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# THE EFFECTS AND INFLUENTIAL FACTORS OF EMPLOYEE'S KNOWLEDGE INTEGRATION CAPABILITY IN THE CONVERGENCE ENVIRONMENT

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## Abstract

*Knowledge integration is becoming a primary function of improving organizational capabilities and performance in today's convergence environment in which the integration of individual knowledge is the source of organizational knowledge creation for new product and service development. This study investigates the influential factors of employee's knowledge integration capability and its effects. A theoretical research model was developed based on knowledge creation, socio-technical, and information processing perspectives. In particular, the model proposes a positive relationship between the knowledge integration capability of employees and their knowledge creation output. The model also includes organic organizational structure, teamwork quality, expertise, IT support, and knowledge complexity as the influential factors of an employee's knowledge integration capability. A large-scale survey was conducted for data gathering (a total of 316 samples from 141 organizations) to test the proposed model. The analysis results of the hypotheses test show that expertise and knowledge complexity are the significant influential factors of employee's knowledge integration capability. In turn, this capability has a positive effect on the knowledge creation output of employees. The results of this study will contribute to the development of initiatives for promoting knowledge integration in the development processes of convergence products and services.*

*Keywords: Knowledge Management, Employee's Knowledge Integration, Theory of Knowledge Creation, Socio-Technical Perspective, Information Processing Perspective*

# 1 INTRODUCTION

Since the mid-1990s, the strategic management field has recognized knowledge integration as the essential capability for achieving competitive advantage. Grant (1996) argues that knowledge integration has a primary function in improving organizational capabilities and performance. Prior research empirically shows that knowledge integration has positive effects on organizational performance at various levels, such as financial performance (Collins & Smith, 2006), product development performance (Lin & Chen, 2006), and information systems development performance (Tiwana & McLean, 2005). Moreover, due to the radical diffusion of convergence, “the synergetic combination of different objects or ideas of other contexts” (Lee & Olson, 2010, p. 8), knowledge integration is becoming a more crucial capability of contemporary firms in today’s business environment.

In the convergence process for creating new business opportunities and value, the integration of various functionalities and knowledge is essential (Ojanperä, 2006). In particular, Hacklin et al. (2009) argue that the combination of external and internal knowledge, i.e., knowledge integration, represents the potential for a higher level of business convergence (e.g., technological, applicational, and industrial convergence). Therefore, when a firm carries out a convergence strategy, knowledge integration which allows utilization and reconfiguration of existing knowledge of the firm is a critical success factor for its business success (de Boer et al., 1999). However, unlike other knowledge activities (e.g., knowledge seeking, sharing, and transfer), knowledge integration has been relatively ill-understood in prior research.

In the organizational knowledge integration process, employees are the primary agents of organizational knowledge integration (Zheng et al., 2009; Jang, 2012). An employee gathers knowledge from external sources (e.g., other individuals, documents, information systems) and then generates integrated knowledge by combining, reorganizing, and/or synthesizing the external knowledge and his/her own knowledge (Janczak, 2004). This individual-level integrated knowledge will become a source of knowledge integration at the organization and group levels. However, research on how organizations improve employee’s knowledge integration is lacking in the literature. It causes difficulties in developing firms’ appropriate knowledge integration strategy and initiatives.

To fill these gaps in current literature, this study investigates the effects of employee’s knowledge integration capability on employee’s knowledge creation in the convergence environment and also examines the influential factors of employee’s knowledge integration capability. The study aims to answer two main research questions:

- Does an employee’s knowledge integration capability have a positive effect on his/her knowledge creation output?
- What are the influential factors of an employee’s knowledge integration capability?

The next section describes the conceptual foundations of the study. Next, we describe the study’s research model and hypotheses. Subsequently, we present the details of our data gathering methodology and analysis. Finally, the paper discusses the implications of the study with its potential contribution to the relevant literature.

## 2 THEORETICAL BACKGROUND

As the theoretical backgrounds of the study, we adopt (1) the theory of knowledge creation, (2) socio-technical perspective, and (3) information processing perspective.

### 2.1 Theory of Knowledge Creation

The relationship between employee’s knowledge integration capability and knowledge creation can be explained by the theory of knowledge creation. Nonaka (1994) argued that new technologies and

products (i.e., outcomes of knowledge creation) are produced by synthesizing the employee's and top manager's tacit knowledge (i.e., integration of tacit knowledge). According to Nonaka and Toyama (2003), the knowledge synthesis is a process of "integration of opposing aspects through a dynamic process of dialogue and practice" (p. 2). Nonaka (1994) argued that in the socialization, externalization, combination, and internalization (SECI) processes of organizational knowledge, the transformation between tacit knowledge and explicit knowledge is based on the knowledge synthesis at the individual level and/or group level.

## **2.2 Socio-Technical Perspective**

The main purpose of this study is to investigate the influential factors of employee's knowledge integration capability to enhance employee's knowledge creation process. For this, we adopt the socio-technical perspective. The socio-technical perspective provides principles for designing or explaining the change in work and information systems (Leavitt, 1976; Bostrom & Heinen, 1977). This perspective emphasizes the joint optimization of the social and technical systems (Bostrom & Heinen, 1977). According to this perspective, organizations successfully achieve their change by managing socio-technical variables. The socio-technical variables involve task, people (actors), technology (tools), and structure, which are highly dependent on each other (Leavitt, 1976). Generally, social structure and people are classified into the social variables, whereas technology and task are regarded as the technical variables (Bostrom & Heinen, 1977).

The socio-technical perspective has also been widely adopted in knowledge management research (e.g., Thomas et al., 2001; Lee & Choi, 2003; Lin & Lee, 2006). For example, drawing upon this perspective, Thomas et al. (2001) argued that "knowledge is inextricably bound up with human cognition, and the management of knowledge occurs within an intricately structured social context" (p. 863). Likewise, this perspective has been adopted as the research framework for investigating the antecedents of knowledge creation (Lee & Choi, 2003) and knowledge sharing (Lin & Lee, 2006). It has also been used to explain organizational knowledge integration. Grant (1996) argued that knowledge integration can be achieved by the social process between individuals and groups, as well as by the application of task-specialized knowledge and information systems. In line with these arguments, Jang (2012) suggested some socio-technical practices to support social workers' knowledge integration, such as shared databases, standard forms, electronic forum, rewarding for knowledge sharing, discussion based on shared meanings, and political equity during discussion.

Although an employee's knowledge integration occurs through his/her brain process, the acquisition of external knowledge for knowledge integration can be influenced by the organizational environment. For example, knowledge acquisition from other team members can be easily done when an employee maintain a good relationship with his/her team members (Hoegl & Gemuenden, 2001). Appropriate information technologies for supporting knowledge searching, knowledge gathering, knowledge storing, and communicating have also been discussed to promote the employee's knowledge acquisition (Maier, 2007). Moreover, the employees in an organic (flexible) organization have a better understanding of the relationships among different types of knowledge (Turner & Makhija, 2012). In all, we believe that socio-technical perspective is an appropriate research framework for investigating the influential factors of employee's knowledge integration capability.

## **2.3 Information Processing Perspective**

Although the socio-technical perspective has been used as a useful theoretical framework for technology-related organizational phenomena particularly in terms of their structural and technological dimensions, it may have a limitation to explain the internal processing of human side (Pan & Scarbrough, 1999). To augment the socio-technical perspective, therefore, we adopt information processing perspective in identifying the influential factors of employee's knowledge integration capability. In making a decision or planning a behavior, an individual needs to process his/her perceived or possessed information using various mental components, such as sensory register, long-

term memory, and working memory (Wickens & Carswell, 2006). This human information processing perspective will also be useful to understand employee’s knowledge integration. According to Anderson (1974), a person integrates diverse pieces of information to generate responses (e.g., making an opinion on the new product) through internal information processing. Thus, the person’s information processing capacity will be an important determinant of the performance of human information processing. However, in addition to the personal capacity, the complexity of information for processing (or target tasks) has also been discussed as a critical factor which influences the performance (Schroder et al., 1967). In the workplace context, in particular, the greater task uncertainty (or knowledge complexity) is known to cause an increase in the amount of information that needs to be processed by its decision makers (Galbraith, 1973). Likewise, technological, environmental, and relational uncertainties of an organization increase information processing requirements of its employees and thus require higher information processing capabilities of its employees.

### 3 RESEARCH MODEL AND HYPOTHESIS

Figure 1 shows our research model. Drawing upon the socio-technical and information processing perspectives, we identify five influential factors of the knowledge integration capability of employees. The factors include organic organizational structure, teamwork quality, expertise, IT support, and knowledge complexity. Following the theory of knowledge creation, our model further involves the positive impacts of employee’s knowledge integration capability on employee’s knowledge creation outputs.

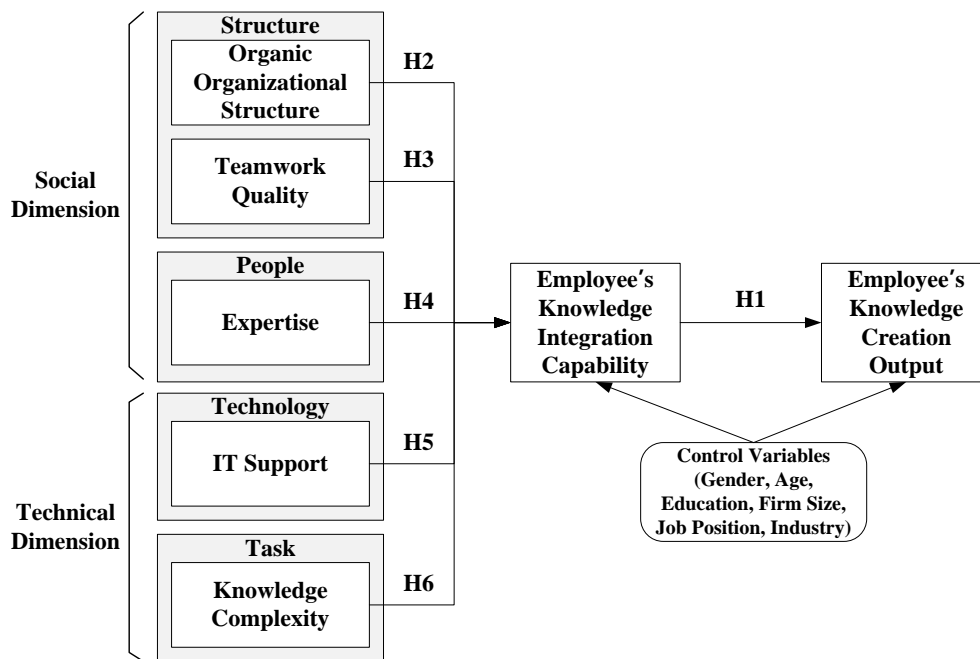


Figure 1. Research Model

#### 3.1 Employee’s Knowledge Integration Capability and Knowledge Creation Output

Knowledge creation refers to the development of new and useful ideas and solutions by employees (Mitchell & Boyle, 2010). Nonaka (1994)’s SECI model suggests that the knowledge creation process occurs through the conversion of knowledge between tacit and explicit knowledge, i.e., knowledge integration. Yamashita et al. (2009) also argued knowledge integration as a prior process of creating new knowledge within an organization. The results of employee’s knowledge integration are frequently used as a solution or new method for organizational challenges (Janczak, 2004). Therefore,

an employee's capability of knowledge integration has an important role in his/her work creativity and performance (Teigland & Wasko, 2003). Based on these arguments, we develop the following hypothesis:

H1: The knowledge integration capability of an employee is positively associated with his/her knowledge creation output.

### **3.2 Structure Factors**

Our research model contains two structure factors, i.e., organic organizational structure and teamwork quality. Organic structure refers to a flatter organizational structure which has decentralized decision-making process and multifunctional structure (Huang et al., 2010). In contrast, mechanistic structure has centralized control and a high degree of task standardization. In the organizations having mechanistic structure, the creativity, risk-taking, exploration, and experimentation of employees are constrained because flexibility of their organizational activities is limited and more controlled (Huang et al., 2010). Appropriate organizational structure is crucial for organizational knowledge integration (Grant, 1996). According to Turner and Makhija (2012), the organic organizational structure promotes the information synthesis of an employee by promoting a comprehensive understanding of the knowledge of others. In the organic organizational structure, moreover, employees can pursue cross-functional communication and decision making more easily. Therefore, organic organizational structure enhances the knowledge integration of employees (Huang & Newell, 2003). Based on these arguments, the following hypothesis is proposed:

H2: Organic organizational structure is positively associated with the knowledge integration capability of an employee.

Teamwork quality refers to "a team's ability for task-related interaction and networking" (Hoegl et al., 2004, p. 43). Prior research considers team-building as a preceding mechanism for the knowledge integration within an organization because knowledge integration needs shared understanding between actors (Grant, 1996). The relationship quality among experienced team members has been discussed as an important success factor in integrating complex project knowledge (Enberg et al., 2006). In particular, from the individual viewpoint, teamwork quality enables an employee to acquire necessary knowledge and skills from other team members more easily (Hoegl & Gemuenden, 2001). The acquired knowledge and skills can be used as the external output in his/her knowledge integration process. Therefore, the teamwork quality, as another structure factor, enhances the knowledge integration of employees. Based on these arguments, the following hypothesis is proposed:

H3: Teamwork quality is positively associated with the knowledge integration capability of an employee.

### **3.3 People Factor**

The people dimension in our research model reflects the employee's information processing capacity. An individual who has a higher information processing capacity is superior in combining novel and useful concepts (Vartanian et al., 2009). While a person has a variety of mental components which are involved in personal information processing (e.g., Wickens & Carswell, 2006), we focus on employee's expertise as a proxy variable of individual information processing capacity in our context of employee-level knowledge integration (Kuchinke, 1997). Expertise refers to "the task-specific knowledge and skill possessed by an employee" (Kuchinke, 1997, p. 74). According to Kuchinke (1997), an individual's expertise is closely related to his/her professional experience and insight. Utilizing such experience and insight, people who have expertise in a specific area, i.e., experts, are known capable in connecting many segregated pieces of knowledge in a meaningful manner. Therefore, such experts show higher knowledge integration capability compared to novices (Schneider & Stern, 2009). Based on these arguments, the following hypothesis is proposed:

H4: Expertise is positively associated with the knowledge integration capability of an employee.

### **3.4 Technical Factor**

Our research model has a technical factor, i.e., IT support. IT support includes any type of technology that supports employee knowledge integration. IT support is regarded as an important influential factor of knowledge integration at various levels within an organization. For example, knowledge management systems (KMS) can support the knowledge integration within a team by enhancing its transactive memory, developing mutual understanding among team members, sharing and retaining contextual knowledge, and fostering strong ties among team members (Alavi & Tiwana, 2002). Likewise, KMS also supports the knowledge integration of an individual by increasing the reusability of existing knowledge (Kankanhalli et al., 2011). According to Teigland and Wasko (2003), as another example, intra-organizational electronic network enhances internal information trading for the knowledge integration of employees. Shared databases, electronic forums, and computer-based learning systems also improve the knowledge integration at the individual level (Jang, 2012). Therefore, IT support enhances the knowledge integration capability of employees. Based on these arguments, the following hypothesis is proposed:

H5: IT support is positively associated with the knowledge integration capability of an employee.

### **3.5 Task Factor**

As a final influential factor of employee's knowledge integration, our research model involves knowledge complexity which reflects the task dimension of the socio-technical perspective. Ditillo (2004) defined knowledge complexity as "the level of uncertainty" (p. 403). Uncertainty can be defined as "the difference between the amount of information required to perform the task and the amount of information already possessed" (Galbraith, 1973, p. 5). In the organizational environment, knowledge complexity is interlinked with task complexity (Ditillo, 2004). In the knowledge integration process, in particular, the intensification of knowledge complexity accompanies the increase in the complexity of knowledge application and the number of dependencies and knowledge sources (Grant, 1996). Therefore, the high complexity of required knowledge to perform an employee's tasks affects his/her effectiveness in knowledge integration by increasing the amount of information processing (Zeffane & Gul, 1993). In the literature, both positive and negative effects of this knowledge complexity on individual information processing have been discussed. In particular, according to Schroder et al. (1967), a person's information processing capability can increase as the knowledge complexity associated with given tasks increases to a certain point. This is because the task complexity can promote the person to be more capable to complete the given tasks (Oldham & Cummings, 1996; Jo & Lee, 2012). On the other hand, when a person needs to process too complex tasks which may exceed the person's information process capability, i.e., the situation of information overload, the person cannot produce the desired outcomes (Eppler & Mengis, 2004). We believe that the former argument is usually appropriate to explain the internal human process of forming an employee's information processing capability, while the latter may be appropriate sometimes to explain the results of human information processing in a specific condition. Therefore, we adopt the former argument to explain the relationship between the perceived knowledge complexity and knowledge integration capability of employees and develop the following hypothesis:

H6: Knowledge complexity is positively associated with the knowledge integration capability of an employee.

## **4 RESEARCH METHOD**

### **4.1 Measures**

The research model of this study includes seven research variables. Research variables were referred from prior research. Based on the guidelines given in the literature (Churchill, 1979; Moore & Benbasat, 1991), we developed survey items through following procedures. First, prior research was

reviewed, and the initial items of research variables were developed with the review of two professors in the management information systems discipline. In the second step, two rounds of card sorting test (Moore & Benbasat, 1991) were conducted to assess the validity and reliability of research variables with four judges at each of the two rounds. Finally, a pilot test to test internal consistency of research variables was conducted through Cronbach's alpha test and exploratory factor analysis with 39 samples. The final items are listed in Table 1. The items were measured on a five-point Likert scale, ranging from strongly disagree (score 1) to strongly agree (score 5).

Variables	Items	Sources
Organic organizational structure	OSS1: A strong emphasis on always getting personnel to follow the formally laid down procedures ⇔ A strong emphasis on getting things done even if it means disregarding formal procedures. OSS2: A strong emphasis on giving the most say in decision making to formal line managers ⇔ A strong tendency to let the expert in a given situation have the most say in decision making even if this means temporary bypassing of formal line authority. OSS3: A strong emphasis on getting line and staff personnel to adhere closely to formal job descriptions ⇔ A strong tendency to let the requirements of the situation and the individual's personality define proper on-job behavior.	Naman and Slevin (1993)
Teamwork quality	TWQ1: My team/project members communicate intensively. TWQ2: Important information and ideas are openly shared among the members of my team/project. TWQ3: My team/project members provide mutual support. TWQ4: A collaborative atmosphere characterizes the team interaction in my team/project.	Brinckmann and Hoegl (2011)
Expertise	EXPT1: I am familiar with my job. EXPT2: I have more knowledge about my job compared to the rest of the employees. EXPT3: I am an expert in my work. EXPT4: I stay in my area of expertise.	Chandler and Jansen (1992) and Mitchell and Dacin (1996)
IT support	My company provides IT support for... ITS1: collaborative work regardless of time and place. ITS2: communication among organization members. ITS3: searching for and accessing necessary information. ITS4: simulation and prediction. ITS5: systematic information storing.	Lee and Choi (2003)
Knowledge complexity	KCPX1: The knowledge used in my team/project requires prior learning in related knowledge. KCPX2: Description of the knowledge used in my team/project requires a large amount of information. KCPX3: The knowledge used in my team/project is sophisticated and difficult to implement. KCPX4: The knowledge used in my team/project is complex.	Pérez-Luño et al. (2011)
Employee's knowledge integration capability	EKIC1: I effectively integrate individual expertise in my work. EKIC2: I effectively synthesize my expertise in my work. EKIC3: I effectively combine several areas of specialized knowledge in my work. EKIC4: I effectively blend new task-related knowledge with what I already know for my work.	Psychogios et al. (2008) and Zheng et al. (2009)
Employee's knowledge creation output	EKCO1: I constantly generate new ideas. EKCO2: I regularly create innovative idea. EKCO3: I make constantly updated information available in my work.	Bryant (2005)

Table 1. *Items and Measurement Sources*



In addition to these principal research constructs, our research model also includes several control variables to control their potential impacts on the proposed dependent and mediating variables. The control variables are respondents' gender, age, education, job position, firm size, and industry type.

## 4.2 Data Collection

Web survey was used to gather data to test the proposed model. For the sampling frame, a list of associations and databases of convergence-oriented industries in South Korea was drawn by searching in NAVER (2012), a dominant web search engine in South Korea. A list of total 5,964 organizations was created from the membership lists of 27 associations and 4 firm/laboratory databases. Survey invitation letters were emailed or faxed to the target organizations and we received a total of 168 participation agreements. The URL of the survey website was emailed to the organizations which agreed to participate in our survey. Finally, a total of 316 completed samples were returned from 141 organizations (83.9%). Cash or mobile coupons worth US\$ 3.50 and a working paper relating to this survey were provided as tokens for participation. An independent sample *t*-test to compare the mean values of research items between early and late respondents (Etter & Perneger, 1997) shows that non-response bias is not a problem in the present samples. Moreover, the existence of common method variance was assessed using Harman's one-factor test (Podsakoff & Organ, 1986). The results of the unrotated exploratory factor analysis indicate that there is no common factor which explains majority of the variance among the factors.

## 4.3 Sample Characteristics

Sample characteristics are shown in Table 2. Two-thirds of the respondents were male, and more than half of the respondents were in their 30s. Most of the respondents were well educated and had careers of less than 15 years. The ratios of the staff and managers were similar, as were those of firm size among small, medium, and large companies. Finally, two-thirds of the respondents worked in the service industry.

Characteristics	Options	N	%	Characteristics	Options	N	%
Gender	Male	214	67.7	Career	≤5 year	123	38.9
	Female	102	32.3		6-10 year	81	25.6
Age	20s	70	22.2		11-15 year	62	19.6
	30s	169	53.5		16-20 year	31	9.8
	40s	65	20.6		≥21 year	19	6.0
	50s	12	3.8	Position	Staff	158	50.0
Education	High school	8	2.5		Manager	132	41.8
	College	30	9.5		Top management	26	8.2
	University	152	48.1	Firm size (number of employees)	1-299	165	52.2
	Master	96	30.4		300-999	71	22.5
Doctor	30	9.5	1,000>		80	25.3	
Industry	Manufacturing	115	36.4				
	Services	201	63.6				

Table 2. Sample Characteristics

## 5 RESULTS

This section assesses reliability and validity of research constructs and tests research hypothesis using SPSS 20.0 (IBM Corp., 2011).

## 5.1 Reliability and Validity

To assess the reliability of principal research constructs, the inter-item correlations, item-to-total correlations, and Cronbach's alpha were tested, which should exceed 0.3, 0.5, and 0.7, respectively (Hair et al., 2006). All of the research constructs satisfied all criteria of the reliability test. Convergent validity and discriminant validity were assessed through exploratory factor analysis with Varimax rotation (Hair et al., 2006). Table 3 shows the results of exploratory factor analysis. The Kaiser-Meyer-Olkin measure of sampling adequacy was 0.854 ( $> 0.5$ ), and Bartlett's test of sphericity was statistically significant (at the 0.001 level). The explanation of seven factors was 74.5% of total variance ( $> 60\%$ ), and all of the item communalities exceeded 0.5. For the convergent validity, factor loadings exceeded  $\pm 0.7$  (Hair et al., 2006), and the values of AVE (Average Variance Extracted) of constructs exceeded 0.5 (Fornell & Larcker, 1981).

Variables	Cronbach's $\alpha$	Communalities	Loadings	AVE
Organic organizational structure	0.761	0.672~0.784	0.777~0.881	0.712
Teamwork quality	0.918	0.785~0.832	0.838~0.887	0.808
Expertise	0.896	0.699~0.851	0.771~0.885	0.765
IT support	0.878	0.594~0.748	0.748~0.853	0.697
Knowledge complexity	0.859	0.657~0.779	0.765~0.842	0.725
Employee's knowledge integration capability	0.891	0.698~0.801	0.727~0.794	0.753
Employee's knowledge creation output	0.850	0.744~0.803	0.787~0.849	0.765

Table 3. Results of Reliability and Validity Assessment

Table 4 presents the correlation matrix of constructs with the square root of AVEs of constructs. For the discriminant validity, the square root of AVE of each construct was greater than the correlations with all other constructs. Therefore, the results of exploratory factor analysis indicated that all criteria satisfied the requirements for the convergent and discriminant validity. After conducting exploratory factor analysis, summated scales were generated using the average of the items (Hair et al., 2006).

Variables	OOS	TWQ	EXPT	ITS	KCPX	EKIC	EKCO
Organic organizational structure (OOS)	<b>0.844</b>						
Teamwork quality (TWQ)	0.128*	<b>0.899</b>					
Expertise (EXPT)	-0.019	0.193**	<b>0.875</b>				
IT support (ITS)	0.029	0.356**	0.152**	<b>0.835</b>			
Knowledge complexity (KCPX)	-0.061	0.182**	0.243**	0.186**	<b>0.851</b>		
Employee's knowledge integration capability (EKIC)	-0.014	0.213**	0.619**	0.205**	0.371**	<b>0.868</b>	
Employee's knowledge creation output (EKCO)	0.059	0.136*	0.321**	0.292**	0.272**	0.525**	<b>0.875</b>
Mean	2.829	3.471	3.805	3.250	3.826	3.678	3.381
Standard deviation	0.964	0.762	0.687	0.782	0.639	0.587	0.678

\*  $p > 0.05$ , \*\*  $p > 0.01$ , The bolded numbers on the diagonal are the square root of AVE.

Table 4. Correlation Matrix of Research Variables

## 5.2 Hypothesis Testing

OLS regression was used to conduct hypothesis test. According to Gefen et al. (2000), in comparison with structural equation modeling techniques, OLS regression is "relatively robust to deviations from a multivariate distribution, with established methods of handling nonmultivariate distributions" (p. 9). Table 5 shows the results of regression analysis between the knowledge integration capability of employees and their knowledge creation output.

Predictors		Criterion variable: Employee's knowledge creation output	
		Model 1 (standardized $\beta$ , p-value)	Model 2 (standardized $\beta$ , p-value)
Control variables	Gender	<b>-0.169 (0.004)**</b>	<b>-0.115 (0.030)*</b>
	Age	-0.004 (0.956)	-0.056 (0.423)
	Education	0.068 (0.255)	0.008 (0.875)
	Job position	<b>0.160 (0.042)*</b>	0.087 (0.212)
	Firm size	0.031 (0.595)	0.022 (0.663)
	Industry	0.076 (0.172)	0.043 (0.387)
Mediating factor	Employee's knowledge integration capability		<b>0.483 (0.000)**</b>
R square		0.094	0.295

\*  $p > 0.05$ , \*\*  $p > 0.01$

*Table 5. Results of Regression Analysis between the Knowledge Integration Capability and Knowledge Creation Output of Employees*

Knowledge integration capability has a significant positive effect on knowledge creation output (at the 0.01 level). Therefore, H1 is accepted. Table 6 shows the results of regression analysis between the proposed socio-technical factors and employee's knowledge integration capability.

Predictors		Criterion variable: Employee's knowledge integration capability	
		Model 1 (standardized $\beta$ , p-value)	Model 2 (standardized $\beta$ , p-value)
Control variables	Gender	-0.113 (0.050)	-0.024 (0.611)
	Age	0.108 (0.165)	0.056 (0.381)
	Education	<b>0.124 (0.034)*</b>	0.008 (0.874)
	Job position	<b>0.151 (0.048)*</b>	0.011 (0.865)
	Firm size	0.018 (0.756)	-0.026 (0.578)
	Industry	0.070 (0.202)	-0.008 (0.851)
Socio-technical factors	Organic organizational structure		0.002 (0.961)
	Teamwork quality		-0.052 (0.274)
	Expertise		<b>0.513 (0.000)**</b>
	IT support		0.071 (0.135)
	Knowledge complexity		<b>0.215 (0.000)**</b>
R square		0.139	0.449

\*  $p > 0.05$ , \*\*  $p > 0.01$

*Table 6. Results of Regression Analysis between the Socio-Technical Factors and Knowledge Integration Capability of Employees*

According to Table 6, employee expertise had a significant positive effect on knowledge integration capability (at the 0.01 level). Knowledge complexity also had a significant positive effect on knowledge integration capability (at the 0.01 level). Therefore, H4 and H6 were accepted. However, other factors, i.e., organic organizational structure, team quality, and IT support were not significant determinants of employee's knowledge integration capability. Therefore, H2, H3, and H5 were not supported. We also tested the mediating effects of the knowledge integration capability between the significant influential factors, i.e., expertise and knowledge complexity, and knowledge creation output of employees. The mediating effects of employee's knowledge integration capability for both expertise and knowledge complexity were significant, i.e., 0.321 ( $z = 0.049$ ) and 0.207 ( $z = 0.048$ ), respectively<sup>1</sup>.

<sup>1</sup> An additional model test using the partial least square (PLS) structural equation modelling technique also confirmed the same results.

## 6 DISCUSSION AND CONCLUSION

According to Nonaka (1994) and Yamashita et al. (2009), employee's knowledge integration is an essential process to create new knowledge within an organization. Moreover, knowledge integration is crucial for developing convergence products or services (de Boer et al., 1999), e.g., SmartPhone, Smart TV, and VoIP (Voice over Internet Protocol). In the literature, knowledge integration capability has been partly discussed by organizational learning capabilities, such as absorptive capacity (Cohen & Levinthal, 1990; Joshi et al., 2010). According to Cohen and Levinthal (1990), for example, knowledge integration can be considered a key component of absorptive capacity which is a collective set of abilities "to recognize the value of new information, assimilate it, and apply it to commercial ends" (p. 128). While prior studies in this area have highlighted the importance of knowledge integration at organization level (e.g., Joshi et al., 2010), the individual-level knowledge integration has seldom discussed in the literature.

In this study, we argue that organizations should put their efforts to develop or improve employee's knowledge integration capability to achieve organizational innovations. The results of our hypothesis test using samples from convergence-oriented industry empirically show that employee's knowledge integration capability is a significant driving force of new knowledge creation within an organization. This finding indicates that employee's knowledge integration capability is crucial to produce knowledge creation outcomes, particularly in the convergence environment.

The results also indicate that amongst the potential influential factors proposed in this study, only employee's cognitive capability (i.e., expertise) and requisite cognitive load (i.e., task complexity) have significant effects on employee's knowledge integration capability. These two factors were proposed based upon the information processing perspective (Schroder et al., 1967; Galbraith, 1973) which was adopted to augment prior socio-technical perspective in explaining employee's knowledge creation capability. The results suggest that the information processing perspective is more appropriate to explain the influential factors of employee's knowledge integration capability. They also suggest that employee's knowledge integration should be understood as an individual's cognitive process rather than as a social-interaction process. Our findings may contribute to the literature by proposing an alternative theory base for individual level of knowledge integration.

In particular, we found a significant positive relationship between knowledge complexity and knowledge integration capability. Since there have been inconsistent perspectives on their relationships in the literature, our further elaboration about this cognitive factor will be useful and necessary. According to Paul and Nazareth (2010), the information processing capability can be influenced by the possession of decision schema which is the "aggregate level information gleaned from the work of prior groups engaged in a similar decision situation" (p. 35). They argue that without a decision schema, too complex tasks can decrease the information processing capability, while with a proper decision schema, such negative effect disappears. Similar arguments have also been applied to individual-level information processing in the literature (Cassie & Robinson, 1982; Balogun & Johnson, 2004). According to these arguments, the development of task-related schema can alleviate an employee's information overload caused by knowledge complexity and thus can enhance his/her knowledge integration capability. In particular, an employee's job-related schema is formed based on his/her experience and beliefs (Lau & Woodman, 1995). In our case, the final samples might have sufficient job-related schema because 97.5% of our samples were highly educated, and 61.1% of them had over 6 years of job experience. Therefore, their job-related schema might cause a positive linear relationship between knowledge complexity and employee's knowledge integration capability.

Inconsistent to our research model, however, our results revealed insignificant effects of organic organizational structure, teamwork quality, and IT support on knowledge integration capability. While these results call for our further investigations, we can find some alternative explanations in the literature. First, according to Mowday and Sutton (1993), employees can be less influenced by the organizational context when it becomes a habitual routine. As we mentioned above, majority of our

samples had over 6 years of job experience. As their job experiences increase, employees may perceive their organizational and team environments as habitual routines due to their prolonged exposure to constant work environments. In this case, the effects of organizational structure and teamwork quality can diminish. Second, in this study, IT support was measured as employee perceptions on the availability of collaboration, communication, information store/retrieve, and simulation/prediction technologies. These technologies may help employees search, store, and share knowledge (Kankanhalli et al., 2011). For knowledge integration, however, employees may need to perform more complex internal processes, such as reconfiguration and restructuring of existing knowledge, and the measured technologies may not fully support these internal processes. Lastly, we can also consider alternative roles of IT support, not as a direct enabler of employee's knowledge integration, but as a conditional or complementary factor of other social factors (e.g., Cohen & Levinthal, 1990; Tanriverdi, 2005; Kankanhalli et al., 2011)

Like any other study, the findings of this study need to be interpreted in light of its limitations. First, although the results of this study indicate a significant effect of employee's knowledge integration capability on employee's knowledge creation, knowledge integration capability may not be only one determinant of knowledge creation of employees. A more comprehensive research model which contains additional factors to explain employee's knowledge creation needs to be developed and tested to investigate the roles of knowledge integration capability more precisely. Second, this study is regarded as a cross-level study (Rousseau, 1985). A cross-level model is at risk of developing biases of misspecification because the model contains variables of different units of analysis (Rousseau, 1985). Various methods have been proposed to avoid such problems of cross-level study, for examples, (1) developing the questionnaires for each unit of analysis and gathering the samples from respondents of different units of analysis, and (2) collecting the separate questionnaires from different respondents in the same unit (Rousseau, 1985). In our future studies, these approaches will be considered.

This study will help extend the literature of organizational knowledge management by investigating an important, yet less-explored subject of individual-level knowledge integration. This study indicates that by enhancing employee's knowledge integration capabilities, organizations can achieve excellence in knowledge creation and competitive advantage. This study also provides important implications for theory development and future research in the stream of individual-level knowledge management research. From the theory development perspective, this study suggests that the information processing perspective is better than the socio-technical perspective in explaining employee's knowledge integration capability. In particular, employee's knowledge integration can be regarded as individual cognitive process, whereas knowledge integration at organization or group level has been considered social interaction process. For extension of this study, the following research topics are proposed: (1) developing information systems which support employee's knowledge integration process, (2) determining the optimal level of knowledge complexity for task design, and (3) investigating the relationships among individual, group, and organizational knowledge integration.

This study also provides practical implications. Our findings suggest that organizations should develop initiatives for enhancing employee's knowledge integration capability to achieve new knowledge creation by their employees. To enhance employee's knowledge integration capability, organizations can implement employee expertise development programs. These programs should involve training to develop and improve employee's task knowledge and cognitive capability. In many organizations, individual task performance is closely related to organizational performance. Therefore, an employee's knowledge integration capability may be crucial to achieve superior organizational performance. Organizations need to invest their resources more efficiently to support and enhance their employees' knowledge integration capability.

## References

- Alavi, M. and Tiwana, A. (2002). Knowledge integration in virtual teams: The potential role of KMS. *Journal of the American Society for Information Science and Technology*, 53 (12), 1029-1037.

- Anderson, N.H. (1974). Information Integration Theory: A Brief Survey. In D.H. Krantz R.C. Atkinson R.D. Luce and P. Suppes (Eds.), *Contemporary Developments in Mathematical Psychology: Learning, Memory, and Thinking* (Vol. 2, pp. 236-305). San Francisco: W.H. Freeman and Company.
- Balogun, J. and Johnson, G. (2004). Organizational restructuring and middle manager sensemaking. *The Academy of Management Journal*, 47 (4), 523-549.
- Bostrom, R.P. and Heinen, J.S. (1977). MIS problems and failures: A socio-technical perspective. Part I: The causes. *MIS Quarterly*, 1 (3), 17-32.
- Brinckmann, J. and Hoegl, M. (2011). Effects of initial teamwork capability and initial relational capability on the development of new technology-based firms. *Strategic Entrepreneurship Journal*, 5 (1), 37-57.
- Bryant, S.E. (2005). The impact of peer mentoring on organizational knowledge creation and sharing: An empirical study in a software firm. *Group & Organization Management*, 30 (3), 319-338.
- Cassie, J.R.B. and Robinson, F.G. (1982). A decision schema approach to career decision making. *International Journal for the Advancement of Counselling*, 5 (3), 165-182.
- Chandler, G.N. and Jansen, E. (1992). The founder's self-assessed competence and venture performance. *Journal of Business Venturing*, 7 (3), 223-236.
- Churchill, G.A. (1979). A paradigm for developing better measures of marketing constructs. *Journal of Marketing Research*, 16 (1), 64-73.
- Cohen, W.M. and Levinthal, D.A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*, 35 (1), 128-152.
- Collins, C.J. and Smith, K.G. (2006). Knowledge exchange and combination: The role of human resource practices in the performance of high-technology firms. *Academy of Management Journal*, 49 (3), 544-560.
- de Boer, M., Van den Bosch, F.A.J. and Volberda, H.W. (1999). Managing organizational knowledge integration in the emerging multimedia complex. *Journal of Management Studies*, 36 (3), 379-397.
- Ditillo, A. (2004). Dealing with uncertainty in knowledge-intensive firms: The role of management control systems as knowledge integration mechanisms. *Accounting, Organizations and Society*, 29 (3/4), 401-421.
- Enberg, C., Lindkvist, L. and Tell, F. (2006). Exploring the dynamics of knowledge integration: Acting and interacting in project teams. *Management Learning*, 37 (2), 143-165.
- Eppler, M.J. and Mengis, J. (2004). The concept of information overload: A review of literature from organization science, accounting, marketing, MIS, and related disciplines. *The Information Society*, 20 (5), 325-344.
- Etter, J.-F. and Perneger, t.V. (1997). Analysis of non-response bias in a mailed health survey. *Journal of Clinical Epidemiology*, 50 (10), 1123-1128.
- Fornell, C. and Larcker, D.F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal Of Marketing Research*, 18 (1), 39-50.
- Galbraith, J.R. (1973). *Designing complex organizations*: Addison-Wesley Publishing Company, Inc.
- Gefen, D., Straub, D.W. and Boudreau, M.-C. (2000). Structural equation modeling and regression: Guidelines for research practice. *Communications of AIS*, 4 (Article 7), 1-79.
- Grant, R.M. (1996). Prospering in dynamically-competitive environments: Organizational capability as knowledge integration. *Organization Science*, 7 (4), 375-387.
- Hacklin, F., Marxt, C. and Fahrni, F. (2009). Coevolutionary cycles of convergence: An extrapolation from the ICT industry. *Technological Forecasting & Social Change*, 76 (6), 723-736.
- Hair, J.F., Black, W.C., Babin, B.J., Anderson, R.E. and Tatham, R.L. (2006). *Multivariate Data Analysis* (6th 6th). Upper Saddle River, New Jersey: Pearson Education, Inc.
- Hoegl, M. and Gemuenden, H.G. (2001). Teamwork quality and the success of innovative projects: A theoretical concept and empirical evidence. *Organization Science*, 12 (4), 435-449.
- Hoegl, M., Weinkauff, K. and Gemuenden, H.G. (2004). Interteam coordination, project commitment, and teamwork in multiteam R&D projects: A longitudinal study. *Organization Science*, 15 (1), 38-55.

- Huang, J.C. and Newell, S. (2003). Knowledge integration processes and dynamics within the context of cross-functional projects. *International Journal of Project Management*, 21 (3), 167-176.
- Huang, X., Kristal, M.M. and Schroeder, R.G. (2010). The impact of organizational structure on mass customization capability: A contingency view. *Production and Operations Management*, 19 (5), 515-530.
- IBM Corp. (2011). *IBM SPSS Statistics 20*.
- Janczak, S. (2004). How middle managers integrate knowledge within projects. *Knowledge and Process Management*, 11 (3), 210-224.
- Jang, K. (2012). An understanding of optimal knowledge management for social work practice: Based on a process-oriented conceptualisation of knowledge integration. *British Journal of Social Work*, 42 (3), 1-20.
- Jo, N.Y. and Lee, K.C. (2012). The effect of organizational trust, task complexity and intrinsic motivation on employee creativity: Emphasis on moderating effect of stress. In J.J.J.H. Park, Q. Jin, M.S.-s. Yeo and B. Hu (Eds.), *Human Centric Technology and Service in Smart Space* (Vol. 182, pp. 199-206). Springer.
- Joshi, K.D., Chi, L., Datta, A. and Han, S. (2010). Changing the competitive landscape: Continuous innovation through IT-enabled knowledge capabilities. *Information Systems Research*, 21 (3), 472-495.
- Kankanhalli, A., Lee, O.-K.D. and Lim, K.H. (2011). Knowledge reuse through electronic repositories: A study in the context of customer service support. *Information & Management*, 48 (2-3), 106-113.
- Kuchinke, K.P. (1997). Employee expertise: The status of the theory and the literature. *Performance Improvement Quarterly*, 10 (4), 72-86.
- Lau, C.-M. and Woodman, R.W. (1995). Understanding organizational change: A schematic perspective. *The Academy of Management Journal*, 38 (2), 537-554.
- Leavitt, H.J. (1976). Applied Organization Change in Industry: Structural, Technical, and Human Approaches. In P. Brophy (Ed.), *Reader in Operations Research for Libraries* (pp. 50-60): Information Handling Services.
- Lee, H. and Choi, B. (2003). Knowledge management enablers, processes, and organizational performance: An integrative view and empirical examination. *Journal of Management Information Systems*, 20 (1), 179-228.
- Lee, S.M. and Olson, D.L. (2010). *Convergenomics: Strategic Innovation in the Convergence Era*. Burlington, VT: Gower Publishing Company.
- Lin, B.-W. and Chen, C.-J. (2006). Fostering product innovation in industry networks: The mediating role of knowledge integration. *International Journal of Human Resource Management*, 17 (1), 155-173.
- Lin, H.-F. and Lee, G.-G. (2006). Effects of socio-technical factors on organizational intention to encourage knowledge sharing. *Management Decision*, 44 (1), 74-88.
- Maier, R. (2007). *Knowledge Management Systems: Information and Communication Technologies for Knowledge Management* (3rd 3rd). Berlin, Heidelberg: Springer-Verlag.
- Mitchell, A.A. and Dacin, P.A. (1996). The assessment of alternative measures of consumer expertise. *The Journal of Consumer Research*, 23 (3), 219-239.
- Mitchell, R. and Boyle, B. (2010). Knowledge creation measurement methods. *Journal of Knowledge Management*, 14 (1), 67-82.
- Moore, G.C. and Benbasat, I. (1991). Development of an instrument to measure the perception of adopting an information technology innovation. *Information Systems Research*, 2 (3), 192-222.
- Mowday, R.T. and Sutton, R.I. (1993). Organizational behavior: Linking individuals and groups to organizational contexts. *Annual Review of Psychology*, 44, 195-229.
- Naman, J.L. and Slevin, D.P. (1993). Entrepreneurship and the concept of fit: A model and empirical tests. *Strategic Management Journal*, 14 (2), 137-153.
- NAVER. (2012). Retrieved 17.05.12, from <http://www.naver.com>
- Nonaka, I. (1994). A dynamic theory of organizational knowledge creation. *Organization Science*, 5 (1), 14-37.

- Nonaka, I. and Toyama, R. (2003). The knowledge-creating theory revisited: Knowledge creation as a synthesizing process. *Knowledge Management Research & Practice*, 1 (1), 2-10.
- Ojanperä, T. (2006). Convergence transforms Internet. *Wireless Personal Communications*, 37 (3/4), 167-185.
- Oldham, G.R. and Cummings, A. (1996). Employee creativity: Personal and contextual factors at work. *The Academy of Management Journal*, 39 (3), 607-634.
- Pérez-Luño, A., Medina, C.C., Lavado, A.C. and Rodríguez, G.C. (2011). How social capital and knowledge affect innovation. *Journal of Business Research*, 64 (12), 1369-1376.
- Pan, S.L. and Scarbrough, H. (1999). Knowledge management from a socio-technical perspective: A case study of Buckman Laboratories: Warwick Business School.
- Paul, S. and Nazareth, D.L. (2010). Input information complexity, perceived time pressure, and information processing in GSS-based work groups: An experimental investigation using a decision schema to alleviate information overload conditions. *Decision Support Systems*, 49 (1), 31-40.
- Podsakoff, P.M. and Organ, D.W. (1986). Self-reports in organizational research: Problems and prospects. *Journal of Management*, 12 (4), 531-544.
- Psychogios, A.G., Alexandris, K. and Onofrei, A. (2008). Addressing individual and organisational factors influencing middle managers' synthesising role in knowledge creation and diffusion. *International Journal of Learning and Intellectual Capital*, 5 (2), 208-222.
- Rousseau, D.M. (1985). Issues of level in organizational research: Multi-level and cross-level perspectives. *Research in Organizational Behavior*, 7, 1-37.
- Schneider, M. and Stern, E. (2009). The inverse relation of addition and subtraction: A knowledge integration perspective. *Mathematical Thinking and Learning*, 11 (1/2), 92-101.
- Schroder, H.M., Driver, M.J. and Streufert, S. (1967). *Human information processing: Individuals and groups functioning in complex social situations*. New York, NY: Holt, Rinehart and Winston.
- Tanriverdi, H. (2005). Information technology relatedness, knowledge management capability, and performance of multibusiness firms. *MIS Quarterly*, 29 (2), 311-334.
- Teigland, R. and Wasko, M.M. (2003). Integrating knowledge through information trading: Examining the relationship between boundary spanning communication and individual performance. *Decision Sciences*, 34 (2), 261-286.
- Thomas, J.C., Kellogg, W.A. and Erickson, T. (2001). The knowledge management puzzle: Human and social factors in knowledge management. *IBM Systems Journal*, 40 (4), 863-884.
- Tiwana, A. and McLean, E.R. (2005). Expertise integration and creativity in information systems development. *Journal of Management Information Systems*, 22 (1), 13-43.
- Turner, K.L. and Makhija, M.V. (2012). The role of individuals in the information processing perspective. *Strategic Management Journal*, 33 (6), 661-680.
- Vartanian, O., Martindale, C. and Matthews, J. (2009). Divergent thinking ability is related to faster relatedness judgments. *Psychology of Aesthetics, Creativity, and the Arts*, 3 (2), 99-103.
- Wickens, C.D. and Carswell, C.M. (2006). Information processing. In G. Salvendy (Ed.), *Handbook of Human Factors and Ergonomics* (pp. 111-149). Hoboken, NJ: John Wiley & Sons, Inc.
- Yamashita, Y., Nakamori, Y. and Wierzbicki, A.P. (2009). Knowledge synthesis in technology development. *Journal of Systems Science and Systems Engineering*, 18 (2), 184-202.
- Zeffane, R.M. and Gul, F.A. (1993). The effects of task characteristics and sub-unit structure on dimensions of information processing. *Information Processing & Management*, 29 (6), 703-719.
- Zheng, M., Bao, G. and Qian, Y. (2009, August 2-6). Employee commitment, knowledge sharing and knowledge integration: An empirical study of professional staffs in Chinese firms. In *Proceedings of the PICMET 2009, Portland, Oregon USA*.