Knowledge Synthesis Using Multichannel of Media in the Case Study of Integrated Circuit Industry

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Abstract

This research develops Knowledge Synthesis model for employees, especially in integrated circuit industry, to convert tacit into explicit knowledge. Multichannel of media is provided alternatives not only for knowledge worker but also user to gain the advantages of synthesized knowledge. Data obtain from a sample in electronic company, privileged from Thailand's Board of Investment. Statistical analysis covering t-test, Pearson's product moment correlation coefficient, and structural equation modelling are assessed. The findings indicate that the model has positive feedbacks both from the treatment group and external organization's management perspectives. Implications of the results are offered.

Keywords: Media, Knowledge Synthesis, Knowledge Management, Integrated Circuit Industry

1 Introduction

Under the flow of dynamic globalization among economic, social, political, and technological changes, it has been solidly driving organizations not only public but also private sectors to focus on responding such challenges. Alley [1] pointed out that capitalism was moving forward from industrial era to knowledge capitalism where traditional management practices had been ended. While typical economic paradigm emphasizes on efficiency and profit, modern organizations can survive, compete, and grow continually depending on the abilities of creative thinking and innovation. Intellectual-based capability is genuinely prominent [2-3] and can be implemented through knowledge management (KM). As the pace of competitiveness increased, physical resources are inadequate to provide distinctive competitive advantage because they can be imitated and acquired by anyone on an equal basis. The real value of organizations counts on their knowledge base and ideas as well as insights that lie in the heads of their employees [4].

From contemporary situation of economic forces, it directly impacts to business units, in particular integrated circuit (IC) industry, that reply on high technology in production and speedy shift of its commercial natures from both market demands and customer's needs. Based on Thailand's Board of Investment data, they report that the amount of investments in electrical and electronic sectors is in the 4th rank of major Thailand's export. The main markets are the United States, Hong Kong, Japan, Singapore, and Malaysia counting at 70% of total electronic export value (19,000 million US dollar) in 2009 [5]. The overall trend of electronic business is positive as external factors still support the growth, but internal competitions within the industry are highly firm [6]. KM has been viewed as a strategic resource for organizations to enhance the competitive advantages [7-8].

The drawbacks in the implementation of KM in many companies including electronic industry (IC) are diverse i.e. no time to practice KM by employees, barriers from company culture, lack of understanding on KM and its benefits, concerns on losing job, poor designed organizational processes, and etc [9]. Without systematically maintaining the knowledge for future usage, scattered knowledge can be spread out and tied up in the organization. This is regrettable

if such knowledge is not organized, then expanded its base and companywide shared to all employees in the firm. The objective of this research was to develop a knowledge synthesis model for KM process that enables to convert employee's tacit to explicit knowledge with the support of multichannel of media. The model will be advantageous for both electronic industry, particularly IC firms, and other business settings where are implementing KM.

2 Theoretical framework, hypotheses, and research model

2.1 *Knowledge Management*

Today, KM is considered as a dominant strategy in business competition. Not only it is known as the foundation for stable development but also the source of maintaining competitive nature for organization [10]. KM is often viewed as multidimensional, multidisciplinary and dynamic. There is no consensus on its definite procedural implementation because it has different viewpoints and opinions among scholars and authors. Researcher; therefore, develops 9 steps of KM framework in this study as follows:

1. Knowledge Acquisition: Employees use several channels to acquire and search for knowledge both internal and external organizations such as supervisor's advice, talk among colleagues, social network and community of practice [11]. There are many potential sources of knowledge for individuals to use such as culturally embedded practices, documents, policies, and individuals themselves [12-13]. Getting the right knowledge on a timely basis is one of the major challenges of knowledge acquisition. If appropriate knowledge sources are not accessible, for example, even the best knowledge can be of limited value [14].

2. Knowledge Creation: Successful firms are companies that are consistently creating and circulating new knowledge in the organization and applying it to new product technology. This implies that knowledge creation must be the centerpiece of the companies' organizational strategies [15]. Everyone can be knowledge creator from a wide range of sources that may be initiated from direct experience, work practices, learning by doing, research and development.

3. Knowledge Storage: After knowledge is absorbed with respect to routines of operational performance, individuals and organizations should retain it onto organizational memory

through any pertinent media such as manuals [16]. This enhances the effective diffusion of organizational knowledge. Furthermore, KM will not succeed unless some are specifically made responsible for compiling, planning, and organizing knowledge with organization network and technology repositories. Companies should communicate to employees for their awareness on channels in seeking knowledge both formal and informal sources [17].

4. Knowledge Sharing: Knowledge will become worthless if it is not shared and transferred. This enables to build up competitive advantages of the organization. Sharing knowledge between units contributes remarkably to organizational performance when people communicate best practices, lessons learned, insights as well as experiences [18]. The more explicit knowledge presents, the greater sharing takes place. As aligned with Inkpen and Dinur [19], implicit knowledge could negatively impact to wide dissemination of shared knowledge. Sharing process can happen between individuals, groups or firms using any type of communication channels intentionally and unintentionally.

5. Knowledge Reuse: If knowledge can be reused, it will reduce the waste caused by of "reinventing the wheel" and improve the process efficiency [20]. Reusage allows explicit knowledge to be edited then distributes the useful information in the organization. Scholars have consensus that explicit knowledge is only format that high technology can circulate and reuse [21]. The advantages of knowledge reuse are paramount such as increasing work performance, strengthening efficacy, accelerating work flow, and reducing operating costs [22].

6. Knowledge Codification: Knowledge codification improves the chance of transferring then knowledge to other units in the firm, and also facilitates its assimilation, retention, and exploitation. Thus, knowledge codification process advances implicit routines to become more tangible asset [23]. The institutionalization of the knowledge through codification helps to create a favorable context for the exchange of different organizational units, less dependent on retaining certain workers, encourage continuous improvement as well as constant innovation [24].

7. Knowledge Application: The key point in KM is to ensure that the presented knowledge, existed in

organization, is applied productively [25]. The effective application of knowledge helps companies increase their efficiency and reduce cost [26]. Knowledge application includes the usage for decision-making protection, action and problem solving which can finally lead to knowledge creation. Information technology can effectively assist knowledge application via using an organizational procedure [27]. Furthermore, Markus [28] suggested that the source of competitive advantage resided in knowledge itself, but in the application of the knowledge.

8. Knowledge Synthesis: Complex interactions between the KM facets of storage and retrieval, and sharing with process coordination mechanisms create knowledge synthesis. Inherent in routine activities is the repeated interaction of employees over time with the business environment; therefore, knowledge synthesis in a workflow context arises from systematic discovery of repeating patterns and creating an optimal set of activities to address those patterns via disseminated channels [29]. The dispersion of knowledge across many individuals allows diverse perspectives, but also raises the need to bring the knowledge together as a "clue gathering" throughout cross-area resources [30]. To gain the greatest advantage, knowledge synthesis describes a situation of dynamic knowledge exchange, reflecting an environment where interactive learning takes place among actors via cooperation [31].

9. Knowledge Evaluation: Shan and Zhang [32] explained criteria of evaluating knowledge including accuracy, understandability, benefit, and innovation. Despite the various studies trying to develop metrics and methods to assess knowledge [33], people think knowledge evaluation is one of the most difficult parts of KM activities [34]. Some studies argue that knowledge cannot be assessed, but that activities or outcomes associated with applying knowledge can be evaluated [35].

H1. Treatment group for KM concept has statistically significant differences from non treatment group.

H2. Knowledge acquisition has statistically significant correlation with knowledge synthesis.

H3. Knowledge creation has statistically significant correlation with knowledge synthesis.

H4. Knowledge storage has statistically significant correlation with knowledge synthesis.

H5. Knowledge sharing has statistically significant correlation with knowledge synthesis.

H6. Knowledge reuse has statistically significant correlation with knowledge synthesis.

H7. Knowledge codification has statistically significant correlation with knowledge synthesis.

H8. Knowledge application has statistically significant correlation with knowledge synthesis.

H9. Knowledge evaluation has statistically significant correlation with knowledge synthesis.

H10. Knowledge acquisition, creation, storage, sharing, reuse, codification, application, and evaluation have statistically significant correlation with knowledge synthesis.

2.2 *Media*

Media are the pipeline for facilitating information transfer; one's choice among different media types depends on information processing context and need [36]. Advanced information system has been brought such as Intranet and Internet for conveying knowledge and information to people both internal and external organizations. Innovative technologies have witnessed a transformation of KM practices where users bring content, collaborate, and share knowledge through social network, web-based forum, and social bookmarking tools. Using Web 2.0, people do not only passively consume information; rather, they are active contributors, even customizing tools and technology for their use [37]. Multichannel of media serves a broad variety of new options for communication, interaction, and sharing either formal or informal manner. No matter how intelligent they are, using social media is better at solving problems, fostering innovation, and coming to wise decisions. In this interconnected, dynamic world, new ways of cultivating and exploiting knowledge with customers, suppliers, and partners are forcing companies to expand their KM concepts [38].

2.3 *Media and Knowledge Synthesis*

Choices of communication media have increased significantly in the last 2 decades with the proliferation of computing and networking technologies. Before the 1980s, conventional communication channels were limited to face-to-face conversation and the use of telephones, and paper

documents. In the 1990's, a great deal of attention was shifted to email and its potential impact on business organizations and society in general [39]. Online social networking systems allow people to manage their interaction with others on a massive scale. Blogs, Twitter, and Skype have provided new communication tools to interact more efficiently with others in opened communities. This perspective has appeared so relevant and promising that many specialists consider this approach to be the future of KM [40]. Unlike classical KM tools (face-to-face, telephone, fax), the new technologies focus not on capturing knowledge, but on enhancing knowledge work by facilitating collaboration [41].

- Type of media: There are numerous types of media such as board announcement, mentoring, seminar, meeting, video sharing, Wikipedia, and social network [42]. To select each type of media should depend upon the purpose or focus of such communication.

- Character of media: The nature of media should enable to be flexible, cover all data content, deliver quality information with accuracy, and facilitate for distributing knowledge to broad users [43].

- Efficiency of media: Mustaffa and Beaumont [44] described the efficiency of media that led to shorten the time and distance, make network efficient, and establish new innovation. Dewett and Jones [45] also believed that the efficiency of modern media would add up the efficiency and innovation for organization.

H11. As for the structural equation modelling knowledge synthesis using multichannel of media, developed by the researcher, includes goodness of fit with empirical data.

2.4 *Research Model*

Figure 1 shows KM framework as proposed for practical implementation in the organization that covers 11 hypotheses. For the 1st hypothesis, it serves for t-test analysis. The 2nd-10th hypothesis are Correlation testing. The 11th hypothesis aims for structural equation modelling. According to the model, the indicators are type, character, and efficiency. The model proposes that media are positively related to knowledge synthesis.

3 Method

3.1 *Sample and procedure*

Sample group of this study was purposively selected from one of 20 plants in electronic industry, manufacturing integrated circuit that has been privileged from Thailand's Board of Investment.

Data collection was included 3 major sections: implementation practice, qualitative method and quantitative research. In terms of implementation by a controlled group out of 11 departments in the purposive organization, the treatment unit (Quality Assurance) was proposed to practice 11 processes as follows:

1st step: Reviewed literature by researching KM concepts and theories regarding knowledge acquisition, knowledge creation, knowledge storage, knowledge sharing, knowledge reuse, knowledge codification, knowledge application, knowledge synthesis, and knowledge evaluation.

2nd step: Gathered information and summarized conceptual ideas for developing research framework.

3rd step: Practiced the framework, started by a knowledge worker acquiring own knowledge. The worker could capture the knowledge and transfer into written evidence by himself, or be assisted by supervisor, through diverse forms of media, to write such knowledge on behalf of the subordinates.

4th step: Either the knowledge worker or supervisor created such knowledge into explicit one.

5th step: Supervisor verified the correctness of such knowledge and commented for further improvement.

6th step: The next round of second knowledge refinement by manager or team was required then stored it on organization system.

7th step: The knowledge was shared on company information system such as share point.

8th step: If the knowledge was reused and could be applied smoothly by a user, it would be synthesized knowledge that could be referred for work area.

9th step: Contrarily, any issue raised by the user had to be codified such knowledge by the worker and forward back to the user for second application. If there was no any further comment, such knowledge would be quoted as synthesised knowledge.

10th step: The synthesized knowledge should be evaluated by another user. In case that there was no feedback, it would be approved by supervisor and manager or team respectively.

11th step: Synthesized knowledge would be shared throughout the organization.
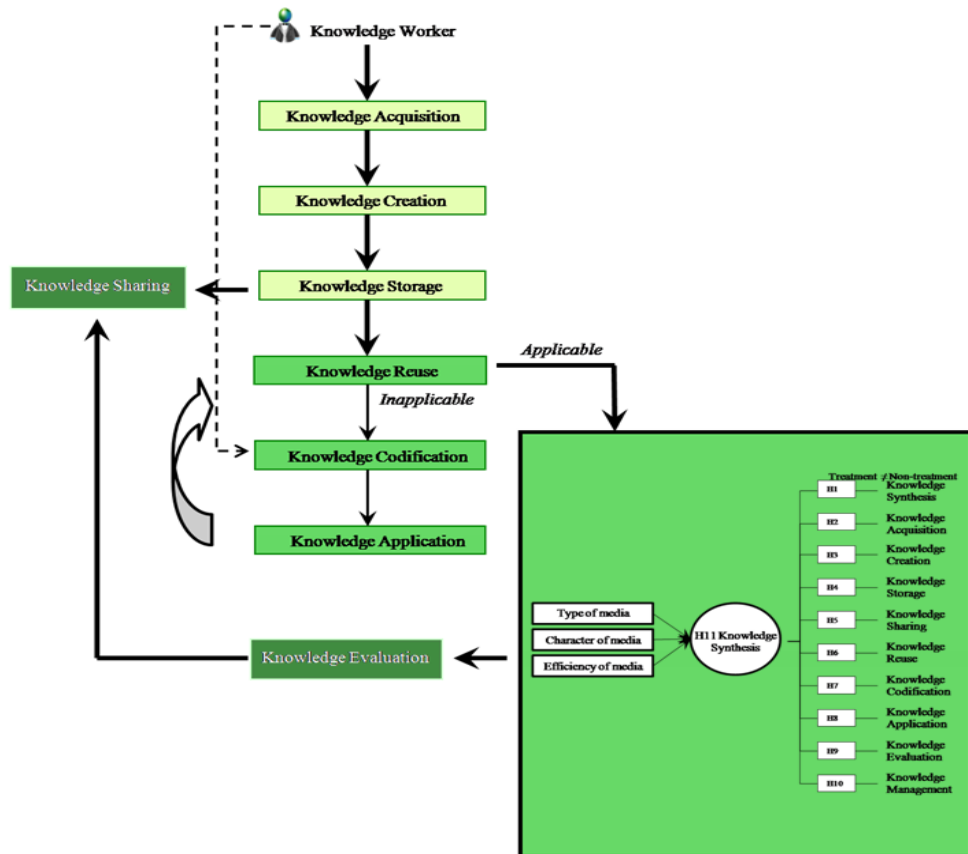
Figure 1: KM framework

With respect to qualitative method, KM conceptual framework was shared to managerial position in external electronic firms, and gathered their opinions by interview if those organizations concretely practiced the framework. Satisfaction questionnaire was also requested for the management to complete.

Regarding quantitative research, it was conducted via 2 questionnaires. Selection sampling at 353 persons from the population at 3,000 was referred to Yamane table with 95% reliability. Sample group was divided into cluster random sampling as each section of the organization which consisted of 12 departments. Next, simple random sampling was done into the sampling unit in each department. The number of respondents for the 1st and 2nd questionnaire was returned at 394 (from 546 distributed) and 632 (from 801 distributed) papers respectively.

3.2 *Measures*

There were 2 questionnaires that gathered empirical data for quantitative analysis from employees in all levels in the sample group. The first questionnaire, consisting of 52 questions about KM opinion, was divided into 2 sections. The first section (7 questions) was to collect general information of respondents and the second part (45 questions of 5 point Likert scale) was to collect opinions of KM aspects. The data aimed to serve statistical analysis for t-test and Pearson's Product Moment Correlation. The second questionnaire, consisting of 23 questions on Media and Knowledge Synthesis, was divided into 2 sections. The first section (8 questions) was to gather overview data of respondents and the second part (8 major questions of 5 point Likert scale) was to focus on Media affecting to Knowledge Synthesis. The data purposed to serve for Structural Equation Modelling. Both questionnaires were examined in terms of Face Validity by 3 experts in human resources, followed by Content Validity. Next, Index

of Item Objective Congruence (IOC) was conducted. The items which were over .5 would be included in the questionnaire. After that, try-out groups at 36 and 33 papers were piloted with sampling group in the same industry for each questionnaire.

3.3 *Data Analysis*

This study employed t-test and Pearson's Product Moment Correlation for the first questionnaire and SEM for the second paper. In terms of SEM analysis, the validation of constructs was developed via confirmatory factor analysis (CFA). Moreover, we tested the internal reliability of the scales through the composite reliability index (CRI) and the extracted variance index (EVI).

The hypothesized relationships were tested using SEM. The overall X^2 measure, CFI (comparative fit index), IFI (incremental fit index), RMSEA (root mean square error of approximation), and SRMR (standardized root mean square residual) were used

to evaluate model fit. The internal consistency reliability was assessed using the cut-off value of .50. The reliability testing by Cronbach's Alpha Coefficient was .91 and .97 respectively.

4 Results

Results from t-test analysis reported the differences between controlled group among other departments in the organization. This advised that the treatment section tended to differ statistically significant KM aspects from non-treatment group. Hypothesis 1 was supported. Only 2 items from 45 questions showed no statistical different. Additionally, results from the correlation analysis were displayed in Figure 2.

The correlation showed that each KM procedure and knowledge synthesis had significantly associated at the $p < .01$ and .05 levels. In overall, the correlation outcome was under average level. Hypothesis items 2-10 were supported.

KM	KSy33	KSy34	KSy35	KSy36	KSy37	KM	KSy33	KSy34	KSy35	KSy36	KSy37
Knowledge Acquisition						**Knowledge Reuse**					
KA5	.227**	.252**	.191**	.132**	.151**	KR21	.515**	.489**	.488**	.496**	.488**
KA6	-.044	-.076	-.092	-.060	-.053	KR22	.461**	.473**	.440**	.423**	.425**
KA7	.253**	.303**	.279**	.228**	.270**	KR23	.463**	.480**	.526**	.420**	.449**
KA8	.248**	.280**	.276**	.264**	.254**	KR24	.505**	.536**	.506**	.457**	.467**
Knowledge Creation						**Knowledge Codification**					
KC9	.271**	.253**	.209**	.218**	.226**	KCo25	.334**	.387**	.336**	.307**	.312**
KC10	.161**	.198**	.268**	.248**	.256**	KCo26	.418**	.429**	.408**	.382**	.389**
KC11	.185**	.189**	.185**	.263**	.259**	KCo27	.420**	.437**	.366**	.322**	.290**
KC12	.219**	.256**	.240**	.343**	.285**	KCo28	.548**	.516**	.531**	.421**	.490**
Knowledge Storage						**Knowledge Application**					
KS13	.124*	.208**	.238**	.247**	.262**	KAp29	.434**	.464**	.447**	.375**	.419**
KS14	.299**	.322**	.330**	.362**	.357**	KAP30	.423**	.418**	.389**	.353**	.346**
KS15	.300**	.296**	.389**	.340**	.463**	KAp31	.188**	.167**	.154**	.105*	.178**
KS16	.253**	.275**	.319**	.322**	.342**	KAp32	.406**	.365**	.358**	.347**	.317**
Knowledge Sharing						**Knowledge Evaluation**					
KSh17	.221**	.206**	.189**	.168**	.196**	KE38	.472**	.436**	.436**	.430**	.427**
KSh18	.288**	.266**	.252**	.209**	.222**	KE39	.434**	.434**	.405**	.478**	.420**
KSh19	.193**	.215**	.210**	.207**	.205**	KE40	.496**	.478**	.436**	.448**	.501**
KSh20	.303**	.336**	.390**	.468**	.316**	KE41	.400**	.430**	.385**	.321**	.389**

** statistically significant correlation at the level .01

* statistically significant correlation at the level .05

Figure 2: Results from the correlation analysis

Measurement results were reported in Table A in Appendix. Table 1 presented means, standard deviations, and correlations of study constructs of study constructs. In the light of the results reported in Table 1, all direct associations were significant. Such results met the conditions for employing a mediation analysis. The fully mediated model was compared with the partially model based on the X^2 difference test ($p<.05$). The X^2 difference tests for the fully (X^2= 486.462, $df = 442$) and partially ($X^2 = 1653.467$, $df =$ 521) mediated models were reported. The fully mediated model provided a better fit to the data than

did the partially mediated model. The fully mediated model fit the data adequately based on a number of fitted statistics: ($X^2 = 486.462$, $df = 442$; $X^2/df =$ 1.001; 653; CFI = .99; IFI = .99; RMSEA = .013; SRMR = .022). The results of SEM for the fully mediated model were present in Figure 3.

The results of SEM indicated that all estimates were significant. The indicators of media were reliable. Specifically, efficiency ($\gamma_{3,1} = .52$, t = 6.95) appeared to be the most reliable indicator, followed by character ($\gamma_{2,1} = .28$, t = 3.81) and type ($\gamma_{1,1} = .13$, t = 3.95). According to the results of SEM, media

significantly and positively influenced knowledge synthesis. Therefore, hypothesis 11 was supported. The results regarding their effects demonstrated only direct and total effects. The results accounted for 76% of the variance in knowledge synthesis.

Table 1: Means, standard deviations, and correlations of study variables

	Mean	SD	WD	VI	VD	wowa	emot	Elect	Easy	Fast	Cover	omple	ransf	Acces	coura	Attrac	Share	Store	Acc	Shar	epen	hann	evelo	Satis	Techn	Capab	Ka	Kc	Kst	Ksh	Kr	Kcool	Kapp	Ksy	Ke	Km
WD	3.73	0.66	1.00																																	
VI	3.56	0.69	0.55	1.00																																
VD	3.27	0.83	0.45	0.46	1.00																															
Twoway	3.59	0.75	0.50	0.57	0.56	1.00																														
Remote	2.75	1.10	0.40	0.45	0.42	0.52	1.00																													
Elect	2.67	1.06	0.38	0.39	0.38	0.46	0.76	1.00																												
Easy	3.85	0.93	0.46	0.36	0.29	0.38	0.27	0.21	1.00																											
Fast	3.87	0.89	0.44	0.39	0.33	0.41	0.30	0.25	0.73	1.00																										
Cover	3.86	0.91	0.42	0.39	0.31	0.39	0.27	0.26	0.68	0.66	1.00																									
Complex	3.77	0.95	0.36	0.29	0.24	0.32	0.25	0.22	0.66	0.62	0.69	1.00																								
Transfek	3.72	0.91	0.40	0.36	0.31	0.37	0.26	0.24	0.59	0.62	0.61	0.61	1.00																							
Access	3.68	0.94	0.40	0.35	0.36	0.35	0.24	0.23	0.57	0.58	0.61	0.59	0.70	1.00																						
Encourage	3.67	0.92	0.37	0.32	0.29	0.35	0.24	0.24	0.55	0.57	0.52	0.53	0.53	0.53	1.00																					
Attract	3.72	0.87	0.36	0.32	0.30	0.36	0.27	0.27	0.53	0.53	0.54	0.52	0.50	0.53	0.72	1.00																				
Share	3.73	0.88	0.42	0.39	0.33	0.38	0.31	0.31	0.57	0.59	0.52	0.54	0.55	0.56	0.62	0.61	1.00																			
Store	3.68	0.89	0.39	0.32	0.38	0.38	0.26	0.27	0.54	0.56	0.51	0.61	0.60	0.65	0.61			1.00																		
Acc	3.84	0.87	0.42	0.34	0.33	0.38	0.29	0.28	0.62	0.57	0.59	0.59	0.58	0.60	0.58	0.59	0.66	0.63	1.00																	
Shar	3.72	0.90	0.39	0.37	0.35	0.33	0.29	0.25	0.57	0.57	0.58	0.55	0.56	0.60	0.57	0.58	0.63	0.62	0.69	1.00																
Depend	3.61	0.89	0.31	0.28	0.32	0.31	0.23	0.20	0.48	0.48	0.46	0.48	0.48	0.53	0.47	0.46	0.58	0.56	0.58	0.63	1.00															
Channel	3.64	0.89	0.37	0.35	0.32	0.37	0.28	0.23	0.56	0.56	0.57	0.55	0.55	0.57	0.56	0.61	0.66	0.61	0.66	0.64	1.00															
Develop	3.72	0.89	0.41	0.33	0.32	0.36	0.25	0.24	0.55	0.52	0.56	0.54	0.52	0.55	0.58	0.54	0.63	0.60	0.63	0.62	0.61	0.68	1.00													
Satis	3.69	0.87	0.37	0.37	0.33	0.36	0.24	0.24	0.52	0.55	0.53	0.62	0.62	0.62	0.65	0.62	0.58	0.62	0.61	0.60	0.59	0.66	0.69	1.00												
Techno	3.88	0.92	0.38	0.31	0.32	0.35	0.25	0.24	0.55	0.54	0.53	0.52	0.49	0.54	0.56	0.57	0.61	0.57	0.63	0.60	0.54	0.61	0.64	0.67	1.00											
Capabi	3.82	0.95	0.42	0.37	0.34	0.36	0.26	0.23	0.56	0.53	0.53	0.52	0.52	0.55	0.55	0.62	0.58	0.62	0.58	0.63	0.64	0.63	0.67	0.51	0.54	1.00										
Ka	3.74	0.81	0.40	0.39	0.34	0.40	0.29	0.27	0.55	0.54	0.50	0.50	0.49	0.44	0.55	0.49	0.54	0.52	0.51	0.48	0.42	0.51	0.50	0.53	0.54	0.47	1.00									
Kc	3.70	0.81	0.36	0.35	0.28	0.37	0.30	0.30	0.51	0.55	0.55	0.53	0.49	0.51	0.48	0.50	0.49	0.51	0.48	0.49	0.49	0.48	0.52	0.48	0.70	1.00										
Kst	3.67	0.88	0.39	0.37	0.31	0.37	0.30	0.28	0.51	0.51	0.52	0.49	0.50	0.50	0.52	0.47	0.56	0.57	0.55	0.54	0.47	0.52	0.51	0.58	0.54	0.51	0.63	0.62	1.00							
Ksh	3.80	0.83	0.34	0.35	0.27	0.36	0.26	0.25	0.54	0.48	0.48	0.49	0.53	0.48	0.49	0.46	0.55	0.54	0.54	0.57	0.51	0.58	0.57	0.51	0.55	0.60	0.62	0.67	1.00							
Kr	3.75	0.83	0.41	0.39	0.32	0.38	0.26	0.24	0.54	0.51	0.53	0.49	0.52	0.49	0.56	0.49	0.55	0.57	0.54	0.52	0.47	0.53	0.57	0.55	0.52	0.51	0.57	0.60	0.62	0.67	1.00					
Kcool	3.64	0.86	0.43	0.34	0.34	0.34	0.34	0.28	0.42	0.48	0.45	0.49	0.42	0.48	0.50	0.52	0.49	0.52	0.50	0.49	0.49	0.49	0.48	0.51	0.58	0.61	0.58	0.62	1.00							
Kapp	3.71	0.89	0.42	0.37	0.30	0.39	0.28	0.28	0.57	0.53	0.51	0.51	0.50	0.52	0.54	0.50	0.57	0.52	0.52	0.51	0.47	0.53	0.56	0.53	0.49	0.48	0.56	0.57	0.59	0.60	0.65	0.64	1.00			
Ksv	3.61	0.90	0.40	0.35	0.33	0.38	0.32	0.32	0.52	0.50	0.48	0.45	0.50	0.56	0.54	0.55	0.53	0.51	0.44	0.56	0.56	0.57	0.49	0.49	0.55	0.58	0.59	0.58	0.61	0.65	0.71	1.00			
Ke	3.59	0.88	0.39	0.40	0.36	0.36	0.35	0.33	0.34	0.50	0.46	0.49	0.50	0.49	0.51	0.50	0.46	0.53	0.52	0.53	0.47	0.53	0.52	0.52	0.52	0.56	0.60	0.61	0.58	0.59	0.63	0.65	0.70	1.00	
Km	3.76	0.90	0.37	0.40	0.36	0.38	0.32	0.28	0.52	0.51	0.54	0.53	0.51	0.52	0.51	0.49	0.59	0.53	0.53	0.54	0.48	0.51	0.51	0.55	0.56	0.51	0.59	0.59	0.62	0.61	0.60	0.59	0.63	0.66	0.70	1.00

5 Discussion

5.1 *Findings*

The results from statistical analysis suggested the differences of outcome between a treatment group and other departments. There was an output that displayed a positive correlation between knowledge synthesis and the other KM aspects. Empirical evidence of the relationship between media (type, character, and efficiency) and knowledge synthesis testing via SEM was viable. To use a type of media needs to be suitable with given communication circumstance [46]. For example, face-to-face conversation is appropriate for immediate response while email tends to be workable for group communication. As studied by Ozmen [47], his recommendations for enhancing KM were (1) multichannel of media should be facilitated through formal and informal settings i.e. coaching, meeting, brainstorming (2) electronic infrastructure should be properly established for effective application (3) company culture and the management should support for learning (4) strategy and action plan should involve practitioners in the implementation (5) organizing sharing session or place for exchanging knowledge and expertise should be encouraged. This was supported by Yang's study [48] that underlined company culture affecting employee's knowledge sharing. Supervisor acted an important role to persuade and cultivate sharing behavior their team.

The results of this study led to a practically knowledge synthesis model as developed on Figure 4 after being modified from actual practice, inputs from the management perspective of external organizations, and data from statistical analysis. The model consists of 6 major steps as follows:

1. Knowledge Acquisition: A knowledge worker acquires tacit knowledge such as expertise, experience, or idea via daily works. Then capture, particular knowledge which would be advantageous to other colleagues. The worker can present such knowledge through a wide range of media i.e. clip, short message, and interview. Multichannel of media openly facilities employees in converting implicit knowledge because some of them may encounter limitations to convey own idea into written message. Supervisor enables to assist subordinates in transferring the knowledge. Deliver the knowledge via media is easier way in presenting tacit concept, rather recording in long written one.

2. Knowledge Creation: The worker or supervisor can take role for creating such knowledge into explicitly written evidence. Supervisor then verifies its correctness and gives suggestions to

the worker for improvement. If the amended knowledge is qualified, it will not be further examined in the next step. Manager or a team will conduct the second check before storing in organization system. On the other hand, if the knowledge is invalid, it will be ended.

3. Knowledge Storage: The stored knowledge will be shared in company database such as share point, share drive, and web board. Moreover, it can be proceed in the form or work procedure including manual as appropriate.

4. Knowledge Reuse: Once the knowledge is reused, if any questions are asked by the user, the worker has to amend and codify the knowledge, based on received feedbacks from the user. After that, the user will apply the codified knowledge. If there is

no any further issue from the user, such knowledge will be cited as knowledge synthesis.

5. Knowledge Synthesis: Conversely, if a user can utilize the knowledge without any problem, it will be considered as knowledge synthesis. The synthesized knowledge can be delivered through various forms of media as suitable with high accuracy of its content due to previous 2 checking in the steps of knowledge creation and knowledge reuse. The knowledge; thus, will be ready to use and quoted for work reference.

6. Knowledge Sharing: Synthesized knowledge will be shared throughout the organization then promote for employees' awareness via several channels such as email notification, pop-up message, and department meeting.
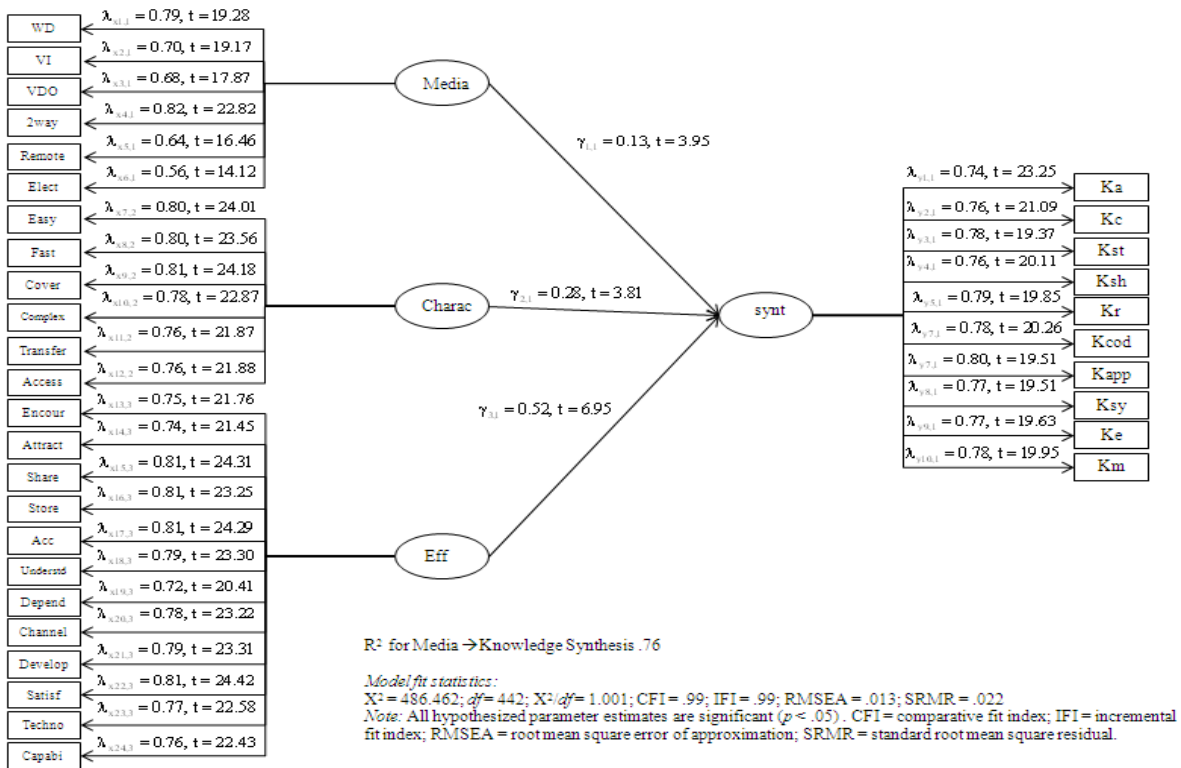

Figure 3: Structural model results

The results also discovered that multichannel of media for presenting synthesized knowledge in accordance to knowledge synthesis model for each step was 1) Knowledge Acquisition: announcement board, manual and email respectively, 2) Knowledge Creation: board, email and specification, 3) Knowledge Storage: computer file on share point, email and photo/graph, 4) Knowledge Reuse: specification, email and storytelling, 5) Knowledge Synthesis: email, board and group meeting, 6) Knowledge Sharing: email, board and informal talk. Additionally, the conceptual model was presented to managers in external organizations then conducted phone interview for collecting their opinions if the model was applied in those companies. They were pleased with the model especially its clear system, uncomplicated process, and accuracy of synthesized knowledge. This was conformed with the results of

satisfaction survey. Nonetheless, the issue of employee's time contribution to implement KM in workplace was highlighted by managerial respondents. This provided the same finding as Wong and Aspinwall [49]; therefore, company should begin KM application from some divisions and gradually extend to wider sections, rather completely launching the practice throughout the whole organization. The data also reported the first two used types of media were 1) Written document: specification and manual, 2) Verbal interaction: meeting and informal talk, 3) One-way video and audio & visual aid: board and photo/graph, 4) Two-way communication: training cours and mentoring, 5) Two-way remote communication: talk over telephone and conference call, 6) Electronic-based media: email and Wikipedia.
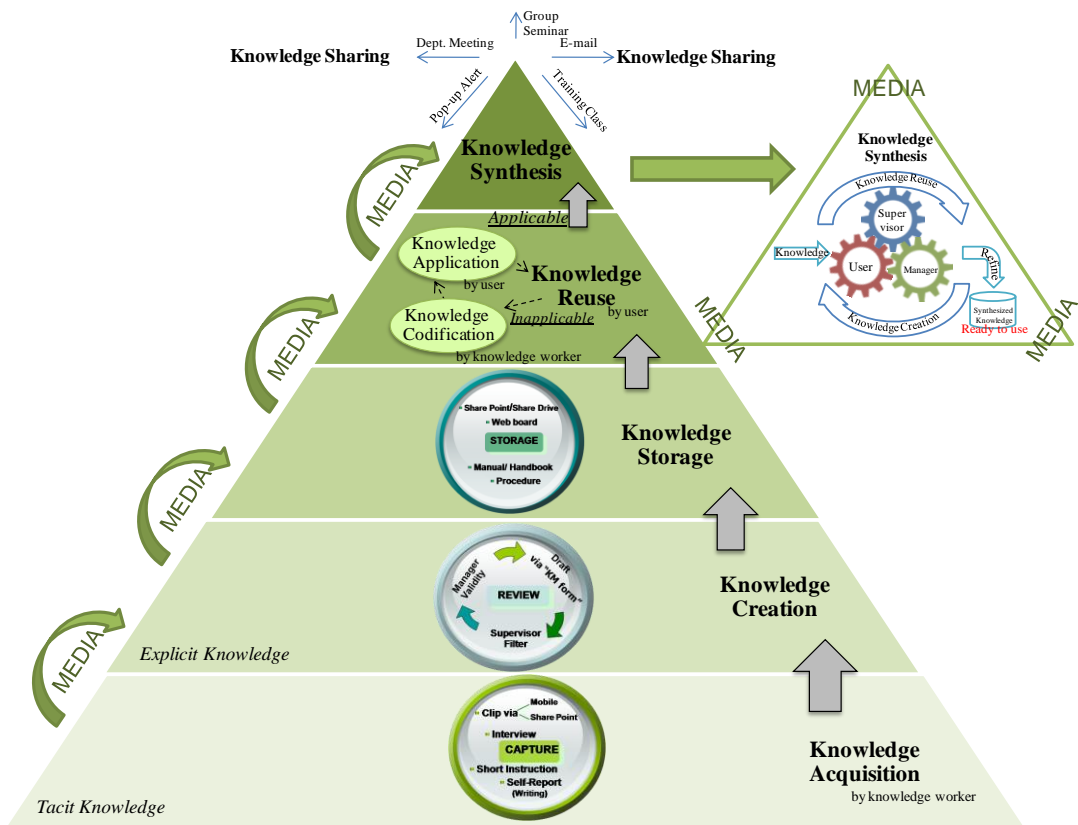

Figure 4: Knowledge synthesis model

5.2 *Management implications*

The results of this research delineated several useful implications regarding the management of KM practice. Knowledge which has been systematized via KM can be reutilized for improving tasks, then reduce operating costs as well as the loss of time and effort on redundant innovation. Especially knowledge synthesis, it is not solely to coordinate and exchange knowledge. Synthesised knowledge is to integrate as an outcome from learning process and inputs towards the knowledge. Organization should assist for synthesizing knowledge and broadly share it to team members. This can increase diverse viewpoints and ideas, then encourage for collecting knowledge in workplace. KM can decrease time consumption and resources in searching information. Additionally, it can capture specific lesson learnt from daily job assignments and further utilize the knowledge for promptly responding to customers' demand and work issues. Organization should promote proper usage of media in communicating and educating employees via announcement board and email. The content should be presented in graph or photo as well as video presentation. Supervisor should encourage and give opportunity to team members for brainstorming that can lead to diversified new ideas then gather them for company knowledge. Supporting for the usage of technological media such as email, FMEA, or online specification, sufficient computer should be provided for employees. Organization, then, should educate on how to cope with advanced media for strengthening employee's abilities in order to handle dynamic KM particularly for applying, reusing, and storing knowledge. The management should ensure that they follow up KM practices from time to time then collect data for further promotion and improvement in workplace. Budget should also be allocated as an incentive for practitioners. This will be helpful to motivate employees for more contributions. As studied by Khalil, Claudio, and Seliem [50], the management should develop policy to draw their KM participation through reward program, especially tangible incentives that can steer KM practices stronger than intangible rewards. On a closing note,

the aforementioned implications would also be beneficial for electronic managers in Thailand, in particular IC business, to understand KM perspectives of the industry, then further effective implementation in the organization.

5.3 *Limitations and avenues for future research*

There are limitations to the present study. Firstly, this study pilots the research framework by one section in the organization. To use cross-sectional data from many divisions for evaluating the model would be advantageous. Second, this conceptual practice does not permit solid conclusions in terms of model effectiveness. Using longitudinal data for testing the implementation would be advantageous. Third, other influencing factors such as organization culture, leadership, and trust would provide a better understanding on KM practice. In future studies, comparing the application of the research model in other electronic organization or business industries would gain a better picture of KM practice.

6 Conclusions

The research developed knowledge synthesis model to convert tacit into explicit knowledge, particularly electronic industry. Multichannel of media allowed for efficient acquiring, sharing, applying, and definitely synthesizing knowledge. The results showed that knowledge synthesis model practically enabled to implement in business unit from the sample group and through the management opinion's of external companies. Statistical measures also suggested the conformity of findings. In today's global competitive market environment, a richer and deeper understanding of multichannel of media that may be linked to knowledge synthesis and, definitely knowledge management, will continue to be important. In closing, it is anticipated that the results of this research can motivate other researchers to focus on the mediating role of media towards knowledge synthesis using data obtained from multiple sources.

Appendix

Table A Confirmatory factor analysis results

Scale items	Standardized loading	t-Values
Type of media		
Written Document media helps for synthesizing knowledge that is ready to be used for your work.	.63	15.83
Verbal Interaction media helps for synthesizing knowledge that is ready to be used for your work.	.69	17.97
One-way Video and Audio ; Visual Aid media helps for synthesizing knowledge that is ready to be used for your work.	.68	17.79
Two-way Communication media helps for synthesizing knowledge that is ready to be used for your work.	.82	22.28
Two-way Remote Communication media helps for synthesizing knowledge that is ready to be used for your work.	.62	16.27
Electronic-based media helps for synthesizing knowledge that is ready to be used for your work.	.57	14.13
Character of media		
Media, easy to use, helps you to gain knowledge advantages that are ready to be used by people in the organization.	.80	23.39
Media, fast managing, helps you to gain knowledge advantages that are ready to be used by people in the organization.	.79	22.60
Media, covering entire information, helps you to gain knowledge advantages that are ready to be used by people in the organization.	.84	25.14
Media, not complex to operate, helps you to gain knowledge advantages that are ready to be used by people in the organization.	.81	23.95
Media, supportive for transferring knowledge among people, helps you to gain knowledge advantages that are ready to be used by people in the organization.	.74	21.01
Media, which can be accessed by users widely, helps you to gain knowledge advantages that are ready to be used by people in the organization.	.72	20.17
Efficiency of media		
Multi-channel of media in knowledge synthesis encourages you become active in acquiring knowledge.	.74	21.18
Multi-channel of media in knowledge synthesis attracts you to gain more advantages from knowledge.	.74	21.19
Multi-channel of media in knowledge synthesis helps you to convey and share knowledge easily.	.80	23.69
Multi-channel of media in knowledge synthesis helps you to better store knowledge the organization.	.77	22.80
Multi-channel of media in knowledge synthesis helps you to more access knowledge.	.80	23.97
Multi-channel of media in knowledge synthesis helps you to more understand the sharing knowledge.	.79	23.40
Multi-channel of media in knowledge synthesis helps you to less depend upon or enquire others about knowledge.	.73	20.85
Multi-channel of media in knowledge synthesis helps you to have a wider alternatives or channels.	.80	24.01
Multi-channel of media in knowledge synthesis helps you to develop personal abilities from gaining knowledge advantages.	.81	24.38
Multi-channel of media in knowledge synthesis makes you satisfy from obtaining knowledge.	.82	25.20
Multi-channel of media in knowledge synthesis is suitable for current situation under advanced technology.	.76	22.30
Multi-channel of media in knowledge synthesis helps organizations to improve capabilities in business competition e.g. innovation and decision making.	.77	22.65
Knowledge management		
Acquiring knowledge for work practices can be improved by using multi-channel of media.	.73	20.73
Creating knowledge for work practices can be improved by using multi-channel of media.	.76	21.78
Storing knowledge for work practices can be improved by using multi-channel of media.	.80	23.34
Sharing knowledge for work practices can be improved by using multi-channel of media.	.76	22.05
Reusing knowledge for work practices can be improved by using multi-channel of media.	.79	23..03
Codifying knowledge for work practices can be improved by using multi-channel of media.	.78	22.96
Applying knowledge for work practices can be improved by using multi-channel of media.	.80	23.68
Synthesizing knowledge for work practices can be improved by using multi-channel of media.	.77	21.89
Evaluating knowledge for work practices can be improved by using multi-channel of media.	.76	22.85
Managing knowledge for work practices can be improved by using multi-channel of media.	.78	22.72

Model fit statistics: $X^2 = 486.462$; $df = 442$; $X^2/df = 1.001$; CFI = .99; IFI = .99; RMSEA = .013; SRMR = .022

Note : All loadings are significant at the .05 level. CFI = comparative fit index; IFI = incremental fit index; RMSEA = root mean square error of approximation; SRMR = standard root mean square residual.

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