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KNOWLEDGE MANAGEMENT AND INTELLECTUAL CAPITAL

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A Dissertation

Submitted in Partial Fulfillment of the Requirements for the  
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DISSERTATION APPROVAL

KNOWLEDGE MANAGEMENT AND INTELLECTUAL CAPITAL

By

Hsiu-Yueh (Sonya) Hsu

A Dissertation Submitted in Partial

Fulfillment of the Requirements

for the Degree of

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in the field of Management

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February 22<sup>nd</sup>, 2006

## AN ABSTRACT OF THE DISSERTATION OF

Hsiu-Yueh Hsu, for the Doctor of Philosophy degree in Management, presented on February 22nd, 2006 at Southern Illinois University Carbondale.

TITLE: KNOWLEDGE MANAGEMENT AND INTELLECTUAL CAPITAL

MAJOR PROFESSOR: Dr. Peter P. Mykytyn Jr.

Neoclassical economics brings up the importance of knowledge and “capital” to the business processes. Followed the stream of the importance of knowledge and capital, this current research attempts to clarify the intertwined properties between intellectual capital (IC) and knowledge management (KM), and at the same time, establish an integrated framework for either IC or KM fields.

With very little information about KM practices in the United States, this research investigated KM with a process perspective and its relationship to IC. The focus is to examine the effects of human capital and innovation capital on organizational effectiveness, accounting for the mediation of knowledge process capabilities and structural capital with organizational effectiveness in turn leading to a firm’s competitive advantage.

One hundred and twenty-five usable questionnaires were collected through an email and Web survey method. Respondents to the questionnaire were middle to top managers who worked in companies that held patents in various industries. Partial Least Squares was utilized to estimate the theoretical model; the unidimensionality, discriminant validity, convergent validity, and reliability were also established. Four out of six research hypotheses were supported by the results, and they were:

- Human capital had an indirect effect on organizational effectiveness via the paths of knowledge management process capability;

- Human capital had an indirect effect on organizational effectiveness via the paths of structural capital;
- Knowledge process capability had a positive effect on organizational effectiveness;
- Organizational effectiveness had a positive influence on organizational competitive advantage.

The hypotheses related to innovation capital were not supported by the model estimation and path analyses. However, the revised model opened up three significant paths when one path: from innovation capital to human capital was added. These three paths supported the position that innovation capital was facilitated by human capital.

Several contributions of this research project were realized. First, an integrated model of KM and IC was empirically tested. Second, emergent KM processes as enablers of organizational effectiveness and the relationship with other IC components, including human networks, knowledge infrastructure, and organization configuration, were established. Third, the importance of innovation capital and its potential influence on organizational performance and competitive advantage was investigated and could be important to further academic research and organizational practitioners. A revised model was presented that may lead to future research in this area.

## ACKNOWLEDGMENTS

I live in a village of intelligent people. My path to a Ph.D. was blessed by these people along the way. It is said that it takes a village to raise a child; it is for sure that this Ph.D. wouldn't be achieved without a "village" of academics who contribute their intelligence, knowledge, and constructive advice at numerous occasions whenever I have doubts or questions. As Dr. Mykytyn once and always said, we, Ph.D. students, are more like a light bulb in an oven that will grow brighter overtime if we keep advancing ourselves. Of course, this oven light bulb can't grow brighter without the guidance and efforts from a whole "village."

This long-processed project would not be taken place if it weren't for Dr. Mykytyn's belief in me. It is not an easy project to develop and there is so much to do with it. I am grateful to have Dr. Mykytyn as my chair to shed the light in the darkness of the process of completing this dissertation. His intelligence, modesty and research integrity will carry me over a long way in my academic career -- more than I may ever realize. I also want to thank Dr. Siva who provided numerous advices and essential mentoring since the very start of my doctoral program. I've learned so much from his classes and they laid a great deal of the foundation for many research projects to come!

I would also like to thank my committee, Dr. Paul, who was there for me throughout this project; Dr. Nelson and Professor Hlavach, who offered their suggestions and encouragement. Further, I appreciate the moral support and rigorous discussions from my colleagues, Ram, Songpol, Jane, and Chris. Most importantly, my thanks go to Dr. White and Dr. Pearson who kindly offered the financial supports from Management Department, College of Business Administration and Pontikes Center to my data

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In this long journey, if it were not because of my husband, Steve, I would have possibly quit long before it was done. For that, I specifically thank Steve, my dearest friend, who shares the ride with me side by side in highs and lows during this journey. His support and love is so immense that still gives me “awe” after 15 years of marriage. My son Joseph and daughter LiAnne give me such a joy to be their proud parent and they make me want to be a better person than who I am day by day. Their understanding and sacrifices make me feel blessed, grateful and guilty at the same time. I wish that I could spend more time with them in my waking hours!! I also appreciate my in-laws’ helps with the kids, so they can have wonderful trips, vacations and campouts that my husband and I can’t afford the time and money.

My family in Taiwan is supportive in many different ways. Especially, I am thankful to my parents’ moral and financial support to all my educations. They raised me well and wish me a success. Hopefully, this report card I turn in this time will give them a joyful satisfaction. I sincerely hope that I have met and even exceeded their expectations. I wish I can ever repay them my forever gratefulness somehow someday. I sincerely hope that I will become a member of a “village” that contributes to someone’s lifetime achievement.

## DEDICATION

To my dearest Mom

Who always believes in me since my birth on earth;  
Who sets the example before me;  
Who is always in heavenly spirit;  
Whose debt I am in for this lifetime and beyond;  
Whom I was afraid of becoming yet can't help becoming!

I become her!!

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## CHAPTER 1

### INTRODUCTION

#### 1.1 Overview

Today's economy is characterized by a rapid rate of change, globalization and knowledge-intensive products. The resource-based view of the firm postulates a firm's profitability as a function of its market and competitive position. Too, a firm's resources consist of its internal capabilities and know-how that facilitate delivery of products and services to customers as well as enhance organizational performance (Alavi, 2000). The competitive environment today dictates that firms must manage their resources well and must endeavor to provide their knowledge workers with the right knowledge assets. This makes knowledge management (KM) vital to organizations.

The Gartner Group, a leading research/consulting firm for the information technology industry in the US, defines "KM as a discipline that promotes an integrated approach to identifying, capturing, evaluating, retrieving and sharing enterprise information" (Seubert, Balaji, and Makhija, 2001), thus making knowledge available when needed. In recent research by *InformationWeek* (Foley, 2001), 94 percent of companies considered KM strategic to their business or information technology (IT) processes. Most of those companies were in the early stages of their KM activities.

Based on Nonaka (2002), the distinction between information and knowledge is that information is a flow of messages, while knowledge is created and organized by the very flow of information, anchored on the commitment and beliefs of its holder. Due to a number of issues, such as enhanced technologies, the global arena, and efforts to achieve competitive advantage, KM has received an increasing amount of attention in the MIS

literature.

The goal of an effective KM strategy should be to enhance the creation, transfer, and utilization of all types of organizational knowledge (Alavi, 2000), thereby taking less time to process the information and reuse the knowledge. Corporations not only realize that knowledge is the critical resource, but they also try to manage organizational knowledge more intensely and effectively. However, there are many issues influencing these activities, such as 1) how knowledge content translates into “historically dependent” capitals (Barney, 1996, 1997, 2002); 2) who are the users that involve knowledge creation processes and commit to using, assimilating, internalizing, externalizing the knowledge (Nonaka, 1994, 2002); and 3) what should be further developed for sustaining a firm’s competitive advantage. This research seeks to study some of these issues by examining the relationship between KM and intellectual capital (IC).

“Historically dependent” capitals spell out the accumulation of a firm’s assets or knowledge over time that is most likely embedded in organizational routines, policies, or culture. They are invisible, invaluable, and immobile all at the same time. In other words, the historically dependent capitals are used over time and help account for task fulfillments in the firm. “Immobility,” intertwined with historically dependent capitals, can be difficult or costly to move from one firm to another. Therefore, the more immobility of a firm’s capital, the more competitive advantage it brings to the firm.

Most IC researchers (Stewart, 1997; Bontis, 2001; Van Buren, 1999) and Barney’s resource-base view (1991, 1997, and 2002) agree that IC is a critical firm resource. ICs are intellectual materials that can be captured as assets, such as knowledge,

information, intellectual property, and employees' experiences, commitments or capabilities. These assets may increase a firm's performance, and they may in turn translate into a competitive advantage if some important assets are "immobile" (Barney, 2002). "Immobile" resources are firm resources that are idiosyncratic, costly to duplicate, and/or "historically dependent" (Barney, 1991, 1997, 2002). To further integrate the concepts of IC and KM, this research introduced a resource-base view, especially as related to the principles of "mobile" versus "immobile" assets.

Several IC studies (Bontis, 1996, 2001, 2002a, 2002b; Van Buren, 1999; Pike et al., 2002; Stewart, 1997) examined components from a classification and conceptual models perspective. Yet, different components of IC can be measured by accounting, financial, disclosure and/or Tobin's q methods. However, there is no consistency as to the various types of capitals to include as IC components. In terms of definition, a given capital can have the same name as another but the meaning of each is different (Bontis, 2001). It is also possible that two capitals can have different names but the definition of each is overlapped, such as process capital versus organizational capital (Bontis, 2002; Pikes et al. 2002). This research intends to take an inward look at the organization. Therefore, human capital, innovation capital, and structural capital are crucial IC components. They need to be examined more closely in order to fill the gap between KM and IC research. Further, this research takes a more integrative approach to IC and attempts to study different IC models as well as clarify their components and definitions. These concepts are developed in greater detail in Section 2.3.

Human capital is a major IC component that has consistently been presented in different IC models (Bontis, 1996, 2001, 2002a, 2002b; Van Buren, 1999; Pike et al.,

2002). As an employee accumulates his or her experiences, techniques, and skills on the job, he or she may become a company's indispensable asset. In a working environment, these experiences, techniques, and skills embedded in organizational culture, policy, and values translate into "tacit knowledge." Tacit knowledge may pass down as it is or it can be "externalized" as explicit knowledge that can be stored in a database and/or a KM system.

Innovation capital is one IC component rarely mentioned in any IC model. Research by Van Buren (1999) seems to be an exception. Innovation capital focuses on explicit knowledge that facilitated the innovation and creation of new products and services (Van Buren, 1999). Explicit knowledge is records that are easily transmissible, such as archives or database. This capital is important in this research for the following reasons: 1) the innovative capability increasingly receives more attention since Drucker's (1993) new economy concept created a greater emphasis on assets; 2) innovation capital ties in with research and development (R&D) that facilitates a company's competitiveness; 3) innovation capital is a capability to respond and change to the market place with flexibility. Like human capital, innovation capital is a part of knowledge assets in KM research (Bontis, 2001, 2002a, 2002b; Van Buren, 1999; Pike et al., 2002).

The third component of IC in this research -- structural capital -- has been ill defined in previous studies, in which it had different labels but similar meanings among different IC models. Structural capital (Bontis, 2001, 2002a, 2002b) can be process capital (Van Buren, 1999) and organizational capital (Pikes, 2002), and it also intertwines with innovation capital (Van Buren, 1999). Bontis (2002a) defined structural capital as the knowledge embedded within the routines of an organization that includes a

technological component and architectural competencies. Overall, it also echoes knowledge infrastructure in Gold et al. (2001) that consists of organizational structure, culture and technology. To establish this variable, the researcher attempts to delineate the overlapping definitions of different labels, such as organizational capital or process capital and focus structural capital that includes two components -- organizational structure and infrastructure.

In addition to these IC components, there are processes associated with KM. Gold et al. (2001) referred to them as organizational capabilities. These capabilities are acquisition, conversion, application, and protection which evolve from Nonaka's (1994, 2002) four modes of knowledge creation. Besides knowledge infrastructure mentioned above, these components are essential or preconditions for effective KM, according to Gold et al. (2001).

In this research, four dimensions of KM process capabilities along with structural capital (Bontis, 2002a & 2002b; Pikes et al., 2002) are hypothesized to mediate the human capital and innovation capital's effects on organizational effectiveness. In sum, human capital and innovation capital are the independent variables in relation to KM process capabilities and structural capital. These relationships may increase organizational effectiveness that leads to firms' competitive advantages.

### **1.1.1 Problem Statement**

As stated above, IC components intertwine with each other, and they act as integral knowledge assets in an organization. In particular, human and innovation capitals are heavily involved in the knowledge conversion, i.e., tacit knowledge, explicit

knowledge and their transformations from one to the other. While there is no clear division between KM and IC, there is an intuitive link between them. Numerous researchers have investigated knowledge components, KM issues, and success achievement in organizations; however, none has been identified that has included these IC components into an integrated research framework. This research presents such a framework.

Additionally, it does the organization little good if effective KM does not lead to success. This success can be defined as how well an organization engages in KM to innovate and reduce uncertainty in a marketplace. Ultimately, an organization should hope to achieve a competitive advantage. This research presents a model with “process” and “content” perspectives instead of just IT effects that were heavily focused in the early KM initiatives. Besides IT, there are also human relationships, knowledge infrastructure, and organization configuration that are critical to KM and its processes.

## **1.2 Research Questions**

A number of KM studies have conceptually established different dimensions of knowledge issues, e.g., knowledge creation (Nonaka, 1994 & 2002), knowledge process capabilities (Gold et al., 2001), KM systems (Alavi et al., 2001), and knowledge ownerships/rewards systems (Jarvenpaa et al., 2001). Most of either KM or IC research utilized interpretive case studies (Massey et al., 2002, Davenport et al., 1998a, 1998b, 1998c, 2000), or positivist quality research, (e.g., classification or frameworks establishment; Teece, 1998; Bontis, 2002a & 2002b, Pike et al., 2002).

However, there are almost no empirical studies examining the relationship

between IC and KM process, and the links between KM process and organizational effectiveness. The research emphases are uniquely set. In sum, this research focused on 1) the links of KM process capability and structural capital to organizational effectiveness, and the effectiveness link to competitive advantage; 2) the examination of the KM process capability in managing capitals, i.e., human, innovation, and structural capitals. Based on these two agendas, four research questions are raised to guide this study:

1. Does human capital and innovation capital affect organizational effectiveness and are their relationships mediated by the process capabilities of KM in an organization?
2. Does human capital and innovation capital affect organizational effectiveness and are their relationship mediated by the structural capital in an organization?
3. Do KM process capabilities affect organizational effectiveness?
4. Does organization effectiveness relate to an organization's competitive advantage?

### **1.3 Purpose and Scope**

This is an exploratory study that attempts to identify the differences between KM and IC as well as their relationships to organizational effectiveness. The research is designed to utilize a systematic sampling and survey method. The survey targeted patent-holding companies nationally. A pilot study involving organizations in the greater St. Louis and Chicago areas were conducted to test the research procedures. It was not successful. Face validity of the instrument, however, was established through solicitations to knowledge workers who worked in various industries. Individual measures of human capital, innovation capital, structural capital and KM processes were

gathered along with data for the dependent variables, i.e., organizational effectiveness and competitive advantage. The reliability and validity of six variables were demonstrated. Partial Least Square (PLS) was utilized to illustrate the relationships between these independent variables and dependent variables and their interrelationships in the research model.

#### **1.4 Expected Contributions**

This study attempts to delineate KM and IC and provide clearer definitions that were neglected by researchers of either field. The integration of KM and IC is an ultimate goal for this research. The extension of Van Buren's (1999) innovation concept leads this research to emergent KM processes rather than static knowledge conversion. Innovation capital has gained increasing attention from practitioners, and it promotes the dynamic interaction between a firm and its marketplace, such as new product development, market share competition, sustaining first mover's position, and so on. Emergent KM processes demonstrate organizational capabilities and structures that respond to a changing marketplace.

And last but not least, the researcher attempts to utilize Barney's (1991, 1997, 2002) concept of "mobile" vs. "immobile" to help defining both KM and IC better. Mobile means that assets can move easily from one firm to another, such as knowledge, information technology, or even employees. However, when assets are developed and embedded in organizations over time, their values are cumulative and costly to move from one place to another. The resources become immobile. The point here is to fill the gaps between the KM and IC research and move forward to an integral explanation and a

dynamic relationship to those fields. Finally, this study goes beyond organizational effectiveness as output by further identifying competitive advantage in an organization that may be related to organizational capitals.

### **1.5 Limitations**

Every study has its limitations. The first limitation is the validity issue. Because the research is based on a survey method, the results offer great generalization yet limit to its validity. This researcher hopes the theoretical foundation to develop the instrument and systematic sampling would compensate for the weakness of a survey method. A second limitation is the absence of control to who filled out the questionnaire. Clear instructions given to the respondents and follow-up emails may contribute to a better-controlled situation.

### **1.6 Outline of the Dissertation**

This chapter is followed by four chapters. Chapter two provides a deeper understanding of literature in KM, IC, organizational effectiveness and competitive advantage. Theoretical foundation, such as Barney's (1991, 2000, 2001) resource-based view, is discussed. A research model is developed along with hypotheses that are guided by the research questions. Chapter three demonstrates the methodology, research design, and sampling used in this study while chapter four presents statistical analyses and their results of the study. Finally, chapter five concludes the research with discussions of the results, limitations for this study and suggestions for future research.

## CHAPTER 2

### LITERATURE REVIEW

#### **2.1 Introduction**

Human capital, innovation capital, knowledge process capability, and structural capital can be described as intangible properties in a firm. Those intangible properties play important roles in the creation of value for the company, and they are important to this research. First, how could we further define those intangible properties by the concepts of mobile and immobile resources that are important and related to Barney's resource-based view? Second, how did those intangibles create organizational effectiveness based on business processes and organizational structures (Gold et al., 2001; Bontis, 2002a, 2002b)? Third, would an organization gain competitive advantages from a firm's effectiveness? This section provides a discussion for the foundation of this research model. Following that, a research model is outlined, the relationships among constructs are illustrated, and hypotheses are presented.

#### **2.2 Resource-Based View**

The resource-based view of the firm postulates that a firm's profitability is not only a function of combining resources of its competitive position but also a function of its internal capabilities and know-how to deliver products and services (Alavi, 2000). According to Barney (2002), firm resources are "all assets, capabilities, competencies, organizational processes, firm attributes, information, and knowledge that are controlled by a firm" (p. 155). These resources enable the firm to implement strategies that increase its effectiveness and efficiency. If the resources are valuable and rare such that they

contribute to a firm's competitive advantage, the firm should nurture and maintain them (Barney, 2001). Most importantly, the resource-based view of the firm focuses on the "idiosyncratic," "costly to duplicate" resources that may give the firm a competitive advantage, such as highly skilled and creative workers, effective managers, and institutional leaders. Barney (2002) further defined these too-costly-to-copy resources as possessing "resource immobility."

Dierickx and Cool (1989) stated that firm resources could be divided into tradable, i.e., unskilled labor, raw materials, and common intellectual property, and nontradable, i.e., firm-specific skills/capabilities, quality reputations, partners' royalty, R&D capability, brand loyalty, and customer trust. Whereas tradable resources are mobile and can be acquired easily, the nontradable resources are immobile and must be developed, accumulated, and maintained through time (Hunt, 2000).

However, what truly matters is how these tradable or nontradable assets are "historically" dependent upon an organization (Barney, 1997, 2002). A patented technology can be purchased or traded; however, if it is a rare and valuable technology to an organization that has specifically accumulated its value over time, it can be an immobile asset. For example, Toyota and Ford can employ similar technologies, i.e., the technology is mobile, but Ford may be unable to perform at the same level as at Toyota because of different organizational capabilities, management, structures, dynamics, processes, and culture. A tradable but invaluable asset can be very costly for a competitor to copy because of its historical dependency that comes with the asset as a package deal. Unfortunately, a competitive firm can easily transfer or buy a technology,

but neither the knowledge nor the structure upon which the technology was cultivated during the course of utilization can be bought.

The differences between mobile and immobile can be further defined by “how” and “what” to produce those too-costly-to-copy resources. A mobile asset can transcend to be immobile because of its historical dependency and rareness to an organization (Barney, 1997, 2002). The immobile resources are those that can’t be physically moved from one firm to the other regardless of whether they are copied or stolen. This research attempts to distinguish between mobile and immobile assets, and perhaps establish the argument on increasing the value of mobile assets by the facilitation of immobile assets. For example, human capital can be mobile if the employees are not committed to an organization, and innovation capital can be moved easily and inexpensively if an organization doesn’t protect patents and/or organizational knowledge from theft or piracy. In other words, human capital and innovation capital may increase their value by the embedded levels of these capitals in a firm. In addition, there may be a rationale for the mediations, such as KM processes capabilities and structural capital, between human/innovation capital and organizational effectiveness. More specifically, a firm’s effectiveness is captured from mobile and immobile assets, i.e., IC, through KM processes capabilities and structural capital.

### **2.3 Intellectual Capital**

A firm creates value from what it captures during the processes of knowledge creation. From accumulation, the stock of knowledge and capabilities is unique to an organization’s learning and experience (Choo and Bontis, 2002). Choo and Bontis

(2002) referred to this stock as “the firm’s intellectual capital” (p. 16). Intellectual capital consists of different capitals that are rooted in employees, organizational routines, intellectual property, and relationships with customers, suppliers, distributors, and partners (Choo and Bontis, 2002).

Stewart (1997) defined IC as the intellectual material – knowledge, information, intellectual property, and experience – that can be put to use for creating wealth. In the spirit of Barney (1991, 1996), a firm’s resources were defined as “capitals.” As such, the firm’s resources can be divided into financial capital, physical capital, human capital, and organizational capital (Barney, 1991, 1996). Financial capital includes all money resources. Physical capital is physical technology in a firm. Human capital refers to the training, experience, judgment, intelligence, relationships, and insight of individuals. Organizational capital includes a formal and/or informal structure in a firm in addition to its culture, reputation, and relations among groups within and between firms (Barney, 1996, 2002).

Bontis (2002a) defined similar concepts, referring to them as human capital, structure capital and customer capital. Among three components of IC, IC researchers such as Stewart (1997), Van Buren (1999) and Bontis (2002) all included human capital. Customer capital is the relationship between firms and their customers. Pike, Rylander, and Roos (2002) referred to customer capital as relational capital; however, customer capital and relational capital were defined similarly. Since the main focus of this research emphasizes inward relationships of an organization, the customer/relational capital is beyond the scope of this research.