



A model of intellectual capital management capability in the dynamic business environment

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Abstract

This paper discusses the way in which intellectual capital (IC) can be managed to assist organization to overcome dynamic challenges. An intellectual capital management capability (ICMC) model is developed which permits the management of an organization to realize the potential of IC by measuring the maturity level of its IC. The model is consistent with dynamic capability theory, which suggests leveraging internal and external resources in response to environment changes to sustain competitive advantage. By utilizing in-depth interviews with 25 chief executive officers from firms possessing high IC, this study seeks to inform the readers of the preliminary work and the way in which the maturity level of ICMC can be measured through the development and deployment of dynamic capabilities. The verification and enhancement of the proposed model has also clarified our understanding on the evolutionary path of management capabilities of IC.

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Introduction

Although intellectual capital (IC) and the measurement of IC by organizations has been an emerging area of substantial research interest, research efforts to date have led to mixed and inconclusive outcomes.

The findings in many studies concerning IC have considered IC as a critical resource of competitive advantage. According to resource-based view, IC is a bundle of critical resources, as firms compete on the basis of 'unique' corporate resources that are valuable, rare, difficult to imitate, and non-substitutable by other resources (Wernerfelt, 1984; Bontis, 1998; Nahapiet & Ghoshal, 1998). Firms possess resources, a subset of which enables them to achieve competitive advantage, and a subset of those that leads to superior long-term performance. Resources that are valuable and rare can lead to the creation of competitive advantage (Barney, 1991). Coakes & Bradburn (2005) note that the exploitation of IC is much about reducing cost of operational errors, as well managed IC yield value to the organization. Harrison & Sullivan (2000) mention that managing IC help organization to create values, as the management of IC can increase profits, strategic positioning, innovative needs, increased customer loyalty, reduced costs, and improved productivity.

However, the resource-based view has been criticized for ignoring factors surrounding resources, as today's business environment is full of constant changes with customers, suppliers, technologies, and business partners. Capabilities of integrating resources and exploiting the value of these

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interrelated IC components for effective business competition are needed. These capabilities are invisible but important sources of IC. Considerations such as how resources are developed, how they are integrated within the firm, and how they are released have been under-explored in the literature (Teece *et al.*, 1997; Eisenhardt & Martin, 2000). Therefore, it is a critical part in IC management to identify the required resources and select a suitable strategy to reduce resource gaps in response to the complicated and changing environment (Grant, 1991; Teece *et al.*, 1997).

Combining the resource-based view and incorporating dynamic capability concepts, this paper reports on the development of an instrument to measure the maturity of management capabilities for IC. This instrument is intended to be a tool for the study of initial adoption and eventual diffusion of IC management within organizations.

Theoretical ground and the model concepts

Dynamic capabilities and IC

Dynamic capabilities are referred to 'the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environment' (Teece *et al.*, 1997, p. 516). The concept of dynamic capabilities emphasizes the development of management capabilities and the unique recombination of organizational, functional, and technological skills to address the changing environment as the nature of the mechanisms that enable firms to sustain their competitive advantage. Eisenhardt & Martin (2000, p. 1107) go on to expand dynamic capabilities as processes of using resources, matching, and creating market change. These authors expand dynamic capabilities to include the creation of market change. Zollo & Winter (2002, p. 304) seek to understand dynamic capabilities through organizational learning aspect and conclude that dynamic capabilities are 'a learned and stable pattern of collective activity through which the organization systematically generates and modifies its operating routines in pursuit of improved effectiveness'. This definition implies that organizations need continuous learning and experimentation to upgrade or modify operational routines in order to sense opportunities in a changing environment. Zahra *et al.* (2006), however, argue that dynamic capability may be most valuable when the environment is changing rapidly, but environment change is not the essential component for dynamic capability. These authors propose that dynamic capabilities are embedded in organizational routines and employed to reconfigure the firm's resources or recombining the resources in an innovative way, as managers are the key agents of change.

Dynamic resources help a firm adjust its resource mix and thereby maintain the sustainability of the firm's competitive advantage, which otherwise might be quickly eroded. While the resource-based view emphasizes resource choices or the selecting of appropriate

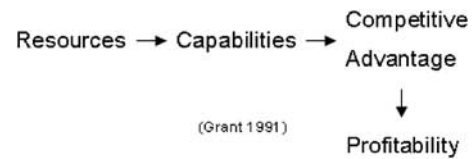


Figure 1 Model concept.

Source: Grant (1991).

resources, dynamic capabilities emphasize resource development and renewal to cope with changes in dynamic environment. Thus, we argue that resources need to be leveraged through management capabilities to yield competitive advantage and bring profitability to organizations (see Figure 1).

Based on the Teece's definition on IC as well as literature works on dynamic capability, we define the management capability for IC as the abilities to integrate, learn, and reconfigure a firm's resources and routines in response to rapidly changing environments. Management capabilities affect organizational knowledge and, in reverse, organizational knowledge and resources determine which capabilities to adapt to emerging conditions. These management capabilities are developed along an evolving path (Teece *et al.*, 1997; Helfat & Raubitschek, 2000; Lavie, 2006). The evolving path has stages of maturity (Kan, 1995). Business positions are gradually established through the life cycle of IC capabilities. Therefore, the concept of dynamic capabilities lay the foundation for analyzing the management of IC. The development and deployment of dynamic capability reflects management's ability to demonstrate timely responsiveness and rapid innovation and to effectively coordinate and redeploy internal and external resources based on managerial and organizational processes, market positions, and path dependencies.

Measuring maturity level with CMM

The Capability Maturity Model (CMM), first described by Humphrey (1989), is a model which aids in the definition and understanding of an organization's processes (Humphrey, 1989; Chrissis *et al.*, 2003). A maturity model can be described as a structured collection of elements that describe certain aspects of maturity in an organization. The CMM involves the following aspects: maturity levels, key process areas, goals, common features, and key practices.

According to SEI report in 2002, there are five levels of maturity defined along the continuum of CMM, as elaborated below:

1. *Initial* (chaotic, *ad hoc*, heroic), the starting point for use of a new process.
2. *Repeatable* (project management, process discipline), the process is used repeatedly.
3. *Defined* (institutionalized), the process is defined/confirmed as a standard business process.

4. *Managed* (quantified), process management and measurement takes place.
5. *Optimizing* (process improvement), process management includes deliberate process optimization/improvement.

Within the five-level continuum, the uppermost (fifth) level is a notional ideal state where processes would be systematically managed by a combination of process optimization and continuous process improvement.

Incorporating the SEI's five levels definition, we extend in our intellectual capital management capability (ICMC) model the five maturity levels as: know when, know how, manage how, measure how, optimize how, which would enable a firm to understand its current state of ICMC and how far is its current performance in terms of managing IC compared to competitors. ICMC model assists a firm to facilitate continual process improvement through evolutionary steps. It also assists a firm to facilitate continual process improvement through evolutionary steps within a framework of three management capability processes that lay successive foundations for continuous process improvement.

IC components

The classification of IC components is widely diversified in the literature. Many authors and institutions have developed index to measure IC (see Table 1). For instance, American Society for Training and Development (1999) proposed IC management model, which classify 50 IC measurement indexes into four dimensions including human capital, innovation capital, process capital and customer capital. Certified Management Accounts (1998) proposed 35 IC measurement indicators and these indicators were used to measure human capital, organizational capital, and customer relationship capital. Kaplan & Norton (1996) also proposed Balanced Scorecard to help organizations turn their business strategies into measurable indexes. Roos & Roos (1997) proposed IC-index, in which, organization strategy, organization characteristics, and the industry an organization operates were deemed important when aggregating IC measurement standards into index. Edvinsson & Malone (1997) elaborate Scandia Navigator model to stress the importance of customer focus, process focus, renewal, and development focus for the management of IC. Stewart (1997) developed 21 indicators to measure human capital, structural capital, and customer capital. Bontis

(1998), from his research on the measurement and modelling in Canadian industry, found that human capital had a significant influence on structure capital and relation capital, and structure capital and relation capital had direct influence on firm performance. Bassi & Van Buren (1999) found that the investment on human capital could improve the quality of organization's product and service.

The aforementioned research in the literature has two commonalities. First, most authors focus on the development of IC and IC measurement. Second, the relationship between IC and performance has been the centre of concern. Although different researchers have different opinions on the classification of IC, human capital, and customer capital, structure capital remains the most commonly used to measure IC.

These indicators are valuable inputs and outputs of IC and reflect static status of these business potential but did not reflect the organizational capability of making them work for creating or sustaining business competitiveness. In the ICMC model, resources to be managed include: customer capital, relationship capital, process capital, innovation capital, and human capital. Taking the consideration of Kaplan & Norton's (2004) five major business operations, we add relation capital and innovation capital into our ICMC model.

Processes of dynamic capabilities

From a close look at the literature of dynamic capability theory, we propose that three processes – integration/coordination, learning/experimentation, and transformation and reconfiguration – are essential to manage IC (see Figure 2).

Integration/coordination

Managerial capabilities are conceptualized in the context of integrating/COORDINATING external and internal knowledge and resources. Capable firms are assumed to show an effective way of integrating resources. Integrating external knowledge that may not be documented in useful way at hand to help problem solving, but lack of absorptive capacity may limit organization's ability to recognize, assimilate, and to apply external knowledge (Zahra & George, 2002a; Marsh & Stock, 2006). Integrating knowledge from internal resources is another important way for organizations to solve problem. Internal knowledge is more accessible and detailed. For

Table 1 IC measurement dimension and number of indicators proposed

<i>Author</i>	<i>Year</i>	<i>Dimension measured</i>	<i>Number of indicators/indexes</i>
ASTD	1999	Human capital, innovation capital, process capital, customer capital	50
CMA	1998	Human capital, structure capital, customer capital	35
Kaplan and Norton	1996	Financial aspect, customer, process and innovation	100
Stewart	1997	Human capital, structural capital, and customer capital	21
Skandia AFS	1997	Financial, human, customer, process, innovation	111

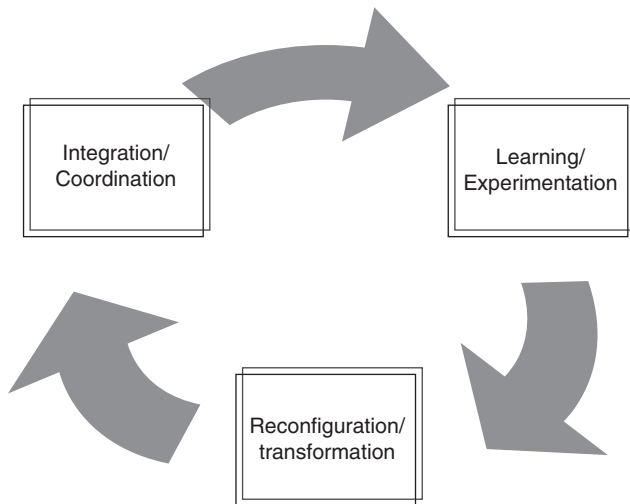


Figure 2 Three key processes of intellectual capital management capabilities.

instance, managers combine varied skills and functional backgrounds to create new products or services (Helfat & Raubitschek, 2000; Menon & Pfeffer, 2003). The combinations of complementary resources are difficult for competitors to duplicate and therefore yield competitive advantage (Dyer & Singh, 1998).

Thus, in the proposed model (ICMC model), we propose that the objective of integration or coordination is to align with business strategy, to produce consistent processes and to obtain efficiency and effectiveness. The scope of resources integration/coordination includes: integration of internal and external resources with major business operations (see, e.g., Kaplan & Norton, 2004), such as operation management processes (i.e. supply chain management, product and service development, and delivery of products and services), customer management process (i.e. customer identification, acquisition, and retention), and innovation management processes (i.e. managing opportunities and developing new products/services). The activities performed in the process of integration/coordination include planning moves with related knowledge integrated and executing planned activities with tasks and resources (human, knowledge, process, information technology, customer, and relationship) coordinated. The capabilities of integration/coordination can be identified when there is a change occurred in market.

Learning/experimentation

Learning/experimentation is one of the most important ways for organizations to create knowledge or build new thinking within the firm, which is a crucial management capability for managing IC. As pointed out by Teece *et al.* (1997, p. 520) 'learning is a process by which repetition and experimentation enable tasks to be performed better and quicker and make new production opportunities to

be identified'. Repeated practices help people to understand processes more fully and to improve routine effectively. A couple of researchers have demonstrated the importance of learning as a mechanism for the development of management capabilities (Zollo & Singh, 1998; Argote, 1999). Learning from experiences or practices makes the organizations easier to apply and accelerates knowledge (Zander & Kogut, 1995). Learning from success and failure also plays a role in the development of management capabilities of IC. Eisenhardt & Martin (2000) point out that small failure leads managers to paying great attention to the process, but does not impede learning. Kim (1998), in his research on crisis construction and organizational learning, found that internal generation of a sense of failure motivated internal learning.

Thus, we propose that the purpose of learning and experimentation process in the ICMC model is to encourage experimenting new knowledge and skills, and to improve and reinvent IC capabilities continuously. The scope of learning and experimentation in ICMC model includes learning and experimenting about better utilizing IC during and after projects. Learning activities include acquiring, distributing, and experimenting knowledge about major business operations.

Reconfiguration/transformation

Reconfiguration/transformation is another key management capability in leveraging IC. In rapidly changing environment, there is obvious value in the ability to sense the need to reconfigure the firm's asset structure, and to accomplish the necessary internal and external transformation. The capabilities to continuously reconfigure or transform the resource a firm has developed are crucial to fit in with uncertainty in rapid changing environment (March & Simon, 1993). Reconfiguration process enables managers to copy, transfer, and recombine resources within the firm. As Teece *et al.* (1997) note, a reconfiguration process enables managers to reconnect webs of collaboration among various parts of the firms to generate new and synergistic resources combinations among business. The capability to reconfigure and transform resources create potential for long-term competitive advantage (Eisenhardt & Martin, 2000). The constant scan of changes in environment and technologies, evaluating markets and competitors enable the firm to sense the need to reconfigure the firm's IC and to accomplish necessary internal and external transformation to meet evolving customer demands and competitor strategies (Teece *et al.*, 1997; Zahra & George, 2002b).

Thus, we propose that the objective of reconfiguration process is to sense, plan, and implement changes. The scope of reconfiguration process in ICMC model should include IC components, business activities, organizational policies, and practices. In order to actualize reconfiguration process, organizations need to take activities including sensing the need for changes in major operations and

customer relationships, and implementing changes with components of IC (complementary resources) reconfigured.

Model development and enhancement – case study

Development of the instrument was carried out in three stages. The first stage was the development of management capability processes, whose purpose was to identify corresponding activities in each process. The basic procedure was to search from literature for activities taken in different management capability process. Then, a first pilot test was conducted to obtain opinions from industrial experts on how to sort the features from the first stage into different processes. Based on their placement, the features would then be examined, and inappropriate wording or ambiguous features would be eliminated. The features were then combined into an overall instrument for the instrument testing stage, which included three separate steps. First, the instrument was distributed to a small sample of respondents, and a focused group discussion was conducted to get an initial indication of the scale's reliability. Wording and features that did not clearly represent a maturity level were culled for the second round of testing, which was another pilot test. In the third step, the scales were further refined, and a field test of the instrument was carried out in 25 companies through in-depth interviews with chief executive officers.

All selected cases must meet three research criteria, so that the research can collect the best practices from every investigated firm. The first criterion is that the selected case companies must have their market value greater than book value, so as to ensure the selected case companies can provide their experiences for other firms to learn. Second, the selected companies must be reported for good ICMC. The third criterion is that all selected company must have maintained competitive positions for at least 3 years in industry. In order to meet up the three criteria more easily, we selected our cases from the 'Industrial Innovation, Research and Development, and Management Award (IIRDMA) winners'. This award is set up to assess model enterprises to promote enterprise innovation and to advance organization competitive advantage. The assessment of IIRDMA includes five dimensions: know-how, product/service, production/process, organization and strategic innovation, research and development and management. IIRDMA was offered by the government to encourage and promote innovation, research and development, and management in the high-technology industry to help firms learn from best practices.

In total, there were 50 prizewinners in 2005 and 2006, within which, three companies did not meet our research criteria, as their market values were less than their book values at the time. We then sent e-mails to those companies that meet our criteria, explaining our research purpose and inviting their CEOs to participate in our interviews. Telephone contacts were made afterwards to

make sure the CEOs received our invitations. In the end, 10 companies rejected participating in the research. Therefore, the non-respondent rate was 21%. Under the constraints of the research schedule, we conducted the in-depth interviews with 25 companies. Each interviews lasted from 2 to 4 h, as interviewees not only provided the answer to the questionnaire but also added evidence to support their answers.

Stage 1: identifying the link between management capabilities with business operations

The objective of this first stage was to ensure content validity. As mentioned earlier in the literature review, we started by studying existing literature on dynamic capabilities and found that dynamic capabilities were reflected in various management processes. However, there is no consensus on what process is necessarily required to leverage IC, and the evolutionary path of dynamic capabilities is inconclusive. By reviewing various studies on dynamic capability theory and evolutionary theory (such as Penrose, 1995; Nelson & Winter, 2002; Helfat & Peteraf, 2003), we obtained the initial ideas about capability development and found that management capabilities were developed through different stages with different patterns of activities.

We measured organization's management capabilities of reacting to changes in five business functional aspects, that is customer, supplier chain, product and service, innovation, and employee capabilities. These management capabilities are embedded in the firm's planning and executing activities. Three management processes, that is integration, learning and experimentation, reconfiguration and transformation, provide a foundation for effective planning and executing strategies and practices to react to change in five identified business dimensions and enables organizations to adapt to changes.

Stage 2: development of corresponding activities

The goal of this stage was to assess the construct validity of the various management capabilities of IC being developed and to identify any particular item that may remain ambiguous. To this end, we conducted a pilot test with six experts. The experts were asked to sort features into construct categories. They were also asked to supply additional features of their own to the construct categories, if any. With this step, we were able to verify the construct validity of the management capabilities of IC. Initially, there were 43 questions in the questionnaire. But some respondents remarked that many questions were inappropriate for the development of the instrument. As a result, we decided to drop some of them while retaining desired reliability level. Then, we conducted a second pilot test of the questionnaire using respondents whose background was similar to the target population of the final study. The primary aim of this test was to ensure that each of the scales could be used to demonstrate appropriate levels of reliabilities.

Table 2 Maturity Levels

Level	Maturity	Explanation
1	Aware (know when)	The firm is aware of the benefit of managing IC but has not begun to manage yet.
2	Defined (know how)	The firm has some IC management practices in one or few department(s).
3	Standardized (manage how)	The firm has set up structured management practices for managing IC across every department, such as setting up standard operation procedures.
4	Managed (measure how)	The firm links the IC management practices with reward systems, such as linking IC practices with key performance indicators.
5	Optimized (optimize how)	The firm constantly monitoring market changes and adjust it IC management practices in accordance with the market changes and internal IC measurement result.

Table 3 Maturity level with characteristics

Level	Maturity	Key practices
1	Aware	<ul style="list-style-type: none"> ✔ Aware of the concept of IC ✔ Begin to pay attention to the value of IC ✔ Begin to recognize the needs for managing intellectual and sharing intellectual management related knowledge
2	Defined	<ul style="list-style-type: none"> ✔ Establish IC management objectives ✔ Explore strategic direction for managing IC ✔ Develop intellectual management strategy ✔ Recognize what IC need to be managed ✔ Identify the barriers to IC management ✔ The above activities are usually practiced at a small group level of a single department
3	Standardized	<ul style="list-style-type: none"> ✔ Begin to align intellectual management objective with business strategy ✔ Execute improvement practices for solving barriers to IC management ✔ Set up IC management and practices for employees to follow ✔ IC management is practiced across all departments
4	Managed	<ul style="list-style-type: none"> ✔ Begin to integrate IC management activities with business measurement ✔ Formulate IC measurement indicators and adjust IC management objectives in accordance with business strategy
5	Optimized	<ul style="list-style-type: none"> ✔ Use reward system to intensify IC management practices ✔ Constantly monitoring market changes and reconfiguring IC in response to meet the customers' needs ✔ Continuously improving IC management and practices ✔ IC management has penetrated a firm's culture

The respondents first completed the questionnaire and made comments on the design of questions in the questionnaire concerning the length, wording, and instructions of the items. After the second pilot test, the questionnaire was revised to reflect the comments and suggestions made by the respondents, and features of different maturity levels were modified to fit in with the norms and practices of the industry. In the end, 25 questions were kept (see Appendix). The development of corresponding maturity levels was finalized (see Table 2).

Stage 3: field test

In the field test, in-depth interviews with chief executive officers in 25 selected case companies were carried out. Each interview lasted for 2 h or longer. The questionnaire (see Appendix) was used to guide the interview processes, and the interviewees were asked to provide 1–2 examples to support their answers on each question. Company

documents were also collected for data analysis. The interviews were taped and transcribed. Then, we allocated organization activities into each maturity level. The next step was to look for patterns, regularities, casual flows, and differences among the selected case companies. From the data analysis, we identified some characteristics for each maturity level as could be shown in Table 3.

From the fieldwork, we found that the three key processes of management capabilities of IC were not going on one direction but going as a recursive process. Thus, we modified the processes of management capabilities to fit in with practical situation occurred in organizations (as in Figure 3). Management capabilities of IC are affected by business strategies. For instance, when a firm's main business is based on original equipment manufacturing (OEM), it naturally pays more attention to the development of process capital. In contrast, when the firm shifts its business strategy from OEM to own brand manufacturing, it will also shift its

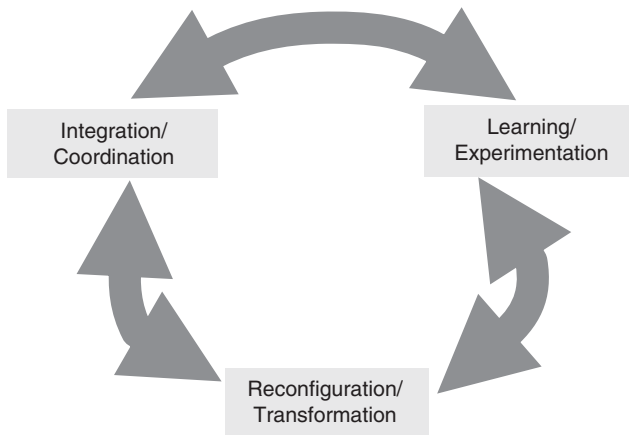


Figure 3 The recursive processes of intellectual capital management capabilities.

attention to the development of relationship capital and customer capital.

In addition, management capabilities of IC may evolve from one stage to an upper maturity level, but may also regress from one stage to a lower level. This is because when a firm changes its business strategy, it has to develop new capabilities to manage different components of IC. Therefore, the management capability may begin a new circle of integration, learning, and transformation to accomplish the new business strategy.

Moreover, the capabilities of leveraging IC are affected by the development process of a firm. A firm may manage one or several IC components rather than all components at a time, as its capabilities have been affected by the nature of a firm's growth. To sum up, the findings derived from the field test of ICMC model provide a more clear insight into the development process of management capabilities of IC.

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Summary and conclusion

The instrument development research described here offers several contributions. The most obvious is the creation of an overall instrument to measure IC management capabilities. The creation process included surveying known instruments, choosing appropriate items, creating new items as necessary, and then undertaking an extensive scale development process. The development processes also helped to clarify and refine some of the concepts in dynamic capabilities. By verifying the model with industrial experts and chief executive officers, it is revealed that the processes of integration/coordination, learning/experimentation, and transformation/reconfiguration are recursive.

The instrument comprises three management capabilities of IC with corresponding features. This model now can be used to investigate what are a firm's ICMC. It enables firms to review their current inventory of IC and identify critical areas that need upgrade. The ICMC model also enables firms to learn from the best practices and to plan for improvement.

When recommending this instrument to researchers investigating IC management capabilities, it should be noted with caution that this model solely focuses on measuring existing management capabilities. Thus, developing improvement guidelines in the future for each IC component will be valuable to industries. Although the ICMC model takes external environment changes into consideration, the way in which business strategy affects a firm's IC management capabilities has yet to be more adequately explored. Future research in the evolution path of management capabilities of IC will shed some light to the literature on IC management. Moreover, further investigation on how to link ICMC model with business strategy will also bring more lights to organizations who wish to leverage their ICs with dynamic capabilities.

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Appendix

Questions asked in the interviews

A. There are 25 questions in this part, concerning 'Management Capabilities of Intellectual Capital'.

	Customer relation	Supplier relation	Production/ service	Innovation management	Employee capabilities
<i>Integration/coordination</i>					
Planning	Q1	Q6	Q11	Q16	Q21
Execution	Q2	Q7	Q12	Q17	Q22
<i>Learning/experimentation</i>					
Learning	Q3	Q8	Q13	Q18	Q23
Experimentation	Q4	Q9	Q14	Q19	Q24
<i>Reconfiguration/transformation</i>					
Sensing changes	Q5	Q10	Q15	Q20	Q25

B. Please indicate the appropriate answer and provide an example to support the answer. Note 1: Very weak. 2: Weak. 3: Ordinary. 4: Strong. 5: Very strong.

(I) Customer relation

- Q1. When customers' requirements or demands change, what is your company's capability of integrating the knowledge about customers and internal resources to plan for new market development and acquiring new customers? (Please provide an example)
1. ___ 2. ___ 3. ___ 4. ___ 5. ___
- Q2. What is your company's ability to integrate processes, technologies and human resources for improving the efficiency of customer development? (Please provide an example)
1. ___ 2. ___ 3. ___ 4. ___ 5. ___
- Q3. During the process of customer relationship management, what is your company's learning ability? (Please provide an example)
1. ___ 2. ___ 3. ___ 4. ___ 5. ___
- Q4. To what extend does your company experiment newly learned knowledge on managing customer relationship? (Please provide an example)
1. ___ 2. ___ 3. ___ 4. ___ 5. ___
- Q5. What is your company's capability of sensing an opportunity for improving customer relationship management (such as ascertaining target customers, attracting new customers, customer retention, and increasing earning per customers etc.)? (Please provide an example)
1. ___ 2. ___ 3. ___ 4. ___ 5. ___

(II) Supplier relation

- Q6. When suppliers or stakeholders (such as strategic alliances) change, what is your company's capability of integrating knowledge about the market and supplier chain with internal resources for planning an improvement project that can increase efficiency and effectiveness of supplier chain? (Please provide an example)
1. ___ 2. ___ 3. ___ 4. ___ 5. ___
- Q7. When suppliers and stakeholders change, what is your company's capability of integrating knowledge about suppliers with internal process, technologies, and human resources to for improving efficiency and effectiveness of supplier chains? (Please provide an example)
1. ___ 2. ___ 3. ___ 4. ___ 5. ___
- Q8. During the process of managing supplier chains and stakeholders, what is your company's capability of learning? (Please provide an example)
1. ___ 2. ___ 3. ___ 4. ___ 5. ___
- Q9. To what extend does your company experiment newly learned knowledge on managing supplier chains and stakeholders? (Please provide an example)
1. ___ 2. ___ 3. ___ 4. ___ 5. ___

Q10. What is your company's capability of sensing the opportunity for improving supplier chain management? (Please provide an example)

1. ___ 2. ___ 3. ___ 4. ___ 5. ___

(III) Production/service

Q11. When market changes, what is your company's capability of integrating knowledge about products or services with internal knowledge to plan for production or services improvement? (Please provide an example)

1. ___ 2. ___ 3. ___ 4. ___ 5. ___

Q12. What is your company's ability to integrate external knowledge with internal process, technologies, and human resources to implement improvement plan for production effectiveness? (Please provide an example)

1. ___ 2. ___ 3. ___ 4. ___ 5. ___

Q13. What is your company's ability to learn from production or service management? (Please provide an example)

1. ___ 2. ___ 3. ___ 4. ___ 5. ___

Q14. What is your company's ability to experiment newly learned knowledge on production and delivery management processes? (Please provide an example)

1. ___ 2. ___ 3. ___ 4. ___ 5. ___

Q15. What is your company's ability to sense opportunity for production and service improvement? (Please provide an example)

1. ___ 2. ___ 3. ___ 4. ___ 5. ___

(IV) Innovation management

Q16. When market and technology changes, what is your company's ability to integrate knowledge about market information, technology development with internal resources such as the understanding about customer behaviours, existing innovation properties, and intellectual rights for new products or services design? (Please provide an example)

1. ___ 2. ___ 3. ___ 4. ___ 5. ___

Q17. What is your company's ability to integrate knowledge about external market with internal process, technologies, and human resources for implementing innovation improvement plan? (Please provide an example)

1. ___ 2. ___ 3. ___ 4. ___ 5. ___

Q18. What is your company's capability of learning during and after the process of innovation projects? (Please provide an example)

1. ___ 2. ___ 3. ___ 4. ___ 5. ___

Q19. What is your company's ability to experiment newly learnt knowledge on innovation project implementation? (Please provide an example)

1. ___ 2. ___ 3. ___ 4. ___ 5. ___

Q20. What is your company's capability of sensing an opportunity for innovation? (Please provide an example)

1. ___ 2. ___ 3. ___ 4. ___ 5. ___

(V) Employee capabilities

Note: Questions in this part are to understand whether your company can sustain competitiveness under dynamic environment. Please indicate the degree of satisfaction on whether or not employees' reactions towards changes in organizational strategy can help organization sustain competitiveness. (Please provide an example to each question)

1: Very unsatisfied. 2: Unsatisfied. 3: Ordinary. 4: Satisfied. 5: Very satisfied.

Q21. When organizational strategy changes, what is employees' ability to adjust working procedures in the relevant department? (Please provide an example)

1. ___ 2. ___ 3. ___ 4. ___ 5. ___

Q22. When organizational strategy changes, what is employees' capability of problem solving in the relevant department? (Please provide an example)

1. ___ 2. ___ 3. ___ 4. ___ 5. ___

Q23. When organizational strategy changes, what is the learning capability of core workers? (Please provide an example)

1. ___ 2. ___ 3. ___ 4. ___ 5. ___

Q24. What is core workers' capability of knowledge sharing for organizational performance improvement under the circumstances of organizational strategy changes? (Please provide an example)

1. ___ 2. ___ 3. ___ 4. ___ 5. ___

Q25. What is core workers' capability of sensing new opportunities for sustaining competitive advantage? (Please provide an example)

1. ___ 2. ___ 3. ___ 4. ___ 5. ___

About the authors

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