Congruent knowledge management behaviors as discriminate sources of competitive advantage

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Abstract

Purpose – While knowledge management has been shown to be a strategic source of competitive advantage, processes designed to enhance the productivity of knowledge do not, however, equally contribute to the organization's capabilities. Consequently, this research aims to focus on the relationship between each mode of the knowledge management process and multiple sources of competitive advantage.

Design/methodology/approach – This research, using questionnaire data collected from the entire population of a pharmaceutical company's head office in Japan, investigates how different perceptions and behaviors related to knowledge management affect the perceived contribution of certain types of organizational knowledge acting as sources of competitive advantage.

Findings – The study finds that the perceived importance of knowledge management activities, especially combination, appears as an important source of competitive advantage related to technical knowledge, and more time spent on knowledge management tasks, in particular socialization, contributes to a competitive advantage related to affective knowledge. Further analysis involves a taxonomy of employees based on their perceived importance of, and the time they spend on, knowledge management activities

Research limitations/implications – This paper focuses on the entire population of a single firm, and for that reason, further research with other companies in different industries is necessary.

Practical implications – There is evidence suggesting that knowledge management strategies should be tailored to fit the discriminate beliefs and actions of each group of workers, identified based on their level of congruence between their espoused theories and theories-in-use related to knowledge management.

Originality/value – The taxonomy of workers introduced in the paper emphasizes the fact that the workforce is not a uniform body and therefore that intrinsic differences need to be taken into account to maximize the efficiency of knowledge management.

Keywords Knowledge management, Competitive advantage, Employee behaviour, Perception, Japan

Paper type Research paper

1. Introduction

In the field of business administration, the paradigm where organizations are regarded as centers of information processing has begun to shift to the paradigm where organizations are considered as sources of knowledge creation (Nonaka *et al.*, 1996) and

where learning has become a key construct defined in terms of outcomes and processes (Argyris and Schön, 1992).

Previous research has shown that the creation and transfer of knowledge as well as knowledge embedded in the interactions of people, tools, and tasks, provide a basis for competitive advantage in firms (Argote and Ingram, 2000). Also, the focus on resources that are developed within the organization and difficult to imitate has propelled organizational knowledge as a leading source of competitive advantage (Spender and Grant, 1996). However, some earlier work on knowledge management and competitive advantage put emphasis on description rather than empirical study (Holsapple and Singh, 2001), while some more recent research used empirical data from several organizations (Chuang, 2004). In this regard, we decided to focus on the entire population of a single firm's headquarters so as to get a comprehensive and consistent account of personal beliefs and actions concerning knowledge management.

The objective of this research is to first examine how each mode of the knowledge management process affects sources of competitive advantage, and then to identify the relationship between identified sub-groups of workers and sources of competitive advantage in order to eventually increase the yield of knowledge management. This paper describes in section two the theoretical foundation and hypothesis of this research. Then, section three presents the methodology of the questionnaire survey, followed by relevant data analysis in section four. Section five discusses the implications of this study for practice and section six concludes this research.

2. Background and hypothesis

2.1 Knowledge-creation theory

The premise of the "knowledge creation theory" based on this paradigm is the supposition that all knowledge can be classified in either tacit knowledge (Polanyi, 1966) or explicit knowledge. On the one hand, tacit knowledge is cognitive knowledge that is hard to express with language or numbers: for example, beliefs, points of view, technical skills and know-how are all part of tacit knowledge. On the other hand, explicit knowledge is objective and rational knowledge that can be expressed with language or numbers: texts, equations, specifications and manuals are a few examples.

In the knowledge-creating view of the firm, knowledge is defined as a process of justifying belief toward the truth (Nonaka and Takeuchi, 1995). The conversion processes between tacit and explicit knowledge – socialization, externalization, combination, and internalization, or SECI – help synthesize subjective values into objective and socially shared knowledge (Nonaka and Takeuchi, 1995). The knowledge-creation process starts with socialization where the tacit knowledge of customers and competitors is acquired through field building. That knowledge is then externalized through dialog into explicit knowledge to be shared within the firm. Next, the explicit knowledge is in a form appropriate to be diffused throughout the organization and combined with other existing knowledge. Subsequently, the firm's workers internalize these complex sets of explicit knowledge, and then determine the most favorable application to be put in action. The multiple ontological levels – individual, group, and organization – in the company enable the creation of an organizational knowledge-creation spiral.

Recent empirical studies have shown that even though not all knowledge management styles equally impact performance (Chuang, 2004), both explicit and tacit

knowledge should be managed simultaneously towards achieving greater results (Jordan and Jones, 1997). Thus, when an organization is considered a source of knowledge creation, the promotion of the knowledge-creation process expressed by the SECI model becomes an important part of the organization's strategic management.

The main reasons for utilizing Nonaka and Takeuchi's (1995) knowledge-creation theory as opposed to other ones is that first, the firm with which we are testing our model has explicitly been using their theory for all its knowledge management initiatives in the past ten years and that second, Nonaka actively participated in the joint development of the questionnaire instrument used in this survey. Therefore, Nonaka and Takeuchi's (1995) knowledge-creation theory is the one theory that appears relevant in considering tacit versus explicit knowledge, and in assessing knowledge management in the firm under consideration in this paper.

2.2 Sources of competitive advantage

Nonaka *et al.* (2000) have shown that at the base of knowledge-creating processes are knowledge assets and they defined those assets as "firm-specific resources that are indispensable to create values for the firm". They consider these knowledge assets as the inputs, outputs and moderating factors of the knowledge-creating process. For example, trust among organizational members is created as an output of the knowledge-creating process, and at the same time it moderates how BA – or shared context in motion – functions as a platform for the knowledge-creating process (Nonaka *et al.*, 2000).

They went on to categorize knowledge assets into four types: experiential knowledge assets, conceptual knowledge assets, systemic knowledge assets and cultural (routine) knowledge assets (Nonaka *et al.* 2000). Experiential knowledge assets consist of the shared tacit knowledge – such as skills and know-how – that is built through shared hands-on experience among the members of the organization, and between the members of the organization and its customers, suppliers and affiliated firms. Conceptual knowledge assets consist of explicit knowledge articulated through images, symbols and language – such as brand equity. They are the assets based on the concepts held by customers and members of the organization. Systemic knowledge assets consist of systematized and packaged explicit knowledge – such as explicitly stated technologies, product specifications, manuals, and documented and packaged information about customers and suppliers. Cultural (routine) knowledge assets consist of the tacit knowledge that is routinized and embedded in the actions and practices of the organization – such as organizational culture and organizational routines for carrying out the day-to-day business (Nonaka *et al.*, 2000).

The key concept of Nonaka *et al.*'s dynamic capability view theory is that cultivating capabilities such as organizational knowledge creation, SECI, and BA, through competition will result in competitive advantage. This strategy is very different from the positioning view of Porter (1990) that recommends avoiding competition or the resource-based view of Prahalad and Hamel (1990), and of Barney (1996), which suggests focusing on inimitable resources. Here, again, for consistency purposes, as we use Nonaka and Takeuchi's (1995) knowledge-creation theory in assessing knowledge management, we also retain Nonaka *et al.*'s (2000) dynamic capability view in measuring sources of competitive advantage.

2.3 Hypothesis
While knowledge management is intended to help improve the organization's efficiency, it can also contribute to and be measured through the creation of competitive advantage (Chuang, 2004). Thus we investigate how the employees' perceived importance of and time spent on knowledge management activities, expressed through the SECI process, affect how they rate the contribution of several business practices, making no prior assumption on the existence or strength of the relationships between the four modes of SECI and sources of competitive advantage (Figure 1).

This multiple regression analysis approach is preferred to a bivariate correlation analysis between each mode of SECI and each source of competitive advantage as there is no a priori hypothesis on the covariance among the four modes of SECI.

3. Methodology
The analysis is using questionnaire data from a single Japanese pharmaceutical corporation, referred to as JPC, which can be qualified in its industry as a medium size company with yearly sales of about JPY 650 billion (FY2006) covering both prescription and over-the-counter drugs. JPC recognized the value of knowledge management early on and conducts frequent surveys of its entire global workforce covering topics such as knowledge management and sources of competitive advantage. The survey has been developed over many years with the collaboration of several professors of knowledge management from a number of Japanese national universities.

Since the data include JPC's entire workforce of 1,330 people at its Tokyo head office in Japan, differences among sub-groups or departments/functions that usually arise in sample surveys can be controlled for. This research focuses on the relationship between knowledge management – SECI – and sources of competitive advantage. The questionnaire uses a five-point Likert scale. The knowledge management section uses tested questions from established research and includes six questions for each of the four modes of the SECI process; each question asks for both perceived importance and time allocation, thus making up a total of 48 items. A total of 11 questions in the survey addressed how employees perceived the contribution of certain behaviors, processes, or instruments at work (Table I). Those questions were designed to encompass the four types of knowledge properties pertaining to sources of competitive advantage: experience such as individual skills and know-how, respect and trust, enthusiasm and competitive spirit, and frequent knowledge and experience sharing; concepts such as concern for quality, company reputation, intellectual property; system such as policies
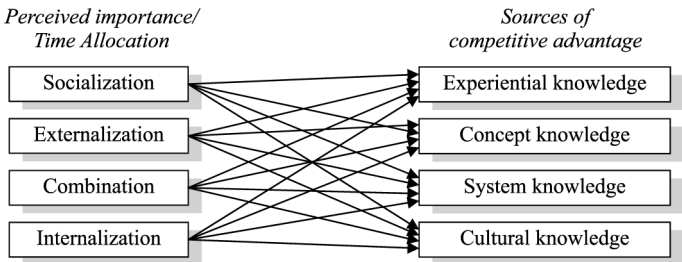

Figure 1.
Structural model exploring the relationship between knowledge management and sources of competitive advantage

Sources of competitive advantage	Questionnaire items	
Experiential knowledge property (four items)	Q305	Employees' individual skills and know-how contribute greatly
	Q306	Respect and trust among department members contribute greatly
	Q307	A great contribution comes from department member enthusiasm and competitive spirit
	Q313	Employees share their knowledge and experience of everyday work activities with fellow department members, which contributes greatly
Concept knowledge property (three items)	Q308	Our concern for quality in our products and our services make a great contribution
	Q309	The reputation of our company and its products make a great contribution
	Q312	The company's intellectual property such as patents and licenses, etc. makes a great contribution
System knowledge property (three items)	Q310	Standardized policies and procedures contribute greatly
	Q311	Readily usable in-company databases make a big contribution
	Q314	Consistent policies and procedures throughout the company contribute greatly
Cultural knowledge property (one item)	Q315	The corporate culture – our mission, vision and values – makes a great contribution

Table I.
Content of questions on
sources of competitive
advantage

and procedures, internal databases; and culture such as corporate culture including mission, vision, and values (Nonaka *et al.*, 2000).

4. Analysis
4.1 Reliability and validity test
The content validity of the variables was established by adopting constructs that have already been validated by other researchers in previous studies (Nonaka, 1994) and have been further confirmed with senior JPC managers involved in knowledge management activities. Constructs measured using reflective or formative questions must be assessed for discriminant validity and, in addition, constructs using reflective questions must be assessed for convergent validity (Hair *et al.*, 1998).

The internal consistency of the independent variables, which use only reflective questions, is assessed by examining Cronbach's alpha, which varies from 0.806 to 0.888 and indeed suggests reliable measurement instruments (Kline, 1999). The item-to-total correlation, between each item and the sum of the remaining items, was used to assess convergent validity. All item-to-total correlation scores were higher than 0.3, which indicated good reliability (Field, 2005). Discriminant validity is typically measured using the factor loading of a factor analysis; however, no such data reduction was conducted here as the independent constructs originate directly from previous seminal research on knowledge creation and have already been subjected to such factor analysis (Nonaka *et al.*, 1994) and are consistent with the theoretical basis of this work.

The dependent constructs were measured with formative questions and therefore were subjected to neither internal consistency measures such as Cronbach's alpha, nor

convergent validity tests (Bollen, 1984; Bollen and Lennox, 1991; Chin, 1998). Convergent validity was verified with a principal components factor analysis (Table II). The factor loadings were examined to ensure that all questions measuring each construct loaded more highly on the intended construct than on other constructs. Loadings of 0.45-0.54 are considered fair, 0.55-0.62 good, 0.63-0.70 very good, and above 0.71 excellent (Comrey, 1979).

4.2. Exploratory statistical analysis

We first looked at the distribution of SECI and the data show that some type of balance has been achieved among the four modes of SECI since the means of both perceived importance and time allocation scores, around 3 on the five-point Likert scale, appear uniform across all 24 questions (Figure 2). This indicates that the respondents equally

Construct	Number of questions	Reliability (Cronbach's alpha)	Convergent validity (correlation of item with total score-item)
Socialization			
Perceived importance	6	0.818	0.544; 0.636; 0.588; 0.559; 0.596; 0.588
Time allocation	6	0.869	0.642; 0.675; 0.708; 0.674; 0.611; 0.712
Externalization			
Perceived importance	6	0.838	0.566; 0.616; 0.557; 0.641; 0.640; 0.666
Time allocation	6	0.888	0.646; 0.697; 0.671; 0.740; 0.717; 0.757
Combination			
Perceived importance	6	0.806	0.426; 0.574; 0.640; 0.564; 0.579; 0.649
Time allocation	6	0.884	0.683; 0.752; 0.722; 0.614; 0.703; 0.718
Internalization			
Perceived importance	6	0.819	0.557; 0.532; 0.660; 0.636; 0.549; 0.568
Time allocation	6	0.881	0.696; 0.688; 0.732; 0.680; 0.682; 0.670

Table II.
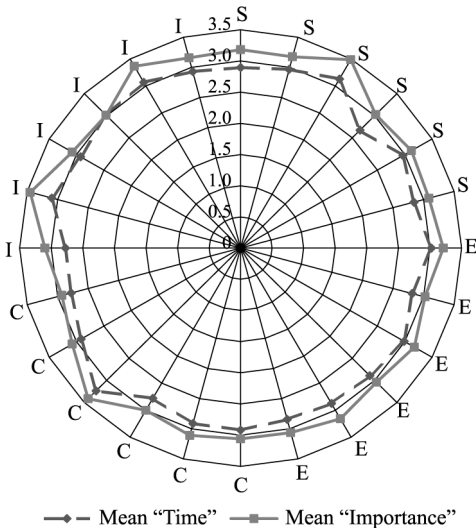Reliability tests for the independent variables

Figure 2.
Correlation radar graph of SECI's perceived importance with each question on sources of competitive advantage

value the four modes of SECI. However, as SECI's perceived importance ranked consistently higher than its time allocation, we can infer that even though respondents know SECI is important, they do not spend as much time as they think is necessary. The standard deviation across all 24 questions ranges from 0.8 to 1.2 and, similarly to the mean, both variables closely follow each other.

It is important to note that JPC has been involved in knowledge management initiatives for more than ten years and has dedicated a team to monitor and implement relevant projects aimed at boosting the yield of SECI activities. Previous similar surveys conducted internally at JPC have demonstrated a steady improvement in SECI's perceived importance and time allocation over time (mean score). The present balanced distribution is the result of constant efforts to increase the efficiency of knowledge management. A few years back, JPC started from an array of unbalanced SECI across S, E, C, and I and implemented specific knowledge management programs to raise the SECI modes to the balanced levels displayed in this survey. The present equilibrium is proof that the perception and practice of knowledge management can be successfully improved through a firm-wide voluntary policy of integration into its elementary business processes.

Let us now examine correlation scores between the questions on perceived importance of SECI and those on sources of competitive advantage. They turned out to be significant ($p < 0.001$ or $p < 0.05$) and to display similar patterns across each of the four modes of SECI (Figure 3). One question on the experiential knowledge property (Q313) – dealing with knowledge and experience-sharing among employees – displayed a much higher correlation with SECI than the others, with coefficients ranging from $R = 0.293$ ($p < 0.001$) with externalization to $R = 0.332$ ($p < 0.001$) with internalization. The next highest correlation was also with another experiential knowledge property question (Q305), with a score of $R = 0.256$ ($p < 0.001$). As a result, we interpreted that those who found SECI important also ranked the experiential knowledge property as important. In other words, SECI appears as the best predictor of
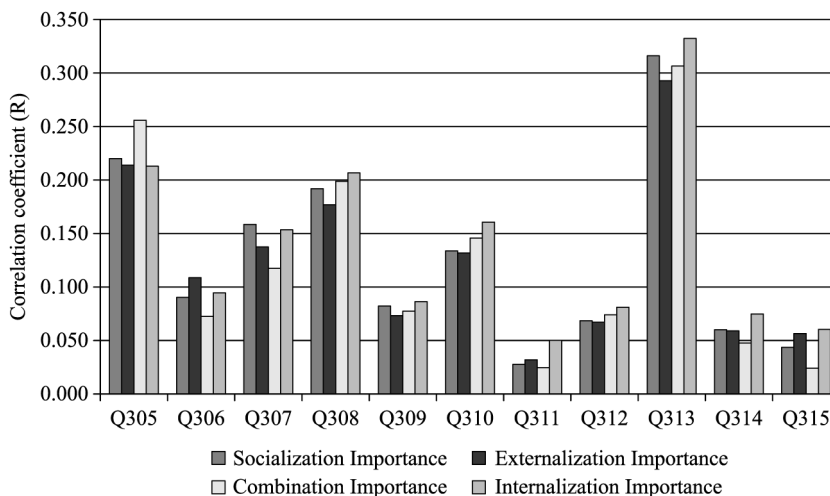

Figure 3.
Mean of SECI's perceived importance and time allocation questions

experiential knowledge property among the four sources competitive advantages investigated here.

While the correlation scores of SECI's time allocation with competitive advantage (not shown) appear consistent across all four SECI modes, they tend to be lower than those with SECI's perceived importance, with no value above $R = 0.253$ ($p < 0.001$). Nevertheless, correlations with questions on the experiential knowledge property (Q306 and Q307) ranked consistently higher overall ($R = 0.253$ and $R = 0.240$ with socialization, $p < 0.001$). As a result, more time spent on SECI activities, socialization in particular, benefits the experiential knowledge property.

These correlation scores show that SECI's importance and time allocation primarily affect the source of competitive advantage related to experiential knowledge.

4.3 Factor analysis and regression model

A factor analysis with varimax rotation of the dependant constructs was carried out to ensure that all 11 questions measuring each competitive advantage displayed higher loadings on the intended construct rather than on the other ones (Table III).

Three components with eigenvalue above 1 were generated and revealed that in fact, the questions on sources of competitive advantage could be grouped into three factors different from the intended constructs. The loadings show that, unlike previously designed, there were six questions in factor 1, three in factor 2 and two in factor 3. Factor 1, with higher loadings on questions Q310, Q311, and Q312 corresponds to embedded knowledge available in written documents, databases, and intellectual property, and explains about 24 per cent of the total variance. Factor 2, with higher loadings on questions Q306 and Q307 is consistent with affective knowledge found respect, trust, and the employees' enthusiasm and competitive spirit, and explains about 18 per cent of the total variance. Factor 3, with higher loadings on questions Q305 and Q313, clearly contributes to technical knowledge related to technical skill and shared know-how, and explains about 13 per cent of the total variance. Those three factors alone explain 55 per cent of the total variance. The results

	1 Embedded knowledge	Component 2 Affective knowledge	3 Technical knowledge
Q305			0.750
Q306		0.738	
Q307		0.788	
Q308		0.484	
Q309	0.508		
Q310	0.702		
Q311	0.702		
Q312	0.638		
Q313			0.753
Q314	0.580		
Q315	0.503		
% of variance	23.594	18.510	13.144
Cumulative %	23.594	42.104	55.248

Table III.
Rotated component matrix of the principal-component analysis of the questions on sources of competitive advantage

Notes: Extraction method: principal component analysis; Rotation method: varimax with Kaiser normalization; rotation converged in 15 iterations

of the factor analysis call for the structural model to be revised and the four sources of competitive advantage to be changed into the three factors defined above.

These three sources of competitive advantage in our sample differ from the theoretical model, which originally consists of four types of knowledge assets (Nonaka *et al.*, 2000). However, these findings are in line with Nonaka *et al.*'s theory (2000) since the factors extracted from the factor analysis are consistent with the original constructs and remain specific to our sample. The main difference is the division of experiential knowledge assets into affective knowledge and technical knowledge whereby in our sample, respondents made a difference between the knowledge originating from the employees' attitudes and the nature of their work relationships, and the knowledge derived from their technical skills.

4.4 Regression model

4.4.1 Perceived importance of SECI and sources of competitive advantage. We first performed a multiple regression analysis with SECI's perceived importance as independent variables and the three constructs on sources of competitive advantage extracted from the principal-component analysis as dependent variables (Figure 4).

The explanatory power of the structural model was evaluated based on the amount of variance in the dependent constructs (embedded knowledge, affective knowledge, and technical knowledge) for which the model could account (R^2). The structural model could explain 17 per cent of the variance for technical knowledge. This exceeded 10 per cent, which was proposed by Falk and Miller (1992) as indication of substantive explanatory power. However, the model could only account for 1.5 per cent of the variance for affective knowledge and less than 1 per cent for embedded knowledge. Each hypothesis corresponded to a path in the structural model. Thus, support for each hypothesis could be determined by examining the sign (positive or negative) and statistical significance for its corresponding path. The value of the beta coefficient (B) indicates which of the independent variables have a greater effect on the dependent variable in the multiple regression analysis. In our model, all the standardized coefficients are significant ($p < 0.001$) and combination shows the strongest effect on technical knowledge and externalization the weakest.

As a result, the perceived importance of SECI, especially combination, appears as the most important source of technical knowledge.
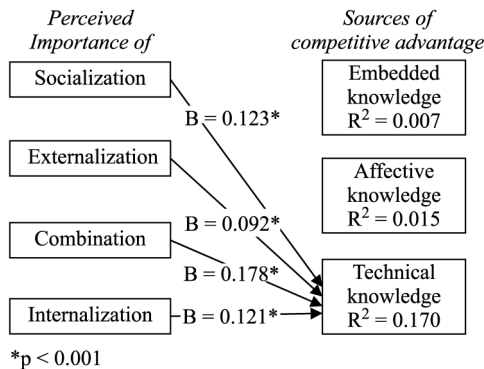

Figure 4.
Graphical summary of results for the regression analysis between the perceived importance of SECI and sources of competitive advantage

4.4.2 SECI's time allocation and sources of competitive advantage. Next, we carried out a multiple regression analysis with SECI's time allocation as independent variables and the three sources of competitive advantage constructs (Figure 5) as dependent variables. The structural model could explain 12 per cent of the variance for affective knowledge, but only 3.5 per cent for embedded knowledge and virtually none for technical knowledge. In our model, all the standardized coefficients are again significant ($p < 0.001$) and socialization shows the strongest effect (B) on affective knowledge and externalization the weakest.

Consequently, more time spent on SECI, in particular socialization, appears as the most important source of affective knowledge.

4.5 Taxonomy of workers toward knowledge management

As aggregate statistics only give the big picture, we decided to divide the population into a taxonomy based on the respondents' perceived importance and time allocation of SECI. We grouped the answers on SECI's perceived importance together and calculated the mean of the 24 scores for each case; we simultaneously did the same for the answers on SECI's time allocation. Clusters were made according to the mean of each respondent's aggregate score for SECI and were labeled as shown in Figure 6.

When the mean of the respondent's aggregate score on SECI's perceived importance and on time allocation are both equal to or greater than 4, he/she is called a knowledge management advocate. When the mean of the respondent's aggregate score on SECI's perceived importance and on time allocation are both equal to or lower than 2, he/she is called a knowledge management skeptic. When the mean of the respondent's aggregate score on SECI's perceived importance is equal or greater than 4 and that on time allocation is equal or lower than 2, he/she is called knowledge management busy person. And when the mean of the respondent's aggregate score on SECI's perceived importance is equal or lower than 2 and that on time allocation is equal or greater than 4, he/she is called knowledge management hopeful.

As the groups in the taxonomy are mutually exclusive, we performed a correlation analysis between those and the three sources of competitive advantages constructs extracted from the principal-component analysis. As the data covers the entire population of JPC's workers at its Japanese headquarters in Tokyo, it can be reasonably assumed that the independent and dependent variables follow a normal
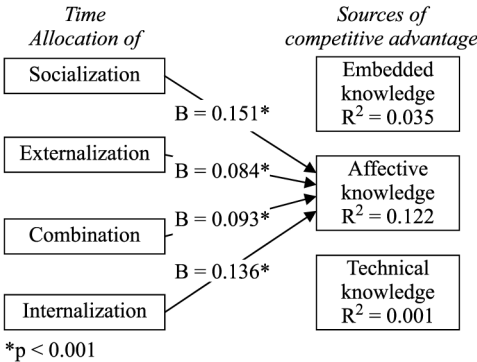
Figure 5.
Graphical summary of results for the time allocation of SECI and sources of competitive advantage

Time Allocation of — Socialization, Externalization, Combination, Internalization

Sources of competitive advantage — Embedded knowledge $R^2 = 0.035$; Affective knowledge $R^2 = 0.122$; Technical knowledge $R^2 = 0.001$

$B = 0.151*$ $B = 0.084*$ $B = 0.093*$ $B = 0.136*$

*$p < 0.001$

5

Mean "SECI's Time Allocation"

Hopeful

4.5%

Advocate

38.8%

Others

25.7%

Skeptic

23.6%

Busy

7.4%

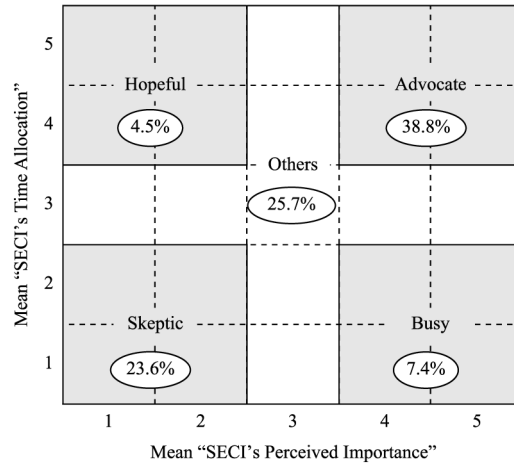1   2   3   4   5

Mean "SECI's Perceived Importance"

Figure 6.
Taxonomy of workers'
perceived importance and
time allocation of SECI

distribution, and therefore the Pearson correlation coefficient can be used as the best estimate of the correlation of SECI and competitive advantage.

The results in Table IV indicate that there is a mild negative correlation ($R = -0.232$, $p < 0.001$) between knowledge management skeptics and the contribution of embedded knowledge, that there is a medium negative correlation ($R = -0.334$, $p < 0.001$) between knowledge management advocates and the contribution of technical knowledge, that there is a medium positive correlation ($R = 0.302$, $p < 0.001$) between knowledge management busy people and the contribution of embedded knowledge, and that there is also an even stronger positive correlation ($R = 0.473$, $p < 0.001$) between knowledge management hopefuls and the contribution of affective

	Factor 1 "Embedded knowledge"	Factor 2 "Affective knowledge"	Factor 3 "Technical knowledge"
Skeptic			
Pearson correlation	0.021	0.178[*]	− 0.232[*]
Sig. (two-tailed)	0.300	0.000	0.000
n	314	314	314
Busy			
Pearson correlation	0.302[*]	− 0.178[*]	0.011
Sig. (two-tailed)	0.000	0.000	0.755
n	98	98	98
Hopeful			
Pearson correlation	0.027	0.473[*]	− 0.056
Sig. (two-tailed)	0.555	0.000	0.219
n	60	60	60
Advocate			
Pearson correlation	0.130[*]	0.230[*]	− 0.334[*]
Sig. (two-tailed)	0.000	0.000	0.000
n	516	516	516

Note: [*]Correlation is significant at the 0.001 level (two-tailed)

Table IV.
Correlation between the
taxonomy of workers and
the three factors of
competitive advantage

knowledge. Also, it is interesting to note that among the population of 1,330 respondents, advocates make up the highest share (516), followed by skeptics (314), busy (98) and hopefuls (60). These four categories of people cover about 75 per cent of the entire population of JPC's Japanese head office operations.

5. Discussion
5.1 Knowledge management as source of competitive advantage
It was shown in the exploratory data analysis that knowledge management, expressed through the SECI process, affects the assessment of the contribution of experiential knowledge. However, SECI's perceived importance and time allocation were found to have distinct effects on experiential knowledge, in particular with the former on individual skills and know-how (Q305) and frequent knowledge and experience sharing (Q313), and the latter on respect and trust (Q306) and enthusiasm and competitive spirit (Q307). In other words, both perceived importance and time allocation of knowledge management activities are necessary since they each promote different characteristics of experiential knowledge as a source of competitive advantage.

This finding on the discriminate contribution of SECI's perceived importance and time allocation was further substantiated by the factor analysis which confirmed the division of experiential knowledge into technical knowledge related to technical skills and shared know-how, and affective knowledge found in love, care and trust, and the employees' enthusiasm and competitive spirit. Also, the structural equation model showed that the perceived importance of combination activities – or the conversion mode from explicit to explicit knowledge between two parties – appears as the most important source of technical knowledge, and that more time spent on socialization activities – or the conversion mode from tacit to tacit knowledge between two parties – emerges as the most important source of affective knowledge.

Combination – "the combination of different bodies of explicit knowledge among individuals" (Nonaka and Takeuchi, 1995, p. 62) – indeed contributes to increased shared technical knowledge, while socialization – "sharing experiences and thereby creating tacit knowledge such as shared mental models and technical skills" (Nonaka and Takeuchi, 1995, p. 67) – plays an important part in raising affective knowledge. This means for practitioners that on the one hand, training activities using manuals and written documents, or means of explicit knowledge diffusion in general, can improve technical knowledge. In the case of technical product specifications for instance, the sharing of technical information results in immediate explicit knowledge available to the recipients at any time, whether in their mind on in a written document at their disposal. On the other hand, on-the-job training involving a more humanized relation, with its full array of sensitivities such as a master and apprentice-type relationship where individuals share practice beyond a common language, can result in increased affective knowledge. However, even though combination and socialization proved to have the strongest effect on technical and affective knowledge respectively, externalization and internalization should also be given some attention since they also significantly contributed to those two sources of competitive advantage.

It is important to note that time spent on SECI activities alone barely contributes to any technical knowledge (less than 1 per cent). This can be interpreted as the belief of JPC workers in Japan that the simple existence of knowledge management actions

embedded in everyday work activities carries far more value for technical knowledge than the time spent on those knowledge management tasks.

5.2 Consistent knowledge management behaviors as discriminate sources of competitive advantage
The perceived importance of knowledge management expressed through SECI and the time spent on it can be compared to the two contrasting theories of action, respectively espoused theories that are used to convey our actions to others and theories-in-use that govern actual behaviors (Argyris and Schön, 1978). The former predict very well what people will say when asked about their perceived importance of knowledge management activities, but may differ from the latter which drives how much time they will actually devote to the same knowledge management activities.

We can therefore refine our taxonomy of workers on the one hand into skeptics and advocates who display a high level of congruence between their theories-in-use and their espoused theories expressed through matching mean scores (whether high or low) for perceived importance and time allocation of SECI, and on the other hand into busy and hopefuls who show a low level of congruence between their theories-in-use and their espoused theories (Figure 7).

According to the taxonomy at hand, the high congruence group is more than five times as large (830) as the low congruence one (158). The high congruence group displays a medium negative correlation with the contribution of technical knowledge, implying that skeptics and advocates believe technical knowledge not to be a source of competitive advantage for the firm. Conversely, the low congruence group displays a mild positive correlation with the contribution of embedded knowledge for busy workers and a medium positive correlation with the contribution of affective knowledge for hopefuls. These results suggest that busy workers consider embedded knowledge to be a source of competitive advantage, while hopefuls regard affective knowledge to be a source of competitive advantage for the firm.
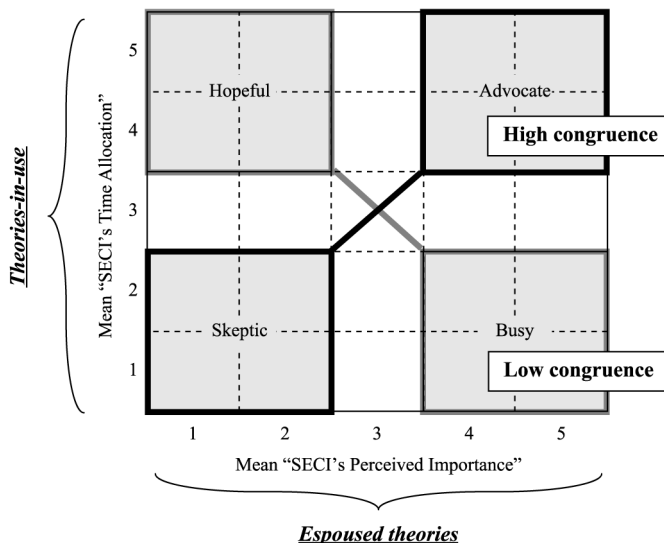
The time that hopefuls spend on knowledge management activities, despite considering them as not important, reflects their opinion that love, care, trust, and zeal make a contribution to the organization. Their dedication goes beyond their personal belief and they choose to put the group's interests ahead of their own. Hopefuls can therefore be considered collectivist, as defined by Hofstede (1980). In contrast, the little time that busy workers spend on knowledge management activities despite considering them important is a sign of their belief that standardized procedures and systems in place greatly benefit the organization. Therefore, these busy workers can be seen as individualist (Hofstede, 1980), since they put their personal interests ahead of those of the group, regardless of their confidence in the importance of knowledge management activities.

Because high knowledge management congruence and low knowledge management congruence groups consider different types of knowledge to make up sources of competitive advantage for the organization, they represent two different targets for human resources and require specifically-tailored training activities and job assignments. As was shown earlier, since combination appeared as the most important source of technical knowledge, identified groups of skeptics and advocates should be trained on the importance of explicit-to-explicit knowledge conversion and mandatory combination activities should be included in their duties in order to increase their perceived contribution of technical knowledge.

The taxonomy emphasizes the fact that not only social forces, but also individuals are responsible for shaping social reality, which is consistent with Giddens's (1984) theory of structuration. This theory provides a way to connect micro and macro analysis or agency and structure, and claims that although people are not entirely free to choose their own actions, and their knowledge is limited, they nonetheless are the agency which reproduces the social structure and leads to social change. The individual influence on knowledge management demonstrates that social structure can exercise a kind of agency, as playing an active role in organizing social systems, but it is also an outcome of individual practices.

Conclusion

This research has revealed discriminate sources of competitive advantage among specific beliefs and behaviors related to knowledge management. As such, the perceived importance of SECI activities – especially combination – appears as the most important source of technical knowledge, while more time spent on SECI activities – in particular socialization – contributes the most to affective knowledge.

Moreover, it is necessary to identify groups of workers in the organizations based on their level of congruence between their theories-in-use and espoused theories related to knowledge management. The workforce is not a uniform body and intrinsic differences need to be taken into account to maximize the efficiency of knowledge management and eventually the output of the firm. The taxonomy of employees based on their perceived importance of and the time they spend on knowledge management shows that KM advocates do not believe technical skills and know-how to be important factors of success, that KM busy workers consider documents and databases as a source of competitive advantage, and that KM hopefuls think that love, care, trust and enthusiasm contribute greatly to the firm.

These findings may help develop tailored knowledge management strategies targeting each group of worker according to their perception of and involvement in knowledge management activities in order to improve their productivity. A finer understanding of the knowledge assets that matter most for its knowledge workers will likely benefit the firm in the pursuit of competitive advantage.

References

Argote, L. and Ingram, P. (2000), "Knowledge transfer: a basis for competitive advantage in firms", *Organizational Behavior and Human Decision Processes*, Vol. 82 No. 1, pp. 150-69.

Argyris, C. and Schön, D.A. (1978), *Organizational Learning*, Addison-Wesley, Reading, MA.

Argyris, C. and Schön, D.A. (1992), *Theory in Practice: Increasing Professional Effectiveness*, Jossey Bass Higher and Adult Education Series, Jossey Bass, San Francisco, CA.

Barney, J.B. (1996), "The resource-based theory of the firm", *Organization Science*, Vol. 7 No. 5, pp. 469-76.

Bollen, K.A. (1984), "Multiple indicators: internal consistency or no necessary relationship?", *Quality & Quantity*, Vol. 18, pp. 377-85.

Bollen, K.A. and Lennox, R. (1991), "Conventional wisdom on measurement: a structural equation perspective", *Psychological Bulletin*, Vol. 110 No. 2, pp. 305-14.

Chin, W.W. (1998), "Issues and opinion on structural equation modeling", *Management Information Systems Quarterly*, Vol. 22 No. 1, pp. vii-xvi.

Chuang, S. (2004), "A resource-based perspective on knowledge management capability and competitive advantage: an empirical investigation", *Expert Systems with Applications*, Vol. 27 No. 3, pp. 459-65.

Comrey, A.L. (1979), *A First Course in Factor Analysis*, Academic Press, New York, NY.

Falk, R.F. and Miller, N.B. (1992), *A Primer for Soft Modeling*, University of Akron Press, Akron, OH.

Field, A. (2005), *Discovering Statistics Using SPSS*, Sage Publications, London.

Giddens, A. (1984), *The Constitution of Society: Outline of the Theory of Structuration*, Polity Press, Cambridge, MA.

Hair, J.F., Andersen, R.E., Tatham, R.L. and Black, W.C. (1998), *Multivariate Data Analysis*, Prentice-Hall, Englewood Cliffs, NJ.

Hofstede, G. (1980), *Culture's Consequences*, Sage Publications, Newbury Park, CA.

Holsapple, C.W. and Singh, M. (2001), "The knowledge chain model: activities for competitiveness", *Expert Systems with Applications*, Vol. 20 No. 1, pp. 77-98.

Jordan, J. and Jones, P. (1997), "Assessing your company's knowledge management style", *Long Range Planning*, Vol. 3 No. 3, pp. 392-8.

Kline, P. (1999), *The Handbook of Psychological Testing*, Routledge, London.

Nonaka, I. (1994), "A dynamic theory of organizational knowledge creation", *Organization Science*, Vol. 5 No. 1, pp. 14-37.

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

Nonaka, I., Toyama, R. and Konno, N. (2000), "SECI, *ba* and leadership: a unified model of dynamic knowledge creation", *Long Range Planning*, Vol. 33 No. 1, pp. 5-34.

Nonaka, I., Umemoto, K. and Senoo, D. (1996), "From information processing to knowledge creation", *Technology in Society*, Vol. 18 No. 2, pp. 203-18.

Nonaka, I., Byosiere, P., Borucki, C.C. and Konno, N. (1994), "Organizational knowledge creation theory: a first comprehensive test", *International Business Review*, Vol. 3 No. 4, pp. 337-51.

Polanyi, M. (1966), *Tacit Dimension*, Peter Smith, Gloucester, MA.

Porter, M.E. (1990), *The Competitive Advantage of Nations*, The Macmillan Press, London.

Prahalad, C.K. and Hamel, G. (1990), "The core competence of the corporation", *Harvard Business Review*, May-June, pp. 79-91.

Spender, J.C. and Grant, R.M. (1996), "Knowledge and the firm: overview", *Strategic Management Journal*, Vol. 17, Winter, pp. 5-9.

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