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The roles and values of personal knowledge management: An exploratory study

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Abstract

Purpose – This paper describes the roles and values of Personal Knowledge Management (PKM). The roles of PKM were investigated in the KM process cycle and the values were assessed for improving the competences of both individuals and organizations. A conceptual framework of PKM 2.0 was developed based on the research results. This conceptual framework defines the directions for future research in this area.

Design/methodology/approach – A research model was developed based on a critical review of KM and the PKM literature, followed by a survey of the KM participants in KM associations / interest groups / societies. The results and conclusions were made based on the quantitative analysis approach.

Findings – The result indicate that PKM is playing important roles in the KM process and both individuals and organizations are benefitting by PKM in improving their competences. The roles of PKM are positively correlated to the values of PKM for individuals and organizations. It is also found that the values of PKM for individuals are correlated to the values of PKM for the organization.

Research limitations/implications – This study is intended as a starting point for exploring the roles and values of PKM. It aims to provide a generalized model of PKM, with further research required for specific contexts.

Originality/value – The conceptual model of PKM 2.0 was developed based on the research findings which provide a better understanding in the area of PKM. This model also sets the foundation for future research and draws the attention of both academics and business executives in this under-explored area. Up to now, there is no PKM framework or model that leverages on the Web 2.0 concepts. This paper provides the first examination of such aspects.

Keywords Knowledge management, Personal Knowledge Management, Web 2.0
Paper type Research paper

Introduction
The topic of Personal Knowledge Management (PKM) has only seen growth recently although PKM is not new, as our ancestors sought ways to learn better and to improve their knowledge. This research aims to investigate this under-explored area and to unlock

understanding of the roles and values of PKM. The paper provides a critical literature review of KM and PKM, and describes the competences required for individuals and organizations. A research model was developed after successfully surveying 206 KM participants in 44 different countries/locations. The results are encouraging in that PKM is playing important roles in the KM process, and the values found were of benefit both to individuals and organizations. A conceptual model namely PKM 2.0 was developed which set the directions for future research in this area.

Literature Review
The literature review provides a critical evaluation of previous literature on KM, KM conversion, KM process, PKM, individuals competences and organizations competences.

Knowledge Management

There is no single agreed definition of knowledge. Grant (2000) mentioned that we have had a philosophical debates about what knowledge is. The philosopher, Plato, has defined knowledge as perception and true judgement. Knowledge in the Oxford English Dictionary are (1) information and skills acquired through experience or education (2) the sum of what is known (3) awareness or familiarity gained by experience of a fact or situation.

Stewart (2000) argued that knowledge is a conclusion drawn from data and information. This knowledge hierarchy can be traced back in the poem "The Rock" by Eliot in 1934 (Sharma 2008). It is a Data, Information, Knowledge and Wisdom (DIKW) hierarchy. Russell Ackoff (1989) added another layer of "understanding" between knowledge and wisdom in the knowledge hierarchy. Understanding requires diagnosis and prescription. In Ackoff's view, the first four layers are related to the past, i.e. to deal with what has been known, and only wisdom deals with the future because it is incorporated with the vision and design (Ahsan & Shan 2006).

Knowledge is commonly viewed in the two dimensions of "Explicit" and "Tacit". Explicit knowledge is deeply ingrained in the traditions of Western management, from Frederick Taylor to Herbert Simon (Nonaka, I. & Takeuchi 1995); it is in the form of words, numbers and can easily be communicated and shared in the form of hard data, scientific formulae, codified procedures, or universal principles (Nonaka, I. & Takeuchi 1995). Polanyi (1996) termed Tacit knowledge based on the logic that "we know more than we can tell". Tt is something not easily visible and expressible; it is highly personal and hard to formalise, making it difficult to communicate or to share with others; subjective insights, intuitions and hunches are classified as tacit knowledge (Nonaka, I. & Takeuchi 1995).

New knowledge always begins with the individual and making personal knowledge available to others is the central activity for knowledge creation (Nonaka, I 1991). It is a continuous cycle of externalization, internalization, combination and socialization to deal with the knowledge transformation in the form of Tacit and Explicit knowledge between individuals (Nonaka, I. & Takeuchi 1995).

Knowledge Conversion

Nonaka and Takeuchi (1995) proposed the SECI knowledge conversion spiral model as illustrated in figure 1. In the SECI model, there are four modes of knowledge conversion namely Socialisation, Externalisation, Internalisation and Combination. Socialisation is converting tacit knowledge to tacit knowledge by face-to-face communication or shared experience. Externalisation is converting the tacit knowledge to explicit knowledge by developing concepts to embed the combined tacit knowledge. Internalisation is converting the explicit knowledge to tacit knowledge and Combination is converting the explicit knowledge to explicit knowledge. These conversion processes are interacting in the spiral of knowledge creation.
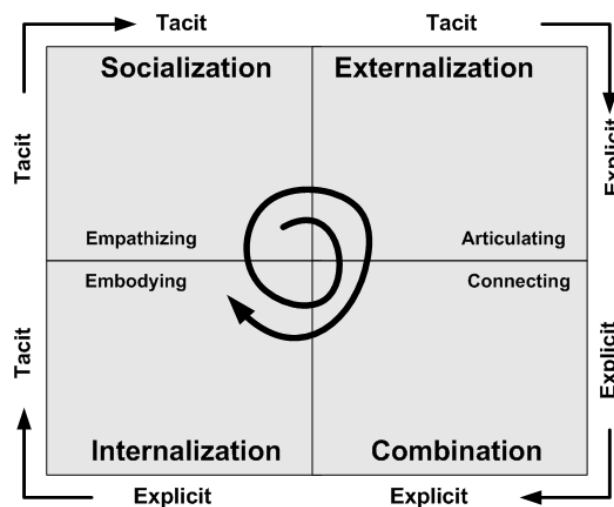

Figure 1: SECI Model (Knowledge Conversion)

Knowledge Management Process

The Knowledge Management Process has been articulated in term of the KM Cycle by many researchers, e.g. Lethbridge (1994), Wiig (1997) and Davenport & Prusak (1998). Furthermore, Schotte (2003) viewed that KM is the cycling process of Use, Provide, Find, Select, Organise, distill, Share and Adapt. Bergeron (2003) argued that KM is the cycle of Create/Acquisition, Modification, Use, Archiving, Transfer, Translation/Repurposing, Access and Disposal. Alfs (2003) and Mertins et al. (2003) stated that it is the cycle comprises of Generating, Storing, Distributing and Applying knowledge which similar to the KM Lifecycle summarized by Seufert et al. (2003) in which there are four generic knowledge processes that can be distinguished: Locating/Capturing, Sharing/Transferring, Creating and Applying; as shown in figure 2, instead of a sequential process, it is an interactive process where the application of knowledge takes the central role.
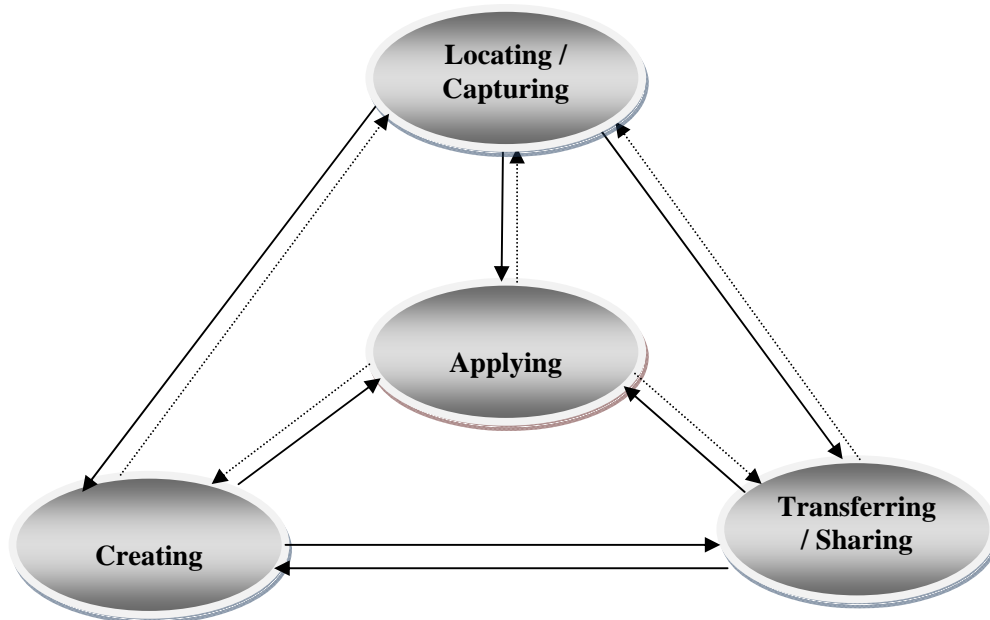
Figure 2: Knowledge Process Categories (Source: Seufert, Back & Krogh (2003, p. 112))

Personal Knowledge Management

Frand and Hixon (1999) defined Personal Knowledge Management (PKM) as a system designed by individuals for their own personal use. It was initially geared toward the MBA students at the Anderson School of UCLA. They are trained in KM principles and use computers as tools for searching/finding, categorizing/classifying, naming things/making distinctions, evaluating/assessing, and integrating or relating.

Avery et al. (2001) defined PKM as an overall structured process for intentionally managing information and turning it into useful knowledge. There are 7 skills in their proposed PKM framework which are for (1) Retrieving information; (2) Evaluating information; (3) Organizing information; (4) Collaborating around information; (5) Analysing information; (6) Presenting information; and (7) Securing information.

Efimova (2005) argued that PKM is an interactive process between individuals, other people and ideas. This is an approach which focuses on supporting knowledge worker productivity by taking an active perspective in studying their work. Wright (2005) mentioned that while PKM was primarily an unconscious process and occurred naturally, it was more than personal. Martin (2008) argued that PKM is knowing what knowledge we have and how we can organize it, mobilize it and use it to accomplish our goal, and how we can continue to create knowledge.

Irrespective of how personal knowledge management is defined by different scholars, the key purpose of PKM is to provide a framework for Individual Knowledge Workers to manage new information, integrate it and enrich each individual knowledge database in an effective manner. Doing this successfully will empower each individual to easily apply their own personal knowledge in dealing with new and old problems, to learn from new experience and to create new knowledge. It is a continuous and interactive process which is not independent of other knowledge management processes.

Individuals' Competencies

The concept of individual competence is widely used in human resource management (Boyatzis 1982; Burgoyne 1993; Schroder 1989). This refers to a set of skills that an individual must possess in order to be capable of satisfactorily performing a specified job. Although the concept is well developed, there is continuing debate about its precise meaning, and it continues to remain one of the most diffuse terms in the management development sector, and the organizational and occupational literature (Collin, 1989).

Some competence definitions are listed below:
1. Competence refers to a potential ability and / or a capability to function in a given situation. Competency focuses on one's actual performance in a particular situation. This means that competence is required before one can expect to achieve competency (Schroeter 2008).
2. The *Concise Oxford English Dictionary* defines competence as "the ability to do, for a task" and (interestingly) as "sufficiency of means for living".
3. Streumer and Bjorkquist (1998) conclude that, in the British literature, competence most often refers to an individual's capability to perform the tasks that have been assigned to him.
4. Cheetham and Chivers (2005) provide the general definition of competence: competence is an effective overall performance within an occupation, which may range from the basic level of proficiency through to the highest levels of excellence (Cheetham & Chivers 2005, p. 54).

Many scholars have tried to define what competences are required for different types of workers. Cheetham and Chivers (1996) proposed a holistic model of professional competence which consists of four key components: (1) functional competence, (2) personal or behaviour competence, (3) knowledge/cognitive competence and (4) values/ethics competence.

1. Functional competence
It is the ability to perform a range of work-based tasks effectively to produce specific outcomes. This includes, and indeed requires, the passion of discrete skills but the emphasis is on putting these to use to achieve specific outcomes.

2. Personal or Behaviour competence
It is the ability to adopt appropriate, observable behaviour in work-related situations.

3. Knowledge / Cognitive competence
It is the possession of appropriate work-based knowledge and the ability to put this to effective use.

4. Values / Ethics Competence
It is the possession of appropriate personal and professional values and the ability to make sound judgments based upon these in work-related situations. The linkage of ethical competence with values emphasizes the point that values, like knowledge, are of little use unless they are effectively applied. This ethical competence refers to the effective and appropriate application of values in professional settings.

Fleming (1991) argued that there are competences which work on other competences and he defined it as Meta-Competence. It is the versatility to deal with a variety of different problems by being able to draw on appropriate skills and knowledge to the circumstances. Developing meta-competence is about lining subject-specific knowledge with the particular competences that should be practised by the learner.

Fleming (1991) did not provide details about what competences are meta-competences but Cheetham and Chivers (1996, 1998) developed a professional competences model and argued that the meta-competences should includes communication, self development, creativity, analysis, problem solving, mental agility and reflection. Cheetham and Chivers (1998) claimed that this model has been tested with 20 different professionals. Their work has influenced a lot of scholars/researchers' work in competence studies e.g. Jackson 's (1998) teacher-scholar research in UK higher education; Boak and Coolican's (2001) research in area managers in a large UK fashion retail company; Foley et al 's (2004) research in the Scottish workforce in sports and fitness, play and outdoor sectors; Watson et al's (2004) research in managerial competence in the Scottish visitor attraction sector; Heilmann's (2007) research in middle management in the Finnish information and communication technology sector and the paper business sector and Hashim's (2008) research involving Malaysian managers.

Organizations' Competences
An Effective Knowledge Organization (EKO) should create a broad, complex and internally-consistent dynamic knowledge capability and integrate it with other strategic business capabilities and with its environment in the overall organizational strategies capabilities architecture (King 2008).

King (2008) argued that an EKO should pursue a hierarchy of objectives, including (1) improve the quality and range of applications of knowledge; (2) improve organizational processes for innovation, individual learning, collective learning, collaborative problem-solving, and knowledge-sharing; (3) improve the quality and the impacts of the decision and behaviour that are taken by the organization; and (4) improve organizational performance.

Nonaka and Takeuchi (1995) argued that in an EKO, the knowledge acquired externally should be able to be shared widely within the organization, stored in the company's knowledge database, and utilised by the staff to develop new technologies, services and products. It requires a conversion process to transform knowledge from the outside to the inside and back outside again in the form of new products, services or systems. It requires continuous innovation which can lead to competitive advantage.

Frameworks for measuring the competences of organization are very mature and one of the models highly relevant to knowledge organization is the Organizational IQ (OIQ) framework proposed by Mendelson and Ziegler (1999). Previous research by Mendelson and Ziegler showed that the OIQ is positively correlated to the firm's performance. The OIQ framework is as shown in figure 3.8 which consists of five key indicators namely (1) External Information Awareness (EIA), (2) Internal Knowledge Dissemination (IKD), (3) Effective Decision Architecture (EDA), (4) Organizational Focus (OF) and (5) Information-Age Business Network (IBN). Ziegler (2008) enhanced the framework to replace the IBN by Continue Innovation (CI).

The EIA is to measure the customer dynamics, technology opportunities and competitive actions; the IKD is to measure the effective flow of information horizontally, vertically (top down and bottom up) and the review process ; the EDA is to measure the decision quality, decision time and sense of ownership and accountability for decisions; the OF is to measure the scope of the business focus, the core competencies focus and simplification of the processes (Mendelson & Ziegler 1999). CI is to measure the creativity, product development and quality improvement (Ziegler 2008).

Research Model

Based on the literature review, a research model was developed as shown in figure 3. The model consists of four concepts which are PKM Skills, KM Process, PKM Values for the individual and PKM values for the organization.

The PKM skills are the underlying measurement of the roles in the KM Process and the values of PKM for both individuals and organizations. There are seven PKM skills as proposed by Avery et al. (2001) namely Retrieving (PKM1), Evaluating (PKM2), Organizing (PKM3), Analysing (PKM4), Collaborating (PKM5), Presenting (PKM6) and Securing (PKM7).

The KM Cycle includes four interactive processes as suggested by Seufert, Back and Korgh (2003, p. 112) which are Locating / Capturing (KMC1), Creating (KMC2), Sharing / Transferring (KMC3) and Applying (KMC4).

The PKM values for individuals are measured by the seven individuals' competences as proposed Cheetham & Chivers (1996, 1998) namely communication (ICOMC), creativity (ICREC), problem solving (IPBSC), learning / self development (ILSDC), mental agility (IMEAC), analysis (IANAC) and reflecting (IREFC).

The PKM values for organizations are measured by the five organization competences as suggested by Mendelson and Ziegler (1999) and Ziegler (2008) which are external information awareness (OEIAC), internal knowledge dissimilation (OIKDC), effective decision making (OEDMC), organization focus (OORFC) and continuous innovation (OCOIC).
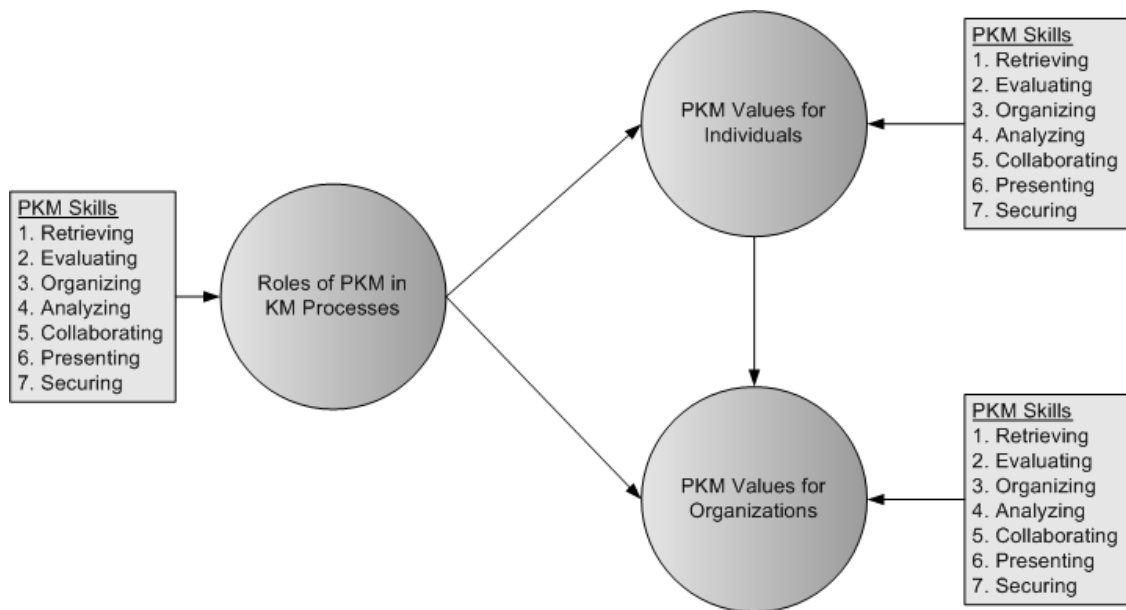

Figure 3: Research Model

Research Findings
The invitation for an online survey was sent to KM participants affiliated to KM associations / interest-groups / societies. There are 4 sections in the questionnaire: section 1 was to determine the roles of PKM, sections 2 and 3 were to determine the values of PKM for individuals and organizations respectively, and section 4 was to determine the demographic factors. The 5 point Likert scale was used to measure the roles of PKM and the values of PKM for both individuals and organisations. The respondents were asked to rate (1 to 5, 1 is the lowest and 5 is the highest) the importance of the role that the seven PKM skills were playing in their KM processes, and to rate (1 to5, 1 is the lowest and 5 is the highest) the values of the seven PKM skills in contributing to their individual competences and organization competences. A sample subset of the questions is shown in figure 4.

Section 1: The Roles of PKM in KM Processes
Please select a single number, from 1 to 5, for each question to reflect your experience or belief about the role of each PKM skill in the Knowledge Management process. 1 = Less Important, 2 = Somewhat Important, 3= Important, 4=Very Important, 5=Critical

PKM Skills / KM Processes	Retrieving	Evaluating	Organizing	Analysing	Collaborating	Presenting	Securing
Capture / Locate Knowledge							
Share / Transfer Knowledge							

Section 2: The Values of PKM for Individuals

Please select a single number, from 1 to 5, for each question to reflect your experience or belief about the perceived value of PKM to improve your competences when you practice these skills.

1 is the lowest values and 5 is the highest values

PKM Skills / Individuals Competences	Retrieving	Evaluating	Organizing	Analysing	Collaborating	Presenting	Securing
Communication competence e.g. persuasion, assertive & negotiation...etc.							
Creativity competence e.g generate ideas, be innovative, share your thought...etc.							

Section 3: The Values of PKM for Organizations

Please select a single number, from 1 to 5, for each question to reflect your experience or belief that the benefits can bring to you when you practice these skills.

1 is the lowest values and 5 is the highest value.

PKM Skills / Organizations Competences	Retrieving	Evaluating	Organizing	Analysing	Collaborating	Presenting	Securing
The External Information Awareness in your organisation e.g. market trends, technology, customer requirement…etc.							
The Internal Information Dissemination in your organisation e.g. effective communication, extract relevant information easily and easy to understand…etc.							

Figure 4: Question Sample

The collected data was analysed by quantitative analysis. The constructs of each concept were tested as to validity, reliability, and normality distribution before the hypotheses tests.

Respondents' profile
A total of 206 valid samples were received. The respondents were distributed in Africa (4.1%), the Americas (36.0%), Asia (35.5%), Europe (20.3%) and Oceania (4.1%). 39.3% of respondents were female and 60.7% male. 44.2% were working in private companies, 21.4% in government and 34.5% in non-governance organizations. There were 16.5% of respondents working at directorate and senior management level, 22.8% were managers and administrators, 45.6% professional, 2.4% associate professional, 1.9% were clerks and service workers and 10.7% others. 21.4% of respondents hold doctoral degrees, 64.6% hold master degree, 13.1% hold bachelor degrees and 1 % hold associate degrees / higher diplomas.

There are 37% of respondents that have attended PKM training, and the respondents' stage of PKM adoption as defined by Rogers (1962) is as shown in figure 6. There are 5 stages of the adoption process, as suggested by Rogers (1962), namely knowledge stage, persuasion stage, decision stage, implementation stage and confirmation stage. In the knowledge stage, the individual is first exposed to PKM but lacks information about PKM and has not been inspired to find more information about PKM. In the persuasion stage, the individual is interested in PKM and actively seeks information or details about PKM. In the decision stage, the individual takes the concept of PKM and makes a decision to adopt or reject PKM. In the implementation stage, the individual uses PKM and may search for further information about PKM. In the confirmation stage, the individual continues using PKM and may use PKM to its fullest potential. There were 23.9% respondents in the knowledge stage, 5 % in the persuasion stage, 8% in the decision stage, 28.2% in the implementation stage and 21.6% in the confirmation stage.
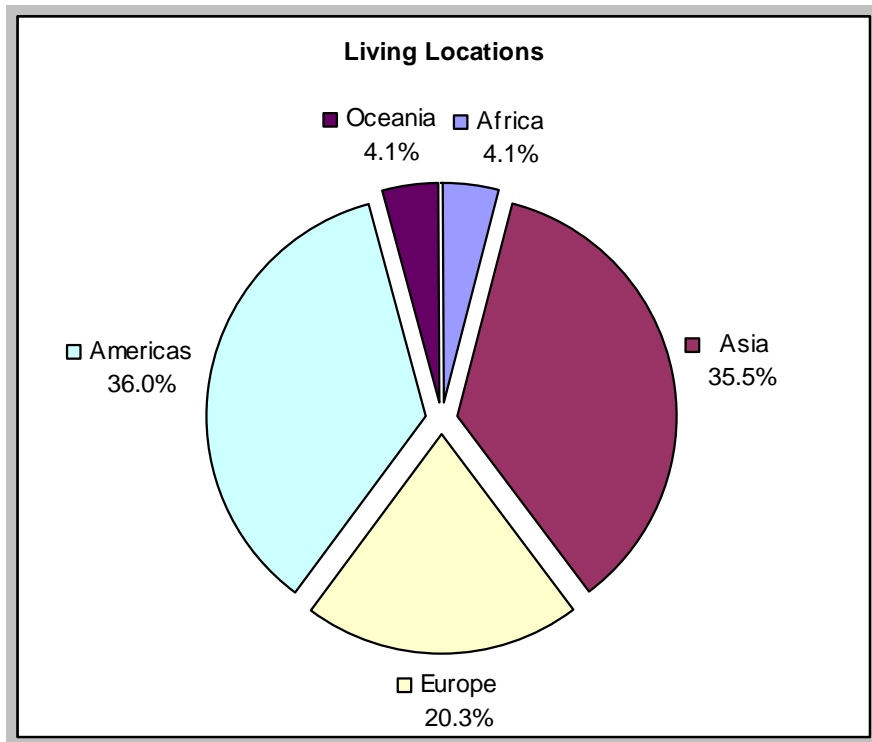
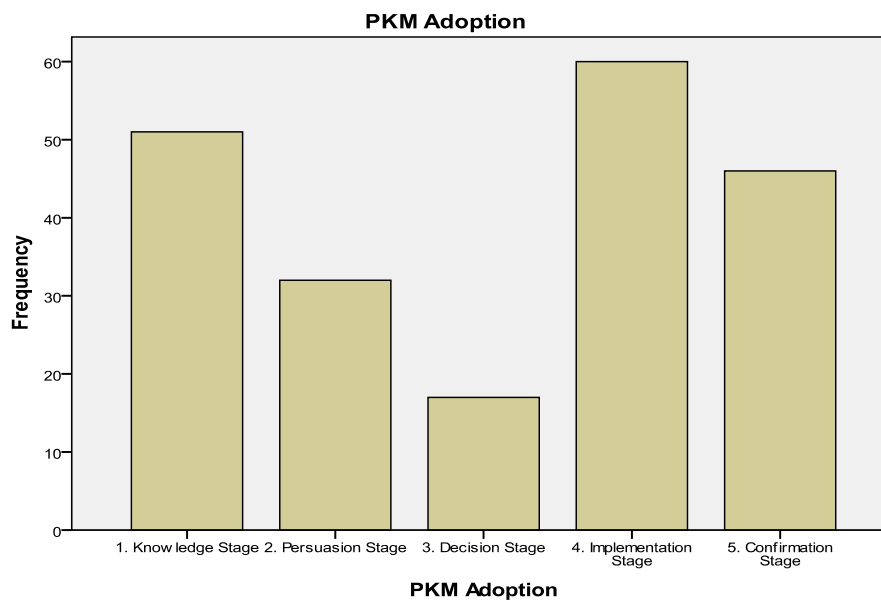Figure 5: Distribution of Respondents based on region

Figure 6: Stage of PKM Adoption

Hypotheses Tests

There are five main hypotheses and the results are reported in this section. The first two hypotheses, H1 & H2, use the mean score rated by the respondents in each variable to measure the roles and values of the PKM to determine if the hypothesis is substantiated

or not. The hypotheses H3 to H5 use the linear regression analysis of the composite variables of the roles of PKM (RPKM1 to RPKM7) and the composite variables of the values of PKM for individuals (IVPKM1 to IVPKM7) and the values of PKM for organizations (OVPKM1 to OVPKM7).

The validity of the composite variables were tested based on the suggestion by Hair et al (1998) that the item-to-item correlations should > 0.3 and item-to-total correlations > 0.5. Besides, Principal Components Analysis was also performed to test if there is only one eigenvalue greater than 1 and the loading factors are > 0.5. The reliability test used Cronbach's Alpha Coefficient and the results are as shown in figure 7, where a value > 0.9 is excellent, > 0.8 is good, >0.7 is acceptable and >0.6 is acceptable for exploratory study, as suggested by Hair et al (1998) and Sekaran (2003).

Cronbach's Alpha Coefficients

RPKM1	RPKM2	RPKM3	RPKM4	RPKM5	RPKM6	RPKM7
0.724	0.771	0.749	0.783	0.695	0.656	0.835
IVPKM1	IVPKM2	IVPKM3	IVPKM4	IVPKM5	IVPKM6	IVPKM7
0.885	0.886	0.898	0.904	0.877	0.631	0.959
OVPKM1	OVPKM2	OVPKM3	OVPKM4	OVPKM5	OVPKM6	OVPKM7
0.861	0.864	0.837	0.864	0.842	0.842	0.925

Figure 7: Reliability test

All the variables were checked, and normality transformation was performed if there was significant skew or kurtosis.

H1: PKM Skills are playing important roles in KM Cycle

The roles of PKM were measured by the 5 point Likert-scale from1 to 5, 1 is less important, 2 is somewhat important, 3 is important, 4 is very important and 5 is critical. The mean score for the seven PKM skills in the four KM processes are illustrated in figure 8.

	KMC1		KMC2		KMC3		KMC4	
	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
PKM1	4.25	.917	3.62	1.013	3.45	1.119	3.52	1.090
PKM2	4.18	.922	4.25	.869	3.77	1.075	4.14	.943
PKM3	3.96	.933	4.08	.904	4.10	.827	3.84	1.000
PKM4	3.99	1.014	4.43	.810	3.87	.966	4.39	.774
PKM5	3.59	1.031	4.07	.921	4.44	.799	4.06	.993
PKM6	3.22	1.150	3.83	1.080	4.53	.730	3.94	1.055
PKM7	3.28	1.125	3.27	1.174	3.42	1.135	3.28	1.151

Figure 8: Mean Score of PKM Skills in KM Cycle

All PKM skills scored above 3 in all KM processes which indicate that the PKM skills are playing important roles in the KM Cycle. Therefore, this hypothesis is substantiated.

H2: PKM can benefit both individuals and organizations

The values of PKM were measured by the 5 point Likert-scale from 1 to 5, 1 is the lowest and 5 is the highest. The mean score for the seven individual competences are illustrated in figure 9a & 9b and the five organization competences are illustrated in figure 10.

	ICOMC		ICREC		IPBSC		ILSDC	
	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
PKM1	3.37	1.100	3.67	1.081	3.96	.904	4.08	.992
PKM2	3.71	1.009	4.09	.917	4.43	.734	4.30	.881
PKM3	3.82	1.037	3.96	.949	4.03	.894	4.24	.914
PKM4	3.95	.909	4.33	.864	4.62	.643	4.44	.786
PKM5	4.15	.922	4.17	.895	4.00	.963	3.85	1.026
PKM6	4.56	.715	4.00	.980	3.62	1.061	3.54	1.167
PKM7	3.09	1.129	3.06	1.138	3.12	1.117	3.18	1.234

Figure 9a: Mean Score of PKM Values for Individuals Competences

	IMEAC		IANAC		IREFC	
	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
PKM1	3.91	1.023	3.78	.996	3.67	1.040
PKM2	4.19	.910	4.52	.703	4.15	.941
PKM3	4.07	.968	4.19	.850	4.09	.906
PKM4	4.35	.818	4.70	.596	4.39	.805
PKM5	3.83	.992	3.70	1.053	3.92	1.067
PKM6	3.60	1.090	3.52	1.146	3.72	1.155
PKM7	3.06	1.220	3.00	1.183	3.16	1.209

Figure 9b: Mean Score of PKM Values for Individuals' Competences

	OEIAC		OIKDC		OEDMC		OORFC		OCOIC	
	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
PKM1	4.21	.963	3.92	1.021	3.88	.986	3.76	1.007	4.01	.965
PKM2	4.26	.842	4.00	.955	4.41	.771	4.03	.934	4.22	.876
PKM3	4.08	.896	4.29	.827	4.20	.793	4.14	.875	4.09	.906
PKM4	4.34	.828	4.07	.897	4.58	.699	4.26	.842	4.37	.778
PKM5	4.12	.978	4.37	.784	4.22	.881	4.22	.859	4.38	.792
PKM6	3.88	1.120	4.38	.810	4.10	.924	3.94	.968	4.07	.973
PKM7	3.29	1.190	3.42	1.185	3.33	1.205	3.30	1.187	3.43	1.194

Figure 10: Mean Score of PKM Values for Organizations' Competences

All PKM skills scored above 3 in all individual competences and organization competences which indicated that PKM can benefit both individuals and organizations in term of their competences. Therefore, this hypothesis is substantiated.

H3: The values of the PKM for individuals are positively correlated to the roles of the PKM skills in KM Cycle

Seven composite variables were created to represent the role of PKM (RPKM1 to RPKM7) and seven composite variables were created to represents the values of PKM for individuals (IVPKM1 to IVPKM7). The Linear regression tests were performed and the results are summarized in figure 11.

| | R | R Square | ANOVA | | Coefficients | | | |
			F	Sig.	B	Beta	t	sig
(Constant)					1.116		6.366	.000
RPKM1 to IVPKM1	.736	.542	241.512	.000	.706	.736	15.541	.000
(Constant)					-.491		-6.801	.000
RPKM2 to IVPKM2	.754	.569	269.518	.000	.714	.754	16.417	.000
(Constant)					.436		5.105	.000
RPKM3 to IVPKM3	.704	.495	200.187	.000	.744	.704	14.149	.000
(Constant)					.607		8.746	.000
RPKM4 to IVPKM4	.716	.513	215.052	.000	.674	.716	14.665	.000
(Constant)					.513		6.584	.000
RPKM5 to IVPKM5	.700	.490	195.987	.000	.682	.700	14.000	.000
(Constant)					.866		10.242	.000
RPKM6 to IVPKM6	.548	.300	87.429	.000	.520	.548	9.350	.000
(Constant)					.268		1.521	.130
RPKM7 to IVPKM7	.760	.577	278.340	.000	.854	.760	16.684	.000

Figure 11: Linear Regression of PKM Skills and PKM Values for Individuals

The results indicated that the PKM values for individuals (IVPKM1 to IVPKM7) are significantly predicted by the roles of PKM (RPKM1 to RPKM7). 54.2% of IVPKM1 is explained by RPKM1 (R^2=.542, p<0.001); 56.9% of IVPKM2 is explained by RPKM2 (R^2=.569, p<0.001); 49.5% of IVPKM3 is explained by RPKM3 (R^2=.495, p<0.001); 51.3% of IVPKM4 is explained by RPKM4 (R2=.513, p<0.001); 49% of IVPKM5 is explained by RPKM5 (R^2=.490, p<0.001); 30% of IVPKM6 is explained by RPKM6 (R^2=.300, p<0.001); and 57.7% of IVPKM7 is explained by RPKM7 (R^2=.577, p<0.001). It indicates that there are positive correlations between the roles of PKM and the values of PKM for individuals; therefore, this hypothesis is substantiated.

H4: The values of the PKM for organizations are positively correlated to the roles of the PKM skills in KM process.

Another set of seven composite variables were created to represent the values of PKM for organizations (OVPKM1 to OVPKM7). Linear regression tests were performed between RPKM (RPKM1 to RPKM7) and OVPKM (OVPKM1 to OVPKM7) and the results are summarized in figure 12.

| | R | R Square | ANOVA | | Coefficients | | | |
			F	Sig.	B	Beta	t	sig
(Constant)					1.391		7.477	.000

	R	R Square	F	Sig.	B	Beta	t	sig
RPKM1 to OVPKM1	.703	.494	198.909	.000	.680	.703	14.104	.000
(Constant)					.476		6.183	.000
RPKM2 to OVPKM2	.742	.550	249.307	.000	.732	.742	15.789	.000
(Constant)					-.460		-5.721	.000
RPKM3 to OVPKM3	.704	.495	200.337	.000	.701	.704	14.154	.000
(Constant)					.514		7.138	.000
RPKM4 to OVPKM4	.722	.521	222.135	.000	.710	.722	14.904	.000
(Constant)					-.125		-1.460	.000
RPKM5 to OVPKM5	.566	.320	96.104	.000	.526	.566	9.803	.000
(Constant)					.925		10.285	.000
RPKM6 to OVPKM6	.492	.242	65.035	.000	.477	.492	8.064	.000
(Constant)					.878		4.395	.000
RPKM7 to OVPKM7	.670	.448	165.779	.000	.747	.670	12.876	.000

Figure 12: Linear Regression of PKM Skills and PKM Values for Organizations

The results indicated that the PKM values for organizations (OVPKM1 to OVPKM7) are significantly predicted by the roles of PKM (RPKM1 to RPKM7). 49.4% of OVPKM1 is explained by RPKM1 (R^2=.494, p<0.001); 55% of OVPKM2 is explained by RPKM2 (R^2=.550, p<0.001); 49.5% of OVPKM3 is explained by RPKM3 (R^2=.495, p<0.001); 52.1% of OVPKM4 is explained by RPKM4 ($R2$=.521, p<0.001); 32% of OVPKM5 is explained by RPKM5 (R^2=.320, p<0.001); 24.2% of OVPKM6 is explained by RPKM6 (R^2=.242, p<0.001); and 44.8% of OVPKM7 is explained by RPKM7 (R^2=.448, p<0.001). It indicates that there are positive correlations between the roles of PKM and the values of PKM for organizations; therefore, this hypothesis is substantiated.

H5: The values of the PKM for individuals are positively correlated to the values of the PKM for organizations.

Linear regression tests were performed between OPKM (OVPKM1 to OVPKM7) and IVPKM (IVPKM1 to IVPKM7) and the results are summarized in figure 13.

			ANOVA		Coefficients			
	R	R Square	F	Sig.	B	Beta	t	sig
(Constant)					.987		5.765	.000
IVPKM1 to OVPKM1	.779	.606	313.852	.000	.786	.779	17.716	.000
(Constant)					1.113		34.742	.000
IVPKM2 to OVPKM2	.795	.632	349.632	.000	.829	.795	18.698	.000
(Constant)					-.468		-6.383	.000
IVPKM3 to OVPKM3	.738	.545	244.471	.000	.695	.738	15.636	.000
(Constant)					.248		3.338	.001
IVPKM4 to OVPKM4	.784	.614	324.399	.000	.819	.784	18.011	.000
(Constant)					-.367		-4.819	.000
IVPKM5 to OVPKM5	.707	.499	203.413	.000	.674	.707	14.262	.000
(Constant)					.637		6.667	.000
IVPKM6 to OVPKM6	.596	.355	112.317	.000	.609	.596	10.598	.000
(Constant)					.895		6.556	.000
IVPKM7 to OVPKM7	.800	.639	361.520	.000	.794	.800	19.014	.000

Figure 13: Linear Regression of PKM Skills and PKM Values for Organizations

The results indicated that the PKM values for organizations (OVPKM1 to OVPKM7) are significantly predicted by the PKM values for individuals IVPKM (IVPKM1 to IVPKM7). 60.6% of OVPKM1 is explained by IVPKM1 (R^2=.606, p<0.001); 63.2% of OVPKM2 is explained by IVPKM2 (R^2=.632, p<0.001); 54.5% of OVPKM3 is explained by IVPKM3 (R^2=.545, p<0.001); 61.4% of OVPKM4 is explained by IVPKM4 (R2=.614, p<0.001); 49.9% of OVPKM5 is explained by IVPKM5 (R^2=.499, p<0.001); 35.5% of OVPKM6 is explained by IVPKM6 (R^2=.355, p<0.001); and 63.9% of OVPKM7 is explained by IVPKM7 (R^2=.639, p<0.001). It indicates that there are positive correlations between the PKM values for individuals and the PKM values for organizations; therefore, this hypothesis is substantiated.

Hypotheses Tests Summary
The results of the research are summarized in figure 14. In short, all seven PKM skills are found to play important roles in the KM process; PKM can benefit in improving the individuals and organization competences; the values of PKM for individuals are positively correlated to their roles in the KM process; the values of PKM for organizations are positively correlated to their roles in the KM process and the values of PKM for organizations are positively correlated to the values of PKM for individuals.

Main Hypotheses	*Results*
H1. PKM skills are playing important roles in the KM Cycle	Supported
H2. PKM can benefit both individuals and organizations	Supported
H3. The values of PKM for individuals are positively correlated to the roles of PKM skills in the KM process.	Supported
H4. The values of PKM for organizations are positively correlated to the roles of PKM skills in the KM process.	Supported
H5. The values of PKM for individuals are positively correlated to the values of PKM for the organization.	Supported

Figure 14: Hypotheses Tests Results

Conclusion
This work is an exploratory study to investigate the roles and values of PKM. The results indicated that PKM is playing important roles and can benefit both individuals and organizations in improving competences.

The PKM skills suggested by Avery et al. (2001) play different and important roles in the KM Cycle, as suggested by Seufert, Back & Krogh (2003) . The results indicate that retrieving skill plays a very important role in locating / capturing knowledge; evaluating skill plays very important roles in locating / capturing knowledge, sharing / transferring knowledge and applying knowledge; organizing skill play a very important roles in sharing / transferring knowledge and creating knowledge; analysing skill plays very important roles in sharing / transferring knowledge and applying knowledge;

collaborating skill is very important in sharing / transferring knowledge, creating knowledge and applying knowledge; presenting skill is very important in creating knowledge.

The values of PKM for individuals were found to improve the individual competences, as suggested by Cheetham and Chivers (1996, 1998). Retrieving skill provides a very high value in learning / self development competence. Evaluating skill provides a very high value in creativity competence, problem solving competence, learning / self development competence, mental agility competence, analysis competence and reflecting competence. Organizing skill provides very high values in problem solving competence, learning / self development competence, mental agility competence, analysing competence and reflecting competences. Analysing skill provides very high values in creativity competence, problem solving competence, learning / self development competence, mental agility competence, analysing competence and reflecting competence. Collaborating skill provides very high values in communication competence, creativity competence and problem solving competence. Presenting skill provides a very high value in communication competence and creativity competence.

For the organization, the PKM values were found to improve the five competences suggested by Mendelson and Ziegler (1999) and Ziegler (2008). In external information awareness competences, the retrieving, evaluating, organising, analysing and collaborating skills scored very high values. In internal knowledge dissimilation competence and effective decision making competence, the evaluating, organizing, analysing, collaborating and presenting skills scored very high values. In organization focus competence, very high scored values were found in evaluating, organizing, analysing and collaborating skills. In continuous innovation competence, all PKM skills, except the securing information skill, scored very high values.

It is noted that securing information skill is the lowest important skill among the other PKM skills in all KM processes and the lowest scored values for both individual competences and organization competences. However, the roles are still important and the values are still high. This result is in line with the Avery et al (2001) view that securing information skill is frequently neglected by knowledge workers as an important skill.

The correlation study indicated that the roles and the values are highly correlated for both the individual competences and organization competences. It is a very good signal to executives that improving the PKM skills for individual knowledge workers will result in improving the organization competences. It is an area that both researchers and executives should focus on and the authors believe that PKM is the foundation on which to build an effective knowledge organization.

Future Research
Following the findings in this research, a conceptual model of PKM 2.0 was developed. There are four core components in this model, namely Personal Information Management (PIM), Personal Knowledge Internalization (PKI), Personal Wisdom Creation (PCW) and

Inter-Personal Knowledge Transferring (IKT). The interaction action of the components is illustrated in figure 14a and 14b and provides more a detailed view of the model in terms of the required skill/competence, the belonging layer of the DIKW transformation, the inherent knowledge conversion and the involved KM process.
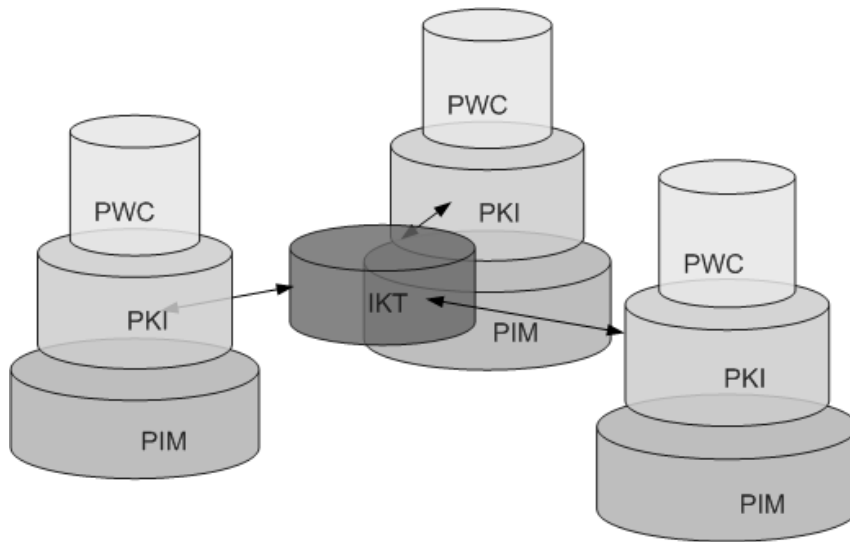

Figure 14a: PKM 2.0 Conceptual Model

PKM 2.0 Components	Personal Information Management (PIM)			Personal Knowledge Internalization (PKI)			Personal Wisdom Creation (PWC)			Inter-Personal Knowledge Transferring (IKT)		
Skill / Competence	Retrieving	Evaluating	Organising	Analysis	Learning / Self Development	Reflection	Problem Solving	Creativity	Mental Agility	Securing	Presenting & Communication	Collaborating
DIKW Transformation Layer	Data ← → Information			Information ← → Knowledge			Knowledge ← → Wisdom			Information / Knowledge ← → Information / Knowledge		
Knowledge Conversation	Explicit ← → Explicit			Explicit → Tacit			Tacit ← → Tacit/Explicit			Explicit / Tacit ← → Explicit / Tacit		
KM Process	Capture /			Create			Apply			Transfer / Share		

	Locate			

Figure 14b: PKM 2.0 Conceptual Model

The PKM 2.0 framework was developed based on the DIKW hierarchy defined by Russell Ackoff (1989), the knowledge conversion framework suggested by Nonaka and Takeuchi (1995) and the KM process described by Seufert et al. (2003).

1. Personal Information Management (PIM)

PIM is the focus of many scholars in the area of PKM. It is the process to capture or locate knowledge as defined by Seufert et al. (2003). It transforms data to information and vice versa; it deals with past knowledge, as argued by Russell Ackoff (1989). Knowledge conversion is in the form of explicit knowledge (from one media, e.g. hard copy to another media, e.g. electronic copy), and is the combination process as suggested by Nonaka and Takeuchi (1995). The PIM is the foundation of PKM 2.0, where individuals are able to create their own knowledge database for immediate or future use in this process.

The required skills / competences in PIM are retrieving, evaluating and organising, which are the skills playing significant roles in capture / locate knowledge, based on the results of this research.

2. Personal Knowledge Internalization (PKI)

PKI is the process of creating knowledge in the KM cycles, suggested by Seufert et al. (2003). It transforms information to knowledge and vice versa. It requires understanding of the past knowledge and current information / knowledge available to an individual. It is the understanding layer as mentioned by Russell Ackoff (1989) between knowledge and wisdom. The knowledge conversion is mainly in the form of explicit to tacit knowledge; it is the internalization process in the SECI model (Nonaka, I. and Takeuchi 1995). PKI is beyond PIM as it turns the past knowledge into new knowledge.

The required competences in PKI are analysis, learning / self development and reflection. Based on the results from this research, the highest scored PKM skills in create knowledge were evaluating, organizing and analysing; these PKM skills were also the biggest contributor for analysis competence, learning / self development competence and reflection competence.

3. Personal Wisdom Creation (PWC)

PWC is the process of applying knowledge in the KM cycles, suggested by Seufert et al. (2003). It transforms knowledge to wisdom, putting the knowledge in practise to tackle the current challenges and prepare for the future, as argued by Russell Ackoff (1989) that wisdom is dealing with the future. The knowledge conversion in this process is between tacit to tacit/explicit; it involves the socialization and externalization process in the SECI model (Nonaka, I. and Takeuchi 1995). PWC is beyond PKI as it puts knowledge in practise in tackling the daily challenges from personal life, social life and work.

The required skills / competences in PWC are problem solving, creativity and mental agility. Based on the research results, organizing, evaluating, analysing and collaborating were the highest scored PKM skills in applying knowledge. These PKM skills were also the essential skills for problem solving competence, creativity competence and mental agility competence.

4. Interpersonal Knowledge Transferring (IKT)
IKT plays an important role in PKM 2.0 which maximizes the knowledge work by others to form a knowledge collaborating environment for individuals. It is the process to share / transfer knowledge in the KM cycles suggested by Seufert et al. (2003). It transforms the information and knowledge in both explicit and tacit form. It is a bidirectional transfer through different social activities in both face-to-face and virtual models. IKT is beyond PIM, PKI and PWC as it positions PKM 2.0 in an interactive and collaborating mode. It links the networked individuals together and gears the distributed process of socialization, externalization, combination and internalization (Nonaka, I. and Takeuchi 1995) in a meshed knowledge network to increase the knowledge flow and knowledge quality.

The required skills / competence in IKT are securing, presenting and communication, and collaborating. Based on the findings in this research, collaborating and presenting were the essential PKM skills for sharing / transferring knowledge which are also the essential skills for communication competence. Although securing information skills always scored the lowest among the seven PKM skills in all KM process, the authors believe that it is an essential PKM skill in sharing / transferring knowledge, and actually securing information skill obtained the highest score in the sharing / transferring knowledge process.

The concept of PKM 2.0 is a dynamic framework where PIM, PKI, PCW and IKT are working in an interactive mode. It is leveraging the knowledge and wisdom of the networked individuals to produce a meshed knowledge network. The authors recommend undertaking future research based on this conceptual model to investigate the relationship between these 4 interactive components. The research agenda should also include the application of PKM in different individual and organization contexts, and also how the recent development of Web 2.0-based PKM tools can enable PKM to maximize the contribution to competency improvement.

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