Measuring Knowledge Acquisition and Knowledge Creation: a Review of Literature 1

Preprint · April 2019

CITATION
1

READS
15,519

2 authors:

Abdoulaye Kaba
Al Ain University
75 PUBLICATIONS **711** CITATIONS
SEE PROFILE

Chennupati Kodanda Ramaiah
Pondicherry University
126 PUBLICATIONS **939** CITATIONS
SEE PROFILE

Fall 11-10-2020

Measuring Knowledge Acquisition and Knowledge Creation: A Review of the Literature

Abdoulaye Kaba
Al Ain University, kaba_abdoulaye@yahoo.com

Chennupati K. Ramaiah
Pondicherry University, ckramaiah@gmail.com

Measuring Knowledge Acquisition and Knowledge Creation: A Review of the Literature

Abdoulaye Kaba
Al Ain University, Al Ain, UAE
kaba.abdoulaye@aau.ac.ae

Chennupati K. Ramaiah
Pondicherry University, Puducherry, India
ckramaiah.lis@pondiuni.edu.in

Abstract

This paper presented a review of literature related to knowledge acquisition and knowledge creation. The paper discussed the nature and types of knowledge, knowledge acquisition, theories and models of knowledge acquisition, in addition to the review of empirical studies measuring knowledge acquisition. For knowledge creation, the paper discussed the definition of knowledge creation, theories and models of knowledge creation, and review of empirical studies measuring knowledge creation. Findings of the review revealed how researchers and scholars have used a variety of variables in investigating and measuring knowledge acquisition and knowledge creation among managers, engineers, and faculty members.

Keywords: knowledge management, knowledge acquisition, knowledge creation, measurement.

1. Introduction

Most of the contemporary dictionaries define "knowledge" as synonym of facts, acquaintance, familiarity, awareness, understanding, comprehension, realization, experience, expertise, skills, and know how. Therefore, the term data and information have been wrongly used to denote "knowledge" (Mathew, 1994; McElroy, 1999).

Data is a collection of symbols, facts, numbers, raw materials; information is a meaningful explanation of data. We produce and provide information through explanations and analysis of data. According to Thierauf (1999), data is an "unstructured collection of facts and figures," whereas information is structured data. We produced information through the process of explanation, interpretation, contextualization, and categorization of data (Davenport & Prusak 2000). Ackoff (1989, 1996) believe that information can be produced by answering who, what, where, when, and how many questions. Accordingly, information deals with digesting, understanding and sensitizing the whole ideas related to data. As result, the effective use of information may help in discovering trends, identifying problems, and guiding to a long lasting solutions and development.

Epistemology is the philosophical study of knowledge (O'hara, 2001). The term is taken from Greek words episteme (episthmh) which refers to knowledge and the term logos (logoV) refers to a word or reason. Therefore, it means reasoning about knowledge (Tuffin, 2004; Pardi, 2011). An epistemologist studies the nature of knowledge, its characteristics, and functions (Pardi, 2011). As part of epistemology, philosophers and scientists, for the past centuries, have tried to understand the nature and characteristics of knowledge. This is evident in the Plato's Theaetetus and Phaedo (Plato, 2007; Welbourne, 2001; Michelini, 2003), Descartes's Meditations and Discourse on Method (Flage, 1999; Descartes, 2006), Locke's An Essay Concerning Human Understanding (Lock, 2001), Hume's An Enquiry Concerning Human

Understanding (Hume, 2000), and Kant's Critique of Pure Reason (Mosser, 2008). Contemporary contributors include Donald Davidson, Alvin Goldman (Joseph, 2004), Susan Haack (Steup, 2001), Jürgen Habermas (French & Wettstein, 2009), Robert Nozick (Edgar, 2005), Richard Rorty (Lacey, 2001), and Timothy Williamson (Malachowski, 2002; Williamson, 1996).

Plato defined knowledge as "justified true belief" (Schmitt, 1992; Welbourne, 2001; O'hara, 2001; Pardi, 2011). According to Nozick (1981) "Knowledge is not simply true belief" (p. 208). Justification of perceptions, ideas, believes, actions, and behavior is needed in order to turn a true belief into knowledge (David, 2001). According to Foley (2001), some kind of knowledge requires justification while others do not. Suan Haack, an English philosopher, believes that it is always wrong to believe something without sufficient justification (Steup, 2001).

The father of the modern philosophy, Rene Descartes (1596-1650) beliefs that knowledge is a certainty supported by a reason. The status of this certainty is so strong to the extent that it can never be shaken by any stronger reason (Flage, 1999; Newman, 2010). John Lock (2001) an English empiricist philosopher, defined knowledge as the perception of the agreement or disagreement of two ideas. According to him, knowledge is nothing but the perception of the connexion of an agreement or disagreement. This means, the existence of perception means the existence of knowledge and the absence of perception means the absence of knowledge. David Hume (2000), a Scottish philosopher and historian, beliefs that human knowledge arises only from experience. His definition is much the same as Descartes.

Knowledge has been also an interest of contemporary scholars and philosophers. The German philosopher, Immanuel Kant differentiates between opinion, belief, and knowledge. Of the three concepts knowledge is the strongest mode of judgment of truth. He defined knowledge as "objective perception". What I know I hold to be universally and objectively certain. This kind of knowledge or certainty is a judgment of truth based on a cognitive ground that is both objectively and subjectively sufficient. According to Kant, human being has two types of knowledge: (1) empirical knowledge, and (2) rational knowledge. Empirical knowledge is based on experiences; whereas rational knowledge is mathematical in nature. He believes that it is impossible to have rational knowledge of everything, but where we can have it, we must prefer it to the empirical knowledge (Guer, 1998; Ross, 2006; Anderson, 2010).

Davidson (2006) in his essay 'Three Varieties of Knowledge', divided knowledge into three components: (1) knowledge of oneself, (2) knowledge of others and (3) knowledge of the world. According to him, these three segments of knowledge form an interdependent set of concepts no one of which is possible in the absence of the others (Davidson, 2006; Malpas, 2010; Joseph, 2004). Similarly, Goldman (1967) states that knowledge requires an appropriate causal connection between the fact that makes a belief true and the person is having that belief. Based on this idea, knowledge is perceived as an outcome of complex causal interactions with environment (Foley, 2001).

Habermas (1971) in his article "Knowledge and human interests", believes that knowledge serves as an instrument that goes beyond self-preservation. He, Like Donald Davidson, divided knowledge into three categories: (1) technical knowledge that helps us to expand our power of technical control, (2) practical knowledge is the interpretations that make possible the orientation of action within common traditions, and (3) cognitive knowledge are the analyses that free consciousness from its dependence on hypostatized powers (Babermas, 1971; Bohman, J. & Rehg, W., 2011). According to Richard Rorty (Malachowski, 2002) knowledge is a reality with true representation. To know something is to be able to represent that thing accurately outside your mind. Timothy Williamson (1996) also believes that Knowledge must be supported by an agreement and clear understanding. To him, what is known is clear.

The above discussed definitions are similar to many others definitions that refer to knowledge as knowing something but able to justify and clarify with other conditions. As such, knowledge resides in our minds. Knowledge is the outcome of human experience and reflection. In general, there is consensus agreement among the philosophers and scholars about the complexity of knowledge. However, the main difference is found in individual role and competencies. Individuals play a prominent role in knowledge acquisition and knowledge creation.

Knowledge could be divided into tacit knowledge and explicit knowledge. Tacit knowledge is not recorded knowledge, it is a knowledge retained in the head of people and developed from experiences and actions. This type of knowledge is shared among people through the process of socialization, and storytelling (Sunassee & Sewry, 2002; Coakes, 2004; Soltero et al., 2006). Therefore, it is difficult to record, communicate and store tacit knowledge. This is because it is placed in human mind and can be shared through the personal communications and interactions (Dalkir, 2011; Cheema, 2010; Collins, 2010).

On the other hand, explicit knowledge is recorded and articulated a knowledge. This type of knowledge, also known as scientific knowledge, is easy to express, share, and store. Normally, the content of explicit knowledge is well organized and can be accessed using tools such as publications, computers or artifacts. Similarly, the content of this type of knowledge are transferrable through information and communication technologies, print materials, and other tangible materials (Dalkir, 2011; Cheema, 2010; Collins, 2010). The following sections discuss about the concept of knowledge management

2. Knowledge Management

The term "Knowledge management" can be defined as appropriate application and implementation of knowledge development process. The process includes knowledge creation, knowledge sharing, and knowledge acquisition. According to Drucker (1999, p. 157) knowledge management is "the coordination and exploitation of organizations knowledge resources in order to create benefit and competitive advantage". Therefore, knowledge organization is an organization that is able to provide all it needs for creating, preserving, disseminating, and using knowledge as needed.

The focus of knowledge management is on the use and enhancement of knowledge-based assets (Bukowitz & Williams, 1999) to facilitate the flow of knowledge into and within an organization (Birkinshaw, 2001). This should be based on systematic activities that support and enhance knowledge creation, sharing, and acquisition (Tian, Nakamori, and Wierzbicki, 2009).

Most experts in knowledge management believe that knowledge progresses through different stages (Bhatt, 2000; Birkinshaw & Sheehan, 2002; Salisbury, 2008). The stages can be described as active, dynamic, and vigorous. Bhatt (2000) believes that the life cycle of knowledge is based on four processes: creation, adoption, distribution, review, and revision. Birkinshw and Sheenhan (2002) also proposed four stages of the life cycle of knowledge as creation, mobilization, diffusion and commoditization. Like Bhatt (2000), Birkinshw and sheenhan (2002) also believe that the life cycle of knowledge begins at the creation stage.

Salisbury (2008) limited the life cycle of knowledge to creation, preservation and dissemination. Like Birkinshw and sheenhan (2002), Salisbury (2008) also believes that creation is the first stage of the life cycle of knowledge. According to him, knowledge creation takes place when organization members solve a new problem, or when they solve smaller parts of a larger problem.

3. Knowledge Acquisition: Understanding the Concept

Acquiring knowledge is an essential activity for intellectual growth and innovation. It consists of elicitation, collection, analysis, modeling and validation of knowledge (Tomei, 2009, p. 134). The conception and notion of knowledge acquisition could be drawn from a statement made by an English philosopher, John Locke. Locke described the birth state of the human mind as "blank slate or tabula rasa" (Locke, 2001; Parker, 2004). He believed that people are born without knowledge and that we acquire knowledge only through experiences (Mack and Meadowcroft, 2009). Accordingly, knowledge acquisition could be defined as learning through experiences and experiments. It is about grasping, integrating, adapting and confirming knowledge for concept formation, clarification, formulating questions or understanding the problem to be solved or reaching conclusions (Mathew, 1985).

Knowledge has become a product for generating incomes and revenues (Hall, 1979; Mizen, 2009). Millions of Dollars are invested on knowledge and knowledge management sectors by governments and non-government organizations. Many governments are paying much attention to improve and protect Knowledge economy of its society (Kefela, 2010). Therefore, an individual ability to learn and acquire knowledge depends could be determined by the level of knowledge of the society (UNESCO, 2005). In addition, to claim that you know something requires the ability to describe and explain about the acquired knowledge (Welbourne, 2001). Therefore, we cannot assume knowledge of something without having the needed knowledge about it (Chisholm, 1982). Figure 1 presents knowledge acquisition techniques and types of knowledge they are mainly aimed at eliciting.

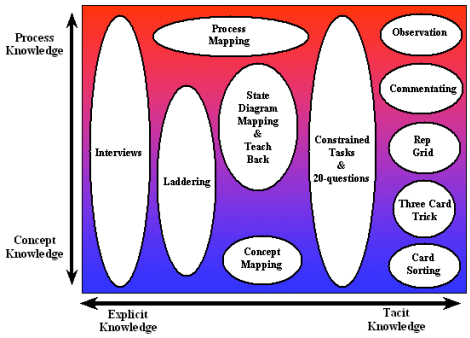

Figure 1. Knowledge Acquisition Matrix (Emberey et al., 2007).

4. Theories and Models of Knowledge Acquisition

Knowledge is the outcome of learning or knowledge acquisition (Al-Khatib, 2011). When we learn or acquire knowledge about something, we can assume that we know something new (Chisholm, 1982). Psychologists, although use mostly the term “learning” instead of “knowledge acquisition”, are among the early scholars to formulate theories of knowledge acquisition. This includes the school of behaviorism, cognitivism, and humanism.

4.1 Behaviorism

Behaviorists believe that human mind is like a “black box”. They did not try to analyze the inner activities of mind, which include thoughts, feelings, or motivation. According to them, knowledge acquisition is a visible change in one’s behavior and can be measured (Graham, 2010; Behaviorism, 2011). From behaviorist point of view, a knowledge seeker starts seeking knowledge from a clear state and simply responds to environmental incentives. Those responses could be changed through positive and negative reinforcement.

Behaviorists believe that learning take place in the form of classical conditioning and operant conditioning (AL-Khatib, 2011). Classical conditioning is a learning process through an association. The learning happens when an organism makes an automatic response to a certain stimulus transferred to a new stimulus through an association made between the two stimuli (Bhugra and Davies, 2004). In an experiment with dogs, the Russian physician and researcher, Ivan Pavlov, observed that the dog salivated not only to the sight of food but also to the sound of footsteps of the person who brought food. According to them, the dogs were responding to both the biological need (hunger), and learned response of salivating to a neutral stimulus 'footstep of the attendant'. This kind of learning is called 'classical conditioning' (AL-Khatib, 2011).

The main difference between classical and operant conditioning is that in classical conditioning the learner's reflex reactions are modified, while the operant conditioning shapes new behavior (Lavond & Steinmetz., 2003; Blackman, 1974). For example, in one experiment Skinner use a rate in to demonstrate operant conditioning and behavior shaping through food reinforcement. He put a hungry rat in a box and pressed a small lever to release food. The rat soon learned that pressing the lever would give him food. Two lights (red and green) were introduced into the box in another experiment, and the rat would only get the food if one of them were on. The rat soon learned to discriminate between the lights, and when the "wrong" light is on, stopped or reduced pressing the lever (Skinner, 1965; Bjork, 1993).

Critics of behavioral knowledge acquisition paradigm say behaviorism does not explain all kinds of knowledge acquisition. It ignores inner mind activities and offers a limited view of knowledge acquisition as it ignores internal factors such as emotions or motivation; and ignores the fact that knowledge acquisition depends on learner's inner subjective representation of environment and learning history (Graham, 2010; Weldman, 2011; Boeree, 2011).

4.2 Cognitivism

Many psychologists do not agree with behaviorist approach of learning. They argue that classical and operant conditioning process simplifies how organisms and especially human being interact with their environment (Al-Khatib, 2011).

Cognitive approach considers the learning process as active acquisition of new knowledge and developing adequate mental constructions. According to cognitivism, knowledge seeker are the focus of control in the process of knowledge acquisition and not just a passive participant. Throughout the process of knowledge acquisition, an individual tries to open the "black box" of his mind and explain complex cognitive processes and architecture (James, 1890; Koffka, 1936; Bandura, 1977; Rock, 1990). Albet Bandura is considered one of the most prominent for cognitive approach. He believed that assumed that people could learn by observing others' behavior, attitudes, and outcomes of those behaviors. Bandura (1977) labeled this method as "social cognitive learning" based on observation, imitation, and modeling.

In an experiment, Bandura and his colleagues (Bandura, Ross, &Ross, 1961; Bandura, Ross, & Ross 19963) used Bobo dolls in testing social cognitive learning theory. At the beginning, three videos of an adult behaving violently to a Bobo doll was shown to three groups of children. Nevertheless, the first video showed the adult being rewarded for the violent behavior, in the second video he was punished for the violent behavior, and in the third video no reward or punishment for the violent behavior. Then, the children were left to play with the doll. The results showed how children imitated observed behavior.

4.3 Humanism

Humanist perspectives on knowledge acquisition suggest that acquiring knowledge is a natural desire, a mean of self-actualization and development of personal potentials. According to them, the importance of acquiring knowledge lies in the process, not the outcome. As result, learners should have more control over the learning process, which is based on observing and exploring. They believe that, as a teacher you have to be a good example your students and give those reasons and motivations for the learning process. Proponents of this approach associate the process of learning and seeking knowledge with the needs to achieve self-actualization (Kramlinger and Huberty, 1990). However, the approach is criticized for reducing experimental research, lack of methods in treating different mental health problems, and disagreement on the basic humanist assumption of inherent human goodness (Humanism, 2011).

Besides psychologists, other scholars also have contributed to the theory of learning and knowledge acquisition. These include skills acquisition theory by Stuart E. Dreyfus and Huber L. Dreyfus in 1980, stage theory of information consumption growth by Raju M. Mathews in 1985, and theoretical framework for knowledge acquisition by Adel Hamdan Mohammad and others in 2010.

4.4 Skill Acquisition theory

After observing and studying the process of acquiring skills from airplane pilots, chess players, automobile drivers and second-language adult learners, Dreyfus and Dreyfus (1980) postulate that when individuals acquire skills through external instruction, they normally go through five stages. The stages are novice, advanced beginner, competence, skill, expertise.

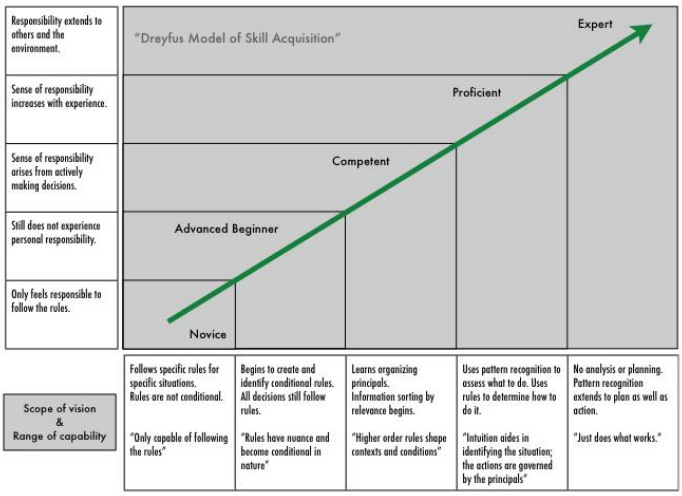

Figure 2: Dreyfus & Dreyfus skill acquisition Model designed by Vitor Pamplona (2008)

4.5 Stage Theory of Information Consumption Growth

Like Dreyfus & Dreyfus skill acquisition theory, Mathews (1985) developed knowledge acquisition growth theory to explain the transformation process from low-level knowledge acquisition to high-level knowledge acquisition through a series of stages. According to him, the four stages; backward or low-level knowledge acquisition stage, pre-condition to take-off stage, critical or take-off stage, advanced stage of affluence; are hierarchical.

4.6 Conceptual Framework for Knowledge Acquisition

In 2010, a group of researchers from the Middle East (Mohammad, Abu Hamdeh and Sabri, 2010) proposed a conceptual framework of tacit and explicit knowledge acquisition. The authors identified six sources of tacit knowledge acquisition. The sources are Interviews,

socialization, observation, monitoring program, relationships and trust, solving sample problem. According to them these sources can be used to elucidate tacit knowledge such as insight, intuitions, hunches, inherent talent, skills, and experiences. The authors believe that socialization is one of main features that help people to acquire tacit knowledge. As part of socialization, the authors strongly recommend regular meetings of organizations to acquire directly tacit knowledge from experts.

For explicit knowledge acquisition, the authors proposed four tasks. The tasks are determining domain area, decomposing knowledge acquisition tasks, determining Interdependencies, and qualitative reasoning.

5. Studies Measuring Knowledge Acquisition

Researchers of knowledge acquisition have designed and used a variety of tools and instruments to measure the acquisition of knowledge among faculty members (Belefant-Miller & King, 2000; Schincariol, 2002; Lovett & Gilmore, 2003; Patitungkho and Deshpande, 2005). In the USA, Belefant-Miller and King (2000) used focus group interviews to understand the reading behavior of science and non-science faculty members. The authors divided the questions into the four steps in accomplishing a document reading: finding, getting, reading, and using a document. Findings of the study showed that a large majority of faculty members read newspapers and books and were most likely to use their reading for research and teaching purposes.

Schincariol (2002) examined and described how two student teachers perceive themselves through teaching unfamiliar and familiar physical educational content in her Ph.D. report for Ohio State University. The research focused on the types, sources and perceived relevance of the knowledge to the teachers, as well as the enacted effects of their knowledge, as they learned to teach a unit of content in which they felt they had little or vast knowledge and experience. Data were collected through formal and informal interviews, non-participant observations, document analysis, stimulated recall videotaped classes, and conference analysis. Findings indicated that participants gained knowledge through a variety of sources such as books, co-operating teachers, past experiences as students, a teaching peer, their disciplinary background, professional training and daily teaching experience.

Lovett and Gilmore (2003) used the QLC to understand the improvement of professional knowledge of teachers. The authors used multiple data sources such as interviews and QLC meeting observational notes from the researcher. Other sources included the teachers ' own documentation of interview transcripts and textual data.

Patitungkho and Deshpande (2005) reported the results of information seeking behavior of faculty members of Rajabhat Universities in Thailand. Data were collected from 260 faculty members of different specialization using a survey questionnaire instrument. Results show that most of the participants use textbooks, general references and internet based information sources for teaching and research.

Asemi (2005) conducted a study at the Medical University of Isfahan (MUI), Iran, to find out the search habits of Internet users. Using a questionnaire, data were collected and interviews with participants from five colleges were followed. Results showed that faculty members are using sources for research, teaching, awareness and professional development based on print and electronic information. Hussin (2007) described the acquisition of knowledge by academics at a local public university in Malaysia as a fulfillment of the requirements for the Degree of Doctor. In semi-structured and in-depth interviews, the author used qualitative research methods to collect data.

Yates (2007) used a survey tool to investigate the impact of ICT on the acquisition of professional knowledge by teachers. The instrument consisted of 21 statements to measure

professional learning based on experience, inquiry and reflection, collaborative knowledge sharing among educators, and related work with students. Goldschmidt and Phelps (2007) examined the impact on knowledge growth and subsequent knowledge retention of professional teacher development. The authors used content and pedagogical assessments of English Language Arts teachers to determine whether the California Professional Development Institutes significantly improve teacher content knowledge and whether teachers retain that knowledge six months after the institutes are completed.

Taylor and Stanton (2009) conducted a study to find out about various aspects of the research and teaching activities of faculty members and their perceptions about the value of their research and publishing relative to their teaching effectiveness. A total of 136 faculty members participated in the study. Findings revealed that faculty perceives teaching and research to be mutually supportive and believed that their research activities made them better teachers. Faculty also acknowledged that securing a publication is often more important than providing a contribution to the advancement of business knowledge.

Maynard and O'Brien (2010) studied how faculty members use information resources to understand the nature and extent of problems associated with their use. A total of 60 institutions were randomly selected and contact was made with a selection of departments. The selected departments received an online questionnaire, resulting in responses from 304 faculty members. The study showed that in both teaching and research among respondents, print materials were still the preferred option. The study revealed a conservative approach to digital information developments.

Abu-Tineh (2011) investigated the acquisition of knowledge by Qatar University faculty members. To collect data from one hundred respondents, the study used survey questionnaire. The survey instrument consisted of 29 items at the individual, group, and institutional level measuring knowledge acquisition.

Appendix A summarizes the sources and purposes of knowledge acquisition, population study, sample size and method of data collection used by researchers to study the acquisition of knowledge. A number of researchers have studied knowledge acquisitions among faculty members in various countries, as indicated in the table. Similarly, a variety of methods and tools were used to collect data, and members of the faculty were found to acquire knowledge for different objectives through different sources and channels.

6. Knowledge Creation: Understanding the Concept

In the previous section, we discussed about knowledge acquisition, its nature, theories and some empirical studies. Based on that discussion, we understood that as result of knowledge acquisition we produce new knowledge. Therefore, knowledge acquisition is an essential step that precedes the process of knowledge creation. It is very challenging if not impossible to create and produce a new knowledge without understanding the nature and characteristics of the problem. According to Kerlinger (1986) “If one wants to solve a problem, one must generally know what the problem is. It can be said that a large part of the problem lies in knowing what one is trying to do” (p.17).

Like most of the concepts, the definition of knowledge creation varies from one author to another. It depends how they look at it. Mathew (1985) defines it as “Creation or invention of new ideas, theories, facts, devices or machines; finding new relationships between variables or phenomenon or providing new interpretations or explanations for known phenomena or facts; application or innovation of theories and principles or ideas in real world situations” (p. 40). Knowledge creation is the ability to add new knowledge to the existing knowledge domain

(Mishra & Bhaskar, 2011). Nonaka (1994) believes that the creation of knowledge takes place through the process of conversion between tacit knowledge and explicit knowledge.

The issue of Knowledge creation has attracted the attention of many academic intuitions around the world. In Japan, the School of Knowledge Science at Japan Advanced Institute of Science and Technology (JAIST) is the first school established in the world to make knowledge creation the core of its scientific research (Tian, Nakamori, and Wierzbicki, 2009).

7. Theories and Models of Knowledge Creation

7.1 Spiral of knowledge Creation Model

A leading Japanese management scholar, Ikujiro Nonaka, whose work on knowledge creation has been recognized and valued in a wide range of fields, identified four general models of knowledge creation as a set of processes involving different patterns of interaction between tacit and explicit knowledge (Academy of International Business, 2012). Nonaka's (1994) intention was to show how new knowledge is created through socialization, externalization, combination, and internalization.

As illustrated in Figure 3, people initially internalize new knowledge (i.e. individual learning). The new knowledge is then socialized into revised working processes and changed behavior (group learning). The new processes of work and the changed behavior are then observed and abstracted, i.e. externalized. This new knowledge is then combined to refine and expand existing knowledge (organizational learning). This process is continuing in new cycles, etc. (Conradi & Dyba, 2001).

Nonaka model has been used directly and indirectly in several empirical studies (Conradi & Dyba, 2001 ; Hermans & Castiaux, 2007 ; Wu & Lin, 2009 ; Wu, Senoo, Manier - Watanabe, 2010). The follo wing section discusses empirical studies that measure knowledge creation.

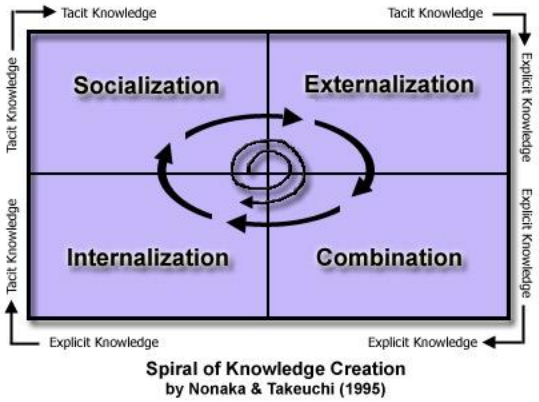

Figure 3: Spiral of knowledge Creation Model

7.2 Theory of Information consumption-production correlation

By observing and studying the behavior of knowledge producers and consumers, Mathew (1985) proposed the "theory of information consumption-production correlation". According to this theory, there is a direct correlation between high level of information consumption and high level of information production. Such correlation may not exist in the case of low level of information consumption. In addition, high levels of information producers are high level of information consumers too, and high levels of information consumers are high level of information producers too. A study by Soman (2001) found a correlation between high level of information consumption and high level of information production.

8. Studies Measuring Knowledge Creation

Researchers around the world have used various approaches and tools to measure the creation of knowledge. This includes questionnaire surveys, interviews, focus group studies and case studies (Inkpen, 1996; Sherif, 2006). Researchers also used a variety of variables to measure the development of knowledge as process, output and output (Micheal and Boyle, 2010). The variables include applications for patents, publications, new products and routines for prototypes (Almeida and Phene, 2004; Malhotra and Majchrzak, 2004; Matusik and Heeley, 2005; McFadyen and Cannella, 2004; Sigurdson, 2000; Styhre et al., 2002).

Teerajetgul and Chaoenngam (2006) examined the relationships between knowledge factors and the process of knowledge creation. The study design was cross-sectional in the survey questionnaire using both quantitative and qualitative methods. Six factors of knowledge: leadership vision, trust, collaboration, incentives, IT support, and individual skills. In addition to four processes of knowledge creation: (1) socialization, (2) outsourcing, (3) mixing, and (4) internalization were used in measurement. Beech et al. (2002) similarly used a multi-perspective examination approach to understand barriers to knowledge creation. The study found that two factors were the main cause of preventing knowledge creation, leaders hip uncertainty for knowledge creation project and concern of individual members of the kno wledge creation group with their own personal relationship to and within the group and wide r organization rather than creating new knowledge.

Teaching is one of the key elements in the process of knowledge creation. Through teaching and related activities such as training, supervision, and mentoring, faculty members create new knowledge. Teaching forces faculty members to be more creative, question their own assumptions and practices, become experimental in trying different teaching methods, and be open to reflection and debate on the core teaching activities (Hargreaves, 1998).

Faculty members, through teaching, are required to elaborate problems and develop a shared language to describe the problem; analyze the practice of the classroom in the light of the problem; seek alternatives or hypothesize solutions to the problem; test alternatives in the classroom and record what is learned in a manner that is shared with other practitioners. Faculty members create knowledge linked to theories and practices because of these activities (Hiebert, Gallimore, and Stigler, 2002). Research and development projects like teaching encourage faculty members to contribute to knowledge creation. By providing adequate funding to faculty members in R&D, there is enormous potential for transforming tacit knowledge into an explicit knowledge (Hargreaves, 1998).

As an output knowledge creation, an immediate product such as the representation of an idea is measured. The measures evaluate the immediate knowledge creation products in such a situation (Micheal and Boyle, 2010). Nezafati, Afrazeh, and Jalali (2009) used the Nonaka and Takeuchi model (SECI) to measure 68 Iranian organizations ' "knowledge volume," "knowledge value," "transformation speed of different knowledge types" and "knowledge benefits and expenses." In a case study, the determinants of who creates knowledge and who controls it were clearly identified by Puga and Trefler (2003).

Lavie and Drori (2012) conducted a study to find out how collaboration and internal resources in university research programs drive knowledge creation and application. The authors found that, when collaboration is moderate, the availability of internal resources decreases the effect of academic collaboration on knowledge creation and complements it as collaboration becomes excessive. Hsu (2006) found significant positive effects of faculty involvement and interactions among students on the creation of tacit knowledge in investigating the relationship between communication mode, e-learning websites design, and knowledge creation. Accessibility and usability of the website had a major direct impact on

tacit knowledge creation, and had indirect effects on both tacit and explicit knowledge creation through explicit knowledge sharing.

Networking and collaboration are another important means of creating knowledge. The quality of teaching and learning could be more effective and efficient when a group of academics work together to create new knowledge. Study by D'Este and Perkmann (2007) found most academics engaged with industry not to commercialize their knowledge but to further their research. In networking for professional knowledge creation, new information and communication technologies play a major role (Hargreaves, 1998). In the form of patented intellectual property of faculty members, Hung (2006) analyzed the relationship between social network and knowledge generation outputs. The study tested whether network density, relationship strength, diversity of relationships, and funding for research have a positive correlation with the number of patents held by faculty members, and whether network size has a negative correlation with the number of patents held by faculty members. A variety of secondary sources collected data. Results show that network density, diversity of relationships, and amount of research funding have a positive correlation with outputs from knowledge generation, while network size has a negative relationship with outputs from knowledge generation.

The creation of knowledge as an outcome is measured in terms of an object that adds value. Measures aimed at capturing the creation of knowledge as a result assess an object's manifestation (Micheal and Boyle, 2010). Chen (2005), for example, used the survey questionnaire to find out the relationship between creating knowledge and using knowledge. By means of a survey instrument, the author collected data from 55 banks in different countries. Study findings revealed a strong relationship between the development of knowledge and the use of knowledge.

Appendix B summarizes independent and dependent variables of knowledge acquisition, population study, sample size and method of data collection used by researchers in knowledge creation measurement. A number of researchers have studied the creation of knowledge of academics and non-academics in different countries as indicated in the table. Similarly, a variety of methods and tools have been used to gather data, and knowledge workers have been found to create knowledge through sources and factors.

9. Conclusion

This paper has reviewed the concepts, theories and empirical studies related to the acquisition and creation of knowledge. The review showed how the researchers have measured knowledge acquisition and knowledge creation. Results of review support the use of different instruments in measuring knowledge acquisition and knowledge creation. As source of knowledge acquisition, researchers have used not only books and journals but also the internet, experience, peers, and professional developments to find out whether the participants use them to acquire knowledge. Similarly, teaching, learning, research, current awareness, professional development, academic performance, and salary were used for indicating the purpose of acquiring knowledge among respondents. Meanwhile, in measuring knowledge creation, many researchers have used leadership, personal relationship, trust, collaboration, sustainability, faculty involvement, SECI, students' interactions, etc. as independent variable. Future researchers may use these findings to support the use of variables in measuring knowledge acquisition and knowledge creation.

REFERENCES

Abu-Tineh, A. M. (2011). Exploring the relationship between organizational learning and career resilience among faculty members at Qatar University. International Journal of educational management, 25(6): 635-650.

Academy of International Business (2012). AIB Fellow - Ikujiro Nonaka. Retrieved on August 24, 2012, from: http://aib.msu.edu/Fellow/192/Ikujiro-Nonaka

Ackoff, R. (1989). From data to wisdom. Journal of Applied Systems Analysis, 16: 3-9.

Ackoff, R. (1996). On learning and systems that facilitate it. Center for Quality of Management Journal, 5(2): 27-35

Al-Khatib, S. A. (2011). General psychology. Sharjah: Bright Horizon.

Anderson, P. S.; Bell, J. (2010). Philosophy and theology: Kant and theology. London: Continuum.

Asemi, A. (2005) information searching habits of internet users: a case study on the medical sciences university of Isfahan, Iran. Webology, 2(1), Article 10. Retrieved on 23 December 2012 at: http://www.webology.org/2005/v2n1/a10.html

Ashworth, F. et al. (2004). Learning theories and higher education. Retrieved August 12, 2012, from http://arrow.dit.ie/cgi/viewcontent.cgi?article=1003&context=engscheleart

Bali, R. K.i, Wickramasinghe, N., Lehaney, B. (2009). Knowledge management primer. London: Routledge

Bandura, A. (1977). Social learning theory. New Jersey: Prentice Hall.

Bandura, A., Ross, D., Ross, A. S. (1961). Transmission of aggression through imitation of aggressive models. Journal of Abnormal and Social Psychology, 63 (3): 575-582.

Bandura, A., Ross, D., Ross, A. S. (1963). Imitation of film mediated aggressive models. Journal of Abnormal and social psychology, 63 (3): 575-582.

Baron, R. A. (2001). Psychology. USA : Allyn & Bacon.

Beech, N., MacIntosh, R., MacLean, D., Shepherd, J., & Stokes, J. (2002). Exploring constraints on developing knowledge: On the need for conflict. Management Learning, 33(4), 459-475.

Behaviorism (2011). Retrieved August 11, 2012, from http://teorije ucenja.zesoi.fer.hr/doku.php?id=learning_paradigms:behaviorism

Belefant-Miller, H. and King, D. W. (2000). How, What, and Why Science Faculty Read. Science & Technology Libraries, 19 (2): 91-112.

Bhatt, G. D. (2000). Organizing knowledge in the knowledge development cycle. Journal of Knowledge Management, 4(1), 15-27.

Bhugra, D. K. L. & Davies, D. (2004). Models of psychopathology. Berkshire, Great Britain: McGraw-Hill Education.

Birkinshaw, J. (2001). Making sense of knowledge management. Ivey Business Journal, 65 (4): 32-6.

Birkinshaw, J. and Sheehan, T. (2002)/ Managing knowledge life cycle. MITSLOAN Management Review, 44(1): 74-83.

Bjork, D. W. (1993). B. F. Skinner: a life. New York: The Perseus.

Blackman, D. E. (1974). Operant conditioning: experimental analysis of behaviour. London: Egmont.

Boeree, G. (2000). Behaviorism. Retrieved June 23, 2012, from http://webspace.ship.edu/cgboer/beh.html

Bohman, J. & Rehg, W. (2011). Jürgen Habermas. In Edward N. Zalta (ed.), the Stanford encyclopedia of philosophy. Retrieved on May 16, 2012 from: http://plato.stanford.edu/archives/win2011/entries/habermas/

Bright, G. w., Bowman, A. H., Vacc, N. N. (1998). Teachers' frameworks for understanding children's mathematical thinking. Paper presented at the annual meeting of the American Educational Research Association, San Diego, CA, April 13-17, 1998.
Bukowitz, W., & Williams, R. (1999). The Knowledge management fieldbook. Harlow: Financal Times/Prentice Hall.
Cheema, D. S. (2010). Knowledge management analysis, design and implementation. Chandigarh, India : Global Media.
Chen, Q (2005) the impact of knowledge creation and utilization process on the effectiveness of innovation. A master thesis submitted to The John Molson School of Business, Concordia University, Montreal, Quebec, Canada.
Chisholm, R. M. (1982). Foundations of Knowing. Minnesota: University of Minnesota Press.
Coakes, E. (2004). Knowledge management: a primer. Communications of the Association for Information Systems. Retrieved July 18, 2012, from: http://aisel.aisnet.org/cais/vol14/iss1/21
Collins, H. (2010). Tacit and explicit knowledge. Chicago: University of Chicago Press.
Conradi, R. and Dyba, T. (2001), ''An empirical study on the utility of formal routines to transfer knowledge and experience'', ACM SIGSOFT Software Engineering Notes, Vol. 26 No. 5, pp. 268-76.
Cooper, S. (2009). Albert Bandura (1925 -): Observational learning. Retrieved August 9, 2012, from http://www.lifecirclesinc.com/Learningtheories/social/bandura.html
D'Este, P., Perkmann M. (2007) Why do academics collaborate with industry? A study of the relationship between motivations and channels of interaction, paper presented at the DRUID Summer Conference, Copenhagen, 18-20 June.
Dalkir, K. (2011). Knowledge management in theory and practice (2nd Edition). Cambridge, MA, USA : MIT Press.
Davenport, T. H. & Prusak, L. (2000). Working knowledge: How organizations manage what they know. Boston, MA: Harvard Business School Press.
David, M. (2001). Truth as epistemic goal. In Mathias Steup (ed.), knowledge, truth, and duty: Essays on epistemic justification, responsibility, and virtue. Oxford: Oxford University Press.
Davidson, D. (2006). Essential Davidson. UK: Oxford University Press.
Descartes, R.; Maclean, I. (Translator). (2006). Discourse on the method of rightly conducting the reason and seeking truth in the sciences. Oxford: Oxford University Press.
Descombes, V. (2001). The mind's provisions: a critique of cognitivism. New Jersey: Princeton University Press.
Drucker, P. F. (1999). Management Challenges for the 21 Century. New York: Harper Collins.
Edgar, A. (2005). Philosophy of Habermas. Durham, Great Britain: Acumen.
Emberey, C.L., Milton, N.R., Berends, J.P.T.J., van Tooren, M.J.L., van der Elst, S.W.G., & Vermeulen, B. (2007). Application of knowledge engineering methodologies to support engineering design application development in aerospace. Seventh AIAA Aviation Technology, Integration and Operations Conference (ATIO), 18 - 20 September 2007, Belfast, Northern Ireland.
Flage, D. E. (1999). Descartes and Method: A search for a method in meditations. Florence, KY, USA: Routledge.
Foley, R. (2001). Intellectual trust in oneself and others. UK: Cambridge University Press.
French, P. A.; Wettstein, H. (2009). Truth and its deformities. Hoboken, NJ, USA: Wiley-Blackwell
Goldschmidt, P. and Phelps, G. (2007). Does Teacher Professional Development Affect Content and Pedagogical Knowledge: How Much and for How Long? CSE Technical

Report 711, University of Michigan. Retrieved on 22 Decmber 2012 at: http://cse.ucla.edu/products/reports/R711.pdf
Graham, G. (2010). Behaviorism. Stanford Encyclopedia of Phyilosopy. Retrieved February 26, 2011, from http://plato.stanford.edu/entries/behaviorism/
Guyer, P. (1998). Kant, Immanuel. In E. Craig (Ed.), Routledge Encyclopedia of Philosophy. London: Routledge. Retrieved April 24, 2012, from: http://www.rep.routledge.com/article/DB047
Habermas, J. (1971). Knowledge and human interests: a general perspective. In Jeremy J. Shapiro (trans.), Knowledge and Human Interests. Boston: Beacon Press, pp. 301-317.
Hall, B. L. (1979). Knowledge as a commodity and participatory research. Prospect: Quarterly Review of Education, 9(4): 393-408.
Hargreaves, D. (1998). Creative professionalism: the role of teachers in the knowledge society. London: Demos.
Hermans, J. & Castiaux, A. (2007). Knowledge creation through university-industry collaborative research projects. The Electronic Journal of Knowledge Management, 5(1): 43 – 54.
Hiebert, J., Gallimore, R. Stigler, J. W. (2002). Knowledge Base for the Teaching Profession: What Would It Look Like and How Can We Get One? Educational Researcher, 31 (5): 3–15
Hsu, S. (2006, November). Analysis on Knowledge Creation and Its Affecting Factors in the Asynchronous Web-based Learning System. The Journal of Human Resource and Adult Learning, : 156-164.
Humanism (2011). Retrieved August 10, 2012, from http://teorije-ucenja.zesoi.fer.hr/doku.php?id=learning_paradigms:humanism
Hume, D. (2000). An enquiry concerning human understanding. Kitchener, Ontario, Canada: Batoche Books.
Hung, W. C. W. (2006). Researching the Researcher: A Social Network Analysis of the Multidisciplinary Knowledge Creation Process. A thesis presented to the University of Waterloo in fulfillment of the thesis requirement for the degree of Master of Applied Science in Management.
Hussin, Md. Nasarudin (2007) Knowledge Acquisition among Academics at a Malaysian Public University. PhD thesis, Universiti Putra Malaysia.
Ivan Pavlov (2003). Retrieved August 8, 2012, from http://www.ivanpavlov.com/default.htm
James, W. (1890). The Principles of Psychology. New York: Holt.
Joseph, M. (2004). Donald Davidson. Durham, Great Britain: Acumen
Kefela, G. (2010). Knowledge-based economy and society has become a vital commodity to countries. International NGO Journal, 5(7): 160-166.
Keursten, P., Kessels, J., and Kwakman, K. (2003). Knowledge productivity in organizations: towards a framework for research and practice. Retreived on August 18, 2012 from: frohttp://kessels-smit.in/files/Artikel_2003_keursten__kessels__kwakman_-_knowledge_productivity.pdf
Kirschner, P. A., Sweller, J., and Clark, R. E. (2006). Why minimal guidance during instruction does not work: an analysis of failure of constructivist, discovery, problem-based, experiential, and inquiry-based teaching. Educational Psychologist, 41(2): 75-86.
Koffka, K. (1936). Principles of Gestalt psychology. New York: Harcourt.
Kop, R. & Adrian, H. (2008). Connectivism: learning theory of the future or vestige of the past? International Review of Research in Open and Distance Learning, 9(3): 1-13.
Kramlinger, T. & Huberty, T. (1990). Behaviorism versus humanism. Training and Development Journal, 44 (12): 41-45.
Lacey, A. R. (2001). Robert Nozick. Durham, Great Britain: Acumen.

Lai, M. & Hung, Y. (2011). Can learning theoretical approaches illuminate the ways in which advertising games effect attitude, recall, and purchase intention. International Journal of Electronic Business Management, 9 (4): 368-380

Lavie, D., & Drori, I. (2012). Collaborating for knowledge creation and application: the case of nanotechnology research programs. Organization Science, 23(3), 704-724.

Lavond, D. G., Steinmetz, J. E. (2003). Handbook of classical conditioning. Dordrecht: Kluwer Academic.

Leidlmair, K. (2009). After cognitivism: a reassessment of cognitive science and philosophy. New York: Springer.

Locke, J. (2001). An essay concerning human understanding. Kitchener, Ontario, Canada: Batoche Books

Lovett, S. and Gilmore, A. (2003): Teachers' Learning Journeys: The Quality Learning Circle as a Model of Professional Development, School Effectiveness and School Improvement: An International Journal of Research, Policy and Practice, 14 (2): 189-211

Mack, E., Meadowcroft, J. (Editor). (2009). Major Conservative and Libertarian Thinkers : John Locke. New York: Continuum.

Malachowski, A. (2002). Richard Rorty. Durham, GBR: Acumen.

Malpas, J. (2010, Fall edition). Donald Davidson. In Edward N. Zalta (ed), The Stanford Encyclopedia of Philosophy.). Retrieved on 15 May, 2012 from http://plato.stanford.edu/archives/fall2010/entries/davidson/

Maslow, A. (1987). Motivation and personality (3rd ed.). New York: Harper and Row.

Mathew, R. M. (1985). Social analysis of information producation and consumption: the new challenges and tasks of Third World Countries. In A. I. Mikhalov, Ed., Theoretical problems of informatics: social aspects of modern informatics. (pp. 37-47). All Union Institute for Scienctific and Technical Information .

Mayer, R. (2004). Should there be a three-strike rule against pure discovery learning? The case for guide methods of instruction. American Psychologist, 59: 14-19.

Maynard, S. and O'Brien, A. (2010). Scholarly output: Print and digital - in teaching and research. Journal of Documentation, 66(3), 384-408.

McElroy, M. W. (1999). The knowledge life cycle. A paper presented in ICM conference on Knowledge Management, Miami, Florida, April 1999.

Mengelkamp, C. & Bannert, M. (2010). Accuracy of confidence judgments: Stability and generality in the learning process and predictive validity for learning outcome. Memory & Cognition, 38 (4): 441-451

Mesulam, M-M. (1998). From sensation to cognition. Brain, 121: 1013–1052

Michelini, A. N. (Editor). (2003). Plato as author: the rhetoric of philosophy. Leiden, NLD: Brill Academic.

Mishra, B. and Bhaskar, U. A. (2011). Knowledge management process in two learning organizations. Journal of Knowledge Management, 15(2): 344-359.

Mizen, P. (2009). Knowledge, the new commodity: a study on the knowledge-based economy. Retrieved on August 10, 2012, from http://cognisco.com/downloads/Knowledge-heNewCommodityReportApril%208,2009.pdf

Mohammad, A. H., Abu Hamdeh, M., and Sabri, A. T. (2010). Developing a Theoretical Framework for Knowledge Acquisition. European Journal of Scientific Research, 42(3): 453-463.

Mosser, K. (2008). Necessity and possibility: the logical strategy of Kant's critique of pure reason. Baltimore, MD, USA: Catholic University of America Press

Newman, L. (2010). Descartes' epistemology. The Stanford Encyclopedia of Philosophy, Edward N. Zalta (ed.). Retrieved on April 21, 2012 from: http://plato.stanford.edu/archives/fall2010/entries/descartes-epistemology/

Nezafati, N., Afrazeh, A. and Jalali, S. M (2009). A dynamic model for measuring knowledge level of organizations based on Nonaka and Takeuchi Model. Scientific Research and Essay 4 (5): 531-542.

Nonaka, I & Toyama, R. (2003). The knowledge-creating theory revisited: Knowledge creation as a synthesizing process. Knowledge Management Research & Practice, 1, 2-10.

Nonaka, I. (1994). A dynamic theory of organizational knowledge creation. Organization Science, 5 (1): 14-37.

Nonaka, I, Byosiere, P., Borucki, C. C., Konnot, N. (1994). Organizational knowledge creation theory: a first comprehensive test. International Business Review, 3 (4): 337-351.

Nonaka, I. and Takeuchi, H. (1995). The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation. Oxford University Press, New York.

Nord, S., Ettrare, D.,2 Drew, D., and Hodge, S. (2001). Muscle learning therapy: efficacy of a Biofeedback Based Protocol in treating work-related Upper Extremity Disorders. Journal of Occupational Rehabilitation, 11(1): 23-31.

Nozick, R. (1981). Philosophical explanations. Cambridge, MA: Harvard University Press.

O'Hara, K. (2001). Plato and the Internet. London: Icon Books.

Pamplona, Vitor (2008). Modelo de Dreyfus para aprendizado. Retrieved July 29, 2012 from http://vitorpamplona.com/wiki/Modelo%20de%20Dreyfus%20para%20aprendizado

Pardi, P. (22 Sept., 2011). What is knowledge? Philosophy News. Retrieved March 18, 2012 from: http://www.philosophynews.com/post/2011/09/22/What-is-Knowledge.aspx

Parker, K. I. (2004). Biblical Politics of John Locke. Waterloo, Ontario, Canada: Wilfrid Laurier University Press.

Patitungkho, K. and Deshpande, N. J. (2005). Information Seeking Behaviour of Faculty Members of Rajabhat Universities in Bangkok. Webology, 2(4), Article 20. Retrieved on 23 December 2012 at: http://www.webology.org/2005/v2n4/a20.html

Pavlov, I. (2003). Conditioned reflexes: An Investigation of the Physiological Activity of the Cerebral Cortex. New York: Dover.

Plato; Benardete, S. (Translated by). (2007). Being of the beautiful: Plato's theaetetus, Sophist, and Statesman. Chicago, IL, USA: University of Chicago Press.

Puga and Trefler (2003). Knowledge creation and control in organizations Working Paper 9121, Toronto : University of Toronto. Retrieved on 25 December 2012 at: http://diegopuga.org/papers/know.pdf

Richelle, M. (1995). B. F. Skinner: a reappraisal. Hove: Taylor & Francis

Rock, I & Plamer, S. (1990). The legacy of gestal psychology. Scientific American, 263 (6): 48-61.

Rogers, C. R. (1980). Freedom to learn for the 80s. New York: Free Press.

Ross, George MacDonald (Editor). (2006). Kant and His Influence. London: Continuum .

Salisbury, M. (2008). From instructional systems design to managing the life cycle of knowledge in organizations. Performance Improvement Quarterly, 20(3): 131-145.

Schincariol, L. (2002). The types, sources, and perceived relevance of knowledge acquisition, and the enacted effects when teaching unfamiliar and familiar physical education content. Dissertation presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

Schmitt, F. F. (1992). Knowledge and belief. Florence, KY, USA: Routledge.

Schunk, D. H. (2009). Learning theories: an educational perspective. London: Pearson Education.

Siemens, G. (2004). Connectivism: a learning theory for the digital age. Retrieved August 11, 2012, from http://devrijeruimte.org/content/artikelen/Connectivism.pdf
Skinner, B. F. (1965). Science and human behavior. New York: Simon & Schuster.
Social cognitive theory (2011). Retrieved August 9, 2012, from http://teorije-ucenja.zesoi.fer.hr/doku.php?id=learning_theories:social_cognitive_learning_theory
Soltero, A. B., Valenzuela, M. B., Schmitz, G. S., Rubio, F.M., and Mendez, T. P. (2006). Knowledge audit methodology with emphasis on core processes. European and Mediterranean Conference on Information Systems (EMCIS), July 6-7 2006, Costa Blanca, Alicante, Spain. Retrieved on July 21, 2012, from: http://www.iseing.org/emcis/emcis2006/Proceedings/Contributions/C20/CRC/EMCIS%20KAMCP%20Final.pdf
Soman, K. N. & Mathew, R. M. (2006). Theories of skill acquisition : a comprarision of five stages of skill acquisition and stage theory of ifnromation consumption growth. Library Progress (International) , 217-225.
Steup, M. (Editor). (2001). Knowledge, Truth, and duty: essays on epistemic justification, responsibility, and virtue. Cary, NC, USA: Oxford University Press.
Sunassee, N. N. & Sewry, D. (2002). A theoretical framework for knowledge management implementation. Proceedings of the 2002 annual research conference of the South African Institute of Computer Scientists and Information Technologists on Enablement Through Technology (SAICSIT), Port Elizabeth, South Africa, pp. 235-245.
Taylor, R. L. and Stanton, A. D. (2009). Academic publishing and teaching Effectiveness: an attitudinal study of AACSB accredited business school faculty. Academy of Educational Leadership Journal, 13(2): 93-106.
Teerajetgul, W. and Chaoenngam, C. (2006), ''Factors inducing knowledge creation: empirical evidence from Thai construction projects'', Engineering, Construction and Architectural Management, Vol. 13 No. 6, pp. 584-99.
Thierauf, R. J. (1999). Knowledge management systems for business. Westport: Greenwood
Tian, J., Nakamori, Y., and Wierzbicki, A. P. (2009). Journal of Knowledge Management, 13(2): 76-92.
Tomei, L. (2009). Lexicon of online and distance learning. Maryland: Rowman & Littlefield Education.
Tuffin, K. (2004). Understanding critical social psychology. London: Sage.
UNESCO (2005). Towards knowledge society. Paris: UNESCO.
van Plon, V. (2006). Connectivism: a new learning theory? Retrieved July 6, 2012. From http://www.scribd.com/doc/88324962/Connectivism-a-New-Learning-Theory
Weidman, N. (2011). Behaviorism- neobehaviorism (1930-1955). Science Encyclopedia. Retrieved June 22, 2011, from http://science.jrank.org/pages/8448/Behaviorism-Neobehaviorism-1930-1955.html
Welbourne, M. (2001). Knowledge. Durham, Great Britain: Acumen
Wellman, J. L. (2009). Organizational Learning. Basingstoke: Palgrave Macmillian.
Williamson, T. (1996). Vagueness. Florence, KY, USA: Routledge.
Wu, C., Lin, C. (2009). Case study of knowledge creation facilitated by Six Sigma. International Journal of Quality & Reliability Management, 26 (9): 911-932.
Wu, Y., Senoo, D., and Manier-Watanabe, R. (2010). Diagnosis for organizational knowledge creation: an ontological shift SECI model. Journal of Knowledge Management, 14(6): 791-810.
Yates, S. M. (2007).Teachers' perceptions of their professional learning activities. International Education Journal, 8(2): 213-221

Appendix A: Studies Measuring Knowledge Acquisition (KA)

Author(s)	Year	Population	Sample	Data Collection	Sources of KA	Purpose of KA
Belefant-Miller & King	2001	Faculty members	130	-questionnaire	-Books - journals	-research -teaching -current awareness -professional development
Schincariol	2002	Students teachers	2	-interviews -observations -content analysis -multimedia	-books -cooperation -experience - peers	-teaching
Lovett & Gilmore	2003	Teachers	8	-interviews -Semi-structured interviews -observations -content analysis	-documents	-teaching
Patitungkho & Deshpande	2005	Faculty members	260	-questionnaire	-textbooks -general books -Internet	-research -teaching
Asemi	2005	Faculty members	188	-questionnaire -interview	-print sources -e-sources	-research -teaching -current awareness -professional development
Yates	2007	Teachers	395	-questionnaire	-professional development	-teaching
Goldschmidt & Phelps	2007	Teachers	599	-questionnaire	-professional development	-teaching -learning

Hussin	2007	Faculty members	12	- semi structured interview -in-depth interviews	-reading -research -discussion -sharing knowledge -conferences -seminar -academic visit -industrial linkages	-learning -academic performance -salary.
Taylor & Stanton	2009	Faculty members	136	-questionnaire	-research -publishing	-teaching
Maynard & O'Brien		Faculty members	304	-questionnaire	-print materials -e-sources	-teaching -research
Abu-Tineh	2011	Faculty members	100	-questionnaire	-organizational learning	-learning

Appendix B: Studies Measuring Knowledge Creation

Author(s)	Year	Population	Sample	Data Collection	Independent Variable	Dependent Variable
Beech et al.	2002	-managers -consultants	10	--face-to-face interview -observation -informal contacts -discussions -written feedback -verbal feedback -reports -minutes of meetings	-leadership -personal relationship	-Knowledge creation
Puga and Trefler	2003	Industries (Sony &Boeing)	2	-observation -field study	- incompleteness -non-appropriability -substitutability	-knowledge creation -knowledge control
Chen	2005	Managers	58	-questionnaire	-knowledge creation	-knowledge utilization
Teerajetgul & Chaoenngam	2006	-managers -engineers	100	-questionnaire	-leadership -trust -collaboration -incentives -IT support - competencies	-Knowledge creation (SECI)
Hsu	2006	-faculty members -students	111	-questionnaire -content analysis -observation	-faculty involvement -students interaction -curriculum -website accessibility -website usability -dual communication -communication frequency	-knowledge creation -tacit knowledge creation -explicit knowledge creation

Hung	2006	-faculty members	400	-content analysis	-network density -network size -strength of relationships - diversity of relationships -amount of research funding	-knowledge creation output
Nezafati, Afrazeh, & Jalali	2009	-academics -non-academics -students	2040	-questionnaire	-Knowledge creation (SECI)	-knowledge volume -knowledge value -transformation of knowledge -knowledge advantages and expenses
Lavie and Drori	2012	Faculty members	268	-interviews -questionnaire -archival data	-collaboration -internal resources	-knowledge creation -knowledge application