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Understanding Knowledge Management in Developing Emerging Concept of Innovation and Technology Into Business: Conceptual Review and Empirical Evidence

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Abstract

The rise of knowledge-based economy signifies the importance of Knowledge Management towards improving business innovation process for generating and enhancing new technology into business. In tandem with this premise, there is a growing need for industries and businesses to leverage superior knowledge within and outside the organization. In doing so, a meaningful understanding of Knowledge Management is so paramount. This paper presents an organizing review of Knowledge Management and conceptual review and empirical evidence of the three main themes of Knowledge Management, namely knowledge creation, knowledge transfer and knowledge application. Based on the empirical analysis, this paper concludes that huge number of prior studies only focuses on the knowledge transfer theme. This is because knowledge transfer is said to be more visible and easier to observe as compared to creation and application. Conversely, little conceptual and empirical evidence has been undertaken to examine the knowledge application theme and the questions of how knowledge is applied remain widely unexplored. Specifically, this paper highlights that the emerging concept of innovation process is about the capability of managing knowledge; as well as also displays past contribution of Knowledge Management towards new technology development. Finally, this paper concludes with a discussion and conclusion.

INTRODUCTION

The issue of knowledge has been widely used in many different academic disciplines particularly in economy, education, marketing, health and social science (Zarinpoush, Sychowski & Sperling, 2007). In the recent years, researchers have paid increasing attention to knowledge in economy or better known as "Knowledge Economy" (Steenkamp & Kashyap, 2010; Den Berg, 2012). From the aforementioned statement, the introduction of knowledge in economy and management by Drucker in 1969 and also other factors such as intense global

competition, rapid technological changes, shorter product life cycles and government intervention through innovation policy (Steenkamp & Kashyap, 2010), has forced organization to examine knowledge and the question of how knowledge is used in the context of business organization. One of the most cited reasons for the importance of managing knowledge is the increasing speed of competition (Nonaka & Takeuchi, 1995) and as the key resources of organization innovation (Gehani, 2002). Furthermore, in an economy that is changeable and uncertain, knowledge is not static, it needs to be identified, evaluated, acquired, transferred, stored, used, maintained and possibly disposed of (Pemberton & Stonehouse, 2000). Effective knowledge management strategy can greatly provide solutions to organization to create, transfer and apply knowledge (Cepeda & Vera, 2007).

The ability to create, transfer and apply knowledge on an on-going basis underpins the organization innovation capabilities and competitive advantage (Teece, 1998). Heinrichs and Lim (2005), describe if knowledge is a source of competitive advantage, then understanding and managing knowledge is become vital for the organization. Thus, the purpose of this paper is to improve and develop an integrative understanding on Knowledge Management (KM) along with the three main themes: Creation, Transfer and Application and further give an insight to how these three themes relate to each other in developing emerging innovation and technology into business. The paper is set out in three sections. First, the paper outlined an organised review of KM and its three main themes, namely Knowledge Creation, Knowledge Transfer and Knowledge Application. Secondly, this paper highlighted the emerging concept of innovation process and displays the past contribution of KM for new technology in the industries and businesses. Finally, the paper ends by enveloping the discussion and conclusion of the thought.

1.1 The Concept of Knowledge in Economy and Management

In order to understand KM, this paper begins by reviewing the broader concept of knowledge in economy and management. The concept of knowledge in the economy and management has been conceptualised in different ways (Birkinshaw, Nobel and Ridderstrale, 2002). This occurs due to the nature of knowledge that is abstract and invisible unlike more visible assets such as tangible and financial assets (Sveiby, 2001). O' Dell and Grayson (1998), explained knowledge is invisible due to the knowledge merely found in the head of individuals that comes from experience and memories. The statement by O'Dell and Grayson (1998) is originated from the earlier knowledge philosopher. Chisholm (1973) claimed that knowledge source comes from perception, reason, experience and memories which cannot be seen but can only observe its effect. Further clarification about the concept of knowledge in the economy and management is made by Reed and DeFillippi (1990). Both author describe the concept of knowledge is related to causal ambiguity. Causal ambiguity is refers to the inability of an organization to understand and imitate the knowledge that constitute competitive advantage which derived from organization's resources and skills (Szulanski, 1996). Many management authors, among others, Nonaka and Takeuchi, (1995); Davenport and Prusak, (1998); Martensson, (2000); and Bender and Fish, (2000), indicate the concept of knowledge in economic and management are being discussed in three aspects: types of knowledge, characteristics of knowledge and the chain of knowledge flows.

To facilitate further discussion, types of knowledge is refers to tacit and explicit knowledge. According to Polanyi (1967), tacit knowledge is subjective in nature and it comes from intuitions, values and hunches and developed through experience (Nonaka & Takeuchi, 1995). Accordingly, tacit knowledge cannot be expressed in words, sentences or formulas and it includes technical skills such as craft and know-how. In contrast, explicit knowledge refers to knowledge that is transmittable in formal and systematic language and be captured in tangible form such as words, formulas, documents and database (Nonaka, 1994; King, 2009). Moreover, the question on the characteristics of knowledge appearing in the literature has been characterised as scattered, messy, self-organize, it seeks community and easy to lose by its nature (Mayo, 1998). Clearly, it can be argued that blurry meaning of knowledge characteristics is too difficult to be well understood (Steyn, 2004). Another aspect of understanding the concept of knowledge is addressing the question of chain of knowledge flow. Many management researchers have studied the distinction between data, information and knowledge in the literature (Court, 1997; Davenport & Prusak, 1998).

The rationale behind understanding these three concepts of knowledge is urgently warranted as knowledge is the key source for innovation and competitive advantage to the organization and also to overcome the causal ambiguity highlighted earlier by Reed and DeFillippi (1990). The concept of knowledge in economy and management functions as a point of departure in understanding the primary goal of this paper and so do to understand the three prominent themes of knowledge management. The next section outlines the overview of the KM and the process within the literature.

2.0 KNOWLEDGE MANAGEMENT: OVERVIEW AND PROCESS

Within the literature, several studies have concluded that KM concept has come into existence from both academics and practitioners in the 1990s emerging from the field of economy and management, sciences, sociology, information and engineering and artificial intelligence (McAdam & McCreedy, 1999; Kakabadse et.al., 2003). Nonaka, (1991); McCambell et.al., (1999) and Alavi and Leidner, (2001) pointed out KM had been started in the private company in the 1990s as the result of the majority of private organizations incapability to identify, locating, maintaining and leveraging knowledge. A study by DiMattia and Oder (1997) found that the empirical origins and growth of KM in 1990s has emerged from two fundamental transition; i.e. organization downsizing and technological development. They explained further, during 1980, organizations used downsizing as the popular strategy to reduce overhead and increase profits. However, the downsizing strategy appeared to be disadvantage to the organization which leads to a loss of important knowledge. Piggot, (1997) describe as employees leave, they took the knowledge with them. Organization had come and realised the significant loss of valuable knowledge. This circumstance has led organization to undertake the KM strategy in an effort to protect valuable knowledge and retained knowledge workers for the future benefits of the organization. Technological development is another fundamental factor that triggered the interest of organizations in KM through the rapid growth of information resources such as internet and other technological change. DiMattia and Oder (1997) describe, the development of information technology has affected both individual and organization and KM is a mechanism in an attempt to tackle the issue of explosion of information and capitalise the increased of knowledge within the organization. In addition, they asserts that the emerging of technological development enable global sharing information within and across organizations and can serve as a tool to leverage knowledge more effectively. Due to the above issues, organizations make an attempt to manage knowledge systematically. Gronhaug and Nordhaug (1992) highlighted organizations must have a good capacity to retain, develop, organise and utilise knowledge and employees competencies in order to remain at the fore front and maintain competitive edge.

The definition of KM are many and varied across scope, but at the minimum common point, all management scholars agreed that the underlying concept of KM is describes as the essence of the organization ability to create, assemble, transfer, integrate and exploit knowledge resources resident in the organization for achieving new innovation and competitive advantage (Inkpen, 2000; Alavi & Leidner, 2001). Alavi and Leidner (2001) define KM as a "systematic and organizationally specified process for acquiring, organizing and communicating both tacit and explicit knowledge of employees so that other employees may make use of it to be more effective and productive in their work". Hedlund (1994) and Beckman (1999) suggest that KM addresses the process of generation, representation, storage, transfer, transformation, application and protecting knowledge in an organization and subsequently creating new capabilities, superior performance, increase innovation and enhance customer value. The working definition for KM according to James (2004) is the "identification, acquisition, utilisation, support, maintenance and disposal of knowledge assets for the purpose of adding value and benefiting all stakeholders" (Rowley, 1999). The following subsection discusses the KM process.

2.*1 KM Process*

There have been various KM process models that describe the relationship of the key process of KM in the literature (Davenport and Prusak, 1998). KM is about managing knowledge-related assets which include tacit and explicit knowledge that is embedded within individuals, processes, products and relationship (King, 2009). Effective KM process can greatly facilitate organization efficiency and effectiveness and increase responsiveness to market changes (James, 2004). Furthermore, for Davenport, Eccles and Prusak, (1992) and Martensson, (2000) stated the ability of organization to deal effectively with the KM process can improve organization innovation, i.e. product development and quality which is the key aspect of competitive advantage (Carneiro, 2000). The review of the literature revealed that the process of KM involves many processes. The processes of KM consist of knowledge creation and acquisition, knowledge refinement and storage, knowledge transfer and sharing and knowledge application and utilization (McCampbell et.al. 1999; King, 2009). For Alavi and Leidner (2001), KM process is largely regarded as a process involving four basic processes of creating, storing, transferring and applying knowledge and can be subdivided into creating and acquiring knowledge, storing knowledge in documents, sharing and transferring knowledge internally and externally and application of knowledge for competitive advantage. Figure 1 illustrates KM Process Model.

FIGURE 1
KM PROCESS MODEL

Source: Alavi and Leidner, (2001); King (2009)

Figure 1 offers a clear overview of KM process involves in an organization. Meier (2011) pointed out the KM process is using varying term of knowledge processes within the literature. The statement is argued by Alavi and Leidner (2001), by stating the KM process only differs in terms of number and labelling of the processes rather than underlying concepts. In line with the previous statement, a study by Gold, Malhotra and Segars (2001) identify KM process as acquisition, conversion, application and protection as the main elements in the KM process. Turner and Makhija (2006) in their study identify acquisition, restoration, transfer and utilization as the elements of KM process. Furthermore, in recent study by Meier (2011), examined on how knowledge processes is managed between organizations. The study indicates knowledge creation, knowledge transfer and knowledge application as the main process of KM.

To sum up, a number of studies by Inkpen and Beamish (1997), Steensma and Lyles (2000), Tsang, Nguyen and Erramilli (2004), Jiang and Li, (2009) and Meier (2011) highlighted KM process creates three prominent themes, namely 1) Knowledge Creation and 2) Knowledge Transfer and; 3) Knowledge Application. The knowledge creation is associated with the development of new knowledge (Nonaka &Takeuchi, 1995; Gourlay, 2006) Knowledge transfer refers to the transmission process whereby knowledge is transferred within or across organization boundaries (Argote & Ingram, 2000); and knowledge application describes how such knowledge is embedded and applied to create value and competitive advantage (Grant & Baden-Fuller, 2004). In other words, organization received knowledge from knowledge creation and knowledge transfer, while knowledge application is how such knowledge is embedded and used to create new innovation value and competitive advantage.

In addition, Meier (2011) argue that empirical research within the literature strongly focus only on knowledge transfer interrelations between variable factors such as knowledge characteristic, partner characteristic, partner interactions and active knowledge management. This outcome have raised the questions of how knowledge is created, retained, retrieved and applied in the organization remain widely unexplored. The next section will discuss in details on the conceptual and empirical evidence of the knowledge creation, knowledge transfer and knowledge application.

2.2 Knowledge Creation, Knowledge Transfer and Knowledge Application - Conceptual understanding and Empirical evidence

This section provides elaborations and discussions on knowledge creation, knowledge transfer and knowledge application in light of providing profound conceptual understanding and empirical evidence.

2.2.1 Knowledge Creation

The literature review demonstrates the work of knowledge creation in an organization is catalyst by the successful of Japanese organizations throughout the 1980s and 1990s. The key contributor of knowledge creation model in the management literature is pioneered by the notable work of Nonaka and Takeuchi (1995) as established and building upon their SECI Model. This statement is supported by Chittoo, Nowbutsing and Ramchurn, (2010) by stating a discussion of knowledge creation will be lacking if it does not consider the contribution of Nonaka and Takeuchi (1995) knowledge creation model. Nonaka and Takeuchi (1995) highlighted that when economic market shift, competitors will increase, product will obsolete and technology will proliferate, causing an organization to rely on knowledge in order to stay competitive and innovative. Furthermore, they defined knowledge creation as an expand process in which individuals create knowledge that disseminates throughout the organization. In another study by Von Krogh, (1998) and also in the later study by Nonaka and Von Krogh (2009) asserted that successful organization is those that consistently create new knowledge and know-how and disseminate it widely throughout organization. Nonaka and Takeuchi (1995) identified four patterns of knowledge creation between tacit and explicit knowledge in their knowledge creation

model. The pattern is exploited in four stages process known as Socialization, Externalization, Combination and Internalization.

In SECI model of knowledge creation, four patterns of knowledge conversion were identified to be able to convert tacit and explicit knowledge and new innovative knowledge is created within the organization. Socialization mode refers to conversion of tacit to tacit. Socialization is an opportunity for individuals to share experience and to learn through observations and imitations. Externalization mode refers to conversion of tacit knowledge to explicit knowledge. Some examples of externalization are the modes of shared, disseminated and transferred of knowledge through verbal and non-verbal languages. Combination mode refers to conversion of explicit knowledge to explicit knowledge, which focus on the process of creating new network structure by using information technology i.e. documents, email, database, meeting and disseminates the knowledge created among members in the organization. Internalization mode refers to conversion of explicit knowledge to tacit knowledge, which involves the process of sharing knowledge throughout an organization.

Within the literature, conceptual argument made by Gilsby and Holden (2005) argues that the model is not transferable since it was formulated based on Japanese management cultural practises which differ from other culture. Apart from that, the SECI Model only considered knowledge existing at an individual level. This however, led to further adaptations of SECI Model to incorporate the role of organization and their employer in the organization knowledge creation. Nonaka, Toyama and Konno (2000), highlighted that managers need to provide necessary context for individual to share and create knowledge in the organization. The introduction of the concept of 'Ba' which refers to a shared space for knowledge activities had enhanced and promoted employee socialization and knowledge sharing within the organization, which in turns help to foster creativity.

To elaborate further, the work by Schulz (2001) somewhat reflect the SECI Model develop by Nonaka and Takeuchi (1995). The author studies the link between knowledge production and knowledge exchange within the organization. Based on the organizational learning theory, which is similar to the concept of 'Ba', Schulz's (2001) study explores on how the production of knowledge by individuals or subunits is shared with others parts of the organization. The finding of the study shows that, tacit, codified and old knowledge that created and produced in the organization process is shared to the entire organization networks such as peers and subunits in an organization. Tacit knowledge is shared in vertical outflows which are from subunit to supervising unit intensifies through social relationship. Codifying knowledge is shared not only to vertical but also horizontal outflows which are sharing knowledge from peer to peer through verbal and nonverbal mechanism such as meeting and organization routines.

Yet it must be noted, the urgency and ability to create new knowledge and ideas that can be applied in the organization products, processes and routines has always been the priority and served to encourage economic growth and organizational development (Pemberton & Stonehouse, 2000; Nonaka et.al, 2006). Knowledge creation is a process that involves parties such as individuals in the organization or between organizations that are creating or jointly creating new knowledge (Nonaka, 1994; Reid et.al. 2001). When the knowledge created is received by the organization it must be disseminates widely throughout the organization for the purpose of applying the knowledge created to the commercial ends.

2.2.2 Knowledge Transfer

The literature has multiple definitions of what is meant by knowledge transfer. Argote and Ingram, (2000) defined knowledge transfer as the "process through which one unit for example an individual, group, department, division or organization is affected by the experience of another". They further assert that the effectiveness of knowledge transfer can be observed through the changes of knowledge or performance of the knowledge recipients. Szulanski, Cappetta and Jensen (2004) also look specifically at the knowledge recipient. They defined knowledge transfer as the "transmission of a message from a source to the recipient in a given context". The knowledge is then absorbed and improves the behaviour and performance of the knowledge recipient. Kumar and Ganesh (2009) refer knowledge transfer as an activity that specifically on exchanging two knowledge, namely: tacit and explicit knowledge between individual, team or an organization (Joshi, Sarker & Sarker, 2007). Furthermore, knowledge transfer involves two actions: 1) Transmission (source of knowledge to the potential recipient); 2) Absorption (recipient receives, absorb and apply the knowledge) (Davenport & Prusak, 1998). Thus, if knowledge has not been transmitted, absorbed and being applied, it has not been transferred (Sheng, Chang, Teo & Lin, 2013). In addition, even transmission and absorption are meaningless in the context of knowledge transfer, if the new knowledge does not lead to changes in behaviour and performance of an organization (Steensma & Lyles, 2000).

From the aforementioned paragraph, Liyanage et.al., (2009, p.7) acknowledge the issue on what they term as "knowledge loss" and "knowledge discontinuity" and has improved the definition for knowledge transfer as "Knowledge transfer is about identifying (accessible) knowledge that already exists and acquiring it and subsequently applying this knowledge to develop new ideas or enhance the existing ideas to make a process/action faster, better or safer than they would have otherwise been. So, basically knowledge transfer is not only about exploiting accessible resources, i.e. knowledge, but also about how to acquire and absorb it well to make things more efficient and effective in organisations".

A large amount of research effort has been invested into the knowledge transfer theme. Conceptual and empirical study in the field of strategic management shows that knowledge transfer approach had received an enormous attention among academician and practitioner (Jiang & Li, 2009; Foss, Husted & Michailova, 2010). There is a wide range of literature within the context of knowledge transfer approach ranging from categories such as platform of knowledge transfer, contributions of knowledge transfer and factors affecting knowledge transfer approach. The reason behind the growth in knowledge transfer is due to the more visibility and easier to observe as compared to knowledge creation and application. The study by Shane (2004) and O'Shea et.al., (2007) provide some empirical evidence to support the above statement. Both studies reveal that in Research and Development partnership between university and industry, knowledge transfer process almost immediately started, in contrast, knowledge creation and application to commercial ends requires development, testing and prototyping which involves the creation of starts-up and spins- off company, patenting and licensing. Knowledge application especially requires more time and cannot be immediately measurable (Meier, 2011). However, Liyanage, Elhag Ballal and Li, (2009) and Bresman Birkinshaw and Nobel, (2010), describe knowledge transfer approach as the most important KM outcomes in obtaining vital knowledge that can improve organization learning and performance.

Within the literature, inter organizational knowledge transfer platform is proved to be more significant and central within the literature as compared to individual and intra organizational knowledge transfer in a quest by organization to search for a new superior knowledge (Huggins, 2010). The significant attention paid to the inter organization knowledge transfer as the result of globalization and increasing difficulty to rely exclusively on in-house knowledge creation activities due to the limited expertise and resources (Hamel & Prahalad, 1994). The statement is echoed by Grant (1996), who stated that there are many types of knowledge and not all of which can be effectively generated or embodied solely within the organization and no single organization has the full range of knowledge and expertise in the quest of competitive advantage and the use of knowledge from external source expands an organization knowledge based (Bettis & Hitt, 1995).

Studies by Menon and Pfeffer (2003) and Perez-Nordtvedt et. al., (2008) on the effectiveness and efficiency of inter organization knowledge transfer provide evidence that organization prefer to obtain knowledge from external sources solely because the knowledge appears to be scarce, unique, valuable, rare and inimitability which reason out why organization attractiveness to external source of knowledge. Subsequently, a study by Contractor and Lorange (2002) indicates that organizations are increasingly motivated in acquiring external sources of knowledge in order to gain market power by reducing and sharing of risks and costs. However, Norman (2002) critics that although inter organization knowledge transfer received much attention due to the aforementioned reasons, organization that involves in inter organization knowledge transfer tend to be more protective when it comes to the knowledge that classified as superior and core knowledge i.e. tacit knowledge. A study by Becerra et.al., (2008) found that when organization views other partners as competitors and have the same capability and resources, it raised concern about inadvertent leakage of critical knowledge and expertise within the process of inters organization knowledge transfer. Easterby-Smith et.al. (2008), argue that even though the mutual understanding of inter organizational knowledge transfer must be in a win-win scenario, it has been challenge by the concept of learning races where organization that learns fastest will dominate and become more formidable competitors.

Past researches have shown that knowledge transfer has an important contribution towards organization survival (Lyles & Salk, 1996). For example, Tsai (2001) found that knowledge transfer activities in the organization increased organizational performance. Furthermore, knowledge transfer also evidently helps to enhance innovation by generating new knowledge for new product development (Subramanian & Venkatraman, 2001). The evidence is also shown by a studies conducted by Monjon and WaelBroeck, (2003) and Brandstetter and Ogura, (2005). The findings show that, effective knowledge transfers have a positive effect on organization innovation and performance. In addition, a study by Katila and Ahuja (2002) revealed that new product development depend upon the effectiveness and efficiency of organizational knowledge transfer.

A great number of scholars studied on the key factors that influence the success of transferring knowledge from source to the recipient in any knowledge transfer structure (Argote & Ingram, 2000; McEvily & Chakravarthy,

2002; Simonin, 2004; Easterby-Smith et.al. 2008). The studies identified knowledge related factors, knowledge ambiguity, knowledge tacitness and complexity, source related factors, recipient related factors and relational related factors as the key determinant or inhibiting factors towards successful of knowledge transfer. Knowledge transfer literature also revealed that a large amount of research effort has been preoccupied in examining on the issue of absorptive capacity, learning intent and partner interaction. Absorptive capacity has emerged as one of the most prominent theme in the organizational knowledge transfer (Van Wijk.et.al. 2008) which deals with the issue of organizational ability to identifies, assimilate and apply new external knowledge to the commercial ends (Cohen & Levinthal, 1990).

Although organization can realise a remarkable benefits by transferring knowledge from one unit to another, it can be meaningless if the new knowledge does not lead to changes in behaviour, innovation and performance of an organization (Steensma & Lyles, 2000). Thus, based on the above review of knowledge transfer literature, organization received new knowledge from the process of knowledge creation and knowledge transfer, the application of knowledge is describe as how such knowledge is embedded and used to create value for innovation and competitive advantage (Grant & Baden-Fuller, 2004). The following subsection will discuss on the knowledge application theme.

2.2.3 Knowledge Application

Knowledge application is another prominent theme of KM. Knowledge application refers to the activities and organization ability to apply internal and external knowledge into new products and services in order to create value and achieve sustainable competitive advantage (March 1991). In the knowledge based literature, knowledge creation and knowledge transfer acted as a vehicle of learning in which organization members uses the partner to create, transfer and absorb partner's knowledge based. Knowledge application is a form to exploit knowledge sharing but with the intention of maintaining its distinctive base of specialised knowledge (Grant & Baden-Fuller 2004). All of these activities and other KM process are based on the premise of Knowledge Based Theory (KBV).

At the core of KBV, organization is viewed as the platforms for application of knowledge which is important and central for development of successful new products (Spender, 1996). In line with the above paragraph, Song, Van Der Bij and Weggeman (2005) asserts that to achieve sustainable competitive advantage, it requires an organization to act in a timely response to technological change by applying the knowledge generated into new product and process. According to Reid et.al., (2001), accumulation of knowledge assets such as patents, new products and technology are the evidence of successful application of knowledge by the organization. Surprisingly, knowledge application remains an underexplored outcome and there is little empirical evidence within the literature discussing on the issues of knowledge application (Watson & Hewett, 2006; Meier, 2011). For example, little empirical research has been undertaken to examine the determinants of knowledge application, how knowledge being applied after it is created or transferred to the organization and interrelation between knowledge creation, transfer and knowledge application (Miles, Miles, Perrone & Edvinsson, 1998; McFadyen & Cannella 2004; Song, Van Der Bij & Weggeman 2005; Lane et.al. 2006; Graham et.al., 2006; Bierly et.al. 2009; Mitchell & Boyle 2010; Vasudeva & Anand, 2011; and Akbar & Tzokas, 2013).

This is a disappointing signal given the importance of knowledge application outcome might have brought to the organization in order to maintain its survival and competitiveness (Tsang et.al. 2004). Lane et.al., (2006) highlighted an extensive theoretical and empirical research must be undertaken to aid further understanding on how organization apply superior knowledge that are created and transfer within or outside the organization. To elaborate further, with the massive contribution of literature made by academicians and practitioners within the context of knowledge creation and knowledge transfer, organization may excel at learning, i.e. creation and transfer internal and external sources of knowledge into the organization but may not be efficient at applying the knowledge to develop new products and processes. In achieving competitive advantage and effective KM, organizations must be able to understand on how to create, transfer and apply knowledge continuously (Zack, 1999).

In contrast, some empirical studies give an insight on the issues of knowledge application. Kang, Morris and Snell (2007), and Bierly et.al., (2009), describe the knowledge application consist of two applications which refers to exploration and exploitation. Exploration is the application of knowledge to produce new products and technologies, while exploitation is the application of knowledge to refine the organization's existing products and improve its process (March, 1991). Although the knowledge from new creation and transfer are vital to both aforementioned applications i.e. exploration and exploitation and it is also act as a central innovation component in the Knowledge Based View Theory (He & Wong, 2004). In other perspective, Yanow (2004) study gives some insight on how external knowledge can be applied into the organization. The study suggests that absorptive capacity acted as an integrative mechanism to move exploration knowledge within open networks to

the exploitation phase within the closed networks. Furthermore, Yanow (2004) argue that most organizations contain internal boundaries which are horizontal and hierarchical and there is no commercial advantage if knowledge obtained from external sources, i.e. knowledge creation and transfer failed to be apply internally.

A study by Harryson et.al., (2008) give further insight on the issue of knowledge application. The study provide an empirical evidence on the interrelation between knowledge creation, knowledge transfer and knowledge application. Their study found that transformation networks i.e. strong and weak ties is the important contribution and have to be established and operates across the knowledge creation, knowledge transfer and knowledge application process. To elaborate further, the study suggests that transformation of knowledge requires all of creation, transfer, application, and adaption process. The transformation networks of different network structure, sizes of units and types of individuals are integral and need to come together not only in the creation and transfer of knowledge but also in the most vital process to transform the knowledge for application and integration of innovation. Other study on knowledge application is done by Song et.al., (2005), examining on determinants of knowledge application. The empirical results indicates that long-term orientation supported by a Research and Development (R&D) budget, formal rewards, R&D location and information technology directly increase the level of knowledge application in the organization. Next section will discuss on the emerging concept of innovation as well as the past contribution of KM towards new technology development in the industries and businesses.

3.0 BUSINESS INNOVATION AND TECHNOLOGY: EMERGING CONCEPT AND KNOWLEDGE MANAGEMENT CONTRIBUTION

The concept of innovation by Schumpeter (1934) is regards as the pioneer work of innovation theory and as a source of inspiration in innovation system (Hagedoorn, 1996). Schumpeter (1934) refers innovation as a "new combination" and "creative destruction" (Schumpeter, 1947). Both terms is referred to the introduction of new quality product, new method of production, new market, new source of supply of raw materials as the elements of new innovation and eventually implementing new innovation to the industry (McFarling, 2000; Dodgson, 2011). The theory of innovation by Schumpeter (1934) is regards as the basic foundation of innovation process in today's economic environment (Afuah & Bahram, 1995; Dodgson, 2011). Since the departure of Schumpeter's theory of innovation, there have been a growing number of innovation approach and activities especially in the 1980s. Scholars such as Nelson and Winter (1982) and Freeman (1982) focus on technological paradigm in discussion on innovation. The work of Nelson and Winter (1982) extend the basic foundation of Schumpeter's theory of innovation. In their new work of innovation system, they argued that innovation not only can be achieved in terms of new technological advancement in products, production, market and supply of dynamic industries, but innovation can also be achieved in terms of human economic behaviour such as competency, behaviour capacity and learning and routines.

In continuity from the above paragraph, Rothwell (1992) develop five stages of the innovation process in different periods. In his history analysis, the first generation (1950s-1960s) of the innovation process is the technology driven model, where Rothwell (1992) terms as "technology push". In this stage, industry innovation is largely depends on the industry R&D. The second generation (1960s- 1970s) of the innovation process is so-called "need pull" which refers to the customer or need-driven, where innovation derives from the exploitation of the market knowledge which comes from close interactions with customers and analysis of market indicators (Sammarra & Biggiero, 2008). The first two stages see innovation as a sequential process and somewhat similar to the Schumpeter's (1934) earlier discussion of innovation system. The third generation (1970s-1980s) began to involve a general process of interaction and integration between technological needs and market needs. The fourth generation (1980s-1990s) involves the notion of global strategy and there was a rapid growth of strategic alliance between companies (Contractor & Lorange, 2002) in the R&D, prototyping and manufacturing with the customers, suppliers and competitors industries. The fifth generation (1990s-present) is describing as the high level of integration and networking at both intra and inter industry level. In order to achieve new and high quality of innovation into product, production and market, strategic knowledge linkages between industries are needed. This emerging concept of innovation depends on multiple functions, actors and resources to transform innovative ideas into economic successful innovation (Sammarra & Biggiero, 2008). Rothwell (1994) highlighted industries that apply the fifth generation process will become the leading innovators in the future.

In today's economic environment, most industries are faced with serious competition and the fast pace of technology change (Lemon & Sahota 2004; Steenkamp & Kashyap, 2010). This situation warrants industries to be able to produce faster and continuous organization innovation and technological advantage (Bueno & Ordonez, 2004). According to Alegre and Chiva (2008), the emerging concept of innovation is depending on the industry's capability to learn, where new knowledge is developed, distributed and being applied. From the

perspective of knowledge, Afuah (1998) defined innovation as a new knowledge incorporated into products, processes and services.

In line with the above paragraph and taken into consideration of earlier Rothwell's fifth generation of innovation process, present economic environment are forcing industry moving into new knowledge based society where industries must be able to explore, learned, retention and exploitation of new knowledge with other partners and leaving behind an industrial age that based on the transformation of raw materials into finished products in order to stay innovative (Lichtenthaler & Lichtenthaler, 2009; Chiva, Ghauri & Alegre, 2014). The statement above leads to the recognition that successful innovation does not depend exclusively on technological and market capabilities but rather on knowledge integration efforts among other actors (Sammarra & Biggiero, 2008). Furthermore, a great deal of empirical research has considered knowledge as the basis for innovation (Nonaka & Takeuchi, 1995).

A study by Lichtenthaler and Lichtenthaler (2009) examine the impact on knowledge management process towards open innovation performance. The authors describe industry's dynamic capabilities of managing its internal and external knowledge is vital factor that contribute to the open innovation performance. Furthermore, they found that in order to generate innovation from internal and external knowledge source, industry needs prior knowledge to commercialise into new products and services. Lemon and Sahota (2004) examine on relationship between knowledge and innovation. Their study found that, continuous organizational learning and seeking for knowledge resource from other partners play an important part in achieving innovation capacity. They describe organizational knowledge culture is paramount to enable efficient responses to changes in competitive environment. Other study by Alegre and Chiva (2008) examine organizational learning capability by using dimension such as knowledge networking and interaction with partners and assessing the impact of product innovation performance. The finding revealed that learning from others has a positive contribution towards innovation performance.

From the aforementioned paragraphs, new emerging innovations that resulted from successful knowledge management can contribute to the nation's economic growth (Simonin, 1997) through the creation, transfer and application of superior knowledge resources. As a result, country residents can enjoy a high standard of living in the future (Reich, 1991). The lesson from the past had shown massive contribution of successful knowledge management efforts. Within the literature, countries such as the USA, UK and Canada is considered as pioneer and regards as the most successful country in implementing Knowledge Management strategy (Mowery, Nelson, Sampat & Ziedonis, 2001). The most notable and ground breaking area of successful KM strategy comes from the area of biotechnology, electronics and computing, chemical and pharmaceutical (Nelson & Walsh, 2002). Industries and businesses have actively engaged in academic entrepreneurial activities by converting new scientific knowledge into commercial activities. These include academic spin-off, Start-ups Company, patenting and licensing of inventions (O'Shea, Allen, Morse, O'Gorman & Roche, 2007; Seigel, 2011). Furthermore, evidence shows that the creation of high technology spin-off and start-ups company as a results of successful KM efforts had created US$ 33 billion to the US economy, produced 3376 new companies and contributed 280,000 jobs to the US citizens from the period of 1980 to 2000 (Shane, 2004).

In the UK, "Cambridge Phenomena" is one of the most significant evidence of success KM efforts (Stam & Garnsey, 2009). According to Druilhe and Garnsey, (2004) it was not until 1970, University of Cambridge actively involved in KM commercial activities. Initially, it started from the creation of spin off university firm within the Cambridge Science Park (Siegel, Westhead & Wright, 2003) to commercialized university research as well as exploiting international demand for specialist high-technology outputs (Breznitz, 2011). In the early 1980s, with a rapid growth of academic research in the area of computers software, bio-technology and electronics (Breznitz, 2011), many multinational companies such as IBM, Napp Pharmaceutics, Siemens, Microsoft and Schlumberger were attracted to the Cambridge region as it has become one of the most important technology centres in Europe (Stam & Martin, 2011). Consequently, these companies had generates economic value and growth to the Cambridge region. In addition, KM efforts has created huge number of Small and Medium Enterprises (SME) within the region, from 200 new firms in the 1980 to a staggering number of 1300 new firms in the year 2000. Apparently, these situations give an employment opportunity to the Cambridge people in general. "Cambridge Phenomenon" helps to establish 36,000 new jobs in the year 2000 as compared to just around 25,000 in 1988 and producing more than $3 billion a year in revenues (Stam & Garnsey, 2009; Stam & Martin, 2011). According to Garnsey and Lawton-Smith (1997) and Breznitz, (2011) biotechnology and IT sector has grown faster in Cambridgeshire area as compared to other UK regions. This, in turn, caused an increasing number of patents and venture capital created in the areas which originated mainly from the academic research of University of Cambridge (Hugo et.al., 2007).

In Canada, KM strategy is considered as a critical catalyst in advancing the region innovation by generating new innovation and technology in the area of science, math and engineering in supporting local firm-based Research and Development (R&D) as well as university entrepreneurial activities in the Waterloo region. To elaborate further, in the year 2000, Waterloo region is one of the most dynamic sources of high technology activities in the country. Successful KM effort contribute 468 established companies in the area of automotive, advanced manufacturing, biotechnology, business and financial services, education, environmental science, food processing, furniture manufacturing, logistics and warehousing, R&D, and telecommunications (Bramwell, Nelles & Wolfe, 2008).

4.0 DISCUSSION AND CONCLUSION

This paper reviewed the conceptual and empirical evidence on knowledge management and its three prominent themes which identified as knowledge creation, knowledge transfer and knowledge application and provide an in-depth understanding on the concept and interrelation of its themes. This paper also discussed on the new concepts of business innovation and the contribution of KM towards generating and enhancing new technology into products processes and services. Organizations are the platforms for the creation, transfer and application of knowledge (Spender, 1996). Building upon this idea, Inkpen (2000) stated that the essence of the organization is its ability to create, transfer, assemble, integrate and exploit knowledge which is the process that has come to be known as KM. So far, it becomes obvious that a large number of conceptual and empirical researches have focused strongly on the outcomes of knowledge transfer (Jiang & Li, 2009). In particular, academician and practitioner contributed and enormous amount of studies by examining the key factors affecting the successfulness of knowledge transfer, platform of knowledge transfer, knowledge related factors, relationship between knowledge transfer and academic entrepreneurship activities, knowledge transfer and organization innovation and performance (Tsai, 2002) and also studies on how absorptive capacity and partners interaction and characteristics influence knowledge transfer. Meier (2011) highlighted that quantitative and qualitative research focuses almost exclusively on knowledge transfer and lack of research on the other two KM themes. This shortcoming can be explained by arguing knowledge transfer theme is more visible and easier to observe. Apart from that, the manifestation of knowledge creation and knowledge application in products and technologies development, organization routines and procedures is time consuming as comparable to knowledge transfer (Rothaermel & Deeds, 2004; Meier, 2011).

Furthermore, knowledge application is the most underexplored KM theme by most researchers. Even though some studies had provide an empirical insight on the issues of knowledge application based on the earlier discussion, there is still a limited number of studies in understanding on the ability of the organization to apply knowledge created and transfer from other sources into organization product, services and routines (McFadyen & Cannella 2004). This statement is supported by Song et.al. (2005) by describing only few studies have systematically investigate the antecedents of knowledge application. In addition, the interrelation between the three aforementioned KM themes is important on the organization innovation and competitive advantage. In line with the above statement, despite the wealth of studies on the KM literature, the interrelation between the knowledge creation, transfer and application is still not well understood. Part of the reason is because massive empirical studies only focus on knowledge transfer (Tsai, 2002; Kotha et.al. 2013) rather than on knowledge creation and knowledge application.

With the concept of business innovation had change from merely dependable on technology based to effective KM strategy, most industries are faced with serious competition that warrants them to have the capability to learn faster on how new knowledge is developed, distributed and being applied in order to achieve continuous innovation and technological advantage (Alegre & Chiva, 2008; Bueno & Ordonez, 2004). The lessons from the past have shown massive contribution of KM can bring to the industries and country if it is manage successfully. Therefore, this paper identifies and provides some promising avenue for future research. The conceptual and empirical evidence presented in this paper also provides a comprehensive overview and understanding of the research field. As such, this paper hopefully offers an improve understanding on the interrelation of knowledge creation, knowledge transfer and knowledge application within the context of KM and the linkages with the emerging concept of innovation.

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