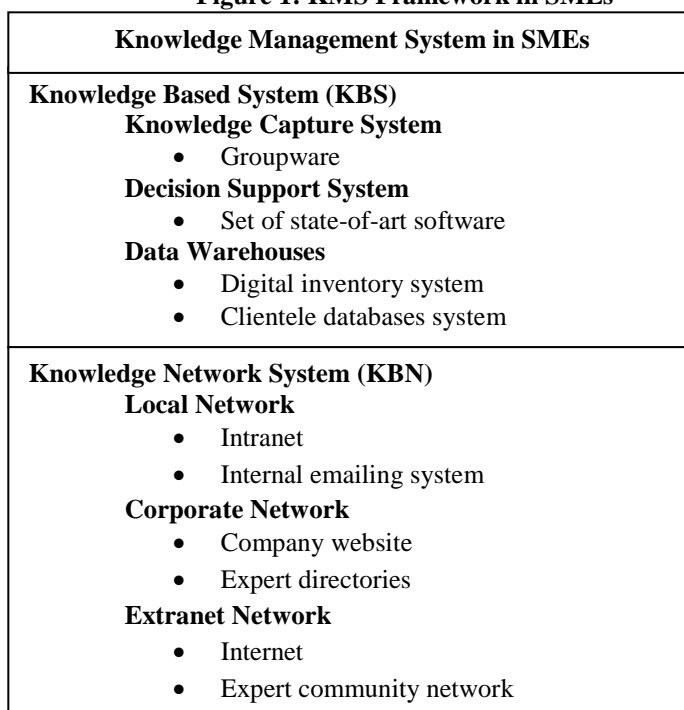
The management of change takes place within the entire cycle of enterprises and corporations regardless its sizes and corporate status quo. The fundamental understanding of knowledge creation or business know-how activities are not most effective restrained to the top management concern, but also up to the lowest layers of any enterprises. Even there are distinctive strategies to examine the mutual characteristics of the knowledge management practices in a single firm; this study however, intended to investigate feasibility SMEs in Sabah and Labuan inserted knowledge management activities inside the context of organizational knowledge management system (KMS).

Classic definition of Knowledge management systems (KMS) can be retrieved to the work of Alavi and Leidner (2001) which signifies KMS to a set of IT-based systems established specifically to support and enhance the enterprises processes of knowledge creation, know-how retrieval, knowledge transfer facilities, and knowledge used (reusing) or reprocessed. Maier (2007) justified KMS as an ICT system that integrates functions for contextualized both enterprise's tacit and explicit knowledge for an enterprise strategic advantages. Nonetheless, the KMS discussed in this paper incorporated both information technology hardware and software that stores

and retrieves knowledge, enriches collaboration, locates knowledge sources, data warehouses for industry methods, tools, procedures and documents, captures and uses-reusable fresh ideas and expertise knowledge, or in some other way utilize the knowledge and experience of a small enterprise. Generally, there were two dimensions of KMS in this study, namely, knowledge-based system (KBS), which focuses on the databases, knowledge capturing system and decisions tools that are used to facilitate managing knowledge within the Sabah and Labuan ICT SMEs and secondly, emphasis on knowledge-based network (KBN) that repressing as local, corporate and external network.

We are using combinations of the early work of Earl's (1997), Prusak (1997), Sharma et al. (2004) and Maier (2007) which focused specifically on KMS that are technology focused. The KMS briefly shown in figure below, consists of two major components, namely, knowledge-based system (KBS) and knowledge-based network system (KBN) and its respective components. The proposed model is illustrated as **Figure 1** below. Detailing of KMS components discussed further in the following segments.

Figure 1: KMS Framework in SMEs



2.1 Knowledge-based system (KBS) in SMEs

A common understanding of knowledge-based system (KBS) is a computerized system which enables enterprises solve problem that is immensely complex and complicated. It's a unit that transforming tacit knowledge into explicit form so that it's can be stored and disseminates (Nonaka, 1991). Nevertheless, Prusak (1997) early work emphasized heavily on the applicability and well-developed KBS as a crucial role in SME's distribution channel. According to Prusak (1997), KBS accelerates capturing experience and knowledge throughout the corporate databases that specifically securing and storing their intellectual capital. Moreover, KBS that associated with decision support systems, such screen-based system analyses decision makers can exploited into new products of knowledge. However, knowledge flow continuously yet in an unsystematic manner, triggered varies magnitudes of coordinating KMS into an enterprise's operations. Thus, an enterprise's such as SMEs would face a challenging issues in getting the essence of information, making sense of it, making it meaningful and useful before being stored as explicit knowledge in tangible provisions (Carneiro, 2002). Some examples of such explicit knowledge in the form of customers' relationship management, client's databases, analysis software, documents sharing system, content management and the like. The most common feature is that KBS using knowledge from various sources, whether data bank and information, such as an expert knowledge database to assist in major problem solving, promoting consistency, as well as saving cost in supporting human capital competency, managerial decision making and acquire collective expert knowledge via a set of software which uses artificial intelligence technique or expert system (Akerkar and Sajja., 2009).

One of the element in Earl's (1997) and Prusak's (1997) knowledge management model indicates knowledge capture system, decision support system, groupware and data warehouses as four major components of the enterprise's KBS. Becerra-Fernandez and Sabherwal (2010) provides an insight of knowledge capture system as one of the system that subsists in KBS. The knowledge capture system by generic definition is a system that supports the process of retrieving either explicit or tacit knowledge that resides within people, artefacts, or organizational entities. The systems were beneficial in capturing internal or external knowledge that resides within industry consultants, competitors, customer's uniqueness, suppliers, and prior vendors within the supply chain network.

By definition decision support systems (DSS) is an integrated storage and processing technologies to provide refined useful document or information retrieval such as integrated workflow system for prudent analysis to enhance the management/decision maker's knowledge through knowledge discovery and supply of relevant information (Sharma et al., 2004; Power & Sharda; 2007., Maier, 2007; Becerra-Fernandez and Sabherwal., 2010). While, groupware systems refers to a set of technology-based tools to communicate a team or a group of people sharing knowledge through the use of computing resources via publishing and communication tools such as emailing system, collaborative management tools, video conferencing and informal communication tools provides facilities to create, share explicit knowledge as well to find the sources of the knowledge beyond geographical boundaries (Sharma et al., 2004; Abdullah et al., 2005; Bhatt et al., 2005; Maier., 2007) . Examples are Lotus Notes, emailing system, and workflow management system. Data warehouses on the hand is literary known as an enterprise data source and knowledge repository used to search stored data for patterns that might lead to new insights. Facilitate acquisition of information or data like market trends and customers databases such store dynamics consumerism behaviors or suppliers/vendors past performance (Sharma et al., 2004; Maier, 2007).

2.2 Knowledge-based network in SMEs

The term network can be defined as a process of social interactions between individuals, group or enterprises. Knowledge itself, on the other hand, was the result of this interaction in social scope and across individuals dwelling inside a network. These interactions lead to motivate knowledge creation and transfer of knowledge between individuals internal or external an enterprise's boundaries. This element of KMS important to modern SMEs for getting businesses running smoothly as well as provides rich data in diagnosing problems within the entire cycle of SMEs supply chain network. The thermal "*knowledge network*" first used in the work of Seufert, Krogh and Bach (1999) to describe the relationship between a sum of people, resources and individual. The main objectives from network and networking activities according to Seufert et al., (1999) and Swan et al., (1999) are ensuring that every individual in the specific network gain mutual advancement in using knowledge shared throughout the network system. Botkin (1999) and Mentzas et al., (2002) presents a classic example on how a successful knowledge management strategy relay on a reliable network management structure with a high connectivity and interdependence systems of Internet network showed the inter-flow of knowledge sharing relationship. This description lithely provide a general overview of the KBN as an effective network which includes the basic features and need to be highly integrated of diverse roles in managing best business practices. In these studies by Earl (1997), Prusak (1997), Sharma et al., (2004) and Maier (2007) justified that KBN components can be divided into three common elements: local network system which components are includes features such as Intranet and company websites, corporate network which includes components such as internal emailing system, expert directories, and finally, external network which refers as Internet, expert community network.

Intranet is an internal browser-based network is a simple term known as web browser with Internet technology that provides loosens flow of information and explicit knowledge in the enterprises. It's representing SME's corporate memory (Mentzas et al., 2001) Thus, Ahamed (2007) referred an Internet as a communication network infostructure of any nation. As such, his analysis suggested that intelligent Internet programmable tend to be major contribution to knowledge flow provided prudence value-added content-based. Generally, there are three main form of network embedding in KBN's model for SMEs. First, is to integrate knowledge by linking knowledge to knowledge in SMEs repositories. Secondly, linking people to knowledge within the intranet or internet and thirdly, is to linking pool of people with relevant components of knowledge together for businesses model enrichment in corporate network system. With that, KBN appears to be a significant component of knowledge acquirement, before being disseminates and executed into enterprise memory. Earlier researchers found that self-regulated network capable of aided businesses in capturing and validating transaction cost before updated them into the corporate database and disseminate unique know-how trends (Earl, 1997). Moreover,

Mentzas et al., (2002) seen network as a valuable medium in mobile knowledge processes whereby occurred of network external and internally encourage knowledge and transfer of knowledge creation of one individual to other individual. Roger (2004) stipulated that SMEs may rely more heavily on external knowledge networks as an input to its innovation collaboration than the large firms. However, knowledge network in this paper describes as both internal and external form of communication behavior among ICT-based SMEs in Sabah and Labuan that representing the accessibility of the information flow and communication structure.

Basic understanding of the network element can be traced within broadband penetration amongst nation's household to represent the market structure of digitalized economics. **Table 2** below presents broadband penetration by state per 100 household for the state of Sabah and Federal Territory Labuan.

Table 2: Broadband penetration by state per 100 household year 2007, 2010 and Q2, 2015

State	2007	2010	2015
Sabah	6.7	25.6	51.8
Federal Territory Labuan	14.9	70.1	66.4

Data 2007 & 2010: Broadband penetration rate by state in The Report Malaysia 2011: Oxford Business Group. Data Q2, 2015: ICT Access and Use by Households and Individuals Survey from Department Of Statistics Malaysia 2015.

In order to enter into sustain networked and digitalized based market player, ICT-based SMEs in both Sabah and Labuan have to improvised its digital networking technologies despites huge opportunity of 40% broadband penetration among the household in Sabah and Labuan (Oxford Business Group, 2011). Thus, SMEs to be more flexible and responsive to today ICT short product and technological life cycle fluctuation that linked to possibility of gear up the role of networks in promoting SMEs innovation culture.

3. DATA COLLECTION METHOD AND PROPOSED SAMPLE

Data used in this study come from overall 265 ICT SMEs in Sabah and Labuan that not only registered in Small and Medium Industries Development Corporation (SMIDEC) in Kota Kinabalu, but also ICT SMEs that registered under Technopreneur Development Division (TeDD) that have been lunched by the government in November 2001, an agency under supervision the Ministry of Science, Technology and Innovation whose names and addresses were selected from the TeDD Website's directories. The population includes all 52 of ICT-based major vendors population listed in Sabah Computer Society Community.

The sample of this study decides on Sabah and Labuan's SMEs in the ICT industry as the main target respondents because we believe that this particular business segments able to reflect the applicability adoptions of knowledge management activities as the ICT-based SMEs frequently improving its capacity in chasing latest ICT product development and perform instantaneous inventory control to rationalized firm's survival in the market. The study was carried out by using a survey where the primary data was collected through structured scale type of measurements. Both closed and structured interview questionnaires were distributed among ICT-based SMEs operators or suppliers dealing directly with ICT-based products or services in Labuan and Sabah. **Table 3** shows the proportions of business and technology focused by type of products and services:

Table 3: ICT-based SMEs business or technology focused by products and services

Technology/Business Focus	Products and Services
Resellers/Value added resellers	Computer software and hardware, computers accessories, vendors
Software development	Domain ERP, CRM enterprises application integration
System integration/incubation	Businesses application software and computer networking, programming
Telecommunication networking	Consultancy, system networking
Computer system security	Provider of security services, management system and networking services
Data centre/support centre	Web hosting, web design
E-content development/Internet based businesses	Development online mapping facility, multimedia graphic design, web content

The primary data collection instrument was a structured self-administered questionnaire which included closed and open-ended questions. The questionnaire is in Malay language, which is used widely in Malaysian SMEs. A self-administered survey was considered due to the possibility of getting a better response rate and as well according to the researchers' past experience. Eighty-eight (88) ICT-based SMEs in Sabah and Labuan responded from the selected sample. Five respondents did not answer the questionnaires and eight of the responded questionnaires are not usable for analyses, thus usable questionnaires for analyses representing about 75 respondents of the study. That places the response rate at 50 percent of the 150 ICT-based SMEs that could be reached by self-administered questionnaires. The questionnaire comprised of structured Likert point-scale questions. The research instrument development segregates into three (3) sections:

First section consisted of 8 items on the demographic characteristics of the respondents such as business locations, positions, time of existence, number of employees, annual gross revenue, company's technology investments, portions of technology investment if any, type of business or technology focused. The second section was designed to access the respondents' concept of managing organization knowledge, tools and process. There were 9 items representing the important knowledge as regarded to the ICT-based businesses in general, adapted from the "Twenty questions about knowledge in organizations" from Ernst & Young Center for Business Innovation and Business Intelligence (Japang, 2003) with minor modification. Whilst the third and fourth section identifies types of KMS namely, KBN and KBS respective components that embedded within ICT-based SMEs. This section was constructed based on 12 elements of knowledge based system and knowledge based network that listed in the work of Earl (1997; 2001), Prusak (1997), Sharma et al., (2001) and Maier (2007) as illustrate in **Figure 1**.

4. RESULTS

Table 4.1 below shows the respondents' business locations. 89.3% (67) of the companies are located in Kota Kinabalu and 10.7% (8) are located in a small island, Labuan. Approximately 9.3% (7) ICT-based SMEs are micro-enterprises and 64.1% (48) are small-enterprises while 26.6% (20) are medium-enterprises. On the hand, the demographic profile of the respondents indicates about 29.3% (22) of the respondents are from the top management team, 42.7% (32) are from operations cum technical department, and 24% (18) from the marketing and customer services department whilst, only 4% (3) respondents from training department.

Table 4.1: Respondent's profile

Business locations	Numbers	Percentage
Kota Kinabalu	67	89.3%
Labuan	8	10.7%
ICT-based SMEs by size		
Micro-enterprises	7	9.3%
Small-enterprises	48	64.1%
Medium-enterprises	20	26.6%
Respondent profiles across department		
Top Management/Directors/Branch Manager	22	29.3%
Marketing and customer services department	18	24.0%
Operations and technical department	32	42.7%
Training department	3	4.0%
Period of business establishment		
Less than 1 year	12	16.0%
1 to 3 years	20	26.7%
4 to 6 years	16	21.3%
7 to 9 years	12	16.0%
10 to 15 years	13	17.3%
More than 15 years	2	2.7%
N=75		

Another segment of the study is to identify the ICT-based SME's business focus or technology focus based on its business strategy and daily operations. This segment enables respondents to mark multiples business or technology focus which is relevant to their business nature. This section would allow us to capture ICT-based SMEs diversified businesses venture within an ICT-industry. **Table 4.2** shows the ICT SMEs' technology and business focus by location. Most of the respondents 44 of ICT-based SMEs are resellers and resellers of value-added (VARs) computers and ICT appliances or vendors. There are 24 of the respondents' ventures into e-content development and Internet based businesses. Thus, the outcome complied with current development in ICT based technology industry where majority of the ICT based SMEs focus more on value-added services and product created opportunity to more wide market demand. However from **Table 4.2**, the reseller market in Sabah and Labuan indeed indicates moving forward into mixture of product to services-oriented business focus when ask about initial solutions to capture current market trend and demand as well as dynamics changing of global ICT technology. Thus, this business focus on value-added resellers helps ICT-based SMEs in supplying loops of technology fluctuate evolutions.

Table 4.2: ICT-based SMEs technology/business focuses by locations.

Business Focus/Technology Focus	Business Location		Total
	Kota Kinabalu	Labuan	
Resellers/Value added resellers/Vendors	38	6	44
Software development	6	0	6
System integration/incubation	17	3	20
Telecommunication networking	19	3	22
Computer system security	11	1	12
Data centre/support centre	6	1	7
E-content development/Internet based businesses	21	3	24

On the other hand, **Table 4.3** shows that almost all nine knowledge streams are perceived to be important. However, knowledge about own products and services are perceived to be the most important with mean value of 4.07 (standard deviation: 0.91). Thus, it supports the nature of SMEs-based ICT ability to converse well in knowledge regards to global technological product development and latest issues in ICT industry with mean value 4.01 (standard deviation 0.86). Knowledge about customers seems to be more crucial with mean 4.00 as compared to the knowledge about its own competitiveness and capabilities with mean value of 3.85 whereby knowledge about the best vendor or supply chain and effective business operations perceived to be at mean value of 3.80 respectively.

Table 4.3: Perceived nine knowledge streams in SMEs

	Mean	Standard Deviation
Knowledge about latest technology	4.01	0.86
Knowledge on existing competitors	3.53	0.96
Knowledge on customers	4.00	0.87
Knowledge on effective process/best practices	3.80	0.92
Knowledge on best vendor/supply chain	3.80	0.93
Knowledge on current market trend	3.77	0.94
Knowledge on cyber law/ICT rules regulations	3.81	0.93
Knowledge about our own competitiveness & capabilities	3.85	0.88
Knowledge about our own products and services	4.07	0.91

Today ICT-based SMEs have to be aware of latest ICTs technology advancements as this has directly influenced the growth and importance of its market share. For instance, a computer components, appliances, and ICTs based accessories, customers are look through for the specifications of the ICTs products as well as the service component access by the ICT-based SMEs. As advances in IT have reduced the products life-cycle and, in addition, have revolutionized the way in which business is conducted in the new economy. Billions of people worldwide are currently connected to the Internet, and exponential growth in this international network means that millions more are being connected annually. Moreover, the nature of business today demands that firms interacts with their customers and business partners using technology to provide services instantaneously across international borders (Maier, 2007; Chin and Lim, 2012). Thus advances in technology have meant that the provision of services sector like ICTs businesses had become the business critical technology-based in today's competitive marketplace. Therefore, it is important for ICT SMEs understand the values that customers attribute to the products specifications and service offering. Therefore, this section assesses ICT-based SMEs technologies investment initiatives. **Table 4.4** below shows ICT-based SMEs willingness to inject investment in acquires latest technological advancement.

Table 4.4: ICT-based SMEs on investment initiatives for innovations and KMS

SMEs categories	Investment in KMS			Total
	No	Yes	Not relevant	
Micro-enterprises	1	2	4	7
Small-enterprises	8	19	21	48
Medium-enterprises	3	9	8	20
Total	12 (16%)	30 (40%)	33 (44%)	75

Table 4.4 above represented ICT-based SMEs willingness to invest in technological advancement for the purpose of innovation and KMS installed within their business process. About 44% (33) respondents across various SMEs categories comments that this aspect of technological investment is not relevant to date for their businesses as they are not in the position to determine the investment feasibility as compared to the top management. An approximately 40% (30) of ICT-based SMEs in the study indeed foreseen investment in technology and innovation as crucial part of its business process enrichment and efficiency, although 16% (12) respondents stated not keen to put sum of investment in KMS or innovations that known to be costly and risky by nature.

Table 4.5: KBS and KBN components used in ICT-based SMEs

Knowledge based systems	Numbers	Percentage
Knowledge capture system		
Groupware	10	13.3%
Decision support system	20	26.7%
State-of-art software	35	46.7%
Datawarehouse		
Digital inventory system	41	54.7%
Clientele databases system	24	32.0%
Knowledge based network		
Local network		
Intranet	16	21.3%
Internal emailing system	67	89.3%
Corporate network		
Company website	61	81.3%
Expert directories	25	33.3%
External Network		
Internet	71	94.7%
Expert community network	44	58.7%
N=75		

Table 4.5 shows the descriptive frequencies and percentage of KMS components marked by both proportion of KBS and KBN tools installed and used in the ICT-based SMEs operated in Sabah and Labuan. Multiple responses were possible for this segment. There were 94.7% (71) and 89.3% (67) of the SMEs in this study utilized internal emailing system and Internet-based communication within their circle of network amongst peers and vendors within supply chain. Moreover, 32% (24) of the ICT-based SMEs respond positively to the features like having clientele databases system that positively enabled SMEs in the study to store new customer's data, also seen as benefit tool to strengthen the relationship among existing customers and retain its customer's royalty. This is every true when come to resellers and value added resellers in this study. Whilst, 33.3% (25) stated that their company have IT-based expert directories that provides latest information on nationwide vendors or suppliers as well includes knowledge think tanks about wide-spread ICTs technologies and gadgets available in the market.

In KMS effectiveness linked to SMEs operations, having a company website and expert community network that attached to its groupware would likely to offers not only a key corporate asset and strategic tool for enhancing SMEs capabilities. Most of the websites displayed general information on company such as business location, contact information and email with some slightly displayed their business focus and services. Another KBN component installed in ICT-based SMEs in Sabah and Labuan is Intranet (21.3% = 16 ICT SMEs). When linked to ICT SMEs in Sabah and Labuan the existence of Intranet, and digitalized inventory system (54.7% = 51 ICTs SMEs) can basically provide indicator on the feasibility of ICT-based SMEs practicing its own knowledge management strategy.

On the other hand, latest development on Malaysian SMEs Technology Commercialization Platform via Digital Malaysia project under The Multimedia Development Corporation (MDEC) have heavily assisted SMEs, both technically and financially in installing affordable Point-of-Sale (POS) terminals, specifically merchants points with Electronic Funds Transfer Point-of- Sale (EFTPOS) which would enabled SMEs, especially micro-enterprises accelerating ePayment system through acceptance of credit card and debit card. This project aimed to gear up innovation synergy and widening commercialization value of Malaysian SMEs' products and services at large. SMIDEC (2016) reported that as November 2013, there were 26,000 such terminals have been deployed through 18,000 merchants. With those initiatives in mind, our study initially asked about availability of online transactions facilities installed by ICT-based SMEs operated in Sabah and Labuan. Table 4.6 below shows the availability of online transactions facilities among the studied ICT-based SMEs.

Table 4.6: Online transactions availability by type of ICT-based SMEs

Type of SMEs	Yes	No	Total
Micro-enterprises	1	6	7
Small-enterprises	16	32	48
Medium-enterprises	9	11	20
	26(34.7%)	49(65.3%)	75

Based on **Table 4.6**, shows the frequencies and percentage of SMEs in the study accelerates the idea of doing online transactions for its customers. This by meant, includes provides possibility of acceptance of credit card and debit cards payments system with incurred certain amount of 1% to 5% of services or miscellaneous charges. About 34.7% (26) ICT-based SMEs installed online transactions facilities in their electronic payments system as compare to other 65.3% (49) did not engaged in any kind online transactions activities. The reasons for this group of respondents are varies, from higher operations cost, limited technical resources, to low confidential level on retaining customers privacy issues. This finding provides a huge opportunity for ICT-based SMEs in Sabah and Labuan in expanding its market share.

5. DISCUSSIONS AND CONCLUSION

There is still an initial small steps execution of KMS initiatives amongst studied SMEs albeit Malaysian Knowledge-Based Economy Master Plan has been launched since 2000 (Economic Planning Unit, 2002). There were remain considerably uncertain amongst ICT-based SMEs in Sabah and Labuan about what is or what should be considered as KMS components and outcome of its acquisitions. Nevertheless, the respective SMEs specifically medium SMEs in the study certainly agreed that installed KMS contributed an organized and planned approach to foster its innovations culture, despites given opportunity in encouraging the creation of new ideas and enterprise creativity. There a number of ICT-based SMEs installed its state-of-art accountings and

inventory software as well as databases used to capture technological changes density within its decision support systems. Most of the customer database in ICT SMEs in this study retained in its electronic database has evolved around transactional data such as amount of purchase, type of products purchase and products gifts, date of purchase, frequency of purchase, method of payment and after sales services. This historical information is retained in either a cumulative manner or by an individual purchasing event whereby in the future, can be utilized to prioritize the best customer's relationship management and to determine circulation policies for future direct marketing efforts among the ICT-based SMEs.

Results from perceived important knowledge streams for SMEs indirectly provides insight that SMEs specifically ICT-based SMEs in this study vigilantly preserved their technology know-how and know-whom in furnished for its market needs and trends. Majority of the respondents are knowledgeable of their company's products and services, about latest ICTs technology advancements, about their own competitiveness and capabilities. Conversely, knowledge about competitors seems to be moderately important to the respondents could illustrate ICT-based SMEs in Sabah and Labuan focused more on customers need and stakeholders rather than their competitors.

Engaging KMS in SMEs business model and operational strategy seems an expensive yet important decisions. Therefore, when asks about their initial investments initiatives in technologies for innovations and KMS installations, respondents regardless of their categories mostly agreed that investment decision is top management game. However, interestingly 39.5% (19) out of 48 small-enterprises and 45% (9) out of 20 medium-enterprises in the study have initial investment for innovations and KMS in their company. Thus, helped SMEs increased businesses workflow efficiently; grasp opportunity of physical space automation via well- organized yet easier data/inventory storage, lower operations and miscellaneous cost (Chin and Lim (2012).

Result from the descriptive statistics of KMS components marked by both proportion of KBS and KBN components installed and used in the ICT-based SMEs operated in Sabah and Labuan provide positives indication that ICT-based SMEs in this study despite its various constraints-financially and technically, still pledges its own KMS instruments into daily operations. For instances, about 94.7% (71) and 89.3% (67) of the SMEs in this study exploited internal emailing system and Internet-based communication within their circle of network amongst peers and vendors within supply chain. This finding indeed in line with Le and Koh (2002)., Abdullah et al., (2005)., Chong et al., (2015) who found that internet have formed a unique external networking that can be viewed as knowledge network in the sense commonly used among SMEs in business and professional service sector. On the other hand, about 21.3% (16) ICT-based SMEs installed Intranet bridging their corporate and local network, parallel to Maier (2007) ideas of Intranet that can be a rich yet centralized documents system in terms of knowledge content that help businesses, like SMEs managing as well as integrated its knowledge flow and information. KBN and KBS integration would create the possibility of external integration of knowledge sharing and dissemination where SMEs knowledge and aggregates decisions is networked not only internally but also with its external entities such as pools of local major suppliers or vendors, regular customers, government agencies such as SMIDEC, SME's governing financial institutions such SME Bank, TEKUN National, and SME Corporation Malaysia as a Central Coordinating Agency under the Ministry of International Trade and Industry Malaysia.

Moving on to national aspirations of Digital Malaysia project, the study shown tentative early stage of embracing Point-of-Sale (POS) terminals or Electronic Funds Transfer Point-of- Sale (EFTPOS) facilities amongst ICT-based SMEs in Sabah and Labuan. Majority of the SMEs are still favor traditional payment methods instead of fast-tracking ePayment system through credit card and debit card. Some respondents relate POS and EFTPOS to higher miscellaneous cost between the entity and respective financial institutions. However, the open opportunity is remain wide open as ICT-based SMEs keeping more open to embrace services notwithstanding technological innovations.

In conclusion, the study presented in this paper has some obvious limitations. First and foremost our study only focused on ICT-based SMEs operated in capital city, Kota Kinabalu, Sabah and a small island, Labuan, which obviously indicates this study small sample size. Therefore, it's a hindering factor in drawing general conclusions on whole benefits of installing KMS in SMEs. However, we believe that this study provides important elements in analyzing and justifying feasibility of knowledge management practices tools amongst SMEs. Especially concerning policy maker and institutional initiatives in rationalized SMEs' modernization efforts such digitalized SMEs business model in 2020, currently under Digital Malaysia project.

REFERENCES

- Abdullah, R., Selamat, M.H., Sahibuddin, S., and Alias. (2005). A Framework for Knowledge Management System Implementation In Collaborative Environment for Higher Learning Institution. *Journal of Knowledge Management Practice*. 6(1).
- Ahamed, S.V. (2007). *Intelligent internet knowledge networks: processing of concept and wisdom*. New Jersey: John Wiley & Sons, Inc.
- Akerkar, Rajendra., and Sajja, Priti. (2009). *Knowledge-Based Systems*. Jones and Bartlett Publishers, Inc., ISBN:0763776475 9780763776473
- Ali, S.S and Ndubisi, N. O. (2006). An Evaluation of SME Development in Malaysia. *International Review of Business Research Papers*. 2 (1), pp.1-14.
- Alavi, M. and Leidner, D. E. (2001). Review: Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues. *MIS Quarterly*. 25 (1). Pp: 07-136.
- Basu, M. (2016). *Malaysia starts planning for digital economy past 2020: Government wants to attract larger ICT companies to the country*. Available online: <https://govinsider.asia/digital-gov/malaysia-starts-planning-for-digital-economy-past-2020/>. GovInsider. Retrieved: 10 September 2016.
- Becerra-Fernandez, I. and Sabherwal, R. (2010). *Knowledge Management: Systems and Processes*. Armonk (N.Y.); London : M.E. Sharpe.
- Bhatt, G. D. (2001). Knowledge management in organizations: examining the interaction between technologies, techniques, and people. *Journal of Knowledge Management*. Volume: 5 (1). pp:68-75. ISSN: 1367-3270
- Bhatt, G., Gupta, J.N.D., and Kitchens, F. (2005). An exploratory study of groupware use in the knowledge management process. *Journal of Enterprise Information Management*. Vol. 18 Iss 1 pp. 28 – 46. <http://dx.doi.org/10.1108/17410390510571475>
- Botkin, J. (1999). *Smart Business: How Knowledge Communities Can Revolutionize Your Company*. New York: The Press.
- Cafneiro, A. (2000). How does knowledge management influence innovation and competitiveness? *Journal Of Knowledge Management*. MCB University Press Limited. 4(2). pp: 87-98.
- Chin, Y. W. and Lim, K.T. (2012). Networking and Knowledge Transfer in Malaysian SMEs through University-Industry Engagement and the State. *The Copenhagen Journal of Asian Studies*. 30,(1). Pp: 97-116.
- Cheng, S.L. and Kuan, Y.W. (2015). Development and validation of knowledge management performance measurement constructs for small and medium enterprises. *Journal of Knowledge Management*. 19 (4). Pp:711 – 734. Doi: <http://dx.doi.org/10.1108/JKM-10-2014-0398>.
- Chong, A. Y.L., Chan, F.T.S., Ooi, K.B., and Sim, J.J. (2011). Can Malaysian firms improve organizational /innovation performance via SCM?. *Industrial Management & Data Systems*. 111 (3). pp.410 – 431. Doi: <http://dx.doi.org/10.1108/02635571111118288>
- Chong, A.Y.L., Chong, K.B., Ooi, H. B and Lin, B. (2014). Can e-business adoption be influenced by knowledge management? An empirical analysis of Malaysian SMEs. *Journal of Knowledge Management*. 18 (1). Pp: 121 – 136. Doi: <http://dx.doi.org/10.1108/JKM-08-2013-0323>
- Davenport, T. H. and Prusak L. (1998). *Working knowledge: How organisations manage what they know*. Boston, MA: Harvard Business School Press.
- Department of Statistics Malaysia. (2015). *ICT Access and Use by Households and Individuals Survey*. Department Of Statistics Malaysia 2015. Putrajaya.
- Earl, M. J. (1997). Knowledge Strategy: reflections on Skandia International and Shorko Films. In Prusak, L.(ed).*Knowledge In Organization*. Boston: Butterworth-Heinemann. Pp: 1-15.
- Earl, M. J. (2001). Knowledge Management Strategies: Toward a Taxonomy. *Journal of Management Information Systems*. 18 (1). Pp: 215-233.
- Economic Planning Unit. (2002). *Knowledge-based Economy Master Plan*. Prime Minister Department, Malaysia.
- Fulantelli, G., and Allegra, M. (2003). Small company attitude towards ICT based solutions: some key-elements to improve it. *Educational Technology & Society*. 6(1). ISSN 1436-4522.
- Government of Malaysia. Economic Planning Unit. (2006). *Ninth Malaysia Plan 2006-2010*. Kuala Lumpur.
- Japang, M. (2003). *Knowledge Management Practices: A Descriptive Study of The Insurance Industry*. Master Dissertation. Universiti Utara Malaysia. Unpublished document.
- Le, T.T. and Koh, A. C. (2002). A Managerial Perspective on Electronic Commerce Development in Malaysia. *Electronic Commerce Research*. 2: 7–29. Kluwer Academic Publishers: Netherlands.
- Maier, R. (2007). *Knowledge Management Systems: Information & Communication Technologies for Knowledge Management*. 3rd Edition. Innsbruck: Springer-Verlag Berlin.
- Mentzas, G., Apostolou, D., Young, R., and Abecker, A. (2001). Knowledge networking: a holistic solution for

- leveraging corporate knowledge. *Journal of Knowledge Management*. 5 (1). Pp: 94 – 107. Doi: <http://dx.doi.org/10.1108/13673270110384446>
- Mentzas, G.N., Apostolou, D., Abecker, A. and Young, R. (2002). *Knowledge Asset Management*. United Kingdom: Springer.
- Mohd Zulkifli, M., Goh, S.L., Tamrin, A., & Nasrul, H.N.M. (2012). ICT skill among Labuan's SMEs: Issues and Challenges. *Jurnal Teknologi (Social Science)*. 59. Pp: 109-114. UTM Press.
- Muhammad, K., Abu Hassan, M.I, Jamal, A.N.S., & Adel, A. (2011). Challenges faced by the small and medium enterprise (SMEs) in Malaysia: An intellectual capital perspectives. *International Journal of Current Research*. 3 (6). Pp: 398-401.
- Nonaka, I. (1991). The knowledge-creating company. *Harvard Business Review*. 69 (3). November-December 96-104.
- Nonaka, I & Teece, D.(ed).(2001). *Managing Industrial Knowledge: Creation, Transfer and Utilization*. London: Sage Publications.
- OECD. (2013). *Structural Policy Country Notes: Malaysia in Southeast Asian Economic Outlook 2013: With perspectives on China and India*. Paris.
- Oxford Business Group. (2011). *The Report Malaysia 2011*. Oxford Business Group. ISBN-13: 978-907065460
- Prusak, L. (2004). Practice and knowledge management. In de la Mothe, J & Foray, D. (2004). *Knowledge Management in The Innovation Process*. Boston: Kluwer Academic Publishers.
- Power, D.J., and Sharda, R. (2007). Model-driven decision support systems: Concepts and research directions. *Decision Support Systems*. Volume 43 Issue 3, April, 2007. Pages 1044-1061. Elsevier Science Publishers B. V. Amsterdam, The Netherlands. Doi:10.1016/j.dss.2005.05.030
- Rogers, R. (2004). Networks, firm size and innovation. *Small Business Economics*. 22. Pp: 141-153.
- Saleh, A.S and Ndubisi, N.O. (2006). An Evaluation of SME Development in Malaysia. *International Review of Business Research Paper.*, 2 (1)., pp.1-14
- Seufert, A., Van-Krogh, G. and Bach, A. (1999). Towards knowledge networking. *Journal of Knowledge Management*. Vol. 3, pp.180-190.
- Sharma, S.K., Gupta, J. N. D., and Wicramasinghe, N. (2004). "Information Technology Assessment of Knowledge Management." In Gupta, J. N. D., and Sharma, S. K. *Creating Knowledge Based Organizations (eds)*. Boston: Idea Group Publishing.
- Small and Medium Industries Development Corporation (SMIDEC). (2002). *SME Development Plan (2001–2005)*. Percetakan Nasional Malaysia Berhad, Kuala Lumpur.
- Small and Medium Industries Development Corporation (SMIDEC). (2014). *Definition of SMEs*. Available online: <http://www.amidec.gov.my>. Retrieved 25 February 2016
- Small and Medium Industries Development Corporation (SMIDEC). (2015). *SME Annual Report 2014/2015. One Business One Community*. Secretariat National SME Development Council and Malaysia National Press, Kuala Lumpur, Malaysia.
- Small and Medium Industries Development Corporation (SMIDEC). (2016). *Enabling ePayment for SMEs and micro-enterprises*. Available online: <http://www.smeCorp.gov.my>. Retrieved 3 March 2016
- Suhaiza, Z., Ong, H. K., and Shahnun, S. (2006). The adoption of Information and Communications Technology (ICT) for effective knowledge management in small and medium industry in Malaysia. *Asian Journal of Information Technology*. 5(1):28-33.
- Swan, J., Newell, S., Scarbrough, H. and Hislop, D. (1999). Knowledge management and innovation: networks and networking. *Journal of Knowledge Management*. 3 (4), pp. 262-75.
- Tan, K. S., Chong, S. C., Lin, B., and Eze, U.C. (2009). Internet-based ICT adoption: evidence from Malaysian SMEs. *Industrial Management & Data System*. 109(2). Pp: 224-244. Emerald Group Publishing Limited.