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**An Understanding of the Capabilities and Limitations of Technology-
based Solutions to Child Protective Services:
Using a Knowledge-based and Process-oriented Mediation Model**

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by

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To my husband and best friend, Tom Liu

Thank you for all of your love, support, and that sweet smile.

You made me laugh, relax, and keep going.

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**An Understanding of the Capabilities and Limitations of Technology-
based Solutions to Child Protective Services:
Using a Knowledge-based and Process-oriented Mediation Model**

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One important research direction that has emerged in Child Protective Services (CPS) is the potential of information technology (IT) to be used by CPS agencies in order to enhance organizational effectiveness by addressing the barriers that caseworkers face in integrating multiple stakeholders' knowledge. Based on empirical findings with regard to numerous unsuccessful IT development initiatives, the present study strives to gain an in-depth understanding of the research question: How can CPS caseworkers be supported by their agency in the integration of knowledge resources, thereby contributing to organizational effectiveness?

A literature review to answer this question revealed the following two major research gaps: the adoption of a technology-focused perspective of intervention and the use of direct research models to evaluate this kind of intervention. In order to bridge these research gaps, this study presented a knowledge-based and process-oriented mediation model, built around the concept of knowledge integration that involves related processes

at the syntactic, semantic, and pragmatic levels. In this model, a process-oriented Knowledge Management System (KMS) stemming from a Socio-Technical System (STS) perspective was proposed as an alternative intervention model consisting of knowledge management intervention in three dimensions: techno-structural, socio-cultural, and inter-organizational practices. This mediation model partitions the effect of this KMS on outcome (organizational effectiveness) into two components: the direct effect and the indirect effect that is mediated by its output (a CPS caseworker's knowledge integration ability). This research model was empirically tested using Structural Equation Modeling. This analysis used a sub-set of the 2008 Survey of Organizational Excellence (SOE) data set, which includes the perceptions of CPS caseworkers in the Texas DFPS about their work environment.

Results indicate that each of the three dimensions of knowledge management practices enhanced a CPS caseworker's knowledge integration ability. This ability was a critical factor in determining organizational effectiveness. The mediation effects of a caseworker's knowledge integration ability were found to mediate the relationship between three dimensions of knowledge management practices and organizational effectiveness. Overall, this mediation model was more useful in explaining the complex relationships among the variables of interest than other direct models.

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CHAPTER I: INTRODUCTION

The present study aims to inform child protective services (CPS) agencies how they can effectively support their caseworkers in accomplishing their organizational mission. For this aim, this study explores the experiences of CPS caseworkers in terms of organizational supports to satisfy their needs to develop a good case knowledge and explains how these supports lead to enhanced organizational effectiveness. Chapter I consists of three parts. The first section discusses the needs and barriers of CPS caseworkers to accomplish the mission of their agencies, and identifies research gaps in previous studies to address these needs and barriers. The second section specifies the research question of this study and provides a brief overview of the methodological approach to answer the question. Lastly, the significance of the study is discussed.

1 Background and Problem Statement

This section is organized into three parts. Part One introduces the knowledge needs that CPS caseworkers have when they perform to achieve their organizational mission. Part Two presents the barriers they face in meeting these needs. Part Three discusses three major management approaches identified in CPS research and practice and the limitations of each approach in addressing these barriers.

1.1 Knowledge Needs of CPS Caseworkers

The mission of CPS organizations is to protect vulnerable children and preserve families. CPS researchers (Fitch, 2006; Jones, 1993; Schoech *et al.*, 2002) have argued that the achievement of this mission requires the ability of CPS caseworkers to develop a good case knowledge by integrating case-related knowledge that different stakeholders

(e.g., clients, family members, teachers, therapists, physicians, law enforcement, medical staff, previous caseworkers, intake workers, etc.) have. Similarly, other child welfare researchers (Hartney *et al.*, 2002) claim that coordinated health care for troubled youth requires effective case management, medical record sharing, and collaboration among agencies, providers, and family members. According to Evashwick (1996), the components of care coordination in long-term care, which many CPS cases involve, includes “interdisciplinary communication, assessment, care planning, service arrangement, monitoring, and reassessment across levels and sites of care” (p. 37).

According to the literature on the subject, a common concept in the above assertions is “knowledge integration,” which is defined as the activities, competencies, or capabilities to combine knowledge from different sources for innovative activities (Dibiaggio & Nasiriyar, 2009; Martinsuo & Kantolahti, 2009). Knowledge integration has been emphasized by researchers as a key factor of organizational effectiveness in organizations that need coordination among multiple stakeholders (Al-Hawari, 2004; Almashari *et al.*, 2002; Grant, 1996a; Herschel & Jones, 2005; Macpherson *et al.*, 2004; Sabherwal & Becerra-Fernandez, 2005).

One researcher (Grant, 1996a) argues that knowledge integration is critical for organizational effectiveness, especially in complex work settings having three specific characteristics. First, the production or service requires a wide array of specialized knowledge that is distributed among multiple individuals. Second, there is a lack of correspondence among different knowledge agents. Third, speed in integrating knowledge is critical in the enhancement of organizational effectiveness. These

organizations are called dynamically-competitive environments (Grant, 1996a) or knowledge intensive organizations (Garrick & Clegg, 2000; Q. Wang & Qin, 2005).

According to this description, CPS agencies can be considered to be knowledge intensive organizations. First, their production or service requires a wide array of knowledge. In order to develop integrated case knowledge, CPS caseworkers are encouraged to seek out necessary information (e.g., key client demographics, strengths and needs, service data like type and amount of services, outcome data, community resources, etc.) from multiple sources. A child welfare researcher (Gambrill, 2008) claims that various knowledge about a case is dispersed among various stakeholders and this knowledge is critical for sound CPS decision-making. Therefore, many CPS researchers have recommended a comprehensive and accurate case assessment through case consultation of different stakeholders for their expertise (Gambrill, 2008; Isaacs-Giraldi, 2002; Jones, 1993; Pammer *et al.*, 2001; Schoech, 2000). A multi-environment and multi-source assessment of a child's functioning is recommended for child welfare workers to confirm the presence of the child's certain behavioral pattern (Urquiza & Winn, 1994). When a caseworker tries to assess whether a child is at risk for possible abuse or neglect, the worker often uses a variety of sources of information in addition to a risk assessment instrument (Fitch, 2006).

Second, there is a lack of perfect correspondence among different knowledge owners. Child welfare researchers recognize that personal, institutional, and/or professional values and biases influence each knowledge owner (e.g., parents, teachers, and previous social workers) in developing his or her own knowledge about a case

(Darlington *et al.*, 2005; Fitch, 2006; Harris & Hackett, 2008). Due to conflicting knowledge about the case (e.g., needs and goals of a child) among stakeholders and different communication styles (e.g., choice of words), CPS caseworkers often experience difficulties communicating with stakeholders and keeping checks and balances on decision-making (Harris & Hackett, 2008; Salus, 2002).

Third, speed in integrating knowledge is critical in the enhancement of organizational effectiveness. According to child welfare researcher (Gambrill, 2008), caseworkers should quickly appraise a situation, make a sound decision, and take an action. Otherwise, abuse and neglect could result in serious impact on the child. Although a comprehensive assessment from multiple sources and environments is recommended, caseworkers may go without developing enough knowledge when it would take too much time for them to integrate knowledge from stakeholders.

1.2 Barriers to Knowledge Integration

In spite of the critical need for their ability to integrate different knowledge in a short amount of time, CPS caseworkers face significant barriers to knowledge integration because various boundaries (e.g., personal, departmental, disciplinary, and organizational boundaries) cause differences in knowledge among different stakeholders. The difficulty of obtaining needed information across these boundaries is a main barrier that most child welfare researchers and administrators have recognized. With few open lines of communication between agencies or organizations, it is challenging for a caseworker to hold interviews and obtain case-related documents (J. U. Schneiderman *et al.*, 2007; Schoech *et al.*, 2002). Caseworkers often experience this difficulty because most

information sources are scattered not only in different places (e.g., case-related records outside of the agency or stakeholders such as family members, teachers, therapists, etc.) but also in different times (e.g., previous caregivers who are not available for contact). In this kind of environment, caseworkers with a heavy workload may go without enough case knowledge when it takes significant time and effort to obtain information. They may choose to focus on what they think is important information. However, one often knows the potential value of a piece of information only after it is acquired (Fitch, 2006).

Even when a caseworker has obtained certain information from a stakeholder, he or she may have a hard time in interpreting the information, or may interpret the information differently from the original knowledge that the stakeholder had.

Caseworkers may experience difficulties in interpreting information due to relatively simple differences, such as interpreting schemes for abbreviations in different organizations and/or different usages of terms or languages. Misinterpretations can be caused by subjective factors such as personal bias. For example, if a caseworker assesses the relationships between a client and parents based on an interview with the client's mother, there is a chance that the caseworker may misinterpret the mother's knowledge when these two stakeholders have different cultural backgrounds from each other.

Even if the caseworker happens to interpret the information accurately, the caseworker's opinion on whether the parents are abusive may be different from the mother's. Due to conflicting ideas and opinions on the same matter among different people (e.g., various definitions of child maltreatment used by various stakeholders), it is difficult for caseworkers to integrate conflicting pieces of knowledge into coherent case

knowledge. A CPS researcher (Rose, 1999) recognizes impacts of conflicting opinions on caseworkers' performance. The researcher articulates that due to the lack of agreement of judgments, caseworkers who work with families from minority group cultures often struggle with ways to meaningfully and fairly incorporate their views about what constitutes best policy and practice for at-risk children.

As discussed, caseworkers experience various difficulties of obtaining knowledge, interpreting the obtained knowledge, and dealing with conflicts in this knowledge. The second and third difficulties are often caused when caseworkers deal with subjective opinions (e.g., child problems, environmental stress) rather than simple factual information (e.g., ethnicity, ages). A CPS researcher (Fitch, 2006) pays attention to this subjective side of information. According to the researcher, some information (e.g., criminal history, mental health history, and substance abuse history) that is often considered objective is affected by individuals' subjective impression and values. Caseworkers' ways of dealing with information are often influenced by many subjective factors, such as individual viewpoints, organizational policies, and experiences in local courts. Knowledge integration researchers (Carlile, 2004; Newell *et al.*, 2004) emphasize that knowledge integration is far more than just assembling available information, and that there are multiple layers of barriers to knowledge integration.

These barriers to knowledge integration are especially large for CPS caseworkers because a single case could be taken care of by different caseworkers within an agency. For example, a case in the Texas DFPS (Department Family and Protective Services) is often transferred between programs; such programs include Intake, Family Based Safety

Services (FBSS), Out-of-Home Care Services, Legal Resolution, Reunification Safety Services, and Preparation for Adult Living (Cockerell, 2007). Suppose a case is transferred via the following path: Intake -> Family-Based Safety Services -> Out-of-Home Care Services. Since a caseworker from Out-of-Home Care Services did not participate in knowledge integration activities in the previous stages, the worker may be informed of case history mainly through documents or communications with the previous caseworkers. Due to this indirect communication, stakeholders' knowledge could be filtered or changed by the previous caseworkers. Even when a caseworker successfully integrates knowledge from multiple stakeholders, he or she may face similar difficulties in integrating previous caseworkers' knowledge. If the caseworker were the only one who took care of this case throughout the whole CPS procedure, he or she would have more detailed information about the case and therefore more reliable case knowledge.

Child welfare researchers (A. Moynihan *et al.*, 2001) assert that the transfer of a case among different caseworkers causes ineffectiveness in child welfare systems, including lost information, discontinuity of service, and delayed responses or service. These barriers to knowledge integration across boundaries may result in caseworkers' poor case decisions and lead to poor organizational effectiveness (Fitch, 2006). Therefore, it is critical for organizations to employ interventions to address these barriers. Some child welfare researchers (Schoech *et al.*, 2002) argue for organizational intervention to support workers in integrating knowledge from multiple, external sources (e.g., previous records in the agency, case-related records outside of the agency, and interviews with different stakeholders). Another CPS researcher (Fitch, 2006) also asserts that

organizations must enhance CPS investigators' ability to obtain information from multiple sources, accessing the information efficiently, and validating information and views. The next section explores how organizational efforts to reduce barriers to knowledge integration are related to some managerial interventions in CPS agencies.

1.3 Managerial Interventions

From the literature on management of CPS and related agencies (child welfare, human services, and public sector), the present study identifies three major managerial interventions suggested for organizations to enhance organizational effectiveness: human resources management (HRM), information management, and knowledge management. The following parts give an overview of each approach and discuss the limitations of each to address the barriers to knowledge integration.

1.3.1 Human Resources Management

HRM has long been a major focus in the research on management of CPS and related agencies. Preston (2008) recognizes that human service agencies have been heavily reliant on the knowledge, skills, and abilities of its employees and considered HRM as the primary institutional mechanism to enhance organizational effectiveness. The researcher asserts that child welfare agencies require a high level of formal pre-employment education and extensive post-employment training and experience in order to achieve practice proficiency. Human services agencies should develop their practitioners professionally and empower them to perform at a high level in delivering services (Patti, 2008).

Stiles and Kulvisaechna (2003) state that even though there are several lists for high performance work practices, at their heart, HRM practices from most studies can be narrowed down as the following: staffing, comprehensive training and broad developmental activity, and empowerment. Organizations aim to promote organizational effectiveness by selecting people that already have adequate knowledge, skills and abilities, assigning everyone an efficient amount of work, training them to perform their jobs better, and motivating employees to work harder.

Recent research has gone beyond this focus on the capability of individual employees to achieve practice proficiency with their own knowledge and skills. In a literature review, Stiles and Kulvisaechna (2003) has found this new research trend also pays attention to the capacity of employees to utilize knowledge, skills, and experience of others, and to add their own knowledge to pre-existing reservoirs of knowledge in their organizations (e.g., databases). The researchers introduce the concept of human capital, which is broader in scope than human resources. The former broadens the scope of management of knowledge by including so-called 'knowledge between humans' as well as each individual's knowledge. This new research trend on human capital is based upon Grant's work on knowledge integration (1996a), which studies the effective management of knowledge between humans. Grant asserts that knowledge intensive organizations have to leverage the skills and capabilities of their employees by creating a supportive environment in which knowledge can be created, shared, and applied.

Some HRM practices (e.g., recruiting employees with existing applicable knowledge and skills, training employees, providing protocols for applying knowledge to

decision-making) influence knowledge integration by leveraging each individual's knowledge. A CPS researcher (Fitch, 2006) asserts that the ability of CPS investigators to integrate knowledge into their decision-making depends on their experiences and training. However, the impacts of HRM practices on knowledge integration is indirect rather than direct; HRM is simply interested in the best work from each individual worker, while knowledge integration is enhanced by the effective management of interactions among a group of workers. Stiles and Kulvisaechana (2003) assert that HRM is only part of the equation for the effective utilization of human capital to enhance organizational effectiveness. Like many knowledge integration researchers (Carlile, 2004; Grant, 1996a; Newell *et al.*, 2004; Okhuysen & Eisenhardt, 2002), these researchers emphasize that the organizations should employ their managerial efforts specifically designed to enhance knowledge integration.

The limitations of HRM-focused interventions to enhance organizational effectiveness have been recognized in the fields of social work research, practice, and education. Austin and Kruzich (2004) conducted an analysis of eleven textbooks and one casebook published during 1992-2002 to educate social work students on administration; they report that virtually all of these books pay a lot of attention to human resources and financial management, but have minimal content on management information systems and knowledge activities. The researchers advocate for more educational attention to support social workers' knowledge activities. This study illustrates that while child welfare researchers and administrators have paid attention to information management to support social workers' knowledge activities for a long time, progress has been slow.

1.3.2 Information Management

Historically, information management has been a focus of managerial efforts in order to address the limitation of HRM-focused interventions to manage knowledge between humans. This approach of management is based on an information-based view of the organization. This view sees the organization as an information-processing entity mainly concerned with the mechanical efficiency in managing information (Simon, 1973). Therefore, researchers who take this view argue that organizational effectiveness depends heavily on the organizational capacity to manage information efficiently so that the capacity of their employees to obtain needed information is improved.

Many researchers and administrators in CPS and related fields such as child welfare, human services, and the public sector (Burton & van den Broek, 2006; Kerlake, 1998; Schoech, 2000; Tregagle & Darcy, 2008) have taken this view and emphasized the importance of information management. Many child welfare researchers have considered information sharing among stakeholders as a key factor for organizational effectiveness (Hawkins, 2004; Jones, 1993; Kaariainen, 2004; Klein-Rothschild & Brittain, 2004; J. U. Schneiderman *et al.*, 2007; Schoech *et al.*, 2004; Shlonsky & Wagner, 2005; Smart *et al.*, 1998) and have recommended organizational intervention to support caseworkers in obtaining information that is necessary for their work (Fancett & Hughes, 1996; Meghan & Natalie, 2008; J. U. Schneiderman *et al.*, 2007; Wiig & Tuell, 2004).

According to a study on foster care (Little Hoover Commission, 2004), information sharing could allow a collective discipline to make difficult decisions to

pursue common objectives, a more seamless system of services, and better coordination between the child welfare, court, and health care systems in order to improve tailoring of services for the individual foster child. A child welfare researcher (Gambrill, 2008) identifies the limited information processing capability of child welfare organizations as one of the barriers to sound decision-making. Some researchers (Pecora, 2002; Stanley, 2005; Weaver *et al.*, 1999) have used information-driven models that include the capability of organizations to facilitate information sharing as a major factor in organizational effectiveness. They state that collecting, storing, structuring, and disseminating the collective expertise and wisdom of different stakeholders contributes to creating therapeutic alliances among them and providing better protective service delivery. A lack of information reportedly inhibits effective decision-making (Jones, 1993; Sanders & Roach, 2006) and timely action (Sanders & Roach, 2006).

A major strategy for effective information management is to develop information technology (IT). As in the term IT that consists of “information” and “technology,” the main purpose for organizations to invest in IT is to enhance organizational effectiveness by utilizing the capability of technology to enable more efficient storage, retrieval, and sharing of information (Bharadwaj, 2000; Melville *et al.*, 2004; Petro, 1985). With efficient information-processing capabilities, IT is a key tool for information management (Melville *et al.*, 2004). This so-called “IT-mediated information management” enables users to aggregate, manage, and deliver information efficiently (Bose, 2003), facilitates the process of integrating explicit knowledge in electronic form using IT features (Grant, 1996a), and improves operating efficiency (Lin & Lee, 2005).

IT-mediated information management has been adopted as a main administrative innovation in many CPS and related fields over many years. In order to meet information needs in their service delivery, paper-based systems have been replaced with electronic-based information systems in many human services and public sector organizations (Burton & van den Broek, 2006; Haux, 2006; Kearns & Sabherwal, 2007; Poertner, 2000) and child welfare agencies (Fancett & Hughes, 1996; Hawkins, 2004; Kerslake, 1998; J. U. Schneiderman *et al.*, 2007; Schoech *et al.*, 2004). Many CPS organizations have invested in IT development (Fancett & Hughes, 1996; Hawkins, 2004; Kerslake, 1998; Schoech *et al.*, 2004; Texas Department Family and Protective Services, 2002). The Texas DFPS used IT development as a major workplace reform to support caseworkers by managing accurate and consistent client and resource information (Texas Department of Family and Protective Services, 2006).

In spite of the prevalence of IT-mediated information management, knowledge integration researchers (Grant, 1996a; Linn, 2000; Okhuysen & Eisenhardt, 2002) criticize the information-based view of organization that supports this approach of management. They assert that any interventions based on this view would not be sufficient to enhance organizational effectiveness in knowledge intensive organizations where the ability of workers for knowledge integration is a main issue related to the workers' performance. According to Simon (1973), a major problem in this view is that this view focuses on the mechanical process of information without taking into account knowledge actors, even though knowledge actors themselves complicate a process of knowledge integration. Information acquired through an efficient IT system could be

inaccurate or misinterpreted by a receiver. Information from different sources often includes conflicting knowledge among different stakeholders.

Many researchers (Carlile, 2004; Grant, 1996a; Newell *et al.*, 2004; Nonaka *et al.*, 1996) have argued for a change in the organizational intervention approach to address barriers to knowledge integration: from information management to knowledge management. Considering the importance of knowledge integration for CPS practice (Fitch, 2006; Foster & Stiffmann, 2009; Jones, 1993; Schoech *et al.*, 2002), this change in CPS agencies seems to be inevitable.

1.3.3 Knowledge Management

Knowledge management is different from information management even though the two concepts have been often used interchangeably (Baskerville & Dulipovici, 2006; Bose, 2003; Bouthillier & Shearer, 2002). Information management aims to promote organizational effectiveness by improving the flow, control, analysis, and synthesis of information (Frishammar, 2002). Knowledge management refers to a set of activities of identifying and leveraging the collective knowledge of the organization in order to enhance organizational effectiveness (von Krogh, 1998).

The terms “information” and “knowledge” are also often used interchangeably (Nonaka, 1994). Information refers to explicit, coded, and processable knowledge that has been owned by experts in a certain subject matter (Alavi & Leidner, 2001; Stenmark, 2001). Knowledge is defined as “information embedded in routines and processes which enable action” (Baskerville & Dulipovici, 2006, p. 84). While the definition of information seems to be similar to knowledge, the crucial difference is that information is

viewed as a medium that transfers knowledge from one knowledge agent (the owner) to another (the user). Information plays an important role as a necessary medium for knowledge users to integrate knowledge that other experts own (Nonaka & Toyama, 2003). A knowledge agent can acquire others' knowledge in the form of information, internalize it to develop their own knowledge, and take an action based on the knowledge.

Knowledge management has been emphasized by researchers with the knowledge-based view of organization. This view perceives knowledge as the most valuable and strategic resource in the organization, compared to the information-based view of organization that emphasizes the importance of managing the medium (information). Therefore, this view perceives each organization as a repository of knowledge, and the organizational structure as a means for maximizing knowledge utilization (Grant, 1996b; Polanyi, 1966).

In order to maximize knowledge utilization, knowledge should be actively processed and integrated by knowledge agents. Knowledge integration does not simply mean a process of synthesizing information (Newell *et al.*, 2004) or absorbing individuals' specialized knowledge from different sources. Rather, knowledge integration also involves the process of integrating collected knowledge to create situation-specific knowledge (Alavi & Tiwana, 2002; Balaji & Ahuja, 2005; Newell *et al.*, 2004). Nonaka (1994) asserts that the organization's primary role is to leverage knowledge resources in individuals' minds efficiently and effectively in order to create useful knowledge for performance improvement.

The goal of managerial intervention should be to support workers' knowledge integration rather than information acquisition. Synthesized information from different sources could be interpreted inaccurately by a knowledge user; information from some sources could also conflict with others. Therefore, information management has limitations in enhancing knowledge integration. Knowledge management is not merely concerned with the process of information acquisition, but also includes further processes. In that aspect, information management is a part of knowledge management. Effective knowledge management creates a teamwork environment in which workers share knowledge (Politis, 2003) and builds a knowledge work support system to enhance an individual worker's ability, motivation, and opportunity to conduct knowledge work through better decision-making (Burstein & Carlsson, 2008).

Some researchers (Alavi & Leidner, 2001; Alavi & Tiwana, 2002) assert that IT-mediated information management could fail in promoting organizational effectiveness because IT is developed based on the information-based view of organization. IT-mediated information management "partially" contributes to enhancing organizational effectiveness by facilitating information sharing among a group of collaborating people. However, while it is a prerequisite factor, it is not itself a sufficient factor for knowledge integration, given the limitations of information management in enhancing knowledge integration.

These researchers recognize that IT could be designed and implemented based on the knowledge-based view of organization and that IT use would go beyond efficient information storage and retrieval. Some IT features (e.g., using a standardized code for

different terminologies) are useful to reduce misunderstanding of others' knowledge. Some features (e.g., electronic forum) can be used to support a group of people in sharing different ideas and integrating them together into a united idea. An effective use of IT as one of many knowledge management tools enhances knowledge integration by providing a virtual environment where a group of people collaborate across boundaries. This approach of management can be conceptualized as IT-mediated knowledge management as opposed to IT-mediated information management.

Compared to other fields (e.g., business), the use of knowledge management to enhance organizational effectiveness in human service organizations (M. J. Austin, 2008) and in social work fields (Leung, 2009) is relatively recent. Most CPS researchers that take a knowledge-based view of organization (i.e., Fitch, 2006; Schoech *et al.*, 2004) have paid attention to knowledge management at the IT level or to IT-mediated knowledge management. Schoech is one of the child welfare researchers that recognize the importance of utilizing IT for knowledge management but not for information management. Over time, the attention of this researcher has moved from information management systems (Schoech, 2000) to knowledge management systems (Schoech *et al.*, 2002; Schoech *et al.*, 2004). Schoech and his colleagues (2002) shed lights on the limitations of IT-mediated information management in child welfare. As IT has been introduced to improve work efficiency, workers are drowning in data but starved for knowledge. Workers' expertise is often buried inside of the information systems of an agency (e.g., case records), difficult to access and codify, and shared informally. Therefore, a primary role of management in human services should be to develop an IT

infrastructure that can transfer data into knowledge and allow workers to utilize the knowledge in agency or field tasks.

Fitch (2006) also warns that the focus on IT use for mechanical processing of information would be problematic for CPS practice. Based on a series of analyses of the responses provided by CPS investigators, Fitch states that the decision-making process is not a perfectly structured decision-making environment where investigators are presented with a discrete number of choices, known probabilities, and factors accounted for by complete information. Rather, decisions are made based on the investigator's knowledge, which is in turn developed through complicated processes of objective or subjective information in his or her mind. Fitch recommends that organizations should develop an effective decision support system by taking into account this subjective nature of knowledge.

Even though many child welfare researchers tend to focus on the issue of how to improve IT in managing knowledge effectively, organizational investments in IT do not seem promising. Empirical evidence of IT impacts on organizational effectiveness in various work settings over time has been mixed. Some report that IT contributes to organizational effectiveness by facilitating communication, collaboration, and coordination among people who work together (Argyres, 1999; Dewett & Jones, 2001; Hannigan & Hannigan, 1999; Helleso & Lorensen, 2005; Helleso, & Ruland, 2001; Kok, 2004; Majchrzak *et al.*, 2005; Powell & Dent-Micallef, 1997; Roberts, 2000; Saouli, 2004; Winthereik & Vikkelso, 2005). More indirectly, the ability of IT to provide efficiency can enable CPS workers to create therapeutic alliances by spending more time

on key task areas such as relationship-building, goal-setting, and problem-solving (Pecora, 2002). Empirical studies have reported IT benefits on organizational effectiveness in human services organizations (Huang, 1999) and in child welfare settings (Andersen *et al.*, 1994; Schoech, 2002; D. C. Smith & Grinker, 2005).

On the other hand, many review studies of empirical impacts of IT (Barua *et al.*, 1995; Downing, 2004; Kohli & Devaraj, 2003; Ravichandran & Lertwongsatien, 2005) have persistently found neutral or negative IT impacts on organizational effectiveness in various settings. A study (Froggett, 1996) reports that social workers have experienced disempowerment and a loss of autonomy since IT had been introduced to their practice. A study on the impact of a case-based management information system on child welfare case management practices in two California counties (Weaver *et al.*, 2003) finds no significant changes in patterns of social interactions after this new computer system was adopted. The amount of time spent with clients was neither reduced nor increased. The computer system was not successful either in reducing the burden of paperwork or in providing better information resources over what was previously available. The cohesion and cooperation among the collegial workgroup members was reduced.

A relatively recent study based on interview data from practitioners in a range of human service agencies and a child protective call center (Burton & van den Broek, 2006) reports that IT resulted in substantial changes in work processes and practice for them, but was not effective to enhance or complement their work. Another study (J. U. Schneiderman *et al.*, 2007) reports practitioners' disappointment with the electronic health care "passport," called the Health and Education Passport (HEP). The participants

thought that many HEPs were not up-to-date and lacked important information necessary to plan and monitor health services for foster youth. According to a relatively recent article about IT use in child welfare (Tregeagle & Darcy, 2008), child welfare administrators and practitioners still face challenges in connecting IT use for their practice improvement.

Based on the current discourse about knowledge management, the negative results of IT interventions may have occurred because IT interventions were developed and implemented based on an information-based perspective instead of a knowledge-based one. Because the empirical studies listed above do not necessarily take a knowledge management perspective, it is not clear why some of the IT interventions were unexpectedly ineffective. Meanwhile, the present study finds that the current discourse about knowledge management also has some limitations in explaining why some workplace reforms using IT are not successful to enhance organizational effectiveness. The next section discusses the limitations in detail.

1.3.4 Limitations of Current Interventions

The current discourse about IT-mediated knowledge management in CPS and related fields still is still limited. There is relatively little discussion about complicated associations among IT, knowledge management, knowledge integration, and organizational effectiveness.

First, the body of CPS literature lacks a deep level of conceptual understanding about how IT is related to knowledge management. Knowledge management initiatives are often considered at the IT level (Han & Anantatmula, 2006). Some studies of IT

related benefits in human services (Kunkel, 2000; Schoech *et al.*, 2002) and on child welfare (Pecora, 2002; Weaver *et al.*, 2003) have reported IT-derived benefits in organizational effectiveness, including saving time, reducing workload and paperwork, challenging local biases with external knowledge, improving case decision-making, and increasing practice effectiveness. These IT-derived benefits are similar to potential benefits of knowledge management: improved efficiency, service quality, reduced costs, and interagency fragmentation (Edge, 2005).

CPS researchers tend to focus on the potential of IT-mediated knowledge management in supporting CPS practices but not on its limitations. Knowledge management researchers have differentiated IT from knowledge management and recognized the limitations of IT. According to the literature on knowledge management, IT-mediated knowledge management could fail in enhancing organizational effectiveness if organizations focus only on IT (Hislop, 2002; McDermott, 1999; Walsham, 2001) because IT is considered just one way of using knowledge to improve workers' performance (Politis, 2003). These researchers argue that organizations should employ a systematic effort not only to maximize the positive effect of IT assets for knowledge management, but also to develop non-IT strategies that can complement and leverage the IT investment (e.g., open communication policy).

With a technology-focused perspective on knowledge management, CPS researchers may not be able to identify problems if any failure of IT interventions in improving organizational effectiveness is due to other factors rather than IT itself. The researchers would recommend that organizations should develop more advanced IT

features. This case indicates an improper way to evaluate IT-mediated knowledge management interventions.

Second, current research on knowledge management in CPS lacks a deep level of conceptual discussion about knowledge integration. Even though a good number of CPS researchers (e.g., Fitch, 2006; Jones, 1993; Schoech *et al.*, 2002) emphasized the importance of knowledge integration and knowledge management, few of them discuss the concept of knowledge integration on a deeper level and how it is related to knowledge management. According to knowledge integration researchers (Alavi & Tiwana, 2002; Grant, 1996a; Linn, 2000; Newell *et al.*, 2004; Okhuysen & Eisenhardt, 2002), knowledge integration is a key concept that can guide knowledge management development and explain why knowledge management can enhance organizational effectiveness.

In order to address the limitations of previous CPS research, CPS research needs to be more aggressive in adopting theories and frameworks from other disciplines. In a literature review, Edge (2005) reports that previous studies of public sector, human services, and child welfare services have often examined a direct linkage between IT and organizational effectiveness without incorporating knowledge management theories and frameworks. The researcher asserts that IT development should be guided and examined based on knowledge-based theories and frameworks.

In a more recent study, Leung (2009) states that research on social services still lacks a conceptual discussion of knowledge management even though knowledge management has been actively employed over the last decades. This researcher argues for

more attention to ‘knowledge as process’ as well as ‘knowledge as object’ when social service organizations develop knowledge management. This assertion is consistent with the insights from the knowledge integration literature that knowledge is more than a coded object (i.e., a piece of information) and therefore should be processed even after the object is obtained (e.g. the meaning is interpreted and conflicts in knowledge are reduced). Simply gathering knowledge as an object could be problematic. Haas (2006) reports some empirical studies reporting that more knowledge often fails to result in improved task outcomes and sometimes knowledge gathering even hurts project performance. Therefore, CPS researchers should understand how knowledge is processed when caseworkers try to integrate knowledge.

The present study finds that the literature on knowledge integration, knowledge management, and information systems provides a wide range of knowledge-based theories and frameworks to explain complicated associations among IT, knowledge management, knowledge integration, and organizational effectiveness. The literature on knowledge integration provides various frameworks to understand how knowledge is processed. The literature on knowledge management and information systems provides useful insights about how organizations should design knowledge management using both IT and non-IT strategies in order to support employees’ knowledge integration. Therefore, there is a need for CPS research to deepen and widen its discourse about knowledge management by adopting insights from these disciplines in order to understand complicated associations among IT, knowledge management, knowledge integration, and organizational effectiveness.

1.4 Summary

The main reason why CPS caseworkers face difficulties in satisfying their knowledge needs is that the CPS work environment situates them in positions where they face huge barriers to knowledge integration across boundaries. This section has discussed three main management approaches (HRM, information management, and knowledge management) and the limitations of each approach in addressing barriers to knowledge integration and in promoting organizational effectiveness.

Knowledge management has emerged in child welfare research as the most viable approach for addressing limitations of the other approaches in enhancing knowledge integration. This approach complements the limitations of HRM, which are caused by its focus on managing knowledge ‘within a person’ rather than ‘knowledge between humans.’ Adopting the knowledge-based view of organization, many researchers have found that information management is limited in its capacity to address other barriers (e.g., misinterpretation and conflicts in knowledge). With a technology-focused perspective on knowledge management, they claim that the limitations of IT-mediated ‘information management’ can be addressed by replacing it with IT-mediated ‘knowledge management’ as a major workplace reform.

The current discourse on knowledge management in CPS research still has a research gap, however. It fails to explain why some IT interventions did not enhance organizational effectiveness; in those cases, these empirical results do not match with the expectation of researchers that, as a vital knowledge management tool, IT plays an important role in enhancing organizational effectiveness. The present study has identified

the research gap as a lack of understanding complicated associations among IT, knowledge management, knowledge integration, and organizational effectiveness. In order to bridge the gap in previous research, the present study has recognized a research need for deepening the discourse on knowledge management in CPS research by drawing insights from other academic disciplines about the complicated associations.

2 Purpose of the Study

The present study aims to answer the research question of how CPS caseworkers can be supported by their agency in the integration of knowledge resources within and outside of organizational boundaries, thereby contributing to organizational effectiveness. In order to answer this question, the present study addresses the limitation of previous studies to understand complicated associations among IT, knowledge management, knowledge integration, and organizational effectiveness.

In order to develop a theoretically-sound research model, this study reviews the literature that adopts the knowledge-based view of organization. The existing literature includes a deep level of conceptual discussion about how knowledge management supports knowledge integration and why knowledge integration is important for organizational effectiveness. Based on the review, this study has developed a knowledge-driven research model and proposed to test the model empirically by using a sub-set of the 2008 Survey of Excellence (SOE) data. This data set includes perceptions of CPS caseworkers in the Texas DFPS about the work conditions in their immediate workplace and organizational effectiveness.

3 Significance of the Study

The present study attempts to make a contribution to social work research, practice, and education. First, this study will contribute to social work research by addressing the limitation of previous studies focusing on IT-mediated knowledge management to enhance organizational effectiveness of CPS agencies. This contribution is sought by applying various theories and frameworks from the knowledge management and knowledge integration literature to investigate managerial challenges that CPS agencies face in supporting their caseworkers in terms of utilizing knowledge effectively. By focusing on the concept of knowledge integration, this study may assist CPS researchers in understanding how organizations should design and implement their knowledge management and why this organizational intervention enhances organizational effectiveness. Therefore, researchers can recommend a more integrated set of predictors for organizational effectiveness based on theoretical grounds than the predictors used in previous research.

Second, this study could convince CPS administrators and practitioners to change their information-based and technology-focused perspective when they develop strategic plans for workplace reform. One of the most serious problems with the existing perspective is a possibility that organizations focus predominantly on improving IT-mediated information management when they design a workplace reform and do not take advantage of the costly development. A good understanding about knowledge management and knowledge integration will be useful for them to maximize the positive effects of IT development, to identify a set of strategies for developing an effective

knowledge management system, and to assess their existing knowledge management system.

Third, this study will make contributions to social work education by shining a light on a new direction for training students and practitioners -- as active knowledge agents rather than passive IT users. Passive IT users have an instrumentalist perspective of IT and simply follow IT instructions without a good understanding of its potential and limitations to support their knowledge integration. The ten-year time difference between the two studies that reported the frustrations of social workers with IT (Burton & van den Broek, 2006; Froggett, 1996) suggests that negative experiences of social workers with IT persist over time in spite of possible IT advancement during the time. While there are both negative and positive sides to heavier use of IT (Herman & Phillips, 1995), passive IT users may remain disempowered without knowing why IT influences their task negatively and how to improve the situation. They may know how to use a certain IT system, but may not be effectively informed from the data in the system, and perceive documenting and communicating just as everyday tedious routines with little use.

By informing them on a conceptual level with the information from the present study, these passive IT users can be transformed to active knowledge agents. Active knowledge agents understand how knowledge is integrated and how organizations support their knowledge integration. They have proper knowledge and skills in utilizing existing knowledge so that they can develop useful case knowledge effectively by incorporating others' knowledge. Understanding that each caseworker is a useful source of knowledge for others, they develop their knowledge and skills to document and

communicate their own knowledge with others effectively. They understand that IT is just one of the tools to facilitate the process and that they are active players. They are empowered to suggest specific ideas to improve IT and non-IT strategies.

4 Chapter Summary

The present study has recognized the need for CPS caseworkers to develop good case knowledge by integrating different knowledge from various stakeholders. Difficulties in the process of knowledge integration across boundaries have been identified as main barriers in CPS agencies. The purpose of this study is to answer how CPS caseworkers are supported by knowledge management interventions that aim to address barriers for their integration of knowledge resources both within and outside of organizational boundaries and to enhance organizational effectiveness. This study has discussed three approaches of managerial interventions from the literature (HRM, information management, and knowledge management) and limitations of each in terms of addressing knowledge integration barriers. In order to address the limitations of previous research, this study develops a theoretically-sound research model by reviewing existing literature that has a long history of studying complicated associations among IT, knowledge management, knowledge integration, and organizational effectiveness.

CHAPTER II: LITERATURE REVIEW & CONCEPTUAL FRAMEWORK

This chapter provides a literature review to develop a research model. The literature review is organized into three sections. The first section starts with an introductory conceptual background that clarifies conceptual relationships between knowledge integration and knowledge management. The second section uses the conceptual understandings to re-analyze the limitations of previous child welfare research that have been briefly discussed in the previous chapter and to present an alternative generalized framework to develop research models that address the limitations. The third section develops a research model based on the framework. The model is developed by identifying a set of knowledge management practices and creating hypotheses on associations between the practices, knowledge integration, and organizational effectiveness.

1. Introductory Conceptual Background

This first section includes five parts: 1) conceptual relationships between knowledge integration and knowledge management, 2) characteristics of knowledge, 3) the process of knowledge integration, 4) optimal strategy of knowledge management, and 5) impacts of knowledge management on organizational effectiveness.

1.1 Knowledge Integration and Knowledge Management

According to the previous chapter, the current discourse about knowledge management in CPS research lacks a conceptual understanding about relationships between knowledge management and knowledge integration. The literature on knowledge integration is useful to clarify the concept of knowledge integration and its

associations with knowledge management. This body of literature has been the subject of review in many studies and has been continuously growing since Grant (1996a) developed a knowledge-based theory of organizational capability. According to this theory, in knowledge intensive organizations where the most important resource of the organization is knowledge and where knowledge resides in specialized form among individuals, the essence of organizational capability is to integrate individuals' specialized knowledge within organizations. Knowledge integration in this theory refers to activities of organizations integrating knowledge distributed in individuals' minds into centralized databases and making it accessible to other members within the organization.

While Grant describes knowledge integration as an organizational capability, some researchers assert that knowledge integration takes place at the individual level and define the concept as the process of absorbing individuals' specialized knowledge from different sources and integrating them into new situation-specific knowledge (Alavi & Tiwana, 2002; Balaji & Ahuja, 2005). In order to be integrated, knowledge is required to be actively processed (i.e., obtained, interpreted, and compared) in the mind of an individual (Alavi & Leidner, 2001).

Considering that the essence of knowledge integration is the creation of new situation-specific knowledge out of existing knowledge (Newell *et al.*, 2004), agents of knowledge integration seem to be individuals rather than organizations. Adopting the definition of knowledge integration as the activities, competencies, or capabilities to combine knowledge from different sources for innovative activities (Dibiaggio &

Nasiriyar, 2009; Martinsuo & Kantolahti, 2009), the present study considers this concept as the capabilities that individual employees have in processing knowledge.

Individuals, however, face significant difficulties in collecting dispersed knowledge across various boundaries (e.g., geographical and organizational) (Carlile, 2004; Grant, 1996a). Therefore, organizations should create a proper knowledge integration environment to support an individual's knowledge integration (Linn, 2000). It is much more efficient for organizations to take a role in collecting dispersed knowledge and make it available to their workers so that the workers process the knowledge to create new situation-specific knowledge. The present study considers the capability of organizations to support workers' knowledge integration as "knowledge management" and distinguishes it from the capability of individuals for "knowledge integration."

Knowledge management refers to a set of activities of identifying and leveraging the collective knowledge in order to enhance organizational effectiveness (von Krogh, 1998). According to Grant (1996a), the concept of knowledge integration, as the organizational capability to integrate individuals' specialized knowledge within organizations, consists of creating multiple knowledge bases and of employing relevant mechanisms that can process dispersed knowledge. The present study conceptualizes knowledge management as a set of organizational activities and capabilities to support individual employees' knowledge integration. Based on this conceptual differentiation, the recommendations of many child welfare scholars for knowledge management and knowledge integration can be stated as follows: in order to maximize knowledge resource

utilization, CPS agencies should improve knowledge management capabilities to support knowledge integration of individual workers.

As discussed, knowledge integration is an important concept for organizations to develop effective knowledge management practices. Cook & Brown (1999) describe knowledge integration by using a metaphor of a “generative dance” between “knowledge” and “knowing” because new knowledge can be generated from a collection of existing knowledge through active communication and interactions among knowledge agents. A key to success in maximizing knowledge resource utilization is to understand the characteristics of knowledge and the dynamics of knowledge processes (Nonaka, 1994). The next section discusses these characteristics.

1.2 Characteristics of Knowledge

Drawing on the work of Polanyi (1966), Nonaka (1994) identifies two dimensions of knowledge in organization (tacit and explicit) and describes characteristics of each dimension. The researcher argues that specialized knowledge in an individual’s mind that has been developed in the person’s unique experiences and used to take an action in a certain context or domain is, in and of itself, a valuable resource for the organization. This is called *tacit knowledge*. Tacit knowledge includes an individual’s images of reality, viewpoints about solutions, and concrete know-how (e.g., how to ride a bicycle).

Since an individual’s tacit knowledge is difficult to formalize and communicate, it is externalized into *explicit knowledge*, which refers to codified knowledge that is transmittable in formal, systematic language (e.g., words, numbers, and graphs). For example, a bicycle expert may write a manual called “How to Ride a Bicycle.” This

“externalization” makes tacit knowledge in the knowledge owner’s mind available to communicate with others. In order for another person (the knowledge user) to apply somebody else’s knowledge to taking an action in a new context or domain, the explicit knowledge should be converted back to the user’s own tacit knowledge. The user may develop his or her own knowledge about how to ride a bicycle. This process of generating a new tacit knowledge is called “internalization.” Through these transformations of knowledge in tacit and explicit dimensions, the owner’s tacit knowledge in a “knowledge domain” is integrated to the user’s new tacit knowledge that can be applied in an “action domain.”

This distinction between tacit knowledge and explicit knowledge is similar to that between knowledge and information. Some researchers (i.e., Rowley, 2007) find it difficult to argue that explicit knowledge is a different concept from information, while others (i.e., Stenmark, 2002) attempt to distinguish explicit knowledge from information. Based on Alavi and Leidner’s assertion “knowledge becomes information once it is articulated and presented in the form of text, graphics, words, or other symbolic forms (2001, p. 109),” any attempt to find a subtle distinction between explicit knowledge and information is of little use, at least for the purpose of the present study. Information is often called explicit knowledge (Polanyi, 1966).

The main distinction between knowledge and information is that knowledge relates to human actions while information does not (Rowley, 2007). Knowledge is closely linked to a knowledge agent (owner) and certain actions of the agent (Nonaka, 1994; Simon, 1973). Explicit knowledge to a knowledge owner is information to a

knowledge user, because information by itself is not connected with the user's actions until it is converted to the user's own tacit knowledge. Explicit knowledge or information plays an important role as a necessary medium for knowledge users to acquire tacit knowledge from various experts or knowledge owners, organize it, and use it so that they can create their own tacit knowledge (Nonaka & Toyama, 2003). The conceptualization of knowledge is summarized in Figure 1.

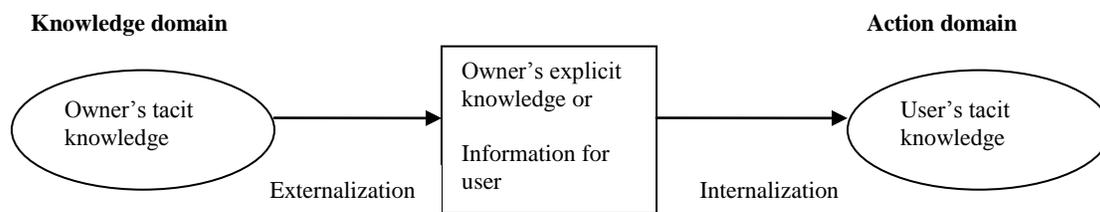


Figure 1. Dimensions of Knowledge

Although information is an important medium to convey knowledge from owners to users, due to the characteristics of knowledge it is limited in its ability to accurately or completely represent what owners know (Alavi & Leidner, 2001; Nonaka, 1994). As stated by Polany (1997), who says “we can know more than we can tell” (p. 136), and by Nonaka (1994), who says “knowledge that can be expressed in words and numbers only represents the tip of [the] iceberg” (p. 16), tacit knowledge is so ambiguous that it is difficult to externalize into explicit knowledge. In addition, tacit knowledge in individual minds is deeply rooted in action and involved in a specific context or domain (Nonaka, 1994). This characteristic of knowledge is called the “stickiness” or “context-dependency” of tacit knowledge (Carlile, 2004; Eric von, 1994; Nonaka, 1994). Due to

this characteristic, tacit knowledge is also called situated knowledge (Nonaka, 1994) or domain-specific knowledge (Carlile, 2004).

Some knowledge, such as *know-how* (cognition about procedures to act) and *know-why* (cognition about causal relationships), is more deeply embedded in situations and hard to articulate than other knowledge such as *know-what* (descriptive cognition about a situation) (Dikmen & Birgonul, 2004). For example, it is more difficult for a mother to communicate with a caseworker about how she interacts with her child or why she does not conceive a certain behavior as abuse than about the specific medical diagnosis of her child.

Although the degree of stickiness and ambiguity varies, these characteristics of tacit knowledge make it difficult for information to represent tacit knowledge perfectly. A piece of information itself could be misleading if a knowledge user assumes that it can perfectly represent the owner's tacit knowledge (e.g., a caseworker assumes that what is written in documents and told in an interview represents the exact meaning of and the total amount of what a child's mother thinks and knows). It could also be misleading if the knowledge user does not take into account the context in which the knowledge owner has developed his or her tacit knowledge, and proceeds to interpret it out of context (e.g., an American caseworker interprets a certain remark of Asian parents based on his or her own culture). Information on its own would be of little value unless organizations address the limitation of information to represent knowledge (Alavi & Leidner, 2001; Stenmark, 2002). In order to address this limitation and maximize tacit knowledge utilization, it is

important to understand how one integrates others' knowledge. The next section identifies knowledge processes involved in the concept of knowledge integration.

1.3 The Process of Knowledge Integration

An element commonly emphasized in various operationalized definitions of knowledge integration is the process of integrating different pieces of knowledge to create new knowledge in a new setting. Knowledge integration is not merely a mechanical process of assembling different pieces of information, which represents a successful transmission of explicit knowledge from a knowledge owner (knowledge domain) to a knowledge user (action domain) (David Knights, 1997; Newell *et al.*, 2004; Okhuysen & Eisenhardt, 2002). Rather, collecting information is merely a starting point for a more important part of knowledge integration, which is creating new tacit knowledge in an action domain (Newell *et al.*, 2004). In other words, knowledge integration involves more than one knowledge process.

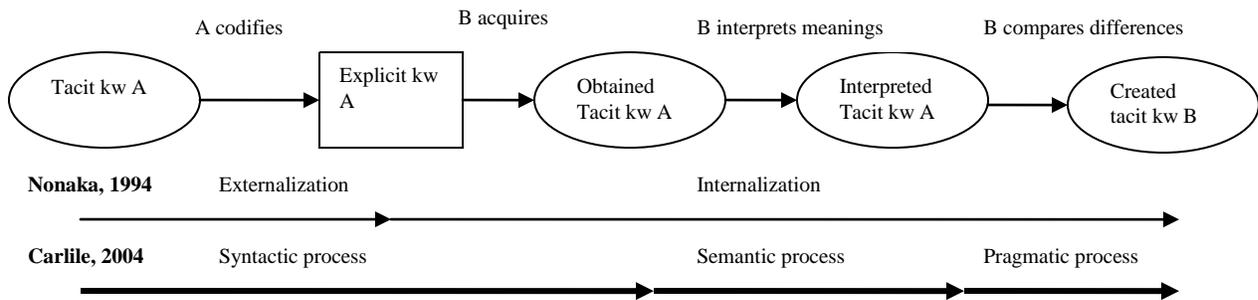
Different researchers have presented different subsets of knowledge processes. As in the discussion of characteristics of knowledge, Nonaka (1994) identifies two knowledge processes: externalization and internalization. In order to maximize tacit knowledge utilization, tacit knowledge should be expressed in such a manner that a knowledge user can interpret it as close as possible to the knowledge owner's original knowledge. Also, this information should be actively processed in the mind of a knowledge user (Alavi & Leidner, 2001). The former process is parallel with what Nonaka (1994) called 'externalization' while the latter process is synonymous with 'internalization.'

According to Carlile's insights on the knowledge integration process (2004), which is drawn based on the work of communication researchers (Cherry, 1957; Shannon & Weaver, 1949/1964), the process involves sequential actions of a knowledge user. For example, a CPS caseworker integrates various stakeholders' knowledge into their own tacit knowledge by acquiring knowledge, interpreting its meaning, and comparing it with existing knowledge to draw a conclusion for any action. From a process-oriented point-of-view, each of these actions represents the knowledge process at the syntactic, semantic, and pragmatic levels respectively.

Based on the definition of knowledge integration as the process of absorbing individuals' specialized knowledge from different sources and integrating them into new situation-specific knowledge, the absorption part of the process may be parallel with the knowledge process at the syntactic level. The absorbed knowledge, conveyed in the form of information, is "integrated" into the user's own tacit knowledge through knowledge processes at the semantic level (i.e., interpreting tacit knowledge) and pragmatic level (i.e., creating a new knowledge by choosing this knowledge over other conflicting pieces of knowledge or by combining them into a new one).

Other researchers (Alavi & Leidner, 2001; Ray, 2003) argue that organizations should pay attention to the further knowledge process of applying knowledge to a decision situation after new knowledge has been created. Although the application process is an important knowledge management issue, it is excluded from the discussion in the present study, as it is beyond the scope of this study focusing on knowledge integration across boundaries.

Figure 2 compares Carlile’s and Nonaka’s subsets of knowledge processes through which a knowledge owner’s (person A’s) tacit knowledge is integrated to a knowledge user’s (person B’s) new tacit knowledge. For easier understanding, the figure includes specific activities of these knowledge agents (A and B) throughout the processes. For example, a syntactic process involves both the knowledge owner codifying his or her tacit knowledge into explicit knowledge (e.g., creating a document) and the knowledge user acquiring the knowledge (e.g., reading the document). These activities of knowledge agents for externalization and for the beginning part of internalization serve a similar purpose, which is to transmit knowledge from the knowledge domain to the action domain. According to Carlile, the purpose of these activities is to process knowledge at the syntactic level. Carlile breaks the remaining part of the internalization process into two knowledge processes: at the semantic and pragmatic levels.



Note: kw is knowledge

Figure 2. A Subset of Knowledge Processes for Knowledge Integration

Carlile’s framework (2004) is chosen as the subset of knowledge processes for knowledge integration in the present study. The rationale for this choice is that this framework bridges some gaps in the existing literature, making it easier to understand the

entire process of knowledge integration. Grant (1996a) emphasizes that organizations employ interventions on a comprehensive scope of knowledge integration process. Some (Carlile, 2004; Nonaka, 1994) argue that the literature on information processing has focused on the issue of efficient mechanical management of information in the externalization process (syntactic process), but has paid little attention to the issue of creating new tacit knowledge in the internalization process (semantic and pragmatic process). Nonaka (1994) asserts that the literature on organizational learning has addressed internalization by taking into account complex human dynamics to comprehend knowledge in the process, but has paid little attention to the critical notion of externalization (syntactic process). Carlile's framework incorporates these two processes that Nonaka emphasizes.

Compared to Nonaka's framework, Carlile's framework is more useful in identifying specific challenges in the internalization process. Challenges that often occur in CPS work environments include the difficulty of aggregating and transmitting large amounts of knowledge scattered in various stakeholders' minds, potential discrepancies of interpretation differences, and interest conflicts among different knowledge agents. This breakdown of syntactic, semantic, and pragmatic knowledge processes has been widely used in the knowledge integration and management literature. In order for external knowledge to affect action and (eventually) performance, it needs to be identified, interpreted, and assessed by knowledge actors (Baskerville & Dulipovici, 2006; Ray, 2003). Considering that disagreement of judgment among stakeholders is a significant barrier to knowledge integration of CPS caseworkers (Rose, 1999), special

attention should be paid to the issue of conflicts or the knowledge process at the pragmatic level.

Researchers have recognized that it would be very inefficient if individuals try to overcome these challenges. Grant (1996a) argues that it would be much more efficient for organizations to intervene to support individual workers' knowledge integration. One of the example interventions is to introduce computer systems so that people can obtain needed information easily (i.e., a syntactic process). The present study conceptualizes a set of these organizational interventions as knowledge management. While many researchers have recommended different knowledge management approaches, Carlile (2004) recognizes that knowledge management also takes significant effort from organizations, even though it reduces effort from individuals. The researcher adds another dimension of efficiency by providing a framework to optimize organizational efforts for knowledge management.

1.4 Knowledge Management

This section is divided into two parts. The first presents a framework to find an optimal knowledge management strategy that CPS agencies should employ. The second discusses different mechanisms for organizations to enact the optimal knowledge management strategy.

1.4.1 A Framework for Finding an Optimal Strategy

Carlile (2004) asserts that each organization has a different knowledge integration environment and therefore should assess their own environment in order to optimize organizational efforts for knowledge management. In order to assess a knowledge

integration environment, the researcher introduces the concept of a “knowledge boundary” that separates each knowledge domain. Each knowledge agent often develops knowledge in his/her knowledge domain that is characterized by, but not limited to, the physical location, time-zone, organizational culture, and practice philosophy (Boland & Tenkasi, 1995; Carlile, 2002, 2004; Karsten *et al.*, 2001; Teigland & Wasko, 2003). Due to the differences in each knowledge domain, people develop different knowledge from others and a knowledge boundary arises. From a knowledge user’s point of view, a knowledge boundary makes it difficult for them to integrate knowledge from other experts (knowledge owners).

Carlile (2004) identifies three different knowledge boundaries (syntactic, semantic, and pragmatic) and posits that, depending on which knowledge boundary individual workers face, they process and integrate knowledge in a different manner. The present study links the concept of ‘the different manners of integrating knowledge across knowledge boundaries’ to knowledge integration modes. Because it takes considerable time and effort for individual workers to integrate knowledge due to differences in knowledge across knowledge boundaries, organizations should employ proper organizational approaches to support knowledge integration by creating ‘common knowledge’ that a group of people can share. Common knowledge is a prerequisite of mutual understanding, agreement, and collaboration among collaborative parties (Mengis & Eppler, 2006). The concept of an ‘organizational approaches to support knowledge integration’ is conceptualized as a knowledge management approach.

Adopting Carlile's insights to find an optimal knowledge management strategy, the present study uses a framework that matches knowledge boundaries, knowledge integration modes, and knowledge management approaches. The three matched parts of this framework are 1) the syntactic boundary-transfer mode-information processing approach, 2) the semantic boundary-translation mode-interpretive approach, and 3) the pragmatic boundary- transformation mode-political approach. The next three parts discuss each category in detail and how IT-mediated knowledge management is useful for each knowledge management approach. The fourth part discusses the optimal knowledge management strategy for CPS agencies.

1.4.1.1 Syntactic –Transfer – Information Processing Approach

Carlile (2004) states that a *syntactic boundary* arises in circumstances where, although collaborating parties own different amounts and types of knowledge, they interpret the meaning of the knowledge in the same manner and do not have conflicts arising from it. Suppose a person takes a responsibility for performing a certain task that requires collaboration with several stakeholders. In order for the person to perform the task well, it would be desirable for them to obtain the stakeholder's knowledge. When collaborating parties do not work within a team unit, it is difficult to transmit knowledge from person to another. Once a knowledge owner's tacit knowledge is transmitted to a knowledge user across a syntactic boundary (knowledge process at the syntactic level), the user can create new tacit knowledge with little effort towards interpreting the meanings and reflecting any conflicts with the existing knowledge. This mode of knowledge integration at a syntactic boundary is called *transfer*.

For organizations where workers normally face syntactic boundaries and transfer is therefore the dominant mode of knowledge integration, Carlile recommends using knowledge management in an *information processing approach*. In this approach, organizations should provide administrative efforts to create *common knowledge bases* for collaborating parties to share (e.g., client records stored in a computer system). With this common knowledge available, workers can be spared the effort for obtaining knowledge that is already stored in the file cabinets of other workers.

Organizations also need to ensure efficient and effective storage, access, and retrieval of information so that people can share information in a short amount of time. Organizational concerns may include how to improve the convenience of documentation (e.g., documenting with a wireless device), where to store information (e.g., papers or electronic repositories), how to structure information (e.g., semi-structured or fully-structured), how to improve convenience of access (e.g., web access), and how to retrieve necessary information efficiently. IT-mediated knowledge management would be useful in this situation because these concerns can be resolved by using IT features.

1.4.1.2 Semantic – Translation – Interpretive Approach

Even after knowledge is processed successfully at the syntactical level, the context-dependency of tacit knowledge makes it difficult for knowledge in one context to be used in another context in the same form (Nonaka & Toyama, 2003). Carlile (2004) states that a *semantic boundary* takes place when a knowledge user and a knowledge owner have different but non-conflicting interpreting schemes. The difference between the two domains causes the knowledge user to interpret the explicit knowledge differently

from what the owner has meant. For example, when a caseworker finds an abbreviation from a previous case record and interprets its meaning differently from what the owner has used, the caseworker may feel puzzled about the obtained knowledge. Therefore, he or she needs to make an additional effort to determine the accurate meaning (e.g., contact the previous caseworker to verify its meaning). Once an individual's tacit knowledge is transmitted (syntactic process) and interpreted (semantic process), it is ready for the user to create new tacit knowledge in a new context with little effort for reflecting on conflicts with the existing knowledge. This mode of knowledge integration at a semantic boundary is called *translation*.

For organizations where semantic boundaries often hamper individual workers from integrating knowledge and from collaborating with each other, Carlile recommends that they should employ knowledge management in an *interpretive approach*. This facilitates the knowledge process at the semantic level by generating *common meanings* for collaborating parties to share (e.g. a standardized set of terminologies, forms, procedures, etc.).

IT-mediated knowledge management would be somewhat helpful in this kind of situation. If an IT system uses a standardized coding system (e.g., medical symptoms), the users may be less likely to be confused than when they use different terminologies for the same meaning. However, this approach may need more complicated intervention by an organization than just using an IT system. At a semantic boundary, subjective knowledge (e.g., the assessment of an abusive relationship) is often involved. Subjective knowledge is easily affected by individual bias (Fitch, 2006), so organizations may need

to intervene to reduce the effect of individual bias. One possible intervention would be to cultivate an organizational culture to encourage collaborating stakeholders to interpret situations and behaviors in the same way.

1.4.1.3 Pragmatic – Transformation – Political Approach

Carlile (2004) states that a pragmatic boundary arises when collaborating people have conflicting perspectives and interests. Even after different stakeholders' tacit knowledge is transmitted (syntactic process) and interpreted correctly (semantic process), conflicts among the stakeholders may hamper an individual worker from transforming existing knowledge to coherently integrated knowledge (pragmatic process). Newell *et al.* (2004) emphasize the importance of the knowledge process at the pragmatic level. The researchers claim that knowledge integration is the process of knowledge workers creating new meanings and insights by identifying associations, connection, and hunches in the different pieces of knowledge, rather than just by synthesizing existing knowledge. The reason why the present study focuses specifically on conflicts, like Carlile, is that this kind of difference in knowledge could be negatively influential without proper organizational intervention.

Suppose a caseworker obtains knowledge about a child from the mother based on an interview (e.g., the mother thinks that the top priority of child's needs is to have his or her family united) and her knowledge is conflicting with the caseworker's existing knowledge that has been integrated from other stakeholders (e.g., other professionals' perceptions of the priority is to keep the child away from abusive parents). In this case, even when knowledge is successfully acquired and interpreted by the caseworker

(knowledge processes at the syntactic and semantic levels), it would be difficult for the caseworker to integrate these conflicting pieces of knowledge to a coherent whole set of knowledge. Therefore, additional efforts are needed for processing knowledge at the pragmatic level. The caseworker would assess the impacts of each piece of knowledge on a decision or the result of having made that decision. Negotiations among conflicting interests may take place in a discussion with the mother, in a staffing meeting, or in the caseworker's mind. The caseworker may choose one stakeholder's knowledge over others' or create a brand new option after reflecting the existing conflicts. This mode of knowledge integration at a pragmatic boundary is called *transformation*.

In order to support workers who often face this kind of boundary, Carlile (2004) recommends that organizations should employ knowledge management in a *political approach*. In this approach, organizations should create *common interests* (e.g., shared goals), meaning that they provide an environment where collaborating people can negotiate their interests around these goals (e.g., encourage an open discussion).

As child welfare researchers (Schoech *et al.*, 2002) recommend, organizations can use some IT features (e.g., an electronic forum board) as a coordination tool or a channel through which collaborating parties can bring different interests together, jointly transform each other's knowledge, and develop integrated knowledge. However, the political approach needs more complicated interventions than IT development, such as an open communication policy and fostering the political equity of each participant in the negotiation or discussion process.

1.4.1.4 Optimal Strategy for CPS Practice

The present study has presented a framework that matches knowledge boundaries (syntactic, semantic, and pragmatic) with three corresponding knowledge integration modes (transfer, translation, and transformation) and knowledge management approaches (information processing, interpretive, and political). Figure 3 illustrates how knowledge is integrated differently at each knowledge boundary.

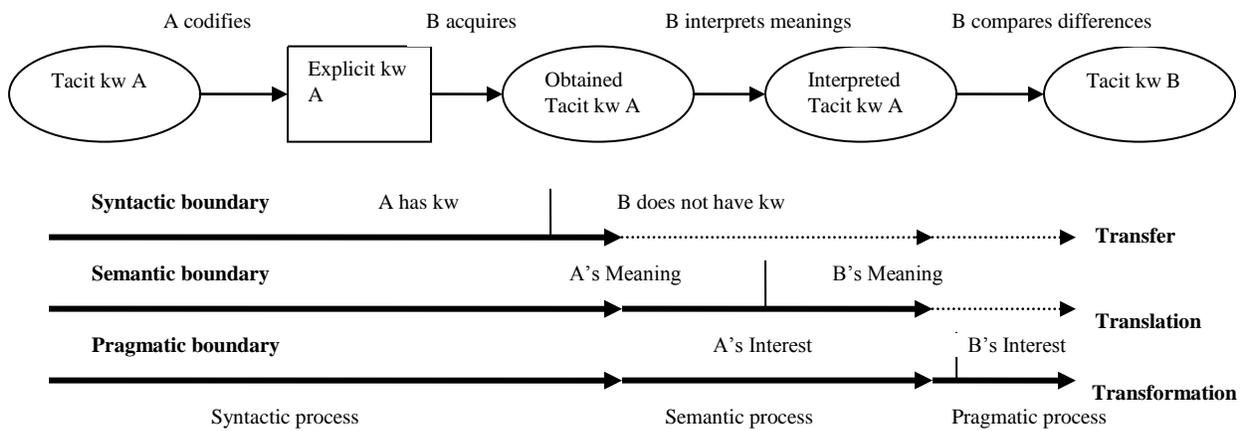


Figure 3. Knowledge Boundaries and Knowledge Integration Modes

According to Carlile (2004), the knowledge boundaries and knowledge integration modes are progressively complex. Progressive complexity means that a more complex boundary often involves more complex challenges in knowledge integration compared to a less complex one. For example, challenges in a transformation of knowledge at a pragmatic boundary (e.g., negotiating conflicts of interest among stakeholders) are often more complicated than those in a transfer of knowledge at a syntactic boundary (e.g., looking for changes in GPA scores from previous records).

In addition, a more complex knowledge integration mode also involves challenges associated with less complex modes. A bold line in the Figure 3 indicates that the knowledge process potentially requires extensive effort from the knowledge user, while a dotted line indicates little effort for the knowledge process. At the syntactic boundary, there is little effort for an individual worker to process knowledge semantically and pragmatically once knowledge is transmitted successfully. At the pragmatic boundary, there is a chance that the individual worker faces difficulties in process knowledge syntactically, semantically, and pragmatically. The three bold lines indicate that knowledge integration at this boundary may involve difficulties not only in comparing/negotiating knowledge but also in obtaining and interpreting knowledge.

According to Carlile (2004), the amount of effort for knowledge management from organizations also increases as the complexity of knowledge integration increases. In order to support the most complex mode of knowledge integration (transformation), organizations need to create common interests (e.g., ensure political equity among people with different interests). This intervention in the political approach might be more complicated than one of creating common knowledge bases that they can share (information processing approach). Moreover, these organizations also need to employ the other knowledge management approaches (information processing and interpretive) because the transformation mode of knowledge integration involves challenges associated with less complex modes. Table 1 summarizes the framework of knowledge integration modes and corresponding knowledge management approaches.

Table 1. Knowledge Boundaries, Integration Modes and Management Approaches

Boundary types	Differences in knowledge between the domains	Knowledge integration modes	Objectives of organizational intervention	Knowledge management approaches: Solutions to support knowledge processes
Syntactic	Types and amount	Transfer	Support the knowledge process at the syntactic level	Information processing approach: to increase the capacity to process more information by creating common knowledge bases (e.g., storage, access, retrieval technology)
Semantic	Meanings	Translation	Support the knowledge process at the semantic level	Interpretive approach: to interpret same knowledge into same meaning by creating common meanings (e.g., standardized forms and methods)
Pragmatic	Interests and perspectives	Transformation	Support the knowledge process at the pragmatic level	Political approach: to transform situated knowledge for shared goals by creating common interests (e.g., political equity in open communication and negotiation)

Carlile (2004) recognizes that each knowledge management approach takes considerable effort and resources from organizations. The researcher argues that to maximize the effectiveness of tacit knowledge use and the efficiency of administrative resources, organizations should understand individual workers' challenges as they try to work across domains and to provide an adequate amount of organizational efforts to address the challenges. Therefore, each organization needs to assess its level of complexity in terms of the knowledge boundary that individual workers normally face and the corresponding knowledge integration mode. Based on the assessed level of complexity, the organization should optimize the level of organizational intervention by deciding which approach or approaches it needs to employ. For an organization whose workers normally face syntactic boundaries, it would not be efficient to develop costly organizational intervention for the transformation mode of knowledge integration. On the other hand, it would not be effective to use organizational intervention for the transfer mode when workers normally face pragmatic boundaries.

An example of an organization that predominantly faces syntactic boundaries would be a survey company where the workers' main task is to obtain survey participants' knowledge, which is quantitatively coded, and to produce a certain type of results by manipulating the data. Given the survey questionnaire items are clear enough to avoid any misinterpretations between survey participants and workers, the predominant mode of knowledge integration that employees use in this company would be the transfer mode. In this case, an optimal knowledge management strategy would be to employ an information processing approach. It would be sufficient for the company to introduce a web-based survey tool for obtaining survey data efficiently. It would not be efficient for this company to invest money and effort in employing knowledge management in the interpretive or political approach.

Based on the political status of children in need (David, 2006), caseworkers in CPS agencies often face pragmatic boundaries. CPS practice involves various stakeholders who have different perceptions and interests in terms of the child's needs and goals (Gisela Trommsdorff, 1993; Moles, 2008), and the quality of a decision depends on the effectiveness of a team decision-making process that involves all of the stakeholders (Annie E. Casey Foundation, 2002). Given that there are differences in perception about the patterns of parent-child interactions across different cultures (Gisela Trommsdorff, 1993), parents and professionals from different cultural backgrounds may have conflicts.

Conflicts also take place among professionals who work together. Moles (2008) reports that professionals from the child welfare and domestic violence systems often

need to collaborate with each other when battered mothers needs help from CPS agencies. However, the differences in organizational missions, priorities, politics, and organizational structures may cause tension between them. Individual- and professional-level conflicts make it difficult to involve multiple stakeholders in decision-making in child welfare practice (Darlington *et al.*, 2005), and therefore hamper caseworkers from implementing their tasks successfully.

The statement that decision-making in child protection cases is the interplay between information, interpretation, and preference (Sheehan, 2001) may indicate that a good decision requires the decision-maker to be able to integrate knowledge at the syntactic, semantic, and pragmatic levels. Therefore, CPS agencies should develop a knowledge management mechanism that can enact various knowledge management approaches in order to support the transformation mode of knowledge integration.

1.4.2 Knowledge Management Mechanisms

The first part discusses key knowledge management mechanisms for knowledge integration and constraints of each mechanism for CPS agencies to use. The following part presents an alternative intervention mechanism.

1.4.2.1 Constraints of Key Mechanisms

Grant (1996a) identifies three key mechanisms to enhance knowledge integration: directions, organizational routines, and team structures. Directions and routines use accumulated knowledge from a group of experts in the organization. An example of directions is an operational manual for McDonald's managers. Organizational routines include mechanisms for workers performing repetitive tasks, such as an assembly line.

These two mechanisms may have limitations as a main mechanism for a caseworker's knowledge integration ability due to the characteristics of CPS practice: the non-routine, flexible work process in case handling (van der Aalst *et al.*, 2005), the non-routine interactive nature of social work jobs (Schwartz, 2007), and the uniqueness of each CPS case in terms of the number and composition of stakeholders (Freitag & Mordes-Noya, 2007). In this work environment, it would be almost impossible either to provide comprehensive directions for knowledge integration or to make the process perfectly routine.

The third mechanism, having a team structure, is reported as one of the most effective mechanisms for knowledge integration (Alavi & Tiwana, 2002) and is positively associated with worker performance and organizational effectiveness (S. G. Cohen & Bailey, 1997; Guzzo & Dickson, 1996; Kozlowski & Ilgen, 2006). A team structure enables team members to easily share each other's knowledge, interpret it accurately, and negotiate conflicts. Unfortunately, forming a team is not easy in a CPS work environment where potential team members are scattered geographically (e.g., parents, teachers, therapists, etc.) and in different time zones (e.g., stakeholders who were previously involved and are currently unavailable). In addition, different stakeholders are involved at different stages. Guzzo and Dickson (1996) recognize that defining a work team is not easy because work teams evolve according to task paths. The next section proposes an alternative to having team structure.

1.4.2.2 Alternative Mechanism: Knowledge Management System

When having a team-structure is not an option, organizations need to create a team-like environment where workers can feel as if they have other collaborating parties from different places and time zones as team members (Buckley & Carter, 1999; McKinney *et al.*, 2004). This kind of environment can be created by developing a systematic mechanism, which is the so-called Knowledge Management System (KMS). KMS refers to a system applied to managing organizational knowledge (Alavi & Leidner, 2001; Ray, 2003). Okhuysen & Eisenhardt (2002) emphasize the need for an organizational structure or system to enhance knowledge integration.

Knowledge integration researchers have argued that knowledge intensive organizations should create an infrastructure to enhance knowledge integration by building an effective KMS (Linn, 2000; McDermott, 1999; Ray, 2003; Sharon Watson, 2006). Maier & Remus (2003) argue that organizations should develop a process-oriented KMS that includes knowledge management practices specifically designed to facilitate knowledge processes.

A process-oriented KMS can be developed by using an open system framework that divides a system into IPO (input, process, and output) components. Taking an open system perspective, Yew and colleagues (2003) analyze a KMS as an IPO system, where knowledge resources in individuals (input) are processed with content management capability (process) to create new situation-specific knowledge (output). They state that the main key to developing an open system is to identify a specific content management capability that “processes” inputs to produce outputs. The content management capability

in a KMS is knowledge management capability because the object to process is knowledge.

Based on Carlile’s insights (2004), the present study presents a process-oriented KMS that is suitable for CPS agencies (Figure 4). This figure illustrates the KMS where tacit knowledge owned by three knowledge owners (A, B, and C) is integrated into new tacit knowledge for a user (D). The integrated new knowledge involves three transactions of knowledge integration. The example shows that each of the transfer, translation, and transformation modes has taken place. Note that knowledge owned by A and B is integrated into A' and B' even though no pragmatic process for transformation is involved. These differences indicate that it is very difficult for the owners’ original tacit knowledge to be transmitted and interpreted perfectly due to the limitation of explicit knowledge (or information) in representing tacit knowledge. The character “ α ” in the output suggests that the user may create new knowledge that has not been included in existing knowledge and is the product of synthesizing existing knowledge.

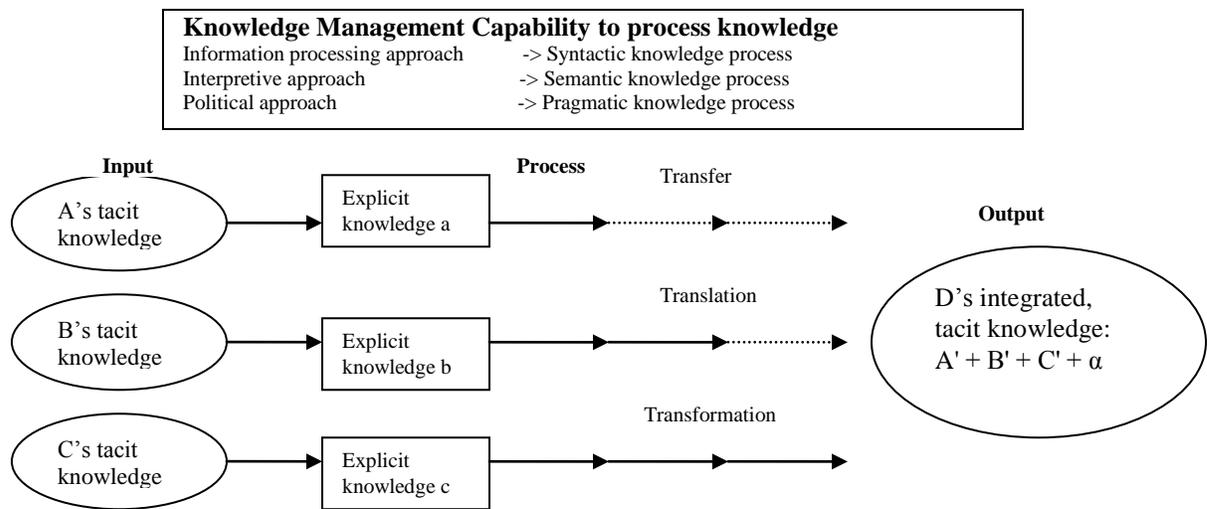


Figure 4. KMS in Knowledge Intensive Organizations

While the output of each transaction/process is a piece of integrated knowledge in the KMS, the objective of this open system is to enhance overall output or the level of a caseworker's knowledge integration ability. Therefore, the main interest of this system is to increase its capability to support CPS caseworkers in processing knowledge at the syntactic, semantic, and pragmatic levels. The capability can be enhanced by developing a set of knowledge management practices using the information-processing, interpretive, and political approaches.

1.4.3 Knowledge Management Summary

Based on Carlile's insights, the optimal knowledge management intervention strategy for CPS agencies is to employ diverse knowledge management practices using information processing, interpretive, and political approaches in order to support a caseworker's knowledge integration in the transformation mode. Although having a team structure is the most effective intervention mechanism to enact this strategy, its employment is difficult in the CPS work environment. To offer an alternative mechanism for CPS agencies to create a team-like environment, the present study presents a process-oriented framework of KMS by applying Carlile's insights to the open system framework. The main focus of this framework is on developing a set of knowledge management practices that enhance a caseworker's ability to process knowledge. Before identifying specific practices in this regard, the upcoming part is devoted to the explanation of why this kind of intervention is expected to enhance organizational effectiveness.

1.5 Knowledge Integration

The previous discussions are helpful in explaining the assertion in child welfare research that knowledge management and knowledge integration are critical predictors of organizational effectiveness. Using the process-oriented framework of KMS presented above, the present study has found that knowledge management capability (organizational intervention) enhances organizational effectiveness by supporting a worker's knowledge integration (overall output). Therefore, the effectiveness of the KMS is supported by a positive association between its output (knowledge integration) and organizational effectiveness (outcome).

Knowledge management outcomes have been measured in diverse related constructs, such as with regard to organizational performance (Al-Hawari, 2004; Almashari *et al.*, 2002), organizational effectiveness (Alavi & Tiwana, 2002; Gold *et al.*, 2001; Sabherwal & Becerra-Fernandez, 2005), and organizational excellence (Macpherson *et al.*, 2004). Researchers have recognized the lack of definitional agreement as to organizational outcomes and have stated that different constructs (e.g., performance, effectiveness, excellence, success, etc.) have been used interchangeably to measure organizational outcomes depending on the approaches, perspectives, and frameworks utilized (Henri, 2004; Huang, 1999; Job & Bhattacharyya, 2007; Kanter & Brinkerhoff, 1981). In order to cover a broad range of organizational outcomes, the present study uses the term “organizational effectiveness,” which is generally defined as the degree to which an organization accomplishes its goals (Ugboro & Obeng, 2004).

The following part discusses insights from the literature on associations among knowledge management, knowledge integration and organizational effectiveness. It then analyzes these insights within the KMS framework, with empirical evidence being presented later.

1.5.1 Knowledge Integration and Organizational Effectiveness

The positive impact of knowledge integration on organizational effectiveness has been supported by the literature on knowledge-based decision-making that has highlighted the importance of using knowledge from various sources for decision-making (Goodhue *et al.*, 1992; Holsapple & Whinston, 1996; Mengis & Eppler, 2006; Newell *et al.*, 2004; Scolobig *et al.*, 2008). Holsapple & Whinston (1996) state that decision-making is a knowledge intensive activity because knowledge is used as a fundamental element in the process. According to the definition of knowledge as information embedded in routines and processes that enable action (Baskerville & Dulipovici, 2006), knowledge is an important element for the making of a decision to take “action” by a worker, and this determines the quality of an individual worker’s performance and, consequently, organizational effectiveness at the agency level.

According to the literature on knowledge-based decision-making, decision-making that only uses knowledge from a single source may result in a bad decision that will negatively influence organizational effectiveness. In a complex and high-risk decision situation where the decision could alleviate or reduce the probability of risk, it is even more important for decision makers to avoid relying upon the premise of individual rationality (Mengis & Eppler, 2006). Because people have different 'thought worlds,'

each individual has different aspects of knowledge about a phenomenon and their knowledge may represent only a partial view of the phenomenon (Newell *et al.*, 2004). Therefore, a single individual's knowledge may not only be inaccurate, it may also be incomplete with regard to their understanding of the phenomenon.

One of the most valuable benefits gained from the use of knowledge from various sources is knowledge synergy. Knowledge synergy refers to new insights and valuable knowledge that is generated from synthesizing different pieces of knowledge (Probst *et al.*, 2002). This is not originally available in any individual's knowledge base; rather, it is created in the process of transforming existing knowledge into newly integrated situation-specific knowledge. Some researchers who have an information-based perspective (Bharadwaj, 2000; Dewett & Jones, 2001; Townsend *et al.*, 2000) call this "information synergy" and argue that this between-person effect allows two or more individuals to pool and share their resources and capabilities, to overcome the constraints of organizational boundaries and geographical distance and, consequently, to accomplish tasks for shared goals. Considering the previous point that valuable organizational resources in knowledge intensive organizations are tacit rather than explicit knowledge, "knowledge synergy" seems to be a more relevant term in the present study than "information synergy."

In order to produce knowledge synergy in a highly complex decision-making situation, researchers have recommended multiple-participant decision-making, meaning that a group of key stakeholders participate in a decision-making process (Holsapple & Whinston, 1996; Mengis & Eppler, 2006). Child welfare researchers have also

recommended multiple-participant decision-making, which is referred to with different terms, such as collaborative decision-making (W. Austin *et al.*, 2009), joint decision-making (Darlington *et al.*, 2005), and team decision-making (Annie E. Casey Foundation, 2002; Jones, 1993). Since it is almost impossible for all stakeholders to make a decision together on every issue, CPS caseworkers, as the first line of decision-makers in CPS practices (Freitag & Mordes-Noya, 2007), often make case decisions on behalf of other stakeholders. Holsapple & Whinston (1996) argue that this kind of decision-making is also considered to be multiple-participant decision-making, which is when an individual decision maker can reflect other stakeholders' knowledge in his/her decision-making process. Using their knowledge integration ability, decision makers can indirectly involve multiple stakeholders in decision-making because their knowledge represents the diverse aspects and perspectives of the stakeholders.

A child welfare researcher (Bose, 2003) also emphasizes the interconnections among knowledge integration, decision-making, and organizational effectiveness by claiming that “knowledge management-enabled collaborative case management” can enhance service quality by supporting a healthcare practitioner's decision-making. Other child welfare researchers (Annie E. Casey Foundation, 2002; Harr *et al.*, 2008; Jones, 1993; Schoech, 2002; Wallace *et al.*, 2007) have reported on the benefits of using different types of knowledge from varied sources toward more informed decision-making and coordinated actions in CPS agencies. Child welfare researchers (Darlington *et al.*, 2005; Isaacs-Giraldi, 2002; Jones, 1993; J. U. Schneiderman *et al.*, 2007; Schoech *et al.*, 2002) have posited that a major goal of multiple-participant decision-making is that of

better enabling decision makers to develop reliable case knowledge by integrating the specialized knowledge that the key stakeholders have. They would then apply such knowledge toward making an important case decision or taking some action, such as the formation of an initial placement decision or a case plan. Rather than having to make all too difficult decisions on their own, it is important for caseworkers to integrate knowledge from the more experienced and knowledgeable stakeholders and/or fellow practitioners while in the process of decision-making (Annie E. Casey Foundation, 2002).

Although ample research has highlighted the importance of utilizing knowledge integration and multiple-participant decision-making for increased organizational effectiveness in both the business and public sector, opinions differ with regard to the relationship between these two concepts. Some researchers (Alavi & Tiwana, 2002; Makowski, 2005; Mengis & Eppler, 2006) separate knowledge integration from decision-making and emphasize the importance of managing both processes. For them, decision-making is a process of ‘applying’ situated-knowledge that has been produced through a knowledge integration process. Some child welfare researchers accept this perspective and recommend the development of effective global assessment systems (Schoech, 2000) or management information systems (Fitch, 2006), as well as decision support systems.

Other researchers consider a knowledge integration process to be an important part of the multiple-participant decision-making process. In the book *“Decision Support Systems: A knowledge-based approach,”* Holsapple & Whinston (1996) argue that decision-making is not limited to the major concept seen in the classic view, which is defined as the activity of choosing one decision from multiple alternative courses of

action. Rather, decision-making also refers to the activity of producing a new piece of knowledge by drawing on and utilizing existing knowledge, a concept that is comparable to knowledge integration. Several researchers take this stance (Burstein & Carlsson, 2008; Grant, 1996a; Janz *et al.*, 1997; Mengis & Eppler, 2006). The difficulty in separating these two concepts is alluded to in a statement by a child welfare researcher (Jones, 1993) who felt that organizational effectiveness in CPS agencies depends on the ability of caseworkers to integrate various stakeholders' knowledge into the decision-making process.

Although these two groups of researchers have different views with respect to the scope of the decision-making process, both groups agree that a decision maker's knowledge integration ability is an important factor in maximizing the positive effects of using different bodies of knowledge from multiple sources in the multiple-participant decision-making and, consequently, with regard to organizational effectiveness. In other words, knowledge integration and decision-making are closely related conceptually and both are crucial predictors of organizational effectiveness. Therefore, rather than including these two concepts in the research model, the present study uses the concept of decision-making to explain the link between knowledge integration and organizational effectiveness. Considering the conceptual closeness of the two concepts and the cost of increasing the complexity of the model, such an inclusion would not be beneficial.

1.5.2 Multi-participant Decision-Making and KMS

The connection among knowledge management, knowledge integration, and organizational effectiveness can be theoretically explained by considering a multiple-

participant decision-making situation and the process-oriented KMS framework presented in the earlier section. Although the main objective of multiple-participant decision-making is to benefit from the use of knowledge diversity among different stakeholders, due to conflicting opinions, such decision-making can also act as a barrier to utilizing the knowledge effectively and may produce some adverse effects on organizational functioning (e.g., delay in decision time, reduced satisfaction, lowered cohesion among collaborating parties) (Carlile, 2004; Pelled *et al.*, 1999).

Given that an individual views a phenomenon through a different interpretive lens that has been constructed in diverse personal, professional, and institutional backgrounds (Newell *et al.*, 2004), different people develop distinct bodies of knowledge, often even about a same phenomenon, in terms of its content, meanings and level of interest. Due to such knowledge divergences, a decision maker may find it difficult to integrate knowledge because they cannot understand the meaning of some information correctly and/or their collected knowledge is in conflict with each other. In such a case, it would not be beneficial for a decision maker to simply collect a wide array of knowledge from multiple knowledge sources; in so doing, the decision maker may merely become more confused or conflicted. Therefore, at a certain point, gathering more knowledge may actually hurt their decision making performance (Haas, 2006).

Multiple-participant decision-making may be effective only when differences in the bodies of knowledge among various stakeholders (input) are successfully integrated into a decision-maker's new tacit knowledge (output) through successful knowledge processes at the syntactic, semantic, and pragmatic levels. In other words, a decision

maker can better use another stakeholder's knowledge in decision-making when they can obtain more information about some aspects of such knowledge from the key stakeholders, can accurately understand its meaning, and can negotiate the conflicting differences in the knowledge. The process-oriented KMS reveals that the objective of knowledge management intervention is to support individual workers in processing knowledge and therefore to increase the effectiveness of multiple-participant decision-making. Therefore, the positive impact that a set of knowledge management practices have on organizational effectiveness is supported by an association between knowledge integration and organizational effectiveness.

1.5.3 Empirical Evidences of Knowledge Integration

Many empirical studies have supported the importance of a decision maker's knowledge integration ability (the overall output of KMS) with respect to enhancing organizational effectiveness. Utilizing this capability can allow decision makers to transform even conflicting knowledge into coherent knowledge that can be used as a valuable resource for better organizational effectiveness. Based on a case study in an inter-organizational project, Tan *et al.* (2005) report that well-managed conflicts can lead to improved decision making quality by encouraging decision makers to evaluate more discerning opinions and to improve the level of understanding among various stakeholders, thus increasing the probability that decisions are implemented as intended.

Based on a survey with a sample of 317 team members from 45 teams, Pelled *et al.* (1999) conclude that functional diversity in a team drives task conflict, having a favorable impact on organizational effectiveness with regard to the improved efficiency

of team operations and the number of innovations or new ideas introduced by the team. The researchers interpret the results by arguing that task conflict “fosters a deeper understanding of task issues and an exchange of information that facilitates problem solving, decision making, and the generation of ideas” (p. 23). Other empirical studies report that the active involvement of key stakeholders and/or sharing their knowledge and opinions in the decision-making process resulted in increased objectivity in decision-making (Tovey & Savicki, 1990), better decisions (Eisenhardt, 1989; Ren *et al.*, 2006), and enhanced organizational effectiveness (Gerry Larsson, 2004; Miller, 1980).

Revilla & Cury (2007) report on the positive impact of knowledge integration in relation to product development performance (the characteristics associated with the value of the product to a customer). The authors assert that knowledge integration between customers and suppliers enables workers to learn about the changing needs and values of their customers, how to better solve problems, and to be better at coming up with innovative solutions in order to create products that have greater value in the marketplace. Based on a case study of three product projects, researchers (Q. Wang & Qin, 2005) recognize knowledge integration to be a major predictor of individual and team-level performance in knowledge-intensive organizations. The authors emphasize that it is important for knowledge intensive organizations to employ knowledge integration mechanisms that can support individual workers with the randomness, chaos, and disorderliness in a worker’s typical task process.

Another study (Singh, 2008) reports on the importance of knowledge integration for inter-organizational tasks. Based on a series of analyses of data regarding over half a

million patents from 1127 firms, the researcher finds a positive correlation between cross-regional knowledge integration and innovation quality. According to a study on IT project team performance from the vantage points of the CIO and IT managers (V. L. Mitchell, 2006), management's level of access to external knowledge is a significant predictor of on-time completion and expected workplace behavior. There are many other empirical studies that support the positive impact of knowledge integration on organizational effectiveness, such as IT project performance (V. L. Mitchell, 2006) and production innovation (C. Wang *et al.*, 2008).

In summary, the literature on knowledge-based decision-making supports the theory that decision-making that is richer in knowledge integration enhances organizational effectiveness by maximizing the effectiveness of multiple-participant decision-making. This theory strengthens the argument of the present study that CPS agencies should develop a process-oriented KMS. As an overall output of the KMS, a decision maker's knowledge integration ability gives them the opportunity to take better advantage of the more collective and diverse knowledge that multiple stakeholders have to offer.

1.6 Section Summary

In order to clarify the conceptual relationship between knowledge integration and knowledge management, whose import child welfare researchers have emphasized for decades, this introductory conceptual background has reviewed the literature concerning this topic. As knowledge intensive organizations, CPS agencies have the following characteristics: the need for a wide array of knowledge among different stakeholders, a

lack of correspondence among them, and a positive association between the speed of knowledge integration and organizational effectiveness. Therefore, the achievement of the missions and objectives of CPS agencies is directly related to the ability of the respective caseworkers to integrate diverse knowledge from various stakeholders. Separated due to various boundaries (e.g., disciplinary and organizational boundaries), stakeholders develop their own distinct knowledge, in terms of knowledge content, meanings, and personal interests.

Based on Carlile's insights (2004) on the efficiency of knowledge management intervention, the present study has found that CPS caseworkers often face pragmatic boundaries and use a transformation mode of knowledge integration involving knowledge processes at the syntactic, semantic, and pragmatic levels. In order to expedite this complex mode of knowledge integration, as previously noted, CPS agencies should employ knowledge management intervention utilizing diverse approaches (information-processing, interpretive, and political) that reduce the amount of time and effort needed for individual workers to share, interpret and compare/negotiate each other's domain-specific knowledge. While such intervention may be costly, considering the complexity of an individual worker's challenges as they try to work across boundaries, this appears to be inevitable in CPS agencies. As an intervention mechanism for CPS agencies to enact such a strategy, the present study has presented a process-oriented KMS that has the knowledge process capability to support an individual worker's ability to integrate knowledge. The literature on knowledge-based decision-making has been adopted to help explain the association between a worker's knowledge integration and organizational

effectiveness. Based on the conceptual understanding noted in this section, the next section goes on to re-analyze the latest research trend in child welfare research: the recommendation of IT-mediated knowledge management.

2 A Re-analysis of the Previous Research on Knowledge Management

This section discusses the limitations in the previous child welfare research in two main areas: The intervention and research model. An alternative in each area is presented.

2.1 Intervention

In this part, the KMS framework from earlier discussions is utilized in order to analyze the latest research approach that has recommended IT-mediated knowledge management. The strengths and limitations of this approach are discussed from the perspective of KMS. The following part presents an alternative perspective of KMS.

2.1.1 Strengths: A Knowledge-based Perspective

According to Chapter 1, knowledge integration has been identified as the main barrier that CPS agencies face in trying to become more effective. In order to address this, for quite some time IT-mediated information management has been used as an approach utilized to foster workplace reform. A good number of researchers on child welfare and in fields like social work and human services (W. Austin *et al.*, 2009; Darlington *et al.*, 2005; Edge, 2005; Fitch, 2006; Isaacs-Giraldi, 2002; Jones, 1993; Leung, 2009; J. U. Schneiderman *et al.*, 2007; Schoech *et al.*, 2002) have recognized the limitations of information-based research models to explain organizational effectiveness in child welfare organizations.

IT-mediated information management has been recommended based on an information-based view of organization emphasizing the organizational capability to process information. If this perspective is analyzed using the open system framework, the object or content that organizations manage is information (input). A main organizational concern here is the attempt to increase the ability of individual workers to acquire information by enhancing content management capacity or the capacity to “process” information. The output in this system is a synthesis of information, rather than integrated knowledge. This perspective is helpful in attempts to develop an information management system (IMS) rather than a KMS. Researchers with this perspective advocate the utilization of IT to process a hoard of information through its capability to create operational efficiency for administrative and management information systems, resulting in more efficient storage, access, and retrieval.

Knowledge management researchers (Alavi & Leidner, 2001; Hislop, 2002; Nonaka, 1994; Stenmark, 2002) have recognized that such information-driven organizational intervention may fail to enhance organizational effectiveness due to over-focusing on organizational capability to manage information or explicit knowledge efficiently, rather than on the more organizational resource of tacit knowledge. Although Li and Gao (2003) criticize the application of an information-based perspective for a broad range of organizations, this perspective can be relevant for some companies. For example, an efficient IMS that supports the improved information acquisition ability of workers is beneficial for manufacturing companies that focus on the efficient management of assembly lines.

According to Carlile (2004), the development of an efficient IMS is a mismatched intervention for CPS agencies that should focus energy on supporting the transformation mode of knowledge integration. An output of the IMS is a synthesis of information that involves knowledge processes at the syntactic level, rather than integrated knowledge that involves more complex knowledge processes at the semantic and pragmatic levels.

Carlile asserts that this mismatch between intervention and organizational needs is caused by the lack of a conceptual understanding of knowledge processes for knowledge integration. Li and Gao (2003) assert that the limitations of information with regard to being able to represent tacit knowledge makes it difficult for knowledge users to “unveil” the secrets of tacit knowledge in different contexts. Unveiling the secrets of tacit knowledge can be viewed as the processing of knowledge at the semantic and pragmatic levels.

Based on the latest discourse, the present study has found that many child welfare researchers (W. Austin *et al.*, 2009; Darlington *et al.*, 2005; Edge, 2005; Fitch, 2006; Isaacs-Giraldi, 2002; Jones, 1993; Leung, 2009; J. U. Schneiderman *et al.*, 2007; Schoech *et al.*, 2002) have properly adopted a paradigm shift from the information-based view of organization to that of a more knowledge-based one. They emphasize the organizational capacity to support a worker’s knowledge integration rather than the ability to merely acquire more information. This knowledge-based perspective is consistent with the goal of this study, which recommends a process-oriented KMS, i.e., the enhancement of knowledge management capacity in order to better support an individual worker’s ability to “process” input knowledge. An output resulting from this process is that of integrated

knowledge at the syntactic, semantic, and pragmatic levels. The knowledge-based view of organization focuses on diversifying IT applications for effective knowledge management intervention. In spite of the strengths of such an approach, the latest research on IT-mediated knowledge management intervention has exhibited limitations in its ability to explain why the neutral and negative results of IT intervention in empirical studies have persisted over time.

2.1.2 Limitations: Technology-focused Solutions

The current opinion of many child welfare researchers about knowledge management is knowledge-based but technology-focused. Some knowledge management researchers (Adli & Daud, [n.d.]; Alavi, 2000; Alavi & Tiwana, 2002) see KMS as an 'IT-based' system developed to enhance knowledge processes. They consider technology to be a primary tool for increasing knowledge management capability, especially in an environment where face-to-face communication is difficult (Alavi & Tiwana, 2002). They recognize the importance of knowledge processes on all of the syntactic, semantic, and pragmatic levels and the potential of IT applications to address challenges in the complex knowledge processes. The core IT competence is its ability to leverage pre-existing knowledge resources by relating group memory to individual work (Bharadwaj, 2000).

Child welfare researchers (Schoech *et al.*, 2002) generally assert that technology plays a primary role in transforming agency data into accumulated agency knowledge because it is able to capture, enhance, and link the collective intelligence. Such a viewpoint suggests that these researchers do not limit the role of technology to the

processing of information or the facilitation of the knowledge process at the syntactic level. Researchers who have this perspective of KMS are interested in diversifying IT applications in order to facilitate knowledge processes at different levels. IT has the capability to provide information in standardized formats (Burton & van den Broek, 2006), and this is helpful in acquiring knowledge at the semantic level. Some IT features (e.g. online forums) help to facilitate the knowledge process at the pragmatic level by providing a virtual environment where workers can integrate different ideas or resolve conflicts (Funaoi *et al.*, 2002).

Even though the assertion of an IT-based KMS seems to be useful for knowledge intensive organizations by taking a knowledge-based view of organization, its technology-focused perspective of KMS seems to have some limitations. In spite of the potential of IT with regard to knowledge integration, it is troubling that administrators and researchers tend to overemphasize the role of IT in knowledge management (Pan & Scarborough, 1999). Many researchers have criticized this technology-focused perspective. Walsham (2001) posits that technology-focused perspectives tend to lack the human-centered view of knowledge that recognizes the complex processes of knowledge sharing and creating activities of human beings. Based on a human-centered view of knowledge, this researcher describes the limitations of IT in knowledge processes as follows:

“Information and communication technologies are not *the* answer to improved knowledge-sharing within and between people and organizations. They do not replicate or replace the deep tacit knowledge of human beings which lies at the heart of all human thought and action. Nor do they remove the need for personal relationships, which normally cannot be developed and maintained effectively solely through electronic media” (p. 608).

Other researchers (Hislop, 2002; McDermott, 1999; Walsham, 2001) assert that IT is a necessary component of the best knowledge management systems but is insufficient on its own. As in the title of an article “Why Information Technology Inspired But Cannot Deliver Knowledge Management (McDermott, 1999),” these researchers recognize that the pitfall of IT-focused knowledge management is that IT is mainly used as an information management tool. They claim that a main limitation of the IT-focused perspective is that it only pays attention to computer- or machine-processable knowledge. Johannessen *et al.* (2001) note that “the danger of IT” comes from mismanaging tacit knowledge in organizations by overemphasizing explicit knowledge.

One case study (Zhang & Faerman, 2004) provides empirical evidence of these limitations. Based on semi-structured interviews with 19 participants across different units, offices, divisions and organizations, the researchers report that the main focus of IT development is that of developing electronic channels and mechanisms to use the channels effectively. However, IT has limitations with regard to the facilitation of the sharing of less codifiable knowledge and knowledge that, rather than being explicit, is embedded in practices and contexts. Even though they understand the limitations of information as media and attempt to diversify IT applications to address such limitations, these critics suggest that the technology-focused perspective of KMS cannot inherently be separated from an information-based perspective. Other researchers (Carlile, 2004; Nonaka, 1994; Polanyi, 1966) also claim that a disproportionate emphasis on information processing may hamper the effective use of knowledge in performance improvement.

Even when new technology is introduced specifically to facilitate knowledge processes at pragmatic levels (e.g., online forums), it has limitations in addressing the more subtle challenges in knowledge integration that Mengis & Eppler (2006) have identified, i.e., the unequal participation of knowledge agents, a lack of common ground and of a big picture perspective, and an unconstructive handling of conflict. The existence of an online forum does not address processing knowledge challenges at the pragmatic level in a situation where power relations and organizational politics affect knowledge-sharing activities.

Like an IT-based IMS, an IT-based KMS would also be a mismatched intervention for CPS agencies. IT intervention has the advantage of enhancing the transfer mode of knowledge integration (Carlile, 2004; Ehlers *et al.*, 2005; Haux, 2006). Based on the earlier discussion about the limitations of the technology-focused perspective, diversifying IT applications to support knowledge processes at syntactic, semantic, and pragmatic levels may not be enough to enhance the organizational effectiveness of organizations where their workers often use the transformation mode of knowledge integration. Technology-focused knowledge management may fail in producing the expected outcomes (Y. Malhotra, 2001). Moreover, it may even produce negative outcomes. Haas (2006) presents some empirical studies that report that having more knowledge often fails to result in improved task outcomes and occasionally even hurts project performance.

Some researchers (Hislop, 2002; McDermott, 1999; Walsham, 2001) have argued that IT may do little to make knowledge management more efficient and effective when

an unbalanced emphasis on IT has been utilized without employing other knowledge management practices to complement its limitations. These researchers have claimed that organizations should pay attention to non-IT knowledge management practices (e.g., open communication policies) along with IT development. Based on an empirical study, Sabherwal & Becerra-Fernandez (2005) found that each knowledge management strategy had advantages in facilitating the knowledge process at a certain level (e.g., syntactic) but had disadvantages at other levels (e.g., semantic and pragmatic). They argued that it is important to employ various management mechanisms to augment knowledge processes at all levels. The next section presents an alternative perspective of KMS that addresses the limitations of an IT-based KMS.

2.1.3 Alternative: the Socio-Technical System Perspective of KMS

Many knowledge management researchers have recognized the limitations of the technology-focused perspective of KMS and have replaced it with an STS (Socio-Technical System) perspective (Coakes *et al.*, 2002; James & Shani, 1999; Ng & Li, 2003; Waterson *et al.*, 2002). STS paradigms originated from the work of Trist and Bamford (1951), which recognized the complementary interplay between the social and technical parts of a work system and emphasized the organizational intervention in both parts. Different STS paradigms have been applied to organizational designs in various settings ever since. The usefulness of an STS perspective for the development of a KMS is supported by the assertion that designing and implementing an effective KMS is dependent on how much an organization can understand human sense-making processes

and complement the limitations of technology in facilitating the processes (Y. Malhotra, 2001).

KMS, in an STS perspective, refers to “a socio-technical system which has as its objective the management and sharing of knowledge to support the achievement of organizational goals” (Ng & Li, 2003, p. 168). This perspective provides broad conceptual insight for organizations to enhance interactions and collaboration among human knowledge workers by shifting the focus of a management effort from information and technology onto knowledge and human beings (James & Shani, 1999). If this human-based view of knowledge were applied to a process-oriented KMS model, a major focus of the development of a KMS would be the improvement of the management capability to transform an individual’s tacit knowledge from different knowledge domains (input knowledge) into integrated knowledge in an action domain (output knowledge). Such improvement can be made by jointly optimizing techno-structural and socio-cultural practices.

Maier and Remus (2007) recommend the development of a process-oriented KMS model from an STS perspective by identifying both techno-structural and socio-cultural knowledge management practices in order to facilitate knowledge processes. This recommendation is stated in different ways in the literature, such as in ‘modeling KMS as STS systems,’ ‘identifying KM socio-technical solutions or strategies,’ ‘developing process-oriented KMS model in an STS perspective,’ ‘developing a socio-technical KMS,’ etc. This kind of KMS utilizes a holistic and systemic approach to support

complex human interactions and collaboration through the effective management of knowledge processes.

Some child welfare researchers (Schoech *et al.*, 2002) explicitly advocate using an STS perspective in knowledge management by recognizing the interrelationships between social and technical systems in child welfare organizations. They recommend the development of a KMS that can “transform human services from stand-alone agency data systems to intelligent systems that share information within and between organizations and learn from such interaction and coordination” (p. 11). Based on this comment, it can be said that they have a human-based view of knowledge. They argue that technology can “transform social systems,” such as communication patterns and work processes, and they recommend the use of an intelligent system of human-technology interaction to function well. Therefore, the focus of this article is that of the diversification of IT applications as knowledge management tools (techno-structural strategies) and on the impact of these applications on human actions. Schoech and colleagues’ argument is not necessarily about the “complementary” nature of technical-structural and social-cultural practices that jointly construct the knowledge process capability that a KMS should have. To address this, they recommend the development of an IT-based KMS rather than the development of a socio-technical KMS.

According to researchers with an STS perspective of KMS (Coakes *et al.*, 2002; James & Shani, 1999; Waterson *et al.*, 2002), unless the socio-cultural part of knowledge management practices is taken into account, an IT-based KMS may still be ineffective. They incorporate the ideas of a technology-focused perspective by employing diverse

applications of IT in facilitating knowledge processes. They also emphasize that socio-cultural knowledge management practices should be explicitly included in a KMS in order to complement IT limitations with regard to facilitating knowledge processes. As previously discussed, the existence of an online forum board for stakeholders (an example of the technological part of knowledge management in a political approach) does not necessarily address the potential problems with respect to political impact on discussion processes on the board. An inter-organizational culture that encourages equity in the discussion process would complement the role of this IT application in incorporating the different ideas of stakeholders and in jointly developing an idea. This complementary combination of techno-structural and socio-cultural practices builds an effective KMS by supporting the knowledge process at the pragmatic level. An effective KMS is helpful in the reduction of potential negative IT effects, the development of knowledge-based assets, and can lead to improved knowledge integration (Almashari *et al.*, 2002; Coakes *et al.*, 2002; Herndon, 1997; Pumareja & Sikkell, 2002; Ray, 2003).

In summary, this literature review has found some research strength in the latest child welfare research on knowledge management intervention, including the knowledge-based view of organization and the recommendation of KMS rather than IMS. However, the technology-focused perspective of this research still has some limitations with regard to the development of an effective KMS that has the knowledge process capability to support knowledge processes at syntactic, semantic, and pragmatic levels. Alternatively, the present study proposes that CPS agencies develop a socio-technical KMS.

2.2 Research Models

This part discusses the limitations of research models that have been used in previous child welfare research and presents an alternative model.

2.2.1 Limitations: Direct Models

In order to analyze the characteristics of the research models used in previous empirical studies on knowledge management intervention in CPS agencies, a search of scholarly articles was conducted to identify such studies. A search for articles that contain “knowledge management” and “child” in the title led to the retrieval of a limited number of empirical studies (i.e., Fowler & Pryke, 2003; Mischen, 2008). Few of these examined the effect of a specific knowledge management intervention on organizational effectiveness. For example, Fowler and Pryke’s study, entitled “Knowledge management in public service provision: the Child Support Agency,” examines to what extent the conditions required for successful knowledge management can be observed and evaluated.

Since IT has been considered to be an important knowledge management tool, the present study extends the scope of these articles in order to include studies on IT intervention on organizational effectiveness in CPS and related fields. As previously discussed, the results have been mixed. Some have found positive effects (Andersen *et al.*, 1994; Huang, 1999; Pecora, 2002; Schoech, 2002; D. C. Smith & Grinker, 2005) while others have found neutral or negative effects (Froggett, 1996; J. U. Schneiderman *et al.*, 2007; Tregeagle & Darcy, 2008) (J. U. Schneiderman *et al.*, 2007; Tregeagle & Darcy, 2008). A commonality of these studies is that they used direct research models that examined the effect of the intervention on organizational effectiveness.

Some information system researchers (Barua *et al.*, 1995; Bose, 2003; Ravichandran & Lertwongsatien, 2005) have recognized the limitations inherent in using direct models in evaluation studies. Barua *et al.* (1995) posit that some neutral or negative impact by an IT intervention on organizational effectiveness in previous studies could be a result of having used the direct models that had been used in the studies. According to them, an appropriate evaluation of an IT-mediated intervention should start with an examination of whether this intervention is designed and implemented to facilitate business processes for core tasks in each organization. Therefore, the IT intervention should be evaluated on whether it successfully facilitates the processes or not. If the study examines the direct effect of IT on organizational effectiveness, the results of an IT evaluation study could be misleading.

Although these researchers have focused on IT rather than socio-technical KMS, their articulated discussions about the limitations in using direct models is beneficial to this study, especially with regard to the evaluation of the effects of techno-structural knowledge management practices. Suppose that a CPS agency introduces an IT intervention that is designed and implemented (e.g., a centralized database, coding system, electronic forum, etc.) to facilitate knowledge processes at the syntactic, semantic, and pragmatic levels in order for its KMS to facilitate the transformation mode of knowledge integration.

Further suppose that a main barrier in this agency is a political conflict among stakeholders that is difficult to address even by using an electronic forum.

If a researcher were to conduct an evaluation study of this IT intervention using a direct model (e.g., examines the association between the IT intervention and the coordinated service delivery), they might find that the intervention will be ineffective. Without knowing that the intervention is unsuccessful in facilitating a particular knowledge process, the researcher might suggest that the organization needs to develop more advanced features that improve the information-processing capability. This costly investment may produce the same results, and researchers may remain uncertain about the reasons for these unexpected results. Researchers who studied IT effects on child welfare case management (Weaver *et al.*, 2003) attributed the disappointing results to the possibility of IT design failure. The analysis of these researchers may be correct, but it may not be able to further guide IT development to concentrate on the knowledge process the developers should be most concerned about.

2.2.2 Alternative: Mediation Models

In order to address the problem of using direct models, some information management researchers (Ashworth *et al.*, 2004; Barua *et al.*, 1995; Radhakrishnan *et al.*, 2008) recommend the utilization of a specific type of mediating model in order to evaluate of an IT intervention: the process-oriented mediation models. They argue that this type of models can explain how organizational intervention and organizational effectiveness are better linked than direct models.

Barua and colleagues (1995) discuss a detailed description of a process-oriented mediation model. The model development starts by identifying the business processes for core tasks that are critical for organizational effectiveness in an agency (e.g., knowledge

processes for knowledge integration). They argue that IT should be designed and implemented to facilitate these processes. Other information system researchers (Bose, 2003; Ravichandran & Lertwongsatien, 2005) similarly argue that investing in IT itself is an insufficient condition for its successful use, and that IT generates competitive values only when IT is designed and implemented to support core tasks. For example, in retail companies that need IT to identify market needs, IT should be designed to assist workers in business processes for the monitoring of a customer's requests on a real-time basis, understanding the requests correctly, and integrating different requests into an adequate response. In manufacturing companies that need IT to offer products at competitive prices and to deliver them with minimal inconvenience, IT should support business processes for efficient manufacturing, more stream-lined supply chains, integrated business processes, etc.

According to Barua and colleagues (1995), a business process mediation model should be developed by clearly defining the degree of how successful the IT intervention is in facilitating the processes (an operational-level variable) and by including this in the model as an inter-mediating variable. This model consists of two stages. At Stage I of the model, a first-order effect of an intervention is evaluated using a mediator variable that is the operational-level variable (e.g., inventory turnover for a manufacturing firm), in terms of the effectiveness in facilitating the processes. At Stage II of the model, a second-order effect of the intervention is measured by the positive association of the mediator variable with the organizational effectiveness (e.g., market share of the firm).

The need for using process-oriented mediation models has been argued by many researchers. Some program evaluation researchers (Cozzens, 1997; Rossi *et al.*, 2004) claim that the effects of an intervention should be evaluated at two levels: the mediate effects on outputs and the ultimate effects on outcomes. Cozzens (1997) identifies two types of intervention effects: outputs and outcomes. This researcher asserts that outputs are often the result of a successful process that is addressed by an intervention. Outcomes, on the other hand, are the goals stemming from these results. These researchers argue that a mediation model can explain the effects of an intervention on the outcomes of a program by separating the process assessment and performance measures. Although different terms are used, this separation has been consistently supported by other program evaluation researchers. Rossi and colleagues (2004) differentiate between mediate and ultimate effects, with the former referring to the direct results of an intervention and the latter referring to the goals of the program. Some researchers (Revilla & Cury, 2007) refer to them as process outcomes and product outcomes.

Many organizational effectiveness researchers also take this stance. Organizational effectiveness generally refers to the degree to which an organization accomplishes certain goals (Ostroff & Schmitt, 1993; Ugboro & Obeng, 2004). Such goals include stated and operative goals (Ugboro & Obeng, 2004). Cunningham (1977) separates the evaluation of organizational effectiveness by assessing the ability to produce desired outputs and the ability to accomplish the overall organizational goals. Therefore, organizational effectiveness should be assessed for both outputs from a certain intervention, in order to examine whether the intervention accomplishes operative goals,

and for outcomes, so as to examine whether these outputs contribute to the fulfillment of the overall organizational goals.

The earlier conceptual discussions about knowledge management (intervention), knowledge integration (output), and organizational effectiveness (outcome) also suggest that a process-oriented mediation model is relevant for knowledge management research. Knowledge management researchers (C. Wang *et al.*, 2008) also argue that a mediation model can lead to a significant improvement in results (as compared to a direct effects model) when there is compelling evidence that a discernible mediating effect on the knowledge integration of the relationships between KM interventions and organizational effectiveness exists. Knowledge management researchers (Fugate *et al.*, 2009) propose to use mediation models by assessing the effect of knowledge management on operational and organizational performance.

Incorporating some major features of Barua *et al.*'s mediation model framework (1995), the present study develops a generalized framework that would guide the development of a "knowledge" process mediation model that is suitable to evaluate a knowledge management intervention in CPS agencies (Figure5).

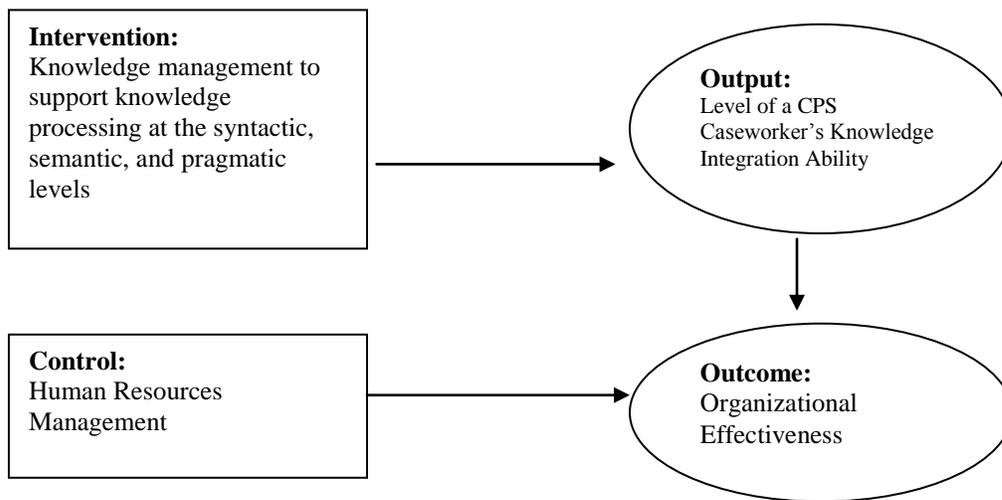


Figure 5. A Generalized Framework for Knowledge-Process Mediation Models

By focusing on knowledge processes at the syntactic, semantic, and pragmatic levels, this generalized framework incorporates Barua *et al.*'s assertion about process-orientation (1995). The present study identifies a process-oriented intermediate variable: the level of an individual caseworker's knowledge integration ability. The construct refers to the degree to which an individual caseworker has the ability to integrate situated knowledge from various stakeholders into a comprehensive and coherent body of case knowledge by processing such knowledge at the syntactic, semantic, and pragmatic levels. The construct of knowledge integration ability satisfies the three criteria for an inter-mediating variable in a process-oriented model that Barua *et al.* (1995) suggested: 1) an output of an intervention, 2) an important input factor for organizational effectiveness, and 3) a measurement of intervention effect at the operational level, meaning the effects of the facilitation of necessary processes. Based on the prior discussion, knowledge integration is an important outcome of knowledge management (Kearns & Sabherwal, 2007) and it is an important input factor for organizational effectiveness in CPS agencies

(Fitch, 2006; Jones, 1993; Schoech *et al.*, 2002). By definition, knowledge integration is a process-oriented concept (Alavi & Tiwana, 2002; Balaji & Ahuja, 2005) and a product of the effective operation of facilitating the sub-processes of knowledge integration: knowledge processes at the syntactic, semantic, and pragmatic levels (Carlile, 2004).

The framework incorporates Barua *et al.*'s assertion of a mediation framework. At the first stage, the first-order effects of the knowledge management intervention (the intervention or independent variable) are evaluated based on the knowledge management's capability to enhance the level of an individual caseworker's knowledge integration (the output of the KMS or the mediator variable). At the second stage, the second-order effects are evaluated based on the association between the level of an individual caseworker's knowledge integration and the observed organizational effectiveness (the outcome or dependent variable).

Unlike the original framework that focuses on developing IT-mediated intervention, this new framework incorporates an STS perspective of KMS by focusing on the development of a set of socio-technical practices that can support the knowledge processes at the syntactic, semantic, and pragmatic levels. This change is critical based on Damanpour and Gopalakrishnan's assertion (1999) that because the technical and social systems in an agency jointly work for organizational operations, it is difficult to comprehend the effect of one without taking the other into account.

2.3 Summary: A Reanalysis of the Previous Research

This section has found that there are two limitations (technology-focused intervention and direct research models) in previous CPS research to the proper

understanding of the complicated associations among IT, knowledge management, knowledge integration, and organizational effectiveness. Alternatively, the present study presents a generalized framework for the development of the knowledge process mediation models that partition the effect of knowledge management intervention (a set of socio-technical practices) on outcome (organizational effectiveness) into two components: the direct effect and the indirect effect that is mediated by output (a caseworker's knowledge integration ability).

3 A Proposed Research Model

Using the generalized framework presented in the previous section, this study develops a research model that explains what kinds of knowledge management intervention CPS agencies should employ in order to support CPS caseworkers in the integration of knowledge resources; the model also explains why these interventions contribute to enhanced organizational effectiveness. This section consists of six parts: 1) The first stage of the research model is developed to explain associations between a set of knowledge management practices and a caseworker's knowledge integration ability; 2) The second stage of the research model is developed to explain why a caseworker's knowledge integration ability enhances organizational effectiveness; 3) This next part discusses the mediating effects of a caseworker's knowledge integration ability on the direct associations between knowledge management and organizational effectiveness; 4) Here the influences of HRM practices on the main factors in the research model are taken into account as control variables; 5) A graphic research model is presented; and 6) The

usefulness of the model in this study is discussed and compared to those of alternative models.

3.1 First Stage: Effects of Knowledge Management System

In the first section, the present study presented a process-oriented socio-technical KMS whose focus is on the knowledge management capability to support an individual caseworker in the most complex mode (transformation) of knowledge integration, involving knowledge processes at the syntactic, semantic, and pragmatic levels. As Maier and Remus (2007) have recommended, the proper focus of the development of a socio-technical KMS is that of defining the knowledge management capability by identifying two dimensions of knowledge management practices: the techno-structural and the socio-cultural dimensions. In addition to these, the present study adds another category of practice (the intra-organizational dimension of knowledge management practices) because the knowledge integration barriers that CPS caseworkers face are difficult to overcome with the intervention of a single CPS agency. The next three parts examine each category of knowledge management practice (the techno-structural, socio-cultural, and inter-organizational dimensions) in order that such practices jointly increase the knowledge management capability to enhance knowledge integration. An association between each category and the level of a caseworker's knowledge integration ability is hypothesized.

3.1.1 The Techno-structural Dimension

The present study finds a framework of IT development principles (Boland Jr. *et al.*, 1994) that is useful in developing this dimension of knowledge management practices.

The following parts discuss the framework, provide empirical evidence on its usefulness, and hypothesize that a set of techno-structural strategies developed based on this framework would enhance the level of a CPS caseworker's knowledge integration ability.

3.1.1.1 A Framework for the Techno-structural Dimension

Boland and colleagues (1994) provide useful insights regarding how IT should be designed specifically to enhance a decision-maker's knowledge integration ability. The researchers argue that IT developments tend to “focus either on the individual as an isolated decision maker, or on the group as a producer of decision or policy statement in common” (p. 456). They recognize that, in practice, most decision-making situations involve a group of autonomous agents and that each agent owns unique interpretations of a situation and acts independently. Therefore, IT should be designed and implemented specifically to assist individuals “in making interpretations of situations at hand, reflecting on them, engaging in dialogue about them with others who share interdependences, making possible changes of existing assumptions and understandings” (p. 146). This kind of IT enables a decision-maker or a group of decision-makers to develop a comprehensive and accurate understanding about a phenomenon by integrating diverse types of knowledge.

The main reason that the present study adopts Boland *et al.*'s framework (1994) is that it is useful to develop specific IT applications that can support an individual caseworker's knowledge integration. Their focus on developing IT applications that engage a dialogue among collaborating parties to understand contextual knowledge and to promote changes in existing knowledge could be restated that IT should be designed to

support decision makers in processing knowledge at the syntactic, semantic and pragmatic levels. The present study has conceptualized this ability as ‘knowledge integration’ ability, more specifically, in the transformation mode (Carlile, 2004). Boland and colleagues (1994) suggest the use of IT design principles in order to support ‘distributed cognition’ or to enhance a decision-maker’s knowledge integration ability. The principles include ownership, easy travel, multiplicity, mixed forms, and emergence. The following describes each suggested principle.

Ownership. Boland *et al.* emphasize that knowledge is always owned by an agent. When a group of people who have different underlying images of the world exchange knowledge and work together, it is important to make ownership clear. This is possible by ensuring that IT users know who is responsible for certain knowledge. Based on this principle, IT applications should be designed to make it clear about an owner who has created a certain document and to ensure that only this owner can change or update the document.

Easy Travel. In order for a worker to integrate distributed knowledge, the person should be able to easily obtain necessary information and be aware of associations among different pieces of knowledge. Boland and colleagues state that it is important to enable IT users to navigate related documents quickly and easily. They recommend that documents should be displayed in a hypertext-like structure so that IT users can move from one document to another by simply clicking the links. This principle can be applied to design a knowledge map. When a knowledge map shows related documents and it is easy for users to access documents through hyperlinks, workers can easily move from a

document to related ones. This greatly assists the workers in readily understanding associations among different knowledge.

Multiplicity. Different interpretations or knowledge from various sources help decision makers to understand different aspects of the same situation. Therefore, it is important for them to participate in the exchange and critique of each other's knowledge. Boland *et al.* argue that it could be counterproductive if the differences between an individual's knowledge are hard to distinguish. IT should make it easy to compare and contrast different pieces of knowledge. The researchers recognize that a window-based environment makes it easier to implement this principle by concurrently displaying associated documents. A more sophisticated application would allow IT users to automatically detect similarities and differences between multiple documents.

Mixed Form. Boland and colleagues state that people express what they understand in different forms, such as with text, tables, pictures, graphs, and audio-visuals. In order to assist an individual worker to understand someone else's knowledge, IT should be designed to have the capability of dealing with different forms of information so that it can be displayed in a more efficient form than others. IT users can choose a preferred mode of expression if IT provides more than one mode. Computers have a huge advantage in being able to manipulate data and produce the manipulated results in diverse forms. An example application of this principle is that a user can transfer a text form of data to a tabular or a graphic presentation. Although graphic presentations often enhance comprehension in complex situations, they can sometimes lose the ability to provide detailed information. Therefore, it is important for IT to

provide knowledge owners with diverse ways to express their knowledge and to present the same data in different forms.

Emergence. Boland and colleagues recognize the importance of IT capability to support the process of synthesizing different pieces of knowledge into new knowledge. They assert that IT should be designed to ease this synthesizing process. The researchers recommend that IT should enable a user to copy contents from multiple documents, to paste them in one's own worksheet, and to edit them. Editing activities include adding, deleting, updating, rearranging, adding new links, etc. When an element is copied, it is important to make sure that the element does not lose all of its properties including links to its context. In this way, knowledge workers can develop their own knowledge in a manner that emerges from existing knowledge while the ownership principle is ensured. Some organizations may be interested in more diverse IT properties than those listed above when they want to utilize IT for various purposes other than that of promoting knowledge integration. However, Boland *et al.*'s framework is relevant for the present study focusing on the knowledge management capability to support the transformation mode of knowledge integration.

3.1.1.2 Empirical Evidence for the Framework

The usefulness of Boland *et al.*'s framework has been supported by empirical (Jarvenpaa & Majchrzak, 2005; Majchrzak *et al.*, 2005; Majchrzak *et al.*, 2000) as well as theoretical studies (Densham *et al.*, 1995; Faniel & Majchrzak, 2007; Richardson, 2005). In their qualitative study, Majchrzak and colleagues (2000) found some preliminary support for the usefulness of this framework. Individuals in a structurally diverse team

reported that the principles of indeterminacy, ownership, and easy travel were important as they used their IT system to discuss their work with others. The researchers admit the limitations of this preliminary study, i.e., that they did not examine the associations between the interventions and their outcomes.

Another empirical study (A. Malhotra & Majchrzak, 2004) was conducted to address the limitations in this qualitative research. This research examined 55 successful far-flung teams consisting of multi-unit/multi-organizational, multi-functional, globally dispersed individuals conducting their interdependent activities mainly through electronic media, with minimal or no face-to-face interaction. Based on a combined methodology through a case study and a survey study of this sample over a period of ten months, the researchers have found that the application of Boland and colleague's framework in an IT system assisted the teams in overcoming substantial barriers to knowledge integration among the team members and to create innovative knowledge.

Majchrzak and colleagues (2005) found that Boland *et al.*'s framework is specifically beneficial for non-routine tasks as opposed to routine ones. Because each principle contributes to the organizational capability to assist individual workers in obtaining a deep level of context knowledge, they conceptualize this framework as IT support for contextualization. They conducted a survey study with a sample of 263 individuals working in structurally diversely distributed teams using a variety of virtual workspace technologies to support their communication needs. Its results indicate that when individuals perceive their task as non-routine, there is a positive linear relationship between their perceived degree of IT support for contextualization and know-how

development. In contrast, there is a non-linear relationship between the two variables for groups of people who perceived their tasks as routine. The researchers acknowledge that the impact of IT support on knowledge integration would be partial given the limitations of IT on complex human communication. However, they argue that the opportunities for misunderstanding when performing non-routine tasks are so great that knowledge integration will benefit from this kind of IT support, even when such support is only.

3.1.1.3 Applications of the Framework in CPS Contexts

The present study posits that Boland *et al.*'s framework can also be useful for CPS agencies since they have similar work environments to the empirical studies discussed above. The IT design principles that Boland *et al.* propose are closely related to the IT features that child welfare researchers (Schoech *et al.*, 2002) recommend. Each principle is not exclusively matched to a single IT artifact. Rather, each is applied to different IT features; these combined features help increase the knowledge management capability of IT to enhance the transformation mode of knowledge integration. The following section analyzes each principle in CPS contexts. Note that although there are many different ways to apply the principles to IT features and functionalities, only a few example applications are presented here.

Ownership. When IT applications clearly inform the viewer who has created a document and secured the ownership, it is helpful for caseworkers to secure the reliance or validity of the knowledge. When a caseworker learns that information originated from a knowledge owner who does not have proper knowledge and experience about a certain topic (e.g., a parent perceives that their child is clinically depressed), the worker would

seek out more reliable knowledge sources to validate the information (e.g., mental health records). If the worker can email the knowledge owner with just one click, the caseworker can validate the information by asking them for more detailed contextual information (e.g., rationales for their perception). This combined application of “ownership” and “easy travel” principles may assist the caseworker, both to more easily acquire needed information (the knowledge process at the syntactic level) and to clarify what the parents meant by the clinical depression (the knowledge process at the semantic level). Similarly, Schoech and colleagues (2002) recommend that IT should be used to create repositories that include comprehensive, relevant, and reliable data and to provide efficient and effective mechanisms for acquiring and validating information.

Easy travel. When IT applications enable caseworkers to navigate related documents quickly and conveniently, such efficiency would motivate them to seek more information in order to develop comprehensive knowledge. Suppose a caseworker retrieves multiple documents that contain information about a child’s depression symptoms. If it is difficult for the worker to navigate the documents, he or she may decide to read only a summarized document. However, if the worker can easily navigate from one document to another just by clicking on hypertext links (e.g., clicking on the parents’ citation of a therapist leads to the document containing the therapist’s perception of depression), the caseworker may be motivated to acquire more information, to gain a deeper understanding of this issue, and to incorporate different ideas. Therefore, the application of this principle is helpful in processing knowledge, not only at the syntactic level but also at the semantic and pragmatic levels. Schoech and colleagues (2002)

recommend that computer systems should have the capability of capturing and codifying knowledge into formats that can be manipulated, visualized, and disseminated in a timely manner. They advocate the use of data warehousing functions that allow for one-time, system-wide data capture to occur and that involve sorting, indexing, and linking of data for easy navigation. The researchers argue that information quality is associated with the speed of communication.

Multiplicity. The application of this principle is useful, especially with regard to facilitating the knowledge process at the pragmatic level. If IT applications were to make it possible to concurrently display more than one ‘inter-related’ document in multiple windows and to highlight a certain phrase, it would be easy for caseworkers to compare different interpretations of various stakeholders concerning a certain issue (e.g., the child’s mental health condition) and to develop integrated knowledge based on such differences. Schoech and colleagues (2002) recommend data mining features so that users can extract relationships, patterns, sequences, classifications, predictions and trends from a significant amount of historical data. They argue that the proper presentation of information could empower workers to learn from accumulated expertise. Their argument indicates that it is important, not only to retrieve related documents, but to also present them in a way where the users can easily understand the connection among them.

Mixed form. According to this principle, IT applications should support multimedia document presentation, such as text, tables, pictures, graphs, and audio-visual data. Sometimes, pictures make it easier to assess child abuse than narrative records. Audio-visual data could also allow caseworkers to understand a certain situation better

than a written description. Caseworkers can develop a good case knowledge when they can use IT applications that summarize or manipulate data and present the results in both tables and graphic formats. For example, if a computer system can graphically present the trend of changes in a child's depression symptoms over time by manipulating the data recorded by a caseworker at each home visit, it would be helpful for the worker to understand the child's depression. This application shows that this principle is useful in the development of IT that enables caseworkers to better understand others' knowledge semantically. Schoech and colleagues (2002) also emphasize that IT developers need to pay attention to information visualization so as to be sure to present knowledge to workers in a usable format.

Emergence. Like the 'multiplicity' principle, this principle is important for the knowledge process at the pragmatic level. Suppose an online forum offers the features needed to allow participants to copy information from previous records, paste it in a new worksheet, and edit the content. This type of convenient ability to work with differences may motivate caseworkers to seek more diverse opinions from various stakeholders, thus assisting them to better integrate knowledge. If users can track back to the original document by clicking on the copied content, forum participants can better understand how new ideas have emerged from the existing knowledge base. Similarly, Schoech and colleagues (2002) recommend a joint knowledge building application (e.g., an electronic knowledge forum) whose features include the automatic documentation of ideas from other users and the tracking of user contributions (such as what has been read and by whom, along with a visual depiction of the idea development process).

In summary, this part has discussed a framework for IT design principles in order to support ‘*distributed cognition*’ (Boland Jr. *et al.*, 1994), its empirical evidence, and its usefulness in the CPS work environment. The principles listed above are relevant in the development of the techno-structural dimension of knowledge management practices that facilitate knowledge processes at the syntactic, semantic, and pragmatic levels. If caseworkers feel that these principles are successfully applied to the techno-structural dimension of knowledge management practices in their organization, they would be more confident about their level of knowledge integration ability. Therefore, the present study makes the following hypothesis about the effectiveness of the techno-structural dimension of knowledge management practices:

Hypothesis 1: There will be a positive relationship between the perceptions of caseworkers with regard to the degree of support provided by the techno-structural dimension of knowledge management practices and their perceived level of knowledge integration ability.

3.1.2 The Socio-cultural Dimension

According to researchers that have conducted several empirical studies about the effectiveness of IT support for integrating distributed cognition (Majchrzak *et al.*, 2005), this IT support contributes to knowledge integration yet offers partial benefits. This assertion is consistent with the earlier discussion about the limitations of IT in regard to addressing different challenges in knowledge processes at the syntactic, semantic, and pragmatic levels. According to researchers that recommend the development of a socio-technical KMS (Coakes *et al.*, 2002; James & Shani, 1999; Ng & Li, 2003; Waterson *et al.*, 2002), the socio-cultural dimension of knowledge management practices should

complement the limitations of the techno-structural practices to support knowledge integration. Unlike the techno-cultural dimension, the present study has not found a useful framework for developing the socio-cultural dimension of knowledge management practices. Rather, the following sections list some socio-cultural practices that have the capability to complement the limitations of IT in facilitating knowledge processes at the syntactic, semantic, and pragmatic levels.

First, when it comes to the knowledge process at the syntactic level, IT has advantages but retains some limitations. IT-mediated communication cannot fully be substituted for direct, real-time dialogue among humans (Squier & Snyman, 2004). Knowledge integration requires both face-to-face communication and technology-mediated communication in order to provide easy, frequent, content-rich, and context-rich interpersonal interactions among colleagues (Alavi & Tiwana, 2002). Although technology can be used for face-to-face communication (e.g., video-conferencing), this application still has limitations in terms of its ability to support caseworkers in acquiring important contextual knowledge. For CPS caseworkers are likely to collect more contextual knowledge when they conduct an interview with family members during a home visit, as compared to one where they simply talk via a telephone call or video-chatting. Indeed, CPS caseworkers may well develop a better understanding of the situation through such direct observation of the environment at the respective home and from interactions among the family members.

In order to address the knowledge process limitations of IT at the syntactic level, organizations need to provide caseworkers with various communication channels (e.g.,

electronic repositories, face-to-face meetings) and educate workers to choose an effective channel based on a given situation. As an example of such policy, many CPS agencies require that a group of case stakeholders have a staffing meeting when a case is transferred from one stage (e.g., investigation) to another (e.g., family-based service). This requirement provides caseworkers with a channel through which they can obtain knowledge that is not readily available in existing case-related records. In addition, multiple key stakeholders can share knowledge more efficiently.

However, the existence of various channels itself is not enough to enhance knowledge integration unless organizations foster an open atmosphere both with regard to face-to-face communication and IT-mediated communication. Social workers often have difficulty obtaining case records or talking to knowledge owners (J. U. Schneiderman *et al.*, 2007). Administrators of public sector agencies find knowledge management challenging due to the isolated nature of most tasks in the public sector and the tendency of workers to maintain and protect their own personal knowledge (Edge, 2005). Hence, CPS organizations should encourage workers to proactively seek and offer to share such knowledge (Salus, 2002).

Organizational efforts to foster a more open atmosphere are also needed when it comes to IT-mediated communication. Without useful information, a computer system may be nothing more than a collection of algorithms. In order for IT to effectively support CPS practices, organizations should ensure that electronic repositories contain comprehensive information (Schoech *et al.*, 2002). Therefore, organizations should not limit their efforts to just the introduction of an IT system, but should also train workers to

externalize their knowledge in repositories both comprehensively and effectively.

Without this training, because IT users may be afraid of the possibility that important information is omitted in the electronic repositories, they may not rely on the information in the system.

Second, organizations should also make explicit efforts to make up for the limitations of IT during the knowledge process at the semantic level. Different interpretation schemes (e.g., using jargon) hamper communication among people and may lead to misunderstandings (Carlile, 2004; Frost & Lloyd, 2006). Most computer systems have some mechanisms, such as standardized coding schemes, to address such barriers to knowledge integration. However, using these mechanisms is not enough to prevent misunderstandings and confusions. Socio-cultural practices to address these barriers include the development of common terminologies, forms, indicators, and procedures in order for key stakeholders to communicate with each other more easily and encourage professionals to understand the unique situations of clients (Darlington *et al.*, 2005; Frost & Lloyd, 2006; Isaacs-Giraldi, 2002; Jones, 1993).

As an example of a standardized procedure to collect case information, CPS agencies may apply the recommendations of child welfare researchers (Schoech *et al.*, 2004) and conduct desirable information sharing transactions at each stage of a CPS procedure. When a case is identified, an investigating caseworker searches for prior CPS records on the child/family and follows investigation protocols. A preliminary assessment based on the information that has been collected may enrich an initial meeting of practitioners with family members. After the case is open, the caseworker needs to seek

out case-related information. Multi-agency or multi-program meetings are arranged to facilitate information sharing and discussion among multiple stakeholders. Organizations may define these kinds of protocol as policies and elect to train employees to follow them.

Third, the need for organizational intervention to make up for the limitations of IT seems to be great, especially when it comes to the knowledge process at the pragmatic level. As for this level of knowledge process, workers produce knowledge synergy by identifying associations, connection, and hunches from the different pieces of knowledge (Newell *et al.*, 2004). Like Carlile (2004), the present study pays special attention to dealing with conflicting knowledge among different stakeholders. Even when various channels for knowledge processing at the pragmatic level (e.g., multi-disciplinary meetings or an electronic knowledge forum) are readily available, the availability itself does not guarantee that CPS caseworkers will integrate conflicting knowledge. Carlile (2004) recommends the ‘political’ approach of knowledge management in order to facilitate the knowledge process at the pragmatic level so that workers can work with common interests for shared goals and integrate different types of knowledge based on common ground. Other researchers (Politis, 2003; Stanley, 2005; Tovey & Savicki, 1990; Zemke, 1987) similarly argue that organizations should ensure the engagement of key stakeholders in the decision-making process by equalizing participation and by managing power relationships.

Tan and colleagues (2005) emphasize the need for organizational efforts to explicitly promote conflicts and to properly manage them. They make specific recommendations, such as the promotion of such conflicts to reap the benefits of

responsive, multifaceted solutions; the cultivation of a candid knowledge-sharing culture to provide the necessary social incentive to upgrade these conflicts into constructive ones; the encouragement of exercising sensitivity and the adoption of accommodative measures in managing them to minimize their rippling negative effects; and consciousness raising about the necessity of taking stock of knowledge interactions so as to better identify problems and needs.

An empirical study (Okhuysen & Eisenhardt, 2002) supports the need for organizations to employ explicit socio-cultural intervention that is specifically targeted to facilitate the knowledge process at the pragmatic level. This study included one control group and three experimental ones. In each group, two-fifths of the total case information about a food poisoning outbreak was provided to each member so that group members possess some common information. Two experimental groups were provided with different formal interventions where group members were explicitly instructed to interact so as to identify associations and differences among their bodies of knowledge. The other experimental group was instructed to simply share information held by individuals. The control group was not provided with any instruction. After a discussion session among the group members, the researchers measured the knowledge integration level in each group by summing up the number of facts that the group identified regarding the food poisoning outbreak. The facts that are expected to be identified included the “simple critical facts” that had been provided to the group members, as well as the “combined critical facts” that had not been provided to any members in each group but could be

identified only by synthesizing knowledge from different sources. The combined critical facts could be viewed as “knowledge synergy.”

The results of this study showed that the two experimental groups that fostered interactions among workers in order to check for associations and differences in their knowledge identified more combined critical facts than the control group. In contrast, the other experimental group that was instructed to share information did not outperform, in terms of identifying combined critical facts, when compared to the control group. The results show no group difference in identifying simple critical facts. The researchers concluded that improved knowledge integration is due to gains in combined critical facts rather than gains in simple critical facts. Gains in combined critical facts, or knowledge synergy, were produced only when group members were instructed to process each other’s knowledge at the pragmatic level. Considering that all groups had a chance to share common knowledge bases and meanings through a discussion session, the main contributor for such differences, in terms of the level of knowledge integration, was the intervention to facilitate the knowledge process at the pragmatic level.

The need for socio-cultural intervention has also been emphasized by child welfare researchers. Child welfare researchers (Annie E. Casey Foundation, 2002; Darlington *et al.*, 2005; Petr, 2004; Salus, 2002; Schoech *et al.*, 2002) have recommended the establishment of organizational policies, procedures, and a culture that ensures that caseworkers and other stakeholders are open to changes in their own knowledge, are able to adjust their interests and practices in order to the best interests of the child, and to integrate different opinions in decision-making. Child welfare researchers (Frost & Lloyd,

2006) state that CPS practice often involves some hierarchical barriers among different stakeholders and some conflicts with regard to the need for change and resistance to it. They report on some recommendations made by a group of child welfare administrators regarding how organizations should address these barriers. Based on their recommendations, organizations develop policies in such ways that the expertise of each stakeholder can be utilized based on shared strategic objectives and common core aims.

As discussed, researchers have recommended various socio-cultural strategies to support an individual worker's knowledge integration. It would not be reasonable to list all of the possible knowledge management practices in the socio-cultural dimension. Instead, the present study presents the general principle that a CPS agency can apply to better develop their own set of practices, such as ensuring organizational policies and culture to assist the CPS caseworkers in processing others' knowledge at the syntactic, semantic, and pragmatic levels. If caseworkers perceive receiving this kind of support, they are likely to be more confident about their knowledge integration. Therefore, the present study hypothesizes:

Hypothesis 2: There is a positive relationship between the perception of caseworkers as to the degree of support provided by the socio-cultural dimension of knowledge management practices and their perceived level of knowledge integration ability.

3.1.3 The Inter-organizational Dimension

In addition to the techno-structural and socio-cultural dimensions of knowledge management practices within an organization, the present study pays attention to knowledge management practices at the inter-organizational level. CPS agencies need to pay special attention to this dimension of knowledge management practices, as inter-

organizational knowledge management is an important factor for knowledge integration in an environment where knowledge integration mostly occurs across organizational boundaries (Knight & Pye, 2002, 2005).

Moreover, the types and levels of challenges in inter-organizational knowledge management differ from those within an organization (Chen *et al.*, 2007). Organizational differences may deepen the challenges for a group of stakeholders who already have challenges due to individual or disciplinary differences. For example, an inter-organizational group of people may interpret the same knowledge differently and ambiguously due to the distinct communication styles, practice sets, and domain schemes among different organizations (Jarvenpaa & Majchrzak, 2005). Any consequent actions based on misinterpretation may prevent the group from coordinating their actions. These challenges may not be addressed properly simply by developing agency policies and fostering the organizational culture.

Many researchers have emphasized the need for inter-organizational intervention to support knowledge integration across organizational boundaries. The absence of effective interagency structures and policies that encourage interagency collaboration has been highlighted as a barrier to the collaborating parties' ability to initiate and maintain cross-organizational relationships and collaboration (Darlington *et al.*, 2005; Frost & Lloyd, 2006). Most of the organizational interventions in collaboration suggested by the researchers are associated with knowledge integration.

Some child welfare researchers have highlighted the need for techno-structural intervention in the inter-organizational dimension. Schoech and colleagues (2002) claim

that an effective IT infrastructure in an agency and electronic links among diverse CPS information systems, judicial, medical and social service agencies make it easier for child welfare workers to integrate the collective wisdom that is dispersed in the case data and diverse stakeholders' expertise. Similarly, many child welfare administrators suggest that child welfare practices could benefit a great deal from using a centralized computer system shared by multiple agencies, or from using data-sharing systems that contain national, state, and county information allowing the aggregate evaluation of health care needs and outcomes (Frost & Lloyd, 2006). Vulliamy and Sullivan (2000) identify some specific required activities for inter-organizational collaboration, including exchanging information, having a joint documentation system, and using proper mechanisms for representatives from multiple-agencies to create solutions together.

Inter-organizational intervention is also needed for socio-cultural strategies to support knowledge integration. Child welfare researchers (J. U. Schneiderman *et al.*, 2007) recommend that organizations formulate explicit policies to encourage the sharing of knowledge among key stakeholders and service providers. They note that there is no universal requirement or Medicaid requirement that health plans be shared with the foster parents or other care providers that are responsible for the daily supervision of a child in foster care. They argue that good communication among stakeholders ensures that the health care needs of foster children are identified accurately and in a timely manner, and that health care plans are implemented in the manner intended.

Some researchers (T. P. Cross *et al.*, 2005; Wiig & Tuell, 2004) state that when multiple organizations work in partnership for the common goal of enhancing child

welfare, their effectiveness is enhanced by setting mutually agreed upon standards and jointly defining case practice procedures. This may take the form of issuing executive orders, charter agreements, memoranda of understanding (MOUs) or memoranda of agreement. When a police and a CPS agency work in conjunction, these partners typically write a MOU to establish their methods of coordination for shared goals. These documents may contain descriptions of the problem, the goals for the initiative, descriptions of the management and organizational structure, the information to be shared, the activities to take place, and the nature of the recommendations to be developed (Wiig & Tuell, 2004).

Using the process-oriented KMS framework from an STS perspective, the inter-organizational dimension of knowledge management practices listed above jointly work to increase knowledge management capability so as to facilitate knowledge processes at the syntactic, semantic, and pragmatic levels. Partner organizations can promote knowledge sharing among individual workers by using a joint document system, by encouraging information exchange, or by identifying the necessary information to be shared (the syntactic level). By describing the structure of each organization and setting up standardized forms and procedures, organizations can enable collaborating workers to understand each other more easily, accurately, and deeply (the semantic level). Inter-organizational intervention for workers to create shared meanings (e.g., standardized document forms and terminologies) makes it easy to carry out smooth communication without any interruptions for clarification or to reduce misunderstandings and confusions. Even when the group of organizations uses different computer systems, they can agree to

share coding schemes. In this case, workers can more easily understand the documents that are exported to them from other organizations. In a MOU, partner agencies may include agreements in which they encourage the collaborating parties to share common goals and to yield creative solutions with other professionals from other partner organizations. With such practices, CPS agencies can ease a caseworker's struggles in negotiating conflicts and help them to achieve the common interest (i.e., the knowledge process at the pragmatic level). Therefore, the present study hypothesizes that the inter-organizational dimension of knowledge management practices that support knowledge processes at the syntactic, semantic, and pragmatic levels will enhance a CPS caseworker's knowledge integration ability.

Hypothesis 3: There will be a positive relationship between the perceptions of caseworkers with regard to the degree of support provided by the inter-organizational dimension of knowledge management practices and their perceived level of knowledge integration ability.

3.1.4 Summary

In this part, the first stage of the research model has been developed. This stage consists of three hypotheses that each of the techno-structural, socio-cultural, and inter-organizational dimensions of knowledge management practices will increase the level of a CPS caseworker's knowledge integration ability. These hypotheses have been developed based on a process-oriented view of KMS: That a set of knowledge management practices, each of which is designed to have the capability to process knowledge (input) at the syntactic, semantic, and pragmatic levels, jointly contribute to the enhancement of a caseworker's knowledge integration ability (output). The next part

sets up the second stage of this research model by examining the association between the level of a caseworker's knowledge integration ability (the output of the KMS) and organizational effectiveness (the outcome); this is also viewed as the second-order effect of knowledge management intervention.

3.2 Second Stage: Effects of Knowledge Integration

The present study develops the second stage of the research model by adopting insights from a review of the previous literature on knowledge-based decision-making in order to explain why a caseworker's knowledge integration, enhanced by various knowledge management practices, promotes organizational effectiveness. The present study has developed the theory that a decision maker's knowledge integration ability is a critical factor for enhancing organizational effectiveness because this ability maximizes the positive effects from the use of different knowledge from multiple sources.

Knowledge integration in the present study conceptually involves knowledge processes at the syntactic, semantic, and pragmatic levels. This ability thus makes it possible for a decision maker to understand situations more comprehensively and accurately and to attain a greater knowledge synergy. Consequently, it enhances the positive impacts arising from using different knowledge from various sources in a multiple-participant decision-making situation, thus promoting organizational effectiveness.

This theory can theoretically support child welfare researchers' argument that a caseworker's knowledge integration ability is critical for better organizational effectiveness (Fitch, 2006; Jones, 1993; Schoech *et al.*, 2002). Similarly, CPS researchers (Annie E. Casey Foundation, 2002; Harr *et al.*, 2008; Wallace *et al.*, 2007) have

consistently emphasized the involvement of multiple participants in the CPS procedure in order for the caseworkers to better identify and assess child abuse cases and to make good decisions that enhance organizational effectiveness.

Even though the child welfare literature is lacking with regard to empirical research on the association between knowledge integration and organizational effectiveness, the theoretical explanations that do exist on the association between these variables indicates that the same theory is applicable to the CPS context. Throughout a CPS procedure, caseworkers make many decisions about how to intervene about children and their families, such as a child's removal from home, a change of placement or reunification, specific safety plans for children at risk, etc. CPS decision-making situations involve complex and confusing facts, high stakes, and multiple stakeholders, such as the child welfare staff, the family members, professionals from various fields (including medical, mental health, nursing, social work, and law enforcement agents), and neighborhood representatives (Freitag & Mordes-Noya, 2007). The quality of decisions about these issues often depends on the ability of caseworkers to develop reliable case knowledge, including the history, current circumstances, and different ideas and opinions of stakeholders involved in the case. Based on decisions informed by their integrated knowledge, caseworkers can provide well-coordinated services and ensure the continuity of services to their clients.

In these multiple-participant decision-making situations, a simple collection of inaccurate, misinterpreted, and/or conflicting information may not maximize the positive effects that should supposedly be present when using different knowledge from multiple

sources. The association between knowledge integration and organizational effectiveness can be explained by discussing how a caseworker's ability to process knowledge at the syntactic, semantic, and pragmatic levels can support their informed decision-making.

First, the ability of caseworkers to process knowledge at the "syntactic" level can support informed decision-making by allowing for the more accurate and comprehensive assessment of a case. Child welfare researchers (Annie E. Casey Foundation, 2002; Isaacs-Giraldi, 2002; Pammer *et al.*, 2001) have recommended the case consultation of various stakeholders in order to assess the concerns, needs, and strengths of a child and their family in order to maximize the accuracy of case assessment. Isaacs-Giraldi (2002) recommends the case consultation of various stakeholders, since this enables caseworkers to develop a more comprehensive pool of programs and resources from those available in the community and greater social support for the child and family involved. Each stakeholder (e.g., physicians, therapists, teachers, and parents) has knowledge about diverse aspects of a child's life and has different perceptions of the child's needs. Therefore, an integrated collection of these partial views leads to a more comprehensive assessment with regard to the disparate aspects of the client's life (e.g., understanding the child's needs from their physical, mental, academic, and financial standpoints). Moreover, overlapping information from various sources about the same phenomenon may help caseworkers to identify any inaccurate information from one source.

Second, the ability of caseworkers to process knowledge at the "semantic" level is likely to support their informed decision-making by ensuring that a more accurate interpretation of the obtained information occurs. There are various examples in the

literature that show that the inability of CPS caseworkers to process knowledge on the semantic level negatively influences the decision-making process. For example, the use of simple, overly ambiguous terms or abbreviations in a document may hamper the ability of caseworkers to correctly interpret the obtained information, leading to confusion. An unclear assessment due to a confusing interpretation may extend the time for decision-making, as the caseworkers then need to get better clarity on it before making a decision. If they fully misinterpret a situation, they could even make a wrong decision.

Cultural differences may also cause caseworkers to interpret a piece of information in a distinct manner since their knowledge differs from that of its original knowledge owners (e.g., Caucasian caseworkers could misinterpret a certain remark by Asian parents). Child welfare professionals from different disciplines and/or working in disparate agencies may operate from rather distinct knowledge bases as well as conceptual frameworks and may have individual, professional, and institutional levels of bias (Darlington *et al.*, 2005). Such bias often affects how caseworkers interpret certain family member behaviors, their perceptions of problems, or a child's ability to deal with possible barriers or impediments (Isaacs-Giraldi, 2002). Cultural misunderstandings or biases may lead to an undesirable decision (Hoshino-Browne *et al.*, 2005). As discussed, caseworkers can make a more informed-decision when they accurately internalize another stakeholders' knowledge at the semantic level.

Third, the ability of caseworkers to process knowledge at the "pragmatic" level can support more informed decision-making by reducing the subjectivity and bias at the

individual, institutional, and professional level. Fitch (2006) states that a caseworker may feel pressured to make a decision to close a case based on a department policy about an institutional definition of physical neglect even when the worker perceives that there are a lot of risks involved. This indicates a situation where the caseworker cannot properly resolve a conflict due to political pressure from the agency involved. Even though subjectivity and bias cannot be completely eliminated from the child welfare decision-making process (Harris & Hackett, 2008; Stanley, 2005), practitioners can reduce their impact with the support of organizational intervention that support the knowledge process at the pragmatic level or that manages conflicts more effectively.

According to child welfare researchers (Frost & Lloyd, 2006; Isaacs-Giraldi, 2002; Jones, 1993; Pammer *et al.*, 2001), better caseworker ability to integrate accumulated practice knowledge and wisdom can lead to the reduction of the effects of subjectivity and bias in decision-making, thus increasing the reliability of decisions. This may not refer to the ability to process knowledge at the syntactic and semantic levels. Rather, it is likely to refer to the ability to process knowledge at the pragmatic level, meaning that subjective cognitions of multiple knowledge agents (e.g., the different perceptions of stakeholders about a child's goals and needs) are confronted, negotiated, and "transformed" into a new situation-specific knowledge (e.g., a new set of goals and needs).

Let us consider a typical situation where a caseworker has a low level of knowledge integration ability in terms of processing knowledge at the pragmatic level. Suppose that a CPS caseworker works with a domestic violence agency in order to assist

an abused mother and her child. Thanks to the partnership between the CPS agency and the domestic violence agency, the worker can obtain the needed knowledge and accurately interpret its meaning. However, the worker often feels torn due to the diverse practice priorities of these two agencies (different interests). The caseworker is often pressured to ignore the opinions of the other agency while the conflicts are yet unresolved. This case indicates that the worker has a low level of knowledge integration ability because they can process knowledge successfully at the syntactic and semantic levels but poorly at the pragmatic level. In such a case, the worker can neither reduce the effects of subjectivity and bias on their decision-making nor increase the reliability of their decisions. Therefore, such a worker may not be confident about the quality of the decision that they make and the service delivered.

On the other hand, let us suppose that the caseworker has a high level of knowledge integration ability, meaning that they can obtain accurate case knowledge (e.g., placement options) from various sources (e.g., previous caseworkers, family members, teachers, physicians, other service providers, etc.) in a timely manner; they can also properly interpret the meanings of their knowledge by taking into account each stakeholder's context (e.g., little confusion about the meanings, culturally sensitive assessment); and they can reflect upon the pros and cons of different placement options. Such a caseworker is likely to develop a deep level of understanding about case-related situations and to apply this knowledge to a placement decision. The worker may well be confident about their performance, in terms of offering quality service delivery by acting upon informed decisions. The present study assumes that individual caseworkers who

rate their own performance level highly may better perceive organizational effectiveness, since organizational effectiveness is a collection of performances by individual workers who conduct similar tasks (case management). Therefore, the present study hypothesizes that there is a positive association between a caseworker's knowledge integration ability and organizational effectiveness.

In order to properly evaluate this association, other predictors for organizational effectiveness need to be identified. Human Resources Management (HRM) has been identified as a main predictor group for organizational effectiveness in child welfare or human service organizations (Huang, 1999; D. P. Moynihan & Pandey, 2005; Selden & Sowa, 2004; B. D. Smith & Donovan, 2003). Taken together, the present study hypothesizes:

Hypothesis 4: A caseworker's perceived level of knowledge integration ability will have a positive association to perceived organizational effectiveness after taking account into HRM effects.

3.3 Mediating Effect

As discussed earlier, previous child welfare studies have used a direct research model to examine the direct relationship between organizational effectiveness and knowledge management intervention (i.e., the techno-structural, socio-cultural, or inter-organizational dimensions of practices). IT is the critical infrastructure of knowledge management for organizational effectiveness (Fancett & Hughes, 1996; Kerslake, 1998; Schoech *et al.*, 2004). Socio-cultural intervention for an open communication environment has been emphasized as an important factor in the enhancement of organizational effectiveness (Azar & Cote, 2002; Davis, 2002; Nick Frost, 2007). The

positive influence of inter-organizational collaboration on organizational effectiveness includes: better decision making and, consequently, better CPS outcomes (Sanders & Roach, 2006; Vulliamy & Sullivan, 2000); increased benefits for both the clients and workers in the CPS environment such as faster and more proactive responses, reduced anxiety for workers, reduced family separation, greater continuity of care, more holistic services, faster access to services, and improved cost-effectiveness (Darlington *et al.*, 2005); improved healthcare and more coordinated practices (Knight, 2002; Knight & Pye, 2002); and better child welfare services (T. P. Cross *et al.*, 2005; Vulliamy & Sullivan, 2000; Wiig & Tuell, 2004).

As opposed to the tendency to use direct research models in child welfare research, knowledge management researchers (C. Wang *et al.*, 2008) argue that the relationship between knowledge management practices and organizational effectiveness is more complex than simple and direct. To better understand such complex relationships, the present study introduces knowledge integration as the inter-mediating variable. The mediating effect of knowledge integration is suggested by the assertions that the core IT competence is its ability to support knowledge integration (Bharadwaj, 2000) and that one of the main purposes of IT development in child welfare agencies is that of enhancing knowledge integration (Schoech *et al.*, 2002).

When IT researchers (Barua *et al.*, 1995; Radhakrishnan *et al.*, 2008) recommend mediation models, they argue that IT effects on organizational level outcomes are mediated by its operational-level outcomes. The present study develops a mediation model that includes techno-structural practices as interventions specifically to increase a

caseworker's knowledge integration ability. Therefore, the present study hypothesizes that the techno-structural dimension of knowledge management practices will enhance organizational effectiveness, mainly through knowledge integration.

Hypothesis 5: The impact of the techno-structural dimension of knowledge management practices on perceived organizational effectiveness will be mediated by a caseworker's knowledge integration ability.

While some studies use mediating models to examine IT effects, few have examined mediated effects on the associations between the other dimensions of practices (i.e., the socio-cultural and inter-organizational dimensions) and organizational effectiveness. However, given that these practices are also used in the same way as the techno-structural dimension of knowledge management practices, the present study develops similar hypotheses:

Hypothesis 6: The impact of the socio-cultural dimension of knowledge management practices on perceived organizational effectiveness will be mediated by a caseworker's knowledge integration ability.

Hypothesis 7: The impact of the inter-organizational dimension of knowledge management practices on perceived organizational effectiveness will be mediated by a caseworker's knowledge integration ability.

Thus far, the present study has made seven hypotheses: three on the relationship between the independent variables (three dimensions of knowledge management practices) and the mediator variable (a caseworker's knowledge integration ability); one on the relationship between the inter-mediating variable and the dependent variable (organizational effectiveness); and three on the mediating effect of the mediator variable with regard to the independent variables and the dependent variable. In order to properly assess the impact of knowledge management on organizational effectiveness, which is the

main interest of this study, it is necessary to understand the influences of control variables on the research model. Since HRM practices have been recognized as important management practices for CPS agencies to enhance organizational effectiveness, they are included as control variables.

3.4 The Influences of Control Variables

Researchers have recognized that there are complicated connections among HRM, knowledge management intervention, knowledge integration, and organizational effectiveness (Bourdon & Tessier, [n.d.]; Oltra, 2005; Soliman & Spooner, 2000). Soliman and Spooner (2000) claim that knowledge management may fail to promote organizational effectiveness when organizations do not understand these complicated associations. This complexity takes place because knowledge management is about humans as actors and producers of organizational knowledge rather than an emphasis on technology or a set of specific practices. Therefore, the effect of knowledge management on organizational effectiveness should be studied along with the impact of HRM.

Some researchers (Bourdon & Tessier, [n.d.]; Oltra, 2005) recognize that traditional HRM practices (e.g., staffing, employee development, and empowerment) are correlated with knowledge management intervention and that they influence the effectiveness of knowledge management (knowledge integration in the present study). Oltra (2005) also states that organizations should maximize human capital by employing knowledge management-related HRM practices (e.g., knowledge sharing training, inclusion of knowledge management duties in job design, and the degree of one's productive knowledge sharing being considered for pay reviews). One CPS researcher

(Fitch, 2006) asserts that the ability of CPS investigators to integrate knowledge into their decision-making depends on their experience and training. These HRM practices may increase an individual caseworker's knowledge integration. These associations are added to the conceptual model based on the hypotheses stated above.

3.5 Graphic Research Model

In order to answer the research question with regard to how CPS agencies support their caseworkers in integrating knowledge resources within and across organizational boundaries to provide better quality services, the present study has developed a knowledge-based and process-oriented mediation model. Figure 6 illustrates this model, which integrates seven hypotheses (marked with solid lines) that have been discussed so far and shows their associations among major variables of interest: knowledge management practices, knowledge integration, and organizational effectiveness. In order to evaluate the impact of the KMS properly, the present study also includes associations between the control variables (HRM practices) and the main variables, which are indicated by the dotted lines.

In Stage I of this model, the combined effect of knowledge management intervention (the techno-structural, socio-cultural, and inter-organizational dimensions of knowledge management practices) that facilitate knowledge processes are examined with respect to the enhancement of a caseworker's knowledge integration ability (Hypotheses 1 through 3). Using the framework of the KMS, these interventions aim to facilitate knowledge transactions that caseworkers "process" with regard to various stakeholders' knowledge (input) in order to produce their own integrated knowledge (output). The

effectiveness of this KMS is measured by the level of a caseworker's knowledge integration ability, which is the overall output of the KM intervention. In Stage II, this enhanced knowledge integration ability has a positive effect on organizational effectiveness (outcome) after taking into account the effect of HRM practices like staffing, employee development, and empowerment (Hypothesis 4).

The hypotheses about the mediating effects (Hypotheses 5 through 7) concern whether the knowledge integration ability mediates the direct relationships between each of the dimensions of knowledge management practices and organizational effectiveness. In other words, they test whether the mediator variable serves to clarify the nature of the relationship between the independent and dependent variables (MacKinnon, 2008). In this figure, each hypothesis is represented with the triangle connecting three variables that associated with the hypothesis.

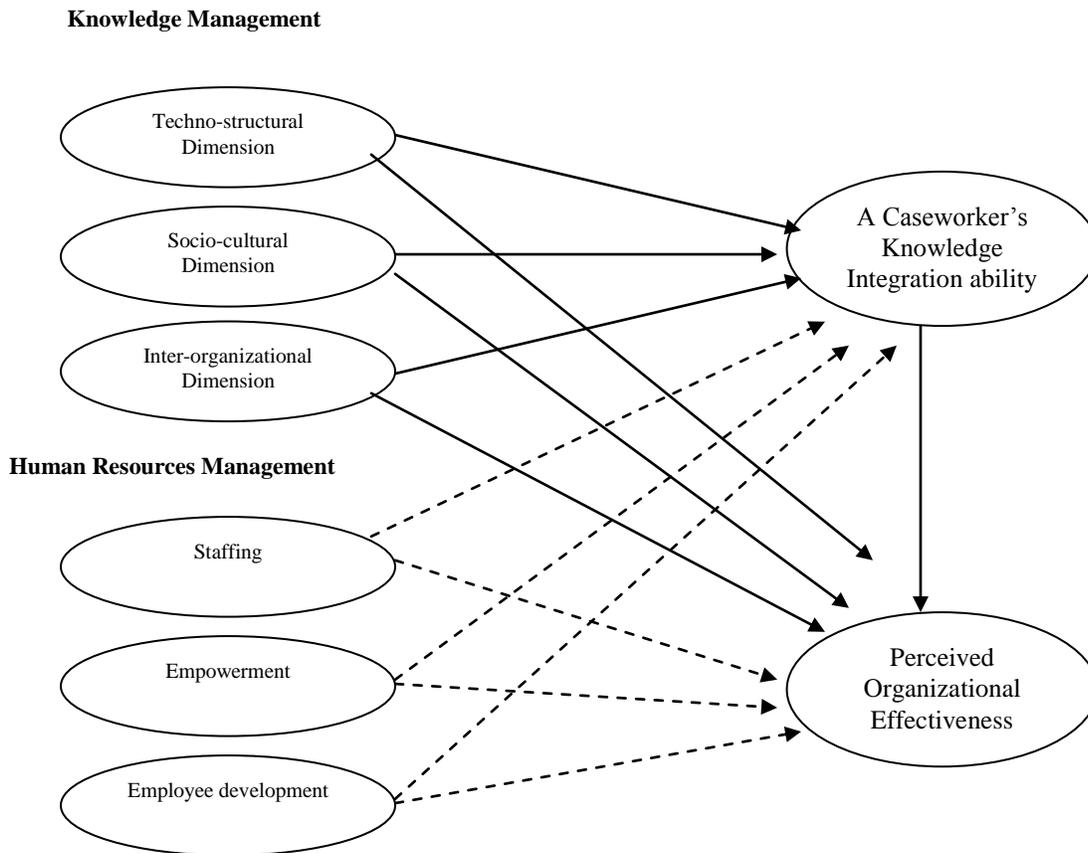


Figure 6. A Research Model of Organizational Effectiveness

3.6 The Usefulness of the Research Model

Many researchers from various disciplines (information systems, knowledge management, and program evaluation) have argued the advantages of direct models over indirect models. Knowledge management researchers (C. Wang *et al.*, 2008) argue that mediation models can lead to a significant improvement over the direct models when there is compelling evidence that the discernible mediating effect of knowledge integration acts on the relationships between knowledge management and organizational effectiveness. The present study attempts to improve predictions on organizational effectiveness by developing a knowledge-based and process-oriented mediation model.

The development of this model is carefully guided by utilizing various theories, frameworks, and perspectives from the literature on knowledge management and information systems. The present study assumes that this mediating model will bridge the research gaps in previous studies. In the first chapter, the present study has found that many child welfare researchers have emphasized the importance of knowledge management (Darlington *et al.*, 2005; Isaacs-Giraldi, 2002; Jones, 1993; J. U. Schneiderman *et al.*, 2007; Schoech *et al.*, 2002) and knowledge integration (Fitch, 2006; Jones, 1993; Schoech *et al.*, 2002) with respect to better organizational effectiveness. Most previous research has studied the direct association between knowledge management and organizational effectiveness, yet without having a good understanding of the concept of knowledge integration. Therefore, little empirical research has been conducted to examine associations between these three factors in conjunction with each other.

Through an extensive literature review, the present study has identified knowledge management practices that specifically aim to facilitate the knowledge integration process. It then attempts to evaluate the effectiveness of the interventions on overall organizational effectiveness by taking into account the mediating role of knowledge integration. Therefore, the mediation model in the present study will improve predictions on perceived organizational effectiveness when compared to a direct model (Figure 7).

Hypothesis 8: When compared to a direct model that hypothesizes associations between knowledge management practices and perceived organizational effectiveness, a mediation model will improve predictions about perceived organizational effectiveness.

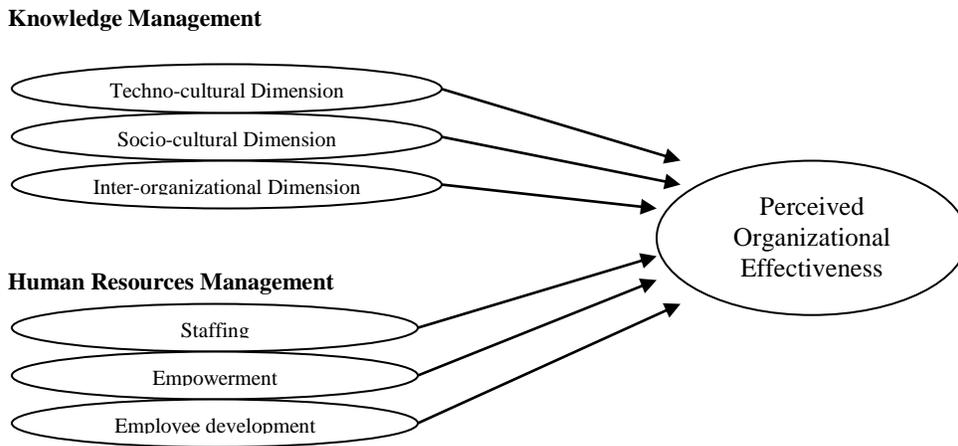


Figure 7. A Direct Model (With the Current Factors)

Previously, the present study discussed the limitations in the information-based and technology-focused perspectives in their ability to understand how a CPS agency can support their caseworkers in integrating knowledge. Previous research models that are developed based on information-based and technology-focused perspectives may not be able to specify IT strategies for knowledge integration. Rather, independent variables in such models are IT resources that are ambiguously defined. Moreover, these models may leave the contributions of non-IT strategies unexplained. In order to address such limitations, the present study has developed an alternative research model by incorporating a knowledge management framework that emphasizes the importance of non-IT practices specifically to support knowledge integration. Therefore, this model is expected to explain organizational effectiveness better than a model that simply examines the direct effect of IT resources, inter-organizational communication support, and HRM practices on organizational effectiveness (Figure 8).

Hypothesis 9: When compared to a direct model that hypothesizes the combined effect of IT resources, inter-organizational communication support, and HRM practices on perceived organizational effectiveness, a knowledge-based and process-oriented mediation model will improve predictions about the perceived organizational effectiveness.

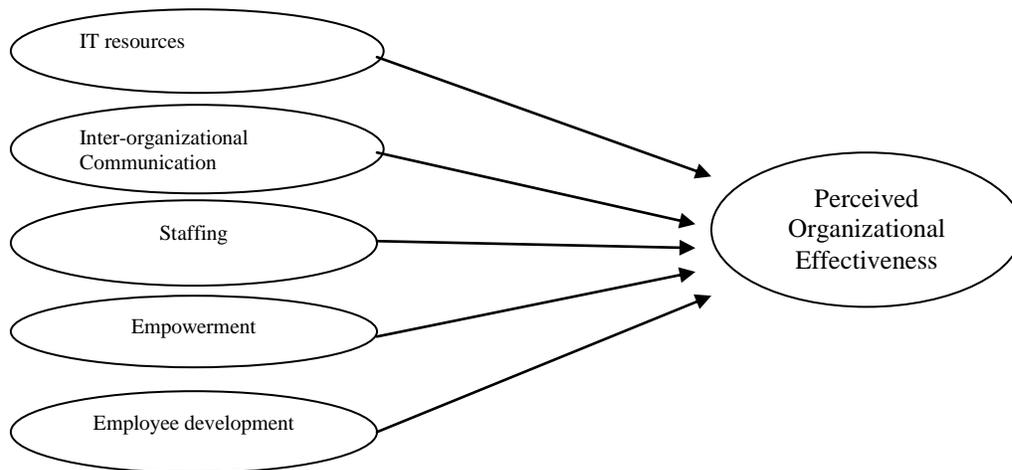


Figure 8. A Direct Model (Without a Knowledge Management Framework)

4 Chapter Summary

This chapter has conducted an extensive literature review on conceptual the background of knowledge management and knowledge integration and on the association that these two factors have with respect to organizational effectiveness. Based on the conceptual understanding, the present study has identified some limitations in the previous research and presents a knowledge-based and process-oriented mediation model that can address these limitations.

CHAPTER III: METHODOLOGY

This chapter defines the methodology used to test the research model discussed in the previous chapter. It is divided into five sections: a summary of the research model, the research design, data collection, instruments, and the data analysis methods.

4.1 A Summary of the Research Model

In the previous chapter, a research model has been developed that can answer the main research question in this study: How can CPS caseworkers be supported by the agency through in the integration of knowledge resources, thereby contributing to organizational effectiveness? The model includes the following four hypotheses about direct effects.

Hypothesis 1: There will be a positive relationship between the perceptions of caseworkers with regard to the degree of support provided by the techno-structural dimension of knowledge management practices and their perceived level of knowledge integration ability.

Hypothesis 2: There will be a positive relationship between the perceptions of caseworkers with regard to the degree of support provided by the socio-cultural dimension of knowledge management practices and their perceived level of knowledge integration ability.

Hypothesis 3: There will be a positive relationship between the perceptions of caseworkers with regard to the degree of support provided by the inter-organizational dimension of knowledge management practices and their perceived level of knowledge integration ability.

Hypothesis 4: A caseworker's perceived level of knowledge integration ability will have a positive association to perceived organizational effectiveness after taking account into HRM effects.

The model also includes the following three hypotheses about mediating effects.

Hypothesis 5: The impact of the techno-structural dimension of knowledge management practices on perceived organizational effectiveness will be mediated by a caseworker's knowledge integration ability.

Hypothesis 6: The impact of the socio-cultural dimension of knowledge management practices on perceived organizational effectiveness will be mediated by a caseworker's knowledge integration ability.

Hypothesis 7: The impact of the inter-organizational dimension of knowledge management practices on perceived organizational effectiveness will be mediated by a caseworker's knowledge integration ability.

The present study also has made two hypotheses about the usefulness of the research model as compared to other alternative models.

Hypothesis 8: When compared to a direct model that hypothesizes associations between knowledge management practices and perceived organizational effectiveness, a mediation model will improve predictions about perceived organizational effectiveness.

Hypothesis 9: When compared to a direct model that hypothesizes the combined effect of IT resources, inter-organizational communication support, and HRM practices on perceived organizational effectiveness, a knowledge-based and process-oriented mediation model will improve predictions about the perceived organizational effectiveness.

4.2 Research Design

To test the hypotheses above, the present study will conduct an empirical study based on a survey of the perceptions of individual CPS caseworkers in the Texas DFPS with respect to their work profile (their work conditions and performance outcomes). According to Sekaran's classifications of research designs (2003), the research design that this study employs is described in the following manner.

In order for hypothesis testing (purpose of the study) to occur, the present study uses a correlation study (type of investigation) that delineates the variables associated with the research objectives and identifies the important determinants of organizational

effectiveness. This correlation study is conducted in a non-contrived setting (location of the study) or a natural environment where work proceeds normally with minimal interference from the researcher. Organizational research done in such an environment is, in effect, a field study, i.e., scientific research in which the subjects are observed in their natural habitat (Sekaran, 2003). This field study has a minimum level of interference (the extent of researcher interference) when the researcher attempts to understand the parameters in the population of all of the CPS caseworkers in the US by investigating the relationships among variables from the sample of caseworkers in the Texas DFPS. This study collects evidence from quantitative sources using a cross-sectional survey (a time horizon) where data are only collected once during a certain period of time in order to determine the relationships between variables at the time of study.

The unit of analysis (the level to which the data will be analyzed) in this study is the individual caseworker. Because many of the questionnaire items are measured at the group level (e.g., “We are known for the quality of service we provide”), the present study has contemplated the alternative of using the group (those persons who are members of an immediate workplace) as the unit of analysis by computing the group means and examining the group differences. If an immediate workplace is assumed to be a CPS program in the Texas DFPS, any statistical analysis will use the difference in the factors among the diverse CPS programs (e.g., Intake, Family Based Safety Services, and Out-of-Home Care Services).

With regard to analysis, there are a few reasons why the present study uses an individual rather than a group approach. First, if the present study were to use the group

as the unit of analysis, the number of cases would be too small to conduct a SEM analysis because there are just several CPS programs in the Texas DFPS. A sample size of 100-200 is generally recommended for a SEM analysis (Kline, 2005). In order to have enough group cases, the option of including the aggregated cases of non-CPS workgroups has been considered. However, it would be illogical to use data from other workgroups that have different needs (e.g., HR or accounting department) in order to test the research model that has been developed based on the CPS environment.

Second, the differences among individuals in the same group are meaningful to examine. Although caseworkers in the Texas DFPS may share similar work conditions (e.g., the same computer systems, agency policy), a caseworker's experiences vary based on the unique situations of each individual. Different caseworkers who belong to the same program but have distinct supervisors may have disparate experiences and, therefore, have different perceptions about workplace profile. The perceived usefulness of computer systems may vary based on individual education, training, and work experiences.

Third, perceptions about group level variables are reflected by the respondent's individual experiences. For example, because individuals in the group conduct similar tasks in different cases, an intake caseworker may rate the questionnaire item of "We are known for the quality of service we provide" highly when they think, "I am confident about the quality of service I provide, so the group of intake caseworkers may provide good quality service." Therefore, the variance in a group level variable may not be departures in a respondent's subjective opinion on the group performance, but may

actually reflect differences in the respondent's perception of his/her performance.

Therefore, such kinds of variables can be considered at the individual level despite being worded at the group level. In addition, some questionnaire items are measured at the individual level (e.g., "The amount of work I am asked to do is reasonable").

4.3 Data Collection

The present study employs a secondary data analysis using the 2008 Survey of Organizational Excellence (SOE) data. This biennial survey has been administered by the University of Texas School of Social Work every other year from 1979 to the present (Landuyt, 2005; Lauderdale, 1999). Based on the belief that the assessment of the individual perceptions of employees is a powerful and necessary tool for organizational improvement, the survey has been used to enable employees to express how they perceive the strengths and weaknesses in their workplaces in five categories. The major objective of this survey is for administrators to use the responses toward the implementation of successful change in agency management practices.

The 2008 SOE data were collected by the Survey Office, which compiled a contact database of Texas state agencies and employees (Landuyt, 2005; The University of Texas at Austin, 2007). Every individual contact receives an invitation to participate via mail, email or fax. Since such participation was voluntary, participants were unlikely to be vulnerable to coercion or undue influence. The survey form assures anonymity by noting that all responses were anonymous and that demographic items were used for research purposes only. Participants were also informed that the participants'

organization would not receive any information that could identify an individual or any group of less than five people.

Two survey formats were utilized to customize the participants' environment: a paper survey and an online survey. For the paper survey, a bulk of survey packets were shipped to an organization for distribution. Each packet was individually addressed and contained a cover letter that included the name of the head of the organization, the contact person within the organization, and the deadline. Survey instruments were distributed through the organization's mail system. For the online survey, two emails (an initial message and a second request) were sent to individuals. An initial message included the URL of the survey, an access code, and the deadline. The survey could be accessed anywhere and anytime. A second request email included the link directly to the online survey. Completion time for the survey is about 15-20 minutes and, on average, the response rate of the SOE is 60%.

From the 2008 SOE data set, the cases of the CPS caseworkers in the Texas DFPS were selected. Then, the questionnaire items that measure the constructs in the research model were selected as the working data set. Since every CPS caseworker in the Texas DFPS were identified and selected for participation in the survey, the sampling method of this study is a census sampling.

4.4 Measurements

The present study measures the constructs in the research model by selecting survey items that conceptually represent each of the constructs. Such selections were made because a set of definitions and scales used by the SOE Office (The Survey of

Organizational Excellence, 2002) may not serve the purpose of the present study focusing on knowledge management practices, while the survey has been administered for a more general aspect of management.

Five questionnaire items were added to the 2008 survey because there were no existing items available to measure a construct (the Techno-structural Dimension of Knowledge Management Practices). For this new measurement, content validity was assessed through a consensus method. The researcher of this study created some questionnaire items that might represent each of the IT development principles suggested by Boland and colleagues (1994). The items were initially reviewed for face validity by two social work professors and were amended according to their suggestions. The amended measurement was assessed by a knowledge management professor in order to determine whether all the questionnaire items were relevant with regard to being able to represent all of the facets of each content or domain that they are supposed to measure.

Excluding the demographic information of the respondents, each survey item was rated on a 1-to-5 response scale in terms of their agreement or disagreement that the item describes the organization: (1) strongly disagree; (2) disagree; (3) feel neutral; (4) agree; and (5) strongly agree. The scores have their own correspondent meanings, such that: scores of 4.0 or higher mean substantial organizational strength; a score of 3.0 is neutral; scores of below 3.0 show weakness; and scores below 2.0 mean that there is a significant source of concern and a need for attention. The survey items had the option of checking “don't know or not applicable,” but this response was excluded from analysis. To follow

is a discussion of the operationalized definition of each construct and how it is measured by using SOE survey items.

- **Perceived Organizational Effectiveness.** This construct is defined as the degree to which a caseworker perceives that the agency accomplishes its goals in terms of the organizational outcomes. This construct is measured by five survey items that ask how well the respondents think a group of people in their immediate workplace perform with respect to diverse organizational features such as: quality of service, continuous improvement of service, the degree of goals met, productivity, and efficiency. This categorization is a good fit for the multi-dimensional nature of organizational effectiveness, as it requires the assessment of both process and outcomes for effectiveness (Selden & Sowa, 2004).

- **The Level of a Caseworker's Knowledge Integration Ability.** This construct is defined as the degree to which a caseworker perceives that they can integrate external knowledge at the syntactic, semantic, and pragmatic levels. There are two questionnaire items related to this construct in the existing SOE survey: "The right information gets to the right people at the right time" and "We integrate information and act intelligently upon the information." The statements in these two items may not capture the full construct that represents the result of facilitating knowledge processes, especially at the semantic and pragmatic levels. Yet it seems reasonable to believe that these two can be representative of the results of knowledge management practices administered by the agency.

- **The Techno-structural Dimension of Knowledge Management Practices.** This construct is defined as the degree to which a caseworker perceives that IT systems used in his or her agency have the appropriate properties to support their knowledge integration ability, i.e., easy travel, ownership, multiple perspectives, mixed forms, and emergence. The existing SOE survey items about IT resources (i.e., “We have adequate computer resources” and “Information systems are in place and accessible for me to get my job done”) are too general to capture this construct. Therefore, the following new items were added in the 2008 survey:

- 1) Our computer systems enable me to easily and quickly find the information that I need (easy travel)
- 2) The information available from our computer systems is reliable (ownership)
- 3) Our computer systems provide thorough information (multiple perspectives)
- 4) Overall, our computer information systems present data in an understandable way (mixed forms)
- 5) Computer systems help me to make better decisions (emergence)

These questionnaires do not exactly linguistically match with the corresponding concepts because such wording should be general enough to meet the needs of the survey.

- **The Socio-cultural Dimension of Knowledge Management Practices.** This construct is defined as the degree to which a caseworker perceives that the agency employs adequate policies and promotes an organizational culture in order to enable employees to have enriched knowledge interaction with stakeholders and to incorporate others’ opinions without the involvement of political power influences. The SOE survey includes an “Internal Communication” construct that is measured by three questionnaire items: an atmosphere conducive to open and honest communication, an effort to get opinions from external sources, and training of work groups to incorporate different opinions. The present study uses these three items.

- **The Inter-Organizational Dimension of Knowledge Management Practices.** This construct is defined as the degree to which a caseworker perceives that his or her agency supports them in the integration of knowledge from other organizations. The SOE survey includes the “External Communication” construct that is measured by three questionnaire items asking whether people in their immediate workplace work well with other organizations, governing bodies, and the public. The present study utilizes these three items because this construct is the closest one that can be found in the survey that can measure the inter-organizational dimension of knowledge management practices. Considering that most inter-organizational collaboration or communication activities aim to enable child welfare stakeholders from different settings to share their expertise, ideas, and information across organizational boundaries (Sanders & Roach, 2006; Vulliamy & Sullivan, 2000), this selection seems to be reasonable.
- **Staffing.** This construct is defined as the degree of adequacy as to the job assignment received by the agency in terms of the amount and pace of work expected. This operationalization is based on a definition of staffing where job assignments are characterized with four principles: the volume of work assigned to individuals, the professional skills required for particular job assignments, the duration of experience in a particular job category, and the work schedule (Oregon Health & Science University Evidence-based Practice Center, 2003, p.1). The operationalized definition does not include the two principles as to the adequate skills and experience of employees, which are also conceptualized as the concepts of recruitment and selection. The SOE survey

items that are closest to these concepts are the levels of a respondent's education and job experience. Given that there is little evidence as to what is the optimum level of skills and experience of CPS caseworkers for enhanced organizational effectiveness, it would be reasonable to exclude this part of a staffing construct.

- **Empowerment.** This construct is defined as the degree to which a caseworker perceives that the agency adequately employs policies and promotes an organizational culture that empower workers to conduct their job successfully. The present study selected eight items that are a good match as to this construct. The scale here is quite similar to that of the "Empowerment" scale in the SOE survey (The Survey of Organizational Excellence, 2002) and the one that was emerged after a principle component analysis in a dissertation study (Huang, 1999).

- **Employee Development.** This construct is defined as the degree to which a caseworker perceives that the agency provides adequate training and/or information for their personal and professional growth. The present study uses the "Employee Development" construct in the SOE data, which is measured by three items: "Training is made available to us so that we can do our jobs better," "Training is made available to us for personal growth and development," and "Employees have access to information about job opportunities, conferences, workshops, and training."

Figure 9 shows the research model along with specific questionnaire items for each construct.

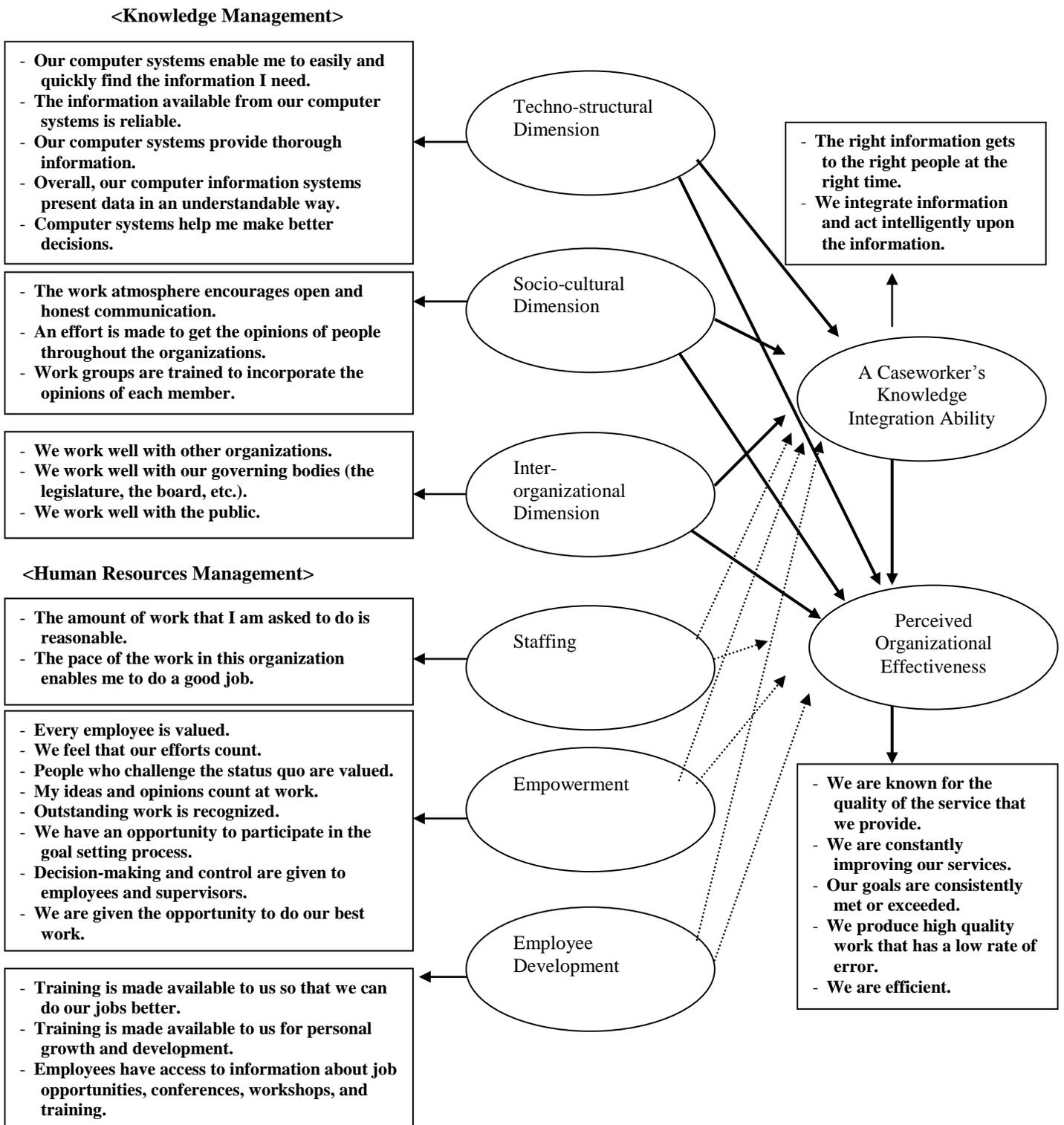


Figure 9. A Conceptual Model with Questionnaire Items

5 Data Analysis Approaches

This section briefly examines data analysis methods, while the details of the techniques used in the analysis and its results will be reported in Chapter V. The discussion falls into four parts: 1) the type of statistical modeling, 2) model testing procedures, 3) model estimation approaches, and 4) the statistical tools and section summary.

5.1 Type of Statistical Modeling

To test the proposed hypotheses in the present study, a multivariate analysis using Structural Equation Modeling (SEM) was performed on the 2008 SOE survey data. As an advanced multivariate statistical technique, SEM has the ability to construct the latent variables that are estimated in the model from several observed variables, as well as the ability to explicitly capture the unreliability of measurement in the model (Kline, 2005). Therefore, the structural relationships between latent variables can be accurately estimated.

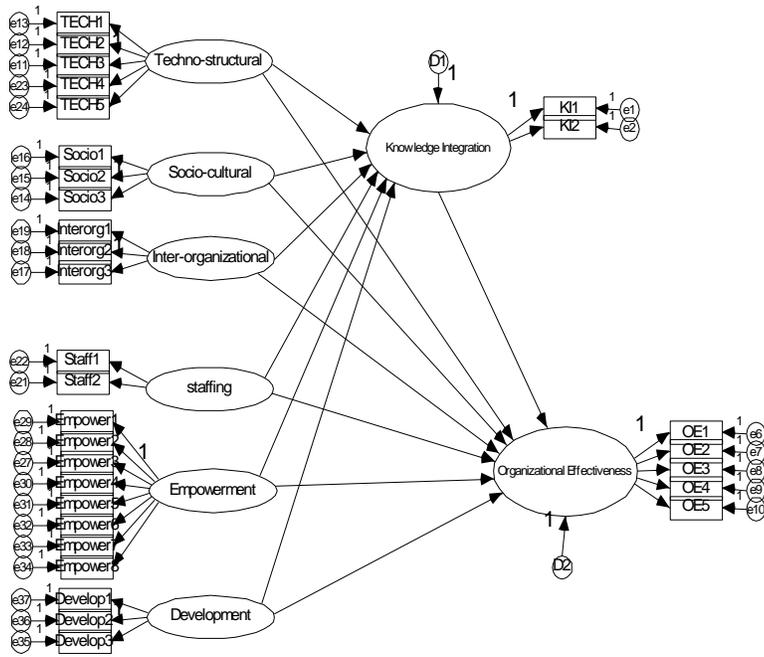
The SEM approach is considered to be adequate here, especially for the testing of the mediation model of the present study. Chung (2007) lists some benefits that come from the formulation of mediation models in SEM rather than multiple regression. A SEM model with latent variables has a higher power to detect mediating effects. It is easier to test the mediating effects of the latent variables than of the observed variables. The measurement unreliability of the observed variables results in the reduction of correlations among them, leading to a serious attenuation of the measurement error. As compared to its counterpart, a mediation model using observed variables has a higher

possibility of concluding that there are no mediating effects present, even when they actually exist.

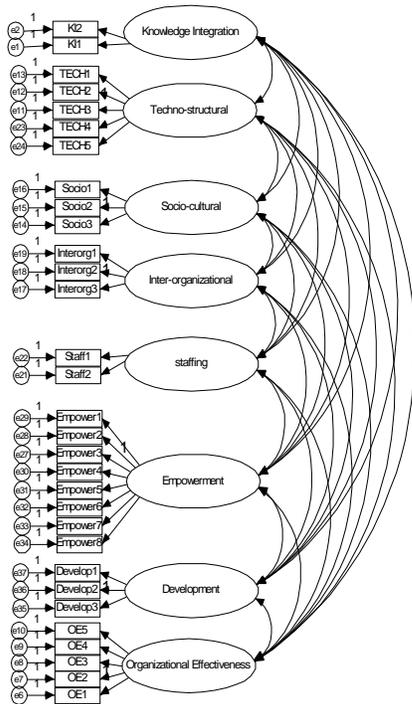
The proposed hypotheses are expressed as a Structural Regression (SR) model, as in Figure 10-a. As the most general kind of structural equation model, the SR model is the synthesis of a measurement component and as a structural component. Therefore, this kind of model combines features from both the factor analysis of the measurement model and from the path analysis of the structural model (Kline, 2005). In the measurement component (Figure 10-b), each latent factor (also called unobserved variables or constructs) is hypothesized to be measured by multiple indicators (also called observed variables), and the measurement errors for each indicator are estimated. In the structural component (Figure 10-c), causal relationships among factors are hypothesized.

Factors are represented with ellipses, indicators with rectangles, and measurement errors and disturbances with circles. Each line with a single arrowhead represents a hypothesized direct effect that one variable has on another. Each error term and disturbance has a two-headed curved arrow that exits and re-enters the same variable (which is not shown in the figure because it would make the figure unreadable), representing the variance of the variable. Each line with a double-headed arrow connecting factors (in Figure 10-b) represents the unanalyzed associations between factors because they are assumed to co-vary, though why they do so is unknown.

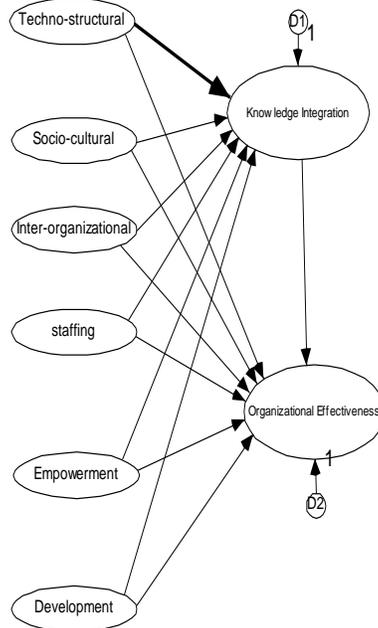
As in Figure 10-a, the original SR model, which was constructed based on the conceptual framework in the present study, consists of eight latent variables, including six exogenous ones (three predictor variables and three control variables) and two



(10-a) Original SR Model



(10-b) Measurement portion



(10-c) Structural portion

Figure 10. The Original Structural Regression (SR) Model

endogenous variables (one inter-mediating variable and one criterion variable). The predictors in this model are three variables for each dimension of knowledge management practice (techno-structural, socio-cultural, and inter-organizational). The control variables here include three major HRM practices (staffing, empowerment, and employee development). Because these three variables are included as controls, their effect is not the main interest of the present study. These six variables are exogenous because the causes of such organizational intervention are not represented in the model.

The causes of the two endogenous variables are explicitly represented in the model. The disturbance connected to each endogenous variable represents all of the causes of the endogenous variable, and these are omitted from the structural model. The inter-mediating variable (A Caseworker's Knowledge Integration Ability), which is presumed to transmit some of the causal effects of the predictors onto the criterion variable, is involved in a total of seven different indirect effects of the predictors. The criterion variable (Organizational Effectiveness) is involved in a total of six different direct effects stemming from the predictor variables and one indirect effect due to the inter-mediating variable.

5.2 Model Testing Procedures

This part briefly presents the model testing procedures. Firstly, the overall procedures are discussed. The second sub-section details some issues regarding model estimation, an important part in the assessment of the measurement and structural models. The following three sub-sections discuss more detailed issues regarding the three main

stages of the model testing procedures: the assessment of the measurement model, the assessment of the structural model, and testing for the usefulness of the research model.

5.2.1 Overall Procedures

The model testing procedures can be divided into three steps: data preparation, data screening, and SEM analysis. The first two steps are pre-analysis procedures. Data preparation includes tasks utilized in order to obtain a data set used for SEM analysis, such as data selection and cleaning, if necessary. At this stage, a series of descriptive analyses was conducted so as to describe the prepared sample. Before this raw data file is created for a SEM model, a series of analyses were conducted for data screening in order to identify any problems due to this particular data set (e.g., any violations of underlying assumptions).

As outlined in a widely-used SEM textbook (Kline, 2005) as well as in an electronic source that is frequently updated (Garson, 2009), the research model was analyzed using a two-step modeling process: 1) validating the measurement component of the SR model through Confirmatory Factor Analysis (CFA) and 2) then fitting the structural component through Path Analysis (PA) with latent variables. Compared to one-step modeling, where these two components are simultaneously analyzed, two-step modeling is better in terms of understanding where the model is mis-specified when an analysis has produced a poor model fit.

The assessment of each model starts with specifying a model and assessing whether it has been identified. These processes are followed by model estimation, which

involves the use of an estimation procedure to fit the model with the data provided. After the estimation, model refinement (either the adding or deleting of a path) is carried out to identify a final model that fits the data well and is parsimonious. After each change in the path, a statistical test is conducted in order to investigate whether the modified model should be selected over the initial model. After the assessment of the measurement and the structural models, the usefulness of the research model is evaluated by comparing it with two competing ones.

5.2.2 Model Estimation

When it comes to SEM analysis, there are many choices to be made about how to estimate models and evaluate their fit. In order to assess the measurement and structural models, the values of the model coefficients that best fit the data should be determined by using statistical procedures called model estimation. Although the mostly frequent estimator choice is a Maximum Likelihood (ML), the present study used the MLR as the estimator because it is robust against the violation of normality assumptions in the data. The results of testing for these assumptions are discussed in detail in the upcoming chapter. MLR is not exactly an acronym since it refers to a maximum likelihood estimator with a robust standard error.

Each model should be validated based on model fit, which measures the extent to which the covariances estimated by the model correspond to the observed covariances in the data. Researchers recommend that multiple indices should be used to evaluate model fit (Garson, 2009; Kline, 2005). There are three major groups of model fit indices: absolute fit indices, incremental or comparative fit indices, and predictive fit indexes.

First, absolute fit indices directly measure how well the proposed model reproduces the sample data. Good of Fit (GOF) measures determine if the model being tested should be accepted or rejected based on the fit of the model to sample moments. These measures use the conventional discrepancy function, which includes GOF Model chi-square, the Standardized Root Mean Squared Residual (SRMSR) and the Steiger-Lind Root Mean Square Error of Approximation (RMSEA).

Second, incremental or comparative fit indices assess how well the proposed model fits relative to some alternative baseline model (generally a null model) that assumes that all of the observed variables are uncorrelated. They differ from absolute fit indices that compare the model covariance matrix with that from the observed data. The Bentler Comparative Fit Index (CFI) belongs in this group.

Third, predictive fit indexes are used to select one out of competing models. These indexes assess model fit in hypothetical replication samples of the same size that are randomly drawn from the same population as the researcher's original sample. This group includes Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC).

Each of the test statistics described above has different strengths and limitations. While there is disagreement on which fit indices should be reported, the researcher decided to follow Kline's recommendations and to select a set of model fit indices (2005): GOF Model chi-square, relative chi-square, RMSEA with its 90% confidence interval, SRMR, and CFI.

GOF Model chi-square is the most common test statistic. It assesses the difference between the observed covariance matrix and the model's covariance structure. A significant chi-square value implies that the researcher's model is rejected because the model would have a better fit to the data if it contained additional parameters that are available in the model. Relying on GOF chi-square statistics to assess a model fit can be misleading, as the model chi-square is sensitive to sample size. This means that tiny differences between the observed model and the perfect fit model may be deemed to be significant if a large number of observations in the sample data are used to estimate parameters. This, therefore, may lead to the rejection of the model, even when there is actually no difference (a Type II error). This measure is also very sensitive to the multivariate assumption.

Relative chi-square, also called normal or normed chi-square, is typically used to reduce the impact of the sample size on the GOF statistic by dividing the chi-square fit index by the degrees of freedom. This statistic should be less than 1 if researchers use conservative criteria to validate that the model is acceptable. However, the cut-off values vary from 1 to 5 (Garson, 2009).

The RMSEA, the mean absolute value of the covariance residuals, is another absolute fit index whose formula includes a built-in correction for model complexity. Since they incorporate a penalty function for poor model parsimony, some researchers call these measures “parsimony correction indices” (Harrington, 2008). Compared to GOF Model chi-square, this evaluates the more realistic hypothesis of *close fit*, rather than the unrealistic hypothesis of exact fit that the chi-square is based on. This statistic

uses the confidence interval around the RMSEA value to assess confidence in the adequacy of model fit. Conventionally, the point estimate of the RMSEA should be less than .05 for good or less than .08 for adequate. These indices need to be interpreted with caution when the sample size is small. It is called a badness-of-fit index because a value of zero indicates the best fit while higher values indicate worse ones. The 90% Confidence Intervals (CI) for the RMSEA supplements these inferences in a sensible way. If the 90% CI includes both .05 and 1.0, this means that your sample does not adequately provide information as to whether model fit is good or bad.

SRMSR is another absolute fit index which concerns the average difference between the predicted and observed variances and covariances in the model based on standardized residuals. Because a high SRMR score represents a great residual difference, the model is acceptable when the score is approaching zero. A SRMR value of less than or equal to .08 is needed to validate the model as acceptable while a value less than .05 suggests a well-fitting model. RMSEA and the Root Mean Square Residual are the most important and frequently reported absolute fit indices (Australian Government, Department of Families Housing Community Services and Indigenous Affairs, 2009).

The CFI assesses the relative fit improvement of the researcher's model as compared to that of the baseline model (independence or null model) where all manifest variables are assumed to be uncorrelated. It also examines whether the model significantly improves the null model. Compared to other measures in the same group, the CFI is less affected by sample size. In order to conclude that the model is acceptable,

the value should reach or exceed the critical value of .9. Some researchers use the higher critical value of .96.

Table 2 presents both the different cut-off values for these fit indices recommended in the literature (Abramson *et al.*, 2005; Garson, 2009; Kline, 2005) and those that the present study used. For the normed Chi-square, the lenient cutoff was chosen in considering the large sample size used in this study. For the other indices, the researcher decided to use a more conservative approach.

Table 2. Cut-off Values for Model Indices

Fit indices group	Fit indices	Lenient cutoffs	Rigid cutoffs	Cutoffs in the present study
Absolute fit indices	GOF Model chi-squared	Not significant	Not significant	Not significant
	Normed Chi-squared	≤ 5.0	≤ 1.0	≤ 5.0
	RMSEA	≤ .08	≤ .05	≤ .05
	SRMR	≤ .08	≤ .05	≤ .05
Comparative indices	CFI	≥ .9	≥ .96	≥ .96

The following three sections discuss some important issues regarding three main stages of the model testing procedure: the assessment of the measurement model, the assessment of the structural model, and testing for the usefulness of the research model.

5.3 Assessment of the Measurement Model

The first part of the two-step SEM modeling starts with the re-specification of a SR model to a measurement (factor) model. The measurement model is assessed for two reasons: 1) to validate whether the measurement model fits the data before testing the structural model and 2) to evaluate construct validity, meaning that the test items are representative of the domain that they are supposed to measure (Kline, 2005). Such measurement assessment can be achieved by utilizing three different approaches: Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), and the hybrid, which combines both EFA and CFA (Kline, 2005).

Suhr (2006) outlines the differences between EFA and CFA in the following manner. EFA is performed in order to check the dimensionality of the proposed measures. In an EFA, researchers simply input all relevant items and then try to make sense of whatever factors are obtained and determine the factor structure that explains a maximum amount of variance. One of the limitations of EFA is that test results may vary among different samples, even with the same set of survey items (Suhr, 2006). Therefore, the results lack generalizability and external validity.

While EFA is often chosen to “determine” the factor structure of the underlying constructs for a set of measured variables by exploring potential latent factors in the development of measures, CFA is used to “verify” a factor structure that has been hypothesized based on theories. CFA analyzes this priori measurement model in which both the number of factors and their correspondence to the indicators and errors are explicitly specified. It statistically tests the hypothesis that a relationship between a specific measurement (the observed variables) and a theoretical concept (their underlying latent construct) exists (Carmines & Zeller, 1979).

Researchers can also use a hybrid approach utilizing both CFA and EFA. Typically, this approach is used when the factor structure is not confirmed through a CFA. In a hybrid approach, EFA is conducted to determine what the factor structure looks like according to how a participant actually responds, rather than simply on theory. The present study utilizes the CFA approach to assess the measurement model. In the previous chapter, the present study had developed a scale for each factor in the model with the expectation that each of the developed scales would uniquely measure its

associated factor. CFA tests whether a set of empirical data supports the hypothesized theoretical relationships between each factor and its respective indicators. Given that this theory-driven approach is used for construct development, CFA “provides an appropriate means of assessing the empirical relationships the efficacy of measurement among scale items and the consistency of a pre-specified structural equation model with its associated theoretical concepts” (Segars & Grover, 1998, p. 148). After the validation of the measurement model, a series of analyses was conducted to test the structural model that involves the hypotheses about relationships between the factors in the model.

5.4 Assessment of the Structural Model

Structural models are assessed through path analysis (PA) in order to test the hypotheses in the present study, which include the direct and mediating effects. T-test results in relation to the significance of regression coefficients were examined to test the hypothesized direct effects of knowledge management practices on a caseworker’s knowledge integration ability and the direct effect of this ability on organizational effectiveness. Considering that the large sample size in this study would lead a small coefficient to be deemed significant, the researcher also decided to examine effect sizes according to Cohen's (J. Cohen, 1988) general guidelines for their interpretation.

After testing the hypothesized direct effects, the mediating effects in the research model (i.e., the indirect effects of three dimensions of knowledge management practices on organizational effectiveness via knowledge integration) were tested. In the literature, there are three major approaches to test mediating effect: 1) the Baron & Kenny method, 2) the Sobel test, and 3) bootstrapping methods.

The first approach, the so-called Baron and Kenny method, was originally suggested by Baron and Kenny (1986) and was updated by Kenny, Kashy, and Bolger (Kenny *et al.*, 1998). It involves four steps of assessment: 1) the relationship between the independent variables and outcome variables without the involvement of the mediation variable, 2) the relationship between the independent and mediating variables, 3) the relationship between the mediating and outcome variables after controlling for the independent variables, and 4) the direct effect of the independent variables on the outcome variables as testing whether this effect is substantially reduced when the mediating variable is included in the model.

Although this is one of the most often used approaches, it has been criticized for its low power, Type I error, and its inability to address suppression effects. Researchers (MacKinnon *et al.*, 2004; Preacher & Hayes, 2004) have focused on a more critical limitation of this approach. Although the central question regarding mediating effect testing is whether the “indirect effect” differs significantly from zero, the Baron and Kenny method does not address this question directly. Its approach, that of the assessment of changes in the “direct effect” of predictors after controlling for mediation variables, may be an overly simplistic way of assessing mediating effects and may lead to erroneous conclusions.

The second (Sobel) approach addresses the limitations of the Baron and Kenny method by using inferential statistics to assess the indirect effect of the independent variable. In other words, this approach quantifies an indirect effect rather than inferring about its existence from a set of tests on their constituent paths. The most frequently used

inferential technique is the product of coefficients approach, or the so-called Sobel test (Sobel, 1986). Figure 11 is an illustration of mediation. The figure shows that the indirect effect of the independent variable (predictor) on the dependent variable (outcome) through the mediator is the product of two path coefficients (ab) while its direct effect is c' . The total effect (c) is calculated by summing the indirect and the indirect effect ($ab + c'$).

The Sobel test determines the significance of the indirect effect. This procedure utilizes the predictor's and the mediator's unstandardized path coefficients as well as their standard errors. The ratio of ab to its standard error is used as a test statistic (z value) for the testing of the null hypothesis that the indirect effect (ab) is zero. Therefore, a significant z value suggests that full mediation occurs, meaning that there is no difference between the total effect and the direct effect ($c - c' = 0$).

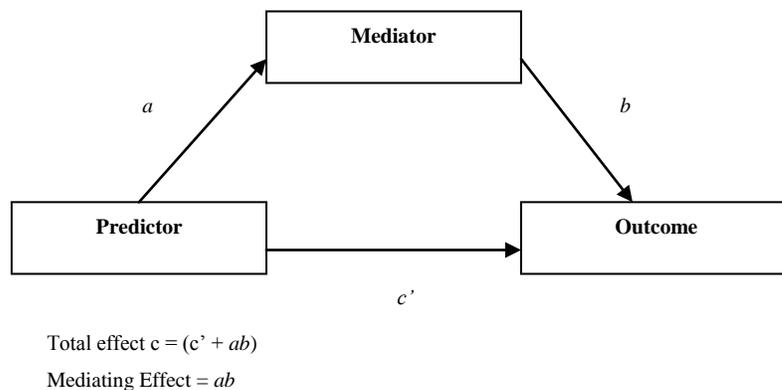


Figure 11. An Illustration of Mediation

The Sobel test has been frequently used as a supplement to the Baron and Kenny method rather than instead of it, meaning that it is utilized to conduct post-hoc probing of the mediating effects in a manner outlined by Sobel (1982). In other words, researchers

first examine whether the Baron and Kenny criteria for the establishment of mediation are met and then go on to conduct the Sobel in order to test the validity of the conclusions based on the criteria. In a recent article, Hayes (2009) argues that there is little point to such an exercise. The results of a set of hypothesis tests about a and b are irrelevant and provides no additional information beyond the Sobel test, in terms of the size or significance of the indirect effect. Thus, researchers should not precondition the use of the Sobel test on significant paths linking the predictor to the mediator or the mediator to the outcome.

Although this second approach is stronger than that of the Baron and Kenny method, the Sobel test has one major flaw: its assumption that the sampling distribution of the indirect effect is normal (MacKinnon *et al.*, 2004; Preacher & Hayes, 2004). The Sobel test uses significance tests for an indirect effect by making a binary decision regarding significance. The binary decision is made by dividing the estimate of the indirect effect by its standard error and comparing the resulting z statistic with a critical value from the standard normal distribution. However, the sampling distribution of ab tends to be asymmetric and assumptions of normality are usually violated, especially in small samples. The violation of normality assumptions leads to a reduced ability to detect true relationships amongst variables.

The third (bootstrapping) approach for the testing of mediating effects overcomes this limitation of the Sobel test, which is based on a normal theory about the shape of sampling distribution. Bootstrapping involves repeated random sampling observations with replacement from the data set and computing the statistic of interest (in this case, the

product of the coefficients (ab) in each bootstrap sample. Over many bootstrap resamplings, an empirical approximation of the sampling distribution of the statistic can be generated and used for hypothesis testing. In other words, bootstrapping methods are used to create empirical standard errors for the mediating effect. This method derives a point estimate and a 95% empirical Confidence Interval (CI) for the product of the pathways involved in the mediation. If the CI does not include zero, this result suggests a significant mediated relationship at the .05 probability level.

Based on simulation studies, researchers (MacKinnon *et al.*, 2004; Preacher & Hayes, 2004) have suggested that the bias-corrected bootstrapping method is the most accurate and statistically powerful test of mediation for continuous outcomes. The bootstrapping method estimates the size of an effect (the confidence limits for the indirect effect) by re-sampling methods. This method is more accurate than the one with single sample methods in which confidence limits for the indirect effect are unbalanced and the true value is more likely to fall outside of the interval (MacKinnon *et al.*, 2004). However, this method has been neither well established for use with categorical outcomes nor available for analyses that use certain estimators (MacKinnon *et al.*, 2004; Preacher & Hayes, 2004). In the present study, mediating effects were investigated by use of the Sobel test because re-sampling approaches are not available for the SEM analysis that uses a MLR estimator.

5.5 Testing for the Usefulness of the Research Model

The third part of analysis was conducted in order to test the hypotheses about the usefulness of the research model as compared to the following two competing models: 1)

a direct model that excludes the mediating variable from the research model and 2) a direct model that does not apply the knowledge management framework proposed in the present study. These comparisons were made based both on model fit and model prediction.

To compare the model fit of competing models, the Akaike's Information Criterion (AIC) and the Bayesian Information Criterion (BIC) values were used. These two indices are adequate for the comparison of, not only nested models, where one is obtained from the other by deleting one or more paths, but also of the non-nested models with separate parametric families (Y. Wang & Liu, 2006). Because the second direct model included a different set of parameters to that of the other models, the comparison was made among non-nested models. The model with the lowest values is considered to be the best one.

Since a model may exhibit adequate fit yet do a poor job of predicting the criterion variable of interest, McCoach and colleagues (2007) strongly argue the need to assess model prediction as well as model fit. Model fit represents the degree to which the model can reproduce the pattern of observed covariances, rather than whether the covariances among variables in the system are large or small. These researchers state that the importance of reporting the measures of variance (or measures of effect size) has been overlooked in SEM studies while it is critical to report the squared multiple correlation (R^2) value in multiple regression studies. A great deal of emphasis has been placed on model fit in SEM studies without paying enough attention to the lack of congruence between model fit and model prediction.

The present study compares the squared multiple correlation coefficient (R^2) for the criterion construct (Organizational Effectiveness) between the competing models. This value represents the amount of variance in an endogenous variable that is explained by a recursive structural model or the model's predictive power and that is used to assess model prediction for the variable in a model (Emam *et al.*, 1996; Oh, 2009).

5.6 Statistical Tools and Section Summary

In summary, this section has discussed issues with regard to the type of SEM, model testing procedures, model estimation methods, and approaches to evaluate models and to compare competing models. The statistical tools used to conduct this series of aforementioned analyses are the Statistical Package for the Social Sciences (SPSS) 18.0 and Mplus (version 5 plus; Muthén & Muthén, 1998–2008). The SPSS was used for descriptive analysis and other tests for data screening, while the Mplus was used to test measurement and structural models.

6 Chapter Summary

This chapter has covered the methodology for the present study. Starting with hypotheses used to answer research questions, it has described research design, data collection, instruments, and data analysis methods. The next chapter offers a detailed data analysis of procedures utilized and their results.

CHAPTER IV: DATA ANALYSIS RESULTS

This chapter presents the results of a multivariate analysis performed to test the research model proposed in Chapter III. This chapter is outlined based on the presentation in the Data Analysis Approaches of Chapter III. The first section describes preliminary data preparation procedures along with the descriptions of the sample that was finalized after the procedures. The second section describes data screening procedures conducted to assess the assumptions for the SEM analysis and presents the results of these assessments. The third section reports the results of the SEM analysis testing the proposed hypotheses. Finally, this chapter concludes with an overall summary of the findings of this study.

1 Data Preparation and Preliminary Data Analysis

The data for this secondary analysis was provided by the Survey of Organizational Excellence (SOE) Office. This sub-set of the 2008 SOE data contained 6,790 survey responses of employees in the Child Protective Services (CPS) programs of the Texas DFPS. After deleting 1,217 cases of supervisors (the value of the variable D05 was 1) and 91 cases with no responses on this variable, the data set was reduced to include 5,482 responses of CPS caseworkers. The researcher also deleted 36 cases that had no responses or responses of “not applicable” for all of the questionnaires except the demographic variable. As a result, a total sample of 5,445 usable responses was obtained.

Before the data analysis began, data cleaning was undertaken to correct any potential inaccuracies or inconsistencies in the data set. Frequency analyses were conducted on the variables of interest, which were demographic variables and the indicator variables represented in the research model. The analyses found no out-of-range

data points; thus, no correction was needed. Answers such as “not applicable” or “don’t know” entered into the data set were set as “missing” values.

Once the data was prepared and cleansed, descriptive analyses were conducted using the SPSS Frequencies in order to understand the characteristics of the respondents (see Table 3). Notice that the total number of cases varies in the Table. It is considered reasonable to report descriptives for all non-missing cases because the present study uses all of the cases in SEM, rather than use list-wise deletion. The rationale for using all of the available cases is discussed later in this chapter.

The age groups of respondents were somewhat evenly distributed among those of from 30 to 39 (27.8%), from 16 to 29 (24.9%), and 40 to 49 (23.2%). Respondents aged between 50 and 59 accounted for 19.7% of the sample while respondents who were 60 and above accounted for only 4.5%. The respondents were predominantly female (83.8 %) and only 16.2% of respondents were male.

Most of the respondents (56.9%) had a Bachelor's Degree. About 17.4% stated their education level to be Some College, while 12.7% mentioned a Master's Degree. A smaller percentage of respondents reported that they a High School Diploma or GED (7.2%) or Associate’s Degree (4.8%). There were few respondents who had Doctoral Degrees (1.0%) or who did not finish High School (0.1%). The racial composition of the sample showed that almost a half of the respondents were categorized in the racial group of Anglo-American/White (46.5%) compared to Hispanic/Mexican-American (25.6%), African-American/Black (23.9%), Islander/Native American (2.4%), and Multiracial/Other Asian-American/Pacific (1.6%).

Table 3. Sample Demographic Characteristics

<i>Demographic Characteristics</i>	<i>Description</i>	<i>Frequency</i>	<i>Valid Percent (%)</i>	<i>Valid Total</i>	<i>Missing cases (%)</i>
Age Group	16-29	1353	24.9		
	30-39	1508	27.8		
	40-49	1257	23.2		
	50-59	1068	19.7		
	60+	242	4.5		
				5428	18 (0.3)
Gender	Female	4541	83.8		
	Male	876	16.2		
				5417	29 (0.5)
Education	Did not finish High School	3	0.1		
	High School Diploma (or GED)	389	7.2		
	Some College	948	17.4		
	Associate's Degree	263	4.8		
	Bachelor's Degree	3092	56.9		
	Master's Degree	691	12.7		
	Doctoral Degree	52	1.0		
				5438	8 (0.1)
Race	African-American/Black	1290	23.9		
	Hispanic/Mexican-American	1384	25.6		
	Anglo-American/White	2515	46.5		
	Asian-American/Pacific	87	1.6		
	Islander/Native American	128	2.4		
	Multiracial/Other				
				5404	42 (0.8)

Note: Frequencies rounded at the second decimal.

2 Data Screening

Data screening is recommended before a raw data file is created for a SEM model (Garson, 2009; Kline, 2005). This section describes the data screening procedures that involve a series of diagnostic analyses to examine the requirements for SEM analysis, including sample size, multi-collinearity, data level, missing data, and the assumption about the distributional characteristics of the data (multivariate normality).

2.1 Sample size

SEM relies on tests which are sensitive to sample size and the magnitude of differences in covariance matrices (Garson, 2009). Therefore, a large sample is

recommended for accurate estimations and interpretations of a SEM analysis because larger samples produce less sampling error than smaller samples (Kline, 2005).

General recommendations of a sample size in the literature is 100 through 200 (Garson, 2009; Kline, 2005). Researchers have argued that one should have a minimum number of cases per measured variable or indicator. After a discussion of different guidelines for a minimum sample size of 10 - 20 cases (R. J. Mitchell, 1993) or 15 cases (Stevens, 1996), Garson (2009) recommends that a sample size should be at least 50 cases more than eight times the number of indicators in the model. One should have a larger sample size than these minimum recommendations when data are non-normal or incomplete.

An adequate sample size also depends on the model complexity. A very complex model that includes many parameters may require a larger sample size than these recommendations in order for the estimates to be comparably stable. Therefore, an adequate sample size is often determined based on the ratio of cases per free parameter estimate cases (including error terms and path coefficients). Kline (2005) suggests that the case/parameter ratio should be at least 10:1 while the ratio of 20:1 is desirable. Bentler and Chou (1987) allow as low as 5:1 when all of the data assumptions have been met. However, the ratio of under 5:1 is undesirable because the statistical precision of the results could be doubtful (Kline, 2005).

Taking these criteria into account, the sample size of the present study ($N = 5,445$ cases) was evaluated for appropriateness for SEM analysis. This sample size not only met the general recommendation of a sample size of 100 - 200 but also exceeded the sample

size requirement based on Garson's criteria of the ratio of cases per indicator ($80 + 5 \times 32$ indicators = 240 cases) and the highest ratio-requirement (20×32 indicators = 640 cases). It also satisfied the requirement of an adequate sample size based on the ratio of cases per parameters. The initial SEM model contained 98 parameters for the CFA portion of the model and 68 parameters for the structural portion of the model. Even when the highest requirement of case/parameter ratio (20:1) based on the highest parameters in the model (98) were applied, the sample size in the present study exceeded the requirement of 1,960 cases.

2.2 Multi-collinearity

Multi-collinearity refers to a situation in which two or more variables in a multiple regression are highly correlated (Cooper, 2009). Complete multi-collinearity is assumed to be absent in SEM analysis because it results in singular covariance matrices with which zero denominators cause the mathematical operations (ex., matrix inversion) to be unstable and prevent a SEM solution (Garson, 2009). A high multi-collinearity decreases the reliability of SEM estimates because it causes relative strengths of the variables and the joint effects to be unreliable (Garson, 2009; Kline, 2005). Therefore, this problem should be screened before data is analyzed. As a remedy, it is recommended that problematic variables be eliminated or redundant ones be combined into a composite variable (Kline, 2005).

The correlation matrix was inspected to identify bivariate collinearity among indicator variables in the model. None of the variable pairs had a high correlation coefficient (above .9). Two pairs of the indicators for the Techno-structural Dimension of

Knowledge Management Practices had relatively high correlations: Tech3 and Tech2 (.822) and Tech1 and Tech3 (.802). Multi-collinearity can also happen not only between indicator variables but also between latent variables (Kline, 2005). The relationships among constructs are estimated more accurately in CFA because this method estimates a direct correlation for measurement errors. CFA often eliminates the need to summate scales because SEM computes factor scores for each respondent. Therefore, any treatment and further assessment were halted until the results of CFA analysis produced more accurate estimates.

2.3 Missing data

The proportion and pattern of missing values were inspected because the manner of dealing with missing data in the data analysis procedure depends on the results. The proportion of list-wise missing cases, or all observations that have missing values for any of the variables of interest, was fairly large (36.19% - 1,917 out of 5,445). A series of analyses were conducted using the software package SPSS 16.0 in order to check the missing pattern and whether it satisfied the assumption of MAR (missing is at random) or MCAR (missing is completely at random). The following procedures were conducted in order to identify the patterns of missingness in the data and to examine whether there were any correlations among the patterns.

First, the researcher created dummy variables for each variable in the model and calculated the means of each factor in the model. Second, a two-step cluster analysis was carried out using the dummy variables as categorical variables and the calculated factor means as the continuous variables. As a result of the cluster analysis, a categorical

variable “MissingPatterns” that included three values was created, indicating that the analysis classified missing patterns in the data in three separate dimensions. Third, in order to examine whether each of these missing patterns was correlated with the factors in the model, the researcher created three dummy variables (Missing1, Missing2, and Missing3) using each value of the variable “MissingPatterns” as the reference category and conducted bivariate correlations between each dummy variable and each factor mean.

The results showed that each missing pattern was evenly distributed (the “MissingPatterns” value of 1 – 28.4%, 2 – 33.6%, and 3 – 38.0%). An inspection of the correlations between the first missing pattern (Missing 1) and the factors in the model indicated that all of the correlations were significant but at a very minimal level (the highest $r=.164$ with the Empowerment factor). However, the other patterns were significantly correlated with the factors. The correlations that involved Missing2 ranged from $-.429$ (with the Techno-structural Dimension factor) through $-.687$ (with the Empowerment factor). As for Missing3, the range was between $.322$ (with the Employee Development factor) and $.516$ (the Empowerment factor). These results indicated that the data set did not satisfy the assumption of MAR or MCAR. The violation of this assumption may have caused biased estimates when using some missing data handling approaches that required this assumption.

Based on the results of the proportion and patterns of missing data, a decision was made to determine how to handle the missing data in the data analysis. There are several methods to handle missing data including omitting missing cases, substituting missing cases with imputed values, and ML/FIML. First, one can omit missing cases from

calculation. Pair-wise deletion means that analyses are carried out by ignoring missing cases only for calculations involving that variable. In list-wise deletion, a case with missing values is ignored in all calculations. Second, missing values can be estimated and replaced with the estimated values. One can use the mean of the variable or predict missing values using a regression equation.

In their recent article, Baraldi and Enders (2010) argue that researchers should abandon the approaches of omitting or filling in the missing values. They strongly recommend using one of the three alternative methods that include missingness in the analysis: Maximum Likelihood (ML) estimation and Multiple Imputation (MI). An ML estimation under Full Information Maximum Likelihood (FIML) condition uses non-missing values, even though other values may be missing for the case rather than discard cases containing some missing values (list-wise deletion), to identify the parameter values that have the highest probability of producing the sample data.

Multiple imputation methods are similar to FIML except that actual raw data values are simulated. It creates several copies of the data set, each containing different imputed values and then conducts analyses on each data set using the same procedures that would have been used as if the data had been completed, and then combined the results into a single summary finding (Baraldi & Enders, 2010).

This recommendation of including missing data in an analysis as a function of research design is strongly supported theoretically and empirically by the methodological literature (Baraldi & Enders, 2010). Pair-wise deletion is never recommended because it can result in correlations or covariances which are outside the range of the possible

(Kline, 2005) substantially bias chi-square statistics (Garson, 2009). List-wise deletion can be used in limited circumstances. Given that SEM uses covariance matrices as input, list-wise deletion is recommended where the sample is fairly large, only five percent of the sample or less are eliminated, and the cases are MCAR. After a list-wise deletion, the sample size of the present study would still be fairly large ($N = 2,404$) to have enough power for a SEM analysis. However, list-wise deletion was not an option for SEM analysis in the present study because the proportion of missing cases was greater than five percent and the cases were not MCAR.

Although list-wise deletion was not chosen because the requirement was not met, these traditional approaches that assume MCAR are virtually never better than ML-based methods (Baraldi & Enders, 2010). Other methods (e.g., mean imputation) can never be effective because they result in biased estimates, incorrect standard errors, or both. This recommendation also is consistent with recommendations from the American Psychological Association (Wilkinson & Task Force on Statistical Inference of American Psychological Association Science Directorate Washington D. C. U. S., 1999) and other researchers' arguments (Garson, 2009; Peters & Enders, 2002) that the ML-based method to handle missing data outperforms other methods in terms of the efficiency and the level of bias.

In order to manage the non-ignorable missingness in the present study, the researcher decided to run an analysis using the FIML method. FIML is widely used in the literature and chosen as default in many of the SEM software. FIML assumes MAR, which the data set of the present study does not satisfy. Two missing patterns (Missing2

and Missing3) will be included in the structural model in order to assess the effects of these missing patterns.

2.4 Data Level

Most of the variables in the research model of the present study were measured at the ordinal level. According to Garson (2009), there are two methods in which ordinal data are modeled in SEM. The first and relatively strict approach is to model the data as ordered-categorical data (by allowing AMOS to use non-numeric data) and use Bayesian estimation rather than ML estimation that assumes interval data. Unlike ML estimation, Bayesian models attempt to avoid the over-fitting problems by using prior information about model parameters (ex., marginal distributions) to calculate posterior distributions (Faraggi & Simon, 1998). According to a researcher who has compared the ML and Bayesian methods (Beerli, 2006), both inference methods use the same Markov chain Monte Carlo algorithm. The difference between these methods exists in only two aspects: Parameter proposal distribution and maximization of the likelihood function. Based on empirical tests using simulated datasets, the researchers found that the Bayesian method outperformed the ML approach in accuracy and coverage. However, the two approaches are equal in performance for some values. Even though many SEM software have recently begun supporting the Bayesian estimation, this approach is not recommended at this moment because it is difficult to interpret the results based on different output from the interval-level output (Garson, 2009) and there is little information on the performance of this approach (Newsom, 2010).

The researcher chose the second and relatively lenient approach of treating ordinal variables with five or more categories as intervals. Although interval data are assumed for purposes of ML estimation in a SEM analysis, many researchers have continued to use this approach just as they do in regression procedures given some evidence to support that this approach is not likely to result in much practical impact on results (Newsom, 2010).

Treating ordinal measurement to represent an underlying continuous variable is truncation of range and leads to attenuation of the coefficients in the correlation matrix used by SEM. Garson (2009) argues that this approach is chosen if researchers intend to use this approach only for exploratory purposes and not to confirm weak but significant paths. Therefore, the limitation of using this approach to confirm the hypotheses will be outlined later in the Limitations section.

2.5 Multivariate Normality and Outliers

SEM requires multivariate normality assumptions in the data (Kline, 2005). Multivariate normality assumptions for the endogenous variables are required especially for ML estimation (Garson, 2009). Multivariate normality refers to “the extent to which all observations in the sample for all combinations of variables are distributed normally” (Mertler & Vannatta, 2001, p. 30).

A violation of the multivariate normality assumptions tends to deflate standard errors, which cause regression paths and factor/error covariances to be statistically significant more often than they should be (Gao *et al.*, 2008; Garson, 2009). The significance of specific relations erroneously attributes to the null rejection and

overestimates chi-square statistics for model fit, in other words, it makes the chi-square (the degree of discrepancy between the model-implied and the sample-derived covariance matrices) positively biased towards Type I error. Therefore, it makes researchers reject the null hypothesis and consider a model modification when it is actually not needed.

A sample is considered multivariate normally distributed when 1) all the univariate distributions are normal, (2) the joint distribution of any pair of the variables is bivariate normal, and (3) all bivariate scatterplots are linear and homoscedastic (Kline, 2005). Since it would be impractical to examine all joint frequency distributions (Kline, 2005), the assessment of multivariate assumptions can be carried out in one step using Mardia's normalized multivariate kurtosis (Gao *et al.*, 2008). This functionality produces univariate distributions for univariate normality of each variable and Mardia's normalized multivariate kurtosis for multivariate normality. Table 4 shows the measures for univariate normality for each variable. According to the Table 4, univariate skewness values of the 32 variables ranged from -0.277 to -1.153 and univariate kurtosis ranged from -0.190 to 2.018. Garson (2009) argues that one should apply conservative rules for discrete data (i.e., ordinal data with less than 15 values): The values of univariate skewness and kurtosis should be within the range of 1.0 through 2.0. On a conservative cut-off of 1.0, some variables were considered to have non-normal distributions.

Although the data do not satisfy the univariate normality assumption based on the conservative rules, Kline (2005) reports the lack of consensus about specific threshold values. He asserts that absolute values of the skew that are greater than 3.0 are

extremely skewed and absolute values of the kurtosis that are greater than 10.0 are problematic. In structural equation modeling based upon the covariance matrix, conventional normality requirements are not as restrictive. Taken as a whole, the univariate normality does not seem to be extremely problematic.

Table 4. Distributions of the Observed Variables in the Model

Latent variable	Indicator Label	Indicator	Mean (SD) *	Skewness **	Kurtosis **
Organizational Effectiveness	Quality_Service	We are known for the quality of service we provide.	3.41 (1.11)	-0.404	-0.692
	Improve_Service	We are constantly improving our services.	3.58 (0.99)	-0.590	-0.115
	Goals_Met	Our goals are consistently met or exceeded.	3.38 (0.98)	-0.410	-0.413
	Low_Error	We produce high quality work that has a low rate of error.	3.34 (1.02)	-0.361	-0.541
	Efficiency	We are efficient.	3.32 (1.09)	-0.484	-0.521
A Caseworker's Knowledge Integration Ability	Right_Information	The right information gets to the right people at the right time.	3.15 (1.00)	-0.289	-0.646
	Act_Intelligently	We integrate information and act intelligently upon that information.	3.57 (0.90)	-0.774	0.481
The Techno-structural Dimension	Easy_to_Find	Our computer systems enable me to easily and quickly find the information I need.	3.72 (0.92)	-1.034	0.972
	Data_Presentation	The information available from our computer systems is reliable.	3.74 (0.82)	-1.044	1.515
	Reliability	Our computer systems provide thorough information.	3.70 (0.83)	-0.924	1.113
	Thoroughness	Overall, our computer information systems present data in an understandable way.	3.78 (0.86)	-1.153	1.769
	Support_Decision	Our computer systems help me make better decisions at work.	3.66 (0.83)	-0.765	0.917
The Socio-cultural Dimension	Open_Communication	The work atmosphere encourages open and honest communication.	3.28 (1.18)	-0.452	-0.763
	Get_Opinion	An effort is made to get the opinions of people throughout the organization.	3.08 (1.06)	-0.341	-0.773
	Train_Incorporate	Work groups are trained to incorporate the opinions of each member.	3.25 (1.01)	-0.457	-0.358
The Inter-organizational Dimension	With_Other	We work well with other organizations.	3.51 (0.89)	-0.836	0.598
	With_Govern	We work well with our governing bodies (the legislature, the board, etc.).	3.39 (0.91)	-0.680	0.364
	With_Public	We work well with the public.	3.50 (0.91)	-0.691	0.229
Empowerment	Employee_Valued	Every employee is valued.	3.23 (1.23)	-0.277	-0.978
	Effort_Count	We feel our efforts count.	3.31 (1.10)	-0.499	-0.502
	Challenge_Valued	People who challenge the status quo are valued.	2.88 (1.05)	-0.146	-0.643
	Opinion_Count	My ideas and opinions count at work.	3.38 (1.04)	-0.632	-0.190
	Work_Recognized	Outstanding work is recognized.	3.17 (1.18)	-0.328	-0.823
	Goal_Setting	We have an opportunity to participate in the goal setting process.	3.13 (1.07)	-0.313	-0.709
	Decision_Control	Decision making and control are given to employees doing the actual work.	3.13 (1.15)	-0.345	-0.858
Staffing	Chance_for_Best	We are given the opportunity to do our best work.	3.49 (1.12)	-0.643	-0.374
	Work_Amount	The amount of work I am asked to do is reasonable.	3.11 (1.23)	-0.384	-1.023
Employee Development	Work_Pace	The pace of the work in this organization enables me to do a good job.	3.20 (1.13)	-0.461	-0.730
	Train_Growth	Training is made available to us for personal growth and development.	3.74 (0.99)	-0.971	0.666
	Train_Task	Training is made available to us so that we can do our jobs better.	3.75 (0.97)	-0.983	0.796
	Access_Info	We have access to information about job opportunities, conferences, workshops, and training.	3.93 (0.84)	-1.145	2.018

* Percentages were rounded at the third decimal. ** Percentages were rounded at the fourth decimal.

Univariate normality of individual variables is a necessary but not sufficient condition for the assumption of multivariate normality. Multivariate normality can be checked using Mardia's measure of multivariate kurtosis (Bentler, 2006). Mardia's kurtosis is the average of the fourth power of the Mahalanobis distances between the observations and the sample mean. Although there is still no absolute determinant of the extent to which a sample can be considered non-normal, Bentler suggests that large positive values of the normalized estimate indicate significant positive kurtosis; large negative values are indicative of significant negative kurtosis. The critical ratio of Mardia's multiple kurtosis is asymptotically distributed standard normal $N(0, 1)$. Therefore, a sample can be considered multivariate normally distributed at the .05 level of significance when the critical ratio is less than 1.96, indicating that the coefficient of multivariate kurtosis is not significantly different from zero.

Multivariate normality was assessed using DeCarlo's macro for the SPSS (DeCarlo, 1997). Model variables may be considered to be 'multivariate normally distributed' because the probability of Mardia's coefficient was rejected (multivariate kurtosis = 3018.1879, $p < .001$). The rejection of the null hypothesis of a multivariate normal distribution means the sample covariance matrix may have greater standard error than its counterpart under the normal distribution assumption (Yuan *et al.*, 2004). Given that the significance of this test can be attributed to the large sample size, the following graph (Figure 12) produced by DeCarlo's macro provides additional evidence for the question of normality.

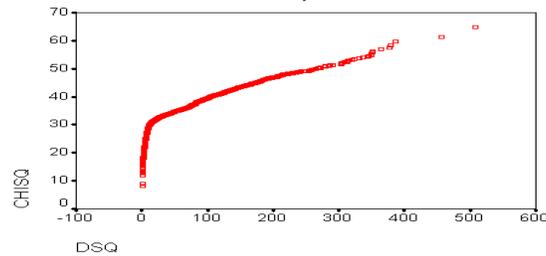


Figure 12. Plot of Ordered Squared Distances

The y axis in Figure 12 is the expected Chi-square for a putative percentile and the x axis is the Mahalanobis distance which is Chi-square distributed. The Mahalanobis distances are ranked and then graphed with the expected Chi-square value. A straight line in the graph would suggest multivariate normality because it means the distribution of the Mahalanobis distances and the theoretical distribution (Chi-square) map well onto each other. The curved line in the graph suggests that the data set was not normally distributed.

Yuan *et al.* (2004) provide empirical evidence to support their argument that one should use the results of this test with caution when missing data is involved because the test of Mardia's coefficient assumes complete data. If the observed marginals for the missing variables sit in a cluster with a restricted range – the approximation is no longer valid, and the rejection rate can be over or under the nominal rate. The data set has this kind of pattern – two groups of the observed marginals are clustered at the point of chi-square 32.20. The researcher divided the data into two sets (one with Chi-square greater than 32.20 and one with Chi-square =32.20 or less). The latter data set had no missing data and had a little bit higher mean compared to the former. Although there was a need for caution with regard to this conclusion, it was concluded that the multivariate

normality assumption was not satisfied based on a graphic examination of the distribution of ordered squared distances.

Researchers (Gao *et al.*, 2008) compare three ways to handle non-normal ordered categorical variables: Transformation, removing outliers, and special estimators to adjust the non-normality. The first remedy is to reduce univariate nonnormality by transforming (by taking square root or logarithm) some individual variables. When non-normality is moderate or slight, however, the impact of transformation is minor, so this remedy could still fail to achieve the univariate normality. Therefore, it may not be helpful for improving a multivariate normality and the model as a whole. Moreover, transformation implies that the relationship of one variable to the others is assumed to be nonlinear. When nonlinear relationships are not true, it makes the interpretation of coefficients more difficult. In addition, it is possible to have multivariate normality even when the univariate normality assumption has been satisfied. Therefore, this method has not been chosen in the present study.

Second, one can remove multivariate outliers until the multivariate kurtosis index reaches the desired level. Multivariate outliers are detected on the Mahalanobis distance measure, which represent the squared distance, in standard units, of the vector of an observation from the vector of sample means for all variables. This remedy focuses on the lowering the multivariate skewness and kurtosis of the original raw data by deleting multivariate outliers. The larger the distance indicates the larger the contribution that an observation makes to Mardia's multivariate kurtosis. One of the advantages of this remedy over transformation is that it retains the assumption of linearity. A disadvantage

is reduced sample size and loss of power and generalizability, which is not recommendable. As an alternative, Gao *et al.* recommend that researchers should find a best balance where the non-normality is controlled at an acceptable level while the loss of information is minimized.

Multivariate outliers are detected on the Mahalanobis distance measure. The test using DeCarlo's macro identified the following five observations using the largest Mahalanobis distance values.

```
5 observations with largest Mahalanobis distances:
rank = 1 case# =3108 Mahal D sq = 507.10 - 474482
rank = 2 case# =3228 Mahal D sq = 456.70 - 474710
rank = 3 case# =3095 Mahal D sq = 386.65 - 474457
rank = 4 case# =3544 Mahal D sq = 379.18 - 475249
rank = 5 case# = 73 Mahal D sq = 377.20 - 468829
```

Given that the line is abruptly bent from the low point of 32.20 (Figure 12), eliminating these outliers would not be useful in straightening the line.

As a remedy for the non-normality distribution, the researcher decided to use a third method, which retained the outliers and used a special estimation of running the model using MLR as the estimator. MLR is an Mplus option for maximum likelihood estimation with standard errors and a chi-square test statistic. This estimator produces ML (FML) parameter estimates and SEs that are robust against non-normality and model misspecification. Using MLR estimator under FIML, this solution would address the missingness and non-normality of the data.

2.6 Summary of Data Screening

The section has found that the sample size of the present study was large enough to conduct SEM analysis. It is justified for treating ordered categorical data as continuous data in this study. A decision was made to use MLR estimator under FIML in order to address the violation of the SEM assumptions about missingness (not MAR) and distributions (non-normality). The issue of multi-collinearity is inspected in the next section.

3 SEM Analysis

This section presents the results of multivariate analysis using the Structural Equation Modeling (SEM) technique. Based on the literature review, this study specified the proposed research model as a Structural Regression (SR) model. The SR model consisted of the measurement portion that depicted the measurement structure between latent variables and their indicators and the structural portion that specified hypothesized causal relationships among latent variable. The first two parts of this section present the results of two-step procedures of testing the SR model. The first part assesses the measurement portion while the second part assesses the structural portion. The third part provides the results of testing the hypotheses about the usefulness of the proposed model compared with other competing models.

3.1 Testing the Measurement Model

This first part consists of four sub-parts: Model specification, model identification, model estimation, and the approaches to address the multi-collinearity problem in the measurement model.

3.1.1 Model Specification

In order to assess its measurement portion, the original SR model was remodeled as a CFA model. All straight arrows connecting latent variables (representing direct effects among latent variables) in the initial SR model were changed into curved arrows representing unanalyzed associations or covariances between every pair of latent variables. Figure 13 illustrates this eight-factor CFA (Confirmatory Factor Analysis) measurement model.

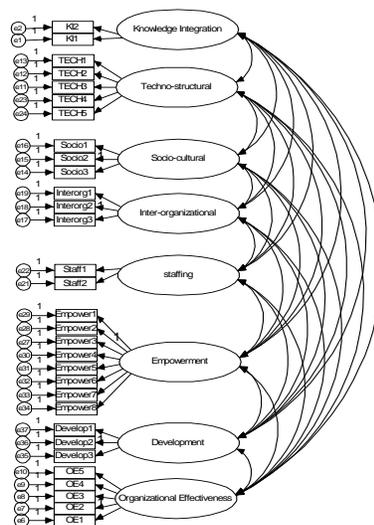


Figure 13. The Initial CFA Measurement Model

3.1.2 Model Identification

Before estimating this CFA model, it was determined whether this model was identified, meaning that it was theoretically possible to derive a unique estimate of every parameter. There are two criteria for a CFA model to be identified. The first requirement is to do with model complexity. As a structural equation model, the number of model parameters to be estimated in a CFA model cannot exceed the number of observations

when the number of observations equals $v(v+1)/2$ and v =observed variables. In other words, the degrees of freedom are greater than zero ($df_M \geq 0$). Secondly, every latent variable in a standard CFA model should be scaled.

The initial CFA model satisfied these two requirements. The first requirement about the degrees of freedom was examined by comparing the numbers of free parameters and observations. With 31 observed variables, 496 observations ($31*32/2$) are available. This CFA model has the total of 98 parameters, which include 67 variances and covariances of exogenous variables (8 variances of the factors, 28 covariances of the factors, and 31 measurement errors) and 31 direct effects of the factors on the indicators, which are also called factor loadings. There are 496 observations available to estimate this model's 98 parameters; thus $df_M = 398$, meeting the first requirement ($df_M \geq 0$). The second requirement was also satisfied because there were at least two indicators per factor.

3.1.3 Model Estimation

The CFA model was analyzed to examine the empirical relationships between the measures of the concept by determining whether it fit the data. Table 5 presents the matrix summaries of the means, standard deviations, and correlations of the observed variables used in this study. The covariance matrix based on this data set was submitted to Mplus for MLR/FIML estimation of eight-factor CFA model in Figure 13.

This converged solution was inadmissible due to a negative variance, which is a common type of improper solution in SEM. The first step recommended to address this problem is to rule out whether it is caused by high multi-collinearity between the

independent variables (Garson, 2009). According to an Mplus output of the estimated correlation matrix for the latent variables in the model, there was a high correlation between the Socio-cultural Dimension factor and the Empowerment factor (.993). This result suggests the existence of multi-collinearity between these two latent variables or the lack of discriminant validity in the initial measurement model (Kline, 2005).

Table 5. Matrix Summaries of the Observed Variables (Correlations, Standard Deviations, and Means)

<i>Observed Variable</i>	<i>Mean</i>	<i>SD</i>	<i>Organizational Effectiveness (1-5)</i>					<i>A Caseworker's Knowledge Integration Ability (6-7)</i>		<i>The Techno-structural Dimension (8-12)</i>				
			1	2	3	4	5	6	7	8	9	10		
1 Quality_Service	3.41	1.11	1											
2 Improve_Service	3.58	0.99	.570	1										
3 Goals_Met	3.38	0.98	.576	.629	1									
4 Low_Error	3.34	1.02	.548	.547	.669	1								
5 Efficiency	3.32	1.09	.476	.505	.573	.541	1							
6 Right_Information	3.15	1.00	.429	.470	.505	.469	.529	1						
7 Act_Intelligently	3.57	0.90	.435	.517	.510	.504	.550	.657	1					
8 Easy_to_Find	3.72	0.92	.231	.289	.257	.211	.335	.355	.332	1				
9 Data_Presentation	3.74	0.82	.232	.307	.283	.265	.352	.373	.378	.674	1			
10 Reliability	3.70	0.83	.240	.312	.287	.249	.363	.385	.382	.719	.806	1		
11 Thoroughness	3.78	0.86	.233	.301	.271	.236	.338	.344	.349	.794	.716	.745	1	
12 Support_Decision	3.66	0.83	.249	.330	.301	.262	.367	.399	.398	.647	.680	.728	.745	1
13 Open_Communication	3.28	1.18	.365	.467	.466	.435	.498	.516	.578	.273	.318	.319	.728	.745
14 Get_Opinion	3.08	1.06	.337	.418	.373	.313	.429	.465	.452	.341	.355	.382	.319	.382
15 Train_Incorporate	3.25	1.01	.372	.497	.458	.409	.499	.501	.539	.299	.331	.340	.382	.382
16 With_Other	3.51	0.89	.367	.415	.390	.354	.453	.480	.503	.377	.402	.423	.382	.382
17 With_Govern	3.39	0.91	.356	.419	.393	.353	.425	.438	.422	.332	.355	.379	.382	.382
18 With_Public	3.50	0.91	.427	.429	.431	.419	.487	.465	.491	.333	.368	.379	.382	.382
19 Employee_Valued	3.23	1.23	.430	.515	.513	.465	.495	.508	.529	.244	.293	.291	.382	.382
20 Effort_Count	3.31	1.10	.430	.525	.509	.464	.554	.520	.540	.298	.338	.331	.382	.382
21 Challenge_Valued	2.88	1.05	.385	.447	.442	.382	.500	.484	.495	.272	.298	.326	.382	.382
22 Opinion_Count	3.38	1.04	.353	.465	.440	.393	.491	.449	.501	.291	.319	.330	.382	.382
23 Work_Recognized	3.17	1.18	.364	.458	.438	.399	.507	.455	.475	.263	.303	.305	.382	.382
24 Goal_Setting	3.13	1.07	.364	.472	.456	.367	.463	.473	.504	.285	.296	.317	.382	.382
25 Decision_Control	3.13	1.15	.348	.412	.423	.391	.465	.461	.485	.271	.302	.318	.382	.382
26 Chance_for_Best	3.49	1.12	.440	.498	.525	.469	.613	.482	.525	.327	.341	.355	.382	.382
27 Work_Amount	3.11	1.23	.366	.393	.423	.353	.556	.374	.342	.246	.245	.251	.382	.382
28 Work_Pace	3.20	1.13	.404	.437	.466	.410	.580	.427	.418	.314	.312	.325	.382	.382
29 Train_Growth	3.74	0.99	.177	.315	.251	.184	.293	.331	.361	.291	.321	.325	.382	.382
30 Train_Task	3.75	0.97	.215	.357	.279	.215	.327	.371	.399	.327	.342	.358	.382	.382
31 Access_Info	3.93	0.84	.177	.299	.247	.188	.287	.321	.363	.314	.336	.351	.382	.382
32 Missing2			-.441	-.509	-.501	-.461	-.571	-.551	-.562	-.361	-.375	-.384	.382	.382
33 Missing3			.338	.388	.381	.336	.403	.418	.420	.254	.276	.286	.382	.382

Table 5 (Continued). Matrix Summaries of the Observed Variables (Correlations, SDs, and Means)

<i>Observed Variable</i>	<i>The Techno-structural Dimension (8-12)</i>		<i>The Socio-cultural Dimension (13-15)</i>			<i>The Inter-organizational Dimension (16-18)</i>			<i>Empowerment (19-26)</i>				
	11	12	13	14	15	16	17	18	19	20	21	22	
11	Thoroughness	1											
12	Support_Decision	.67	1										
13	Open_Communication	.278	.334	1									
14	Get_Opinion	.343	.392	.478	1								
15	Train_Incorporate	.32	.358	.636	.528	1							
16	With_Other	.391	.400	.404	.564	.431	1						
17	With_Govern	.352	.389	.356	.531	.410	.661	1					
18	With_Public	.356	.368	.393	.493	.404	.665	.610	1				
19	Employee_Valued	.259	.325	.650	.472	.580	.388	.383	.383	1			
20	Effort_Count	.308	.380	.620	.528	.594	.463	.441	.455	.644	1		
21	Challenge_Valued	.275	.357	.600	.572	.577	.424	.404	.409	.590	.595	1	
22	Opinion_Count	.302	.363	.635	.515	.607	.411	.393	.398	.600	.668	.660	1
23	Work_Recognized	.258	.339	.566	.501	.560	.387	.364	.388	.614	.682	.590	.614
24	Goal_Setting	.294	.348	.570	.531	.640	.41	.394	.385	.546	.560	.587	.594
25	Decision_Control	.283	.320	.545	.485	.543	.393	.365	.375	.503	.537	.562	.573
26	Chance_for_Best	.328	.360	.567	.472	.530	.414	.403	.431	.567	.599	.549	.576
27	Work_Amount	.247	.262	.372	.344	.392	.293	.342	.316	.427	.481	.394	.411
28	Work_Pace	.314	.333	.441	.436	.445	.384	.392	.391	.47	.538	.497	.488
29	Train_Growth	.303	.321	.356	.354	.384	.323	.273	.267	.355	.393	.354	.397
30	Train_Task	.336	.357	.383	.385	.411	.368	.326	.301	.386	.428	.374	.418
31	Access_Info	.331	.342	.351	.341	.360	.343	.294	.299	.341	.377	.322	.394
32	Missing2	-.369	-.395	-.578	-.520	-.548	-.487	-.463	-.482	-.566	-.582	-.545	-.552
33	Missing3	.255	.301	.428	.396	.428	.361	.331	.360	.430	.437	.419	.423

Table 5 (Continued). Matrix Summaries of the Observed Variables (Correlations, SDs, and Means)

<i>Observed Variable</i>	<i>Empowerment (19-26)</i>				<i>Staffing (27-28)</i>		<i>Employee Development (29-31)</i>			<i>Missing2</i>	<i>Missing 3</i>	
	23	24	25	26	27	28	29	30	31	32	33	
23	Work_Recognized	1										
24	Goal_Setting	.546	1									
25	Decision_Control	.482	.589	1								
26	Chance_for_Best	.546	.519	.544	1							
27	Work_Amount	.441	.357	.356	.534	1						
28	Work_Pace	.466	.442	.429	.597	.707	1					
29	Train_Growth	.399	.394	.329	.350	.213	.274	1				
30	Train_Task	.422	.404	.356	.384	.260	.313	.836	1			
31	Access_Info	.387	.370	.318	.341	.215	.280	.656	.652	1		
32	Missing2	-.533	-.506	-.493	-.566	-.465	-.518	-.382	-.415	-.362	1	
33	Missing3	.396	.408	.376	.407	.329	.382	.293	.311	.262	-.555	1

Since multi-collinearity was a major problem in terms of the construct validity of the measurement model, the researcher attempted to address this before attempting to test the structural model.

3.1.4 Model Refinement for Addressing Multi-collinearity

Bacons (1997) identifies three different approaches to deal with multi-collinearity: 1) ignore multi-collinearity, 2) remove multi-collinearity by making changes in the scales, and 3) model multi-collinearity. The researcher argues that the first two approaches can create serious problems and recommends the approach of modeling multi-collinearity as the best choice.

Based upon a personal communication between the researcher and the advisor, a decision was made to keep the original research model intact if possible before attempting to modify the measurement model. Due to the nature of a secondary analysis, measurements of SOE data do not perfectly fit the conceptualization in the present study. Any attempt to make changes in the theory-driven measurement model according to the sample statistics may increase concerns about over-fitting the data. Therefore, the third approach to solve the statistical problem of multi-collinearity may reduce the problem of overfitting the data and avoid unnecessary changes in the original model that had been developed based on theories.

One way to model multi-collinearity is to declare covariance paths between independent variables (Reisinger & Turner, 2003). Taking this method, the researcher added a covariance path between the two latent factors that contribute to multi-

collinearity as seen in Figure 14. However, this model did not produce a solution because the added path made the model unidentified.

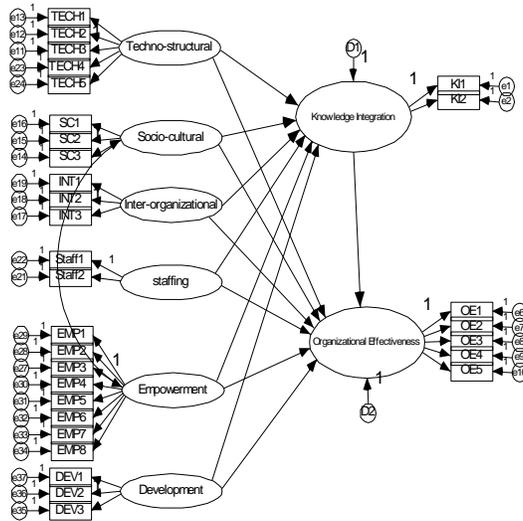


Figure 14. Modeling Multi-collinearity 1

A remedy to resolve this unidentification problem is by either imposing a parameter constraint to the model or by including additional observed variables. As a first remedy, new variables (two missing patterns that have correlations with the variables in the model) were added to the model (Figure 15) because this action did not mean a change in the model but a legitimate solution to address the violation of the MAR assumption.

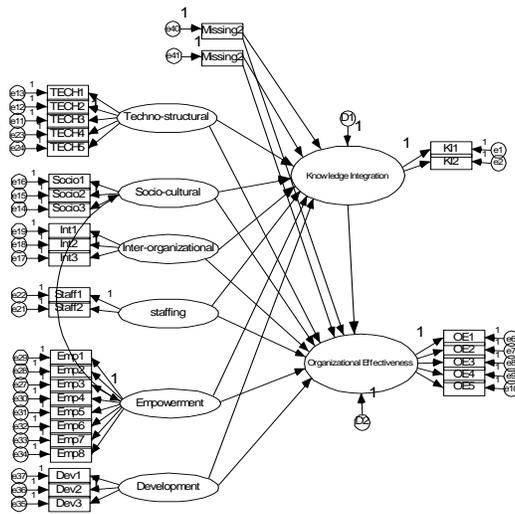


Figure 15. Modeling Multi-collinearity 2

This model was not converged because the covariance matrix between Empowerment and the Socio-cultural Dimension was not positive definite. Another alternative to solving the unidentification problem would be to impose a constraint (e.g., specifying a path as zero). It means a change in the previous hypotheses, and the change should be supported by sound theoretical reasons. It may be arbitrary to choose one of the paths in the model and impose a constraint. Therefore, this approach has not been taken.

Another way of modeling multi-collinearity is by using a higher order factor that is reflected by the highly-correlated factors (Bagozzi, 1994). This approach could be justified not only for this methodological reason but also for some theoretical reasons. In the first chapter of this paper, the concept of human capital was introduced as a broader concept than human resources in terms of its scope. Emphasizing the importance of managing so-called “knowledge between humans,” Stiles and Kulvisaechana (2003) assert that the effect of HRM practices is only part of the equation for the effective

utilization of human capital to enhance organizational effectiveness because they focus only on achieving an individual employee's practice proficiency with their knowledge, skills, and experience. According to knowledge integration researchers (e.g., Grant, 1996b), effective utilization of human capital can be achieved by coupling the HRM approach with the knowledge management approach that facilitates the capacity of employees to add to the reservoirs of knowledge (e.g., database), skills, and experience by integrating others' knowledge.

Some of the indicators to measure the construct of Empowerment are related to the concept of "human capital" in terms of each individual's knowledge being reflected in work processes and decision-making (such as "My ideas and opinions count at work" and "Decision making and control are given to employees doing the actual work"). The construct of the Socio-cultural Dimension (the socio-cultural aspect of knowledge management that addresses the capacity of individual workers to integrate knowledge that other stakeholders have) was measured by the two indicators ("Work groups are trained to incorporate the opinions of each member" and "The work atmosphere encourages open and honest communication"). These two constructs may constitute the higher factor of "Human Capital," which means organizational practices to manage "knowledge between humans" effectively. Therefore, these two factors may have similar variance patterns with each other. In other words, the overlapping part between knowledge management and HRM is the construct of 'Human Capital' that includes the empowerment aspect of HRM and the socio-cultural aspect of knowledge management.

A new model (Figure 16) was specified by including Human Capital as a second-order factor reflected by two first-order dimensions (the Socio-cultural Dimension and Empowerment).

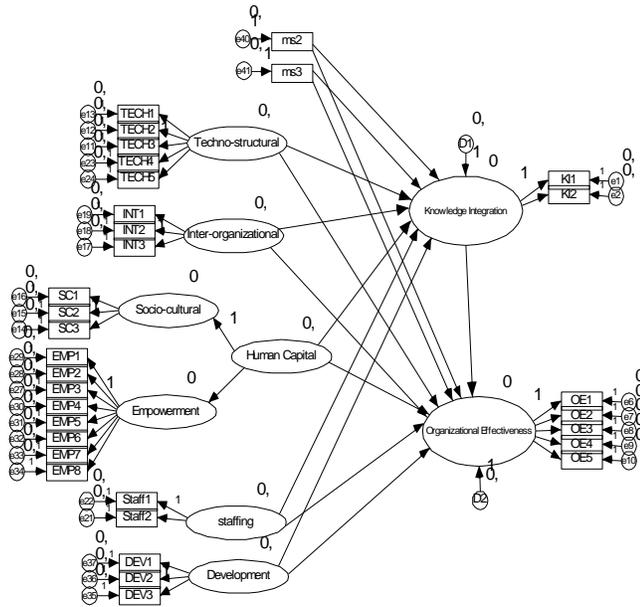


Figure 16. Modeling Multi-collinearity 3

This model converged to a solution, but had a problem in it that the loadings of the Socio-cultural Dimension and Empowerment for “Human Capital” were too high (.995 and .994 respectively). It was concluded that there was no reason for using both of the first-order factors because they had almost the same variance patterns. Based on the results of a series of tests that had been done, all of the attempts to resolve the multi-collinearity by modeling multi-collinearity were not effective due to a severely high correlation between the two factors. Therefore, the researcher decided to employ the second option, which is to make some changes in the measurements.

Changes in the measurements can be made by 1) using Principal Components Analysis (PCA) or Exploratory Factor Analysis (EFA), 2) combining redundant variables into a composite variable, and 3) eliminating variables (Bacon, 1997; Kline, 2005). The first approach (using PCA or EFA) is often used to determine the best combination of variables for a composite measure. Compared to the others, this method may cause a higher level of overfitting in the process of model induction through PCA or EFA. The researcher decided to minimize this problem. The second approach was not chosen because the combination of indicators for Empowerment and the Socio-cultural Dimension factors seemed to be too broad to measure “the socio-cultural aspect of knowledge management practice.”

For SEM analysis, the researcher chose the third approach by including one factor (The Socio-cultural Dimension) and excluding the other (Empowerment). It seemed to be the most legitimate solution because the main interest of the present study was to examine the effect of knowledge management on organizational effectiveness, and the Empowerment factor was a control in the model. In summation, a seven-factor model (Figure 17) that excluded the Empowerment factor was chosen as an initial SR model to test for SEM analysis because it was an alternative closest to the original research model and supported by methodological and theoretical reasons. Further, the assessment of construct validity was conducted by examining factor loadings in the final model after estimating the structural portion.

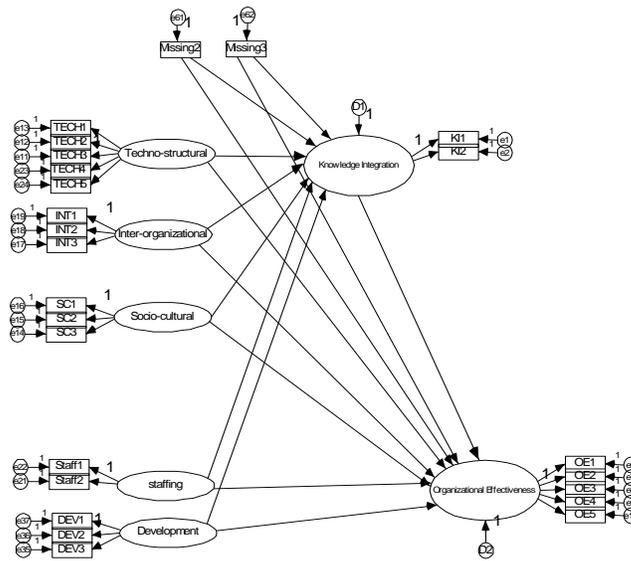


Figure 17. Modeling Multi-collinearity 4: The Initial SR Model

3.2 Testing the Structural Model

This second part of SEM analysis presents the results of testing the hypothesized relationships between latent constructs. The presentation falls into four parts: Model specification, model identification, model validation, and path analysis to test the model structure.

3.2.1 Model Specification

Figure 18 illustrates the specification of the initial SR model with the modified measurements. While this SR model was used to test the structural model, Figure 18 presents the hypotheses about the relationships between the factors in the model (H1 through H7).

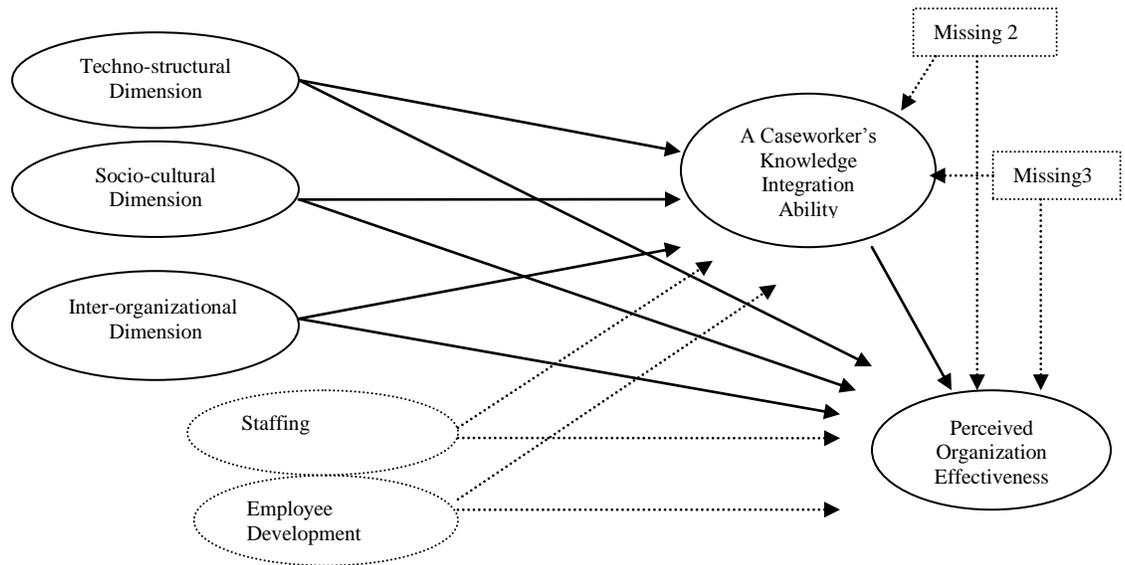


Figure 18. The Structural Portion of the Initial Model

Since knowledge management practices are the main interests of the study, two factors associated with HRM practices and two factors associated with missing patterns are drawn in dotted lines. Note that the Sobel test for mediating effects concerns the product of indirect coefficients.

3.2.2 Model Identification

Before estimating the initial SR model, the structural model was examined to determine whether it was identified. First, this model satisfied the requirement of identification as structural equation model. With 23 observed variables, the model has 276 ($23 \times 24 / 2$) observations available to estimate 68 parameters, which include 40 variances (of 5 exogenous factors, 23 measurement errors, and 2 disturbances), 23 factor loadings, and 15 direct effects. The degrees of freedom (208) were not zero. Second, this also satisfies the identification requirement for a path model because it is a recursive

model, in which causal effects are unidirectional and the disturbances are independent (Kline, 2005).

3.2.3 Model Validation

Model validation is discussed in two parts: 1) the estimation of the initial structural model and 2) model refinement to identify the final model for path analysis.

3.2.3.1 Estimation of the Initial Structural Model

The initial structural model was fitted in Mplus using the MLR estimator (Mplus Version 5.1 software). The analysis converged to an admissible solution. For model validation, values of selected fit indexes were examined. A chi-squared goodness of fit test for this model rejected the null hypothesis that the sample co-variance matrix is equal to the model co-variance matrix ($\chi^2 = 2989.975$, $p < .001$, $df=241$), indicating a poor model fit. In order to take the effect of the sample size on the statistic, the normed chi-squared goodness of fit was inspected by dividing the χ^2 with df . The value of 12.04 was still higher than the critical value (5.0). Considering the discussion in Chapter III about the possibility of a Type II error (rejecting something true) in a very large sample, it would not be appropriate to make a decision about model validation based on this statistic due to the large sample size of this study (5,445).

The other model fit indexes that are less sensitive to the sample size effect, however, indicated that the model fit was in an acceptable range. The CFI value of .955 was close to a conservative cut-off ($\geq .96$). The RMSEA for this model was .046 ($\leq .05$), with its 90% confidence interval of .044 through .047. The SRMR value (.036) was also

below the cutoff value ($\leq .05$). Overall, these fit indices indicated that the SR model fit the data adequately.

Given that the overall model fit was validated, the study examined its model structure. Factor loadings and the path estimates for the initial structural model are presented in Table 6 and Table 7 respectively. Table 6 shows that all indicator items were loaded successfully on their respective latent variables.

Table 6. Factor Loadings of the Initial Structural Model

Observed Variable	Standardized Estimate	Standard Error (S.E.)	Critical Ratio (t-value)	P value
<i>Organizational Effectiveness</i>				
Quality_Service	.811	.007	115.197	<.001
Improve_Service	.699	.010	72.077	<.001
Goals_Met	.750	.008	89.922	<.001
Low_Error	.754	.009	87.281	<.001
Efficiency	.746	.009	82.563	<.001
<i>A Caseworker's Knowledge Integration Ability</i>				
Right_Information	.793	.008	98.953	<.001
Act_Intelligently	.829	.007	111.861	<.001
<i>The Techno-Structural Dimension</i>				
Easy_to_Find	.829	.008	101.122	<.001
Data_Presentation	.857	.007	115.506	<.001
Reliability	.896	.006	160.393	<.001
Thoroughness	.858	.007	118.505	<.001
Support_Decision	.798	.009	90.96	<.001
<i>The Socio-cultural Dimension</i>				
Open_Communication	.765	.009	85.158	<.001
Get_Opinion	.692	.011	63.559	<.001
Train_Incorporate	.777	.009	86.653	<.001
<i>The Inter-organizational Dimension</i>				
With_Other	.839	.008	107.843	<.001
With_Govern	.777	.010	79.237	<.001
With_Public	.795	.009	89.387	<.001
<i>Staffing</i>				
Work_Amount	.791	.009	89.173	<.001
Work_Pace	.895	.008	110.754	<.001
<i>Employee Development</i>				
Train_Growth	.904	.006	142.838	<.001
Train_Task	.922	.006	152.694	<.001
Access_Info	.722	.011	64.738	<.001

Although the initial model has a good overall model fit and a good measurement structure, Table 7 shows that this model included non-significant paths that contributed to model complexity: Organizational Effectiveness and the Socio-cultural Dimension ($t = 1.068$, $p = .268$), A Caseworker's Knowledge Integration Ability and Staffing ($t = -0.169$,

p = .866), A Caseworker's Knowledge Integration Ability and Employee Development (t = 0.55, p = .582). Missing3 and Organizational Effectiveness (t = 1.898, p = .058). The goal of SEM analysis is to find the most parsimonious model which fits the data well (Garson, 2009). This goal is normally achieved by post hoc model refinement that involves model building (e.g., adding more paths) and/or trimming (e.g., deleting non-significant paths).

Table 7. Path Estimates of the Initial Structural Model

Observed Variable	Unstandardized Estimate	Standardized Estimate	Standard Error (S.E.)	Critical Ratio (t-value)	P value
<i>Organizational Effectiveness ON</i>					
A Caseworker's Knowledge Integration Ability	.550	.515	.039	13.205	<.001
The Techno-structural Dimension	-.050	-.047	.015	-3.189	.001
The Socio-cultural Dimension	.042	.048	.045	1.068	.286
The Inter-organizational Dimension	.123	.115	.024	4.857	<.001
Staffing	.233	.295	.019	15.427	<.001
Employee Development	-.064	-.072	.015	-4.831	<.001
Missing2	-.118	-.070	.018	-3.925	<.001
Missing3	.036	.022	.011	1.898	0.058
<i>A Caseworker's Knowledge Integration Ability</i>					
The Techno-structural Dimension	.077	.077	.017	4.497	<.001
The Socio-cultural Dimension	.482	.586	.040	14.717	<.001
The Inter-organizational Dimension	.183	.183	.027	6.744	<.001
Staffing	-.003	-.003	.020	-0.169	.866
Employee Development	.008	.010	.018	0.550	.582
Missing2	-.146	-.092	.021	-4.504	<.001
Missing3	.046	.030	.013	2.257	.024

3.2.3.2 Model Refinement

Given that the model's fit indices were within the acceptable range for all statistics except the chi-square value, any attempt to improve the model fit through model building was not necessary because it would also increase the model complexity. However, the existence of non-significant paths suggests the need for model refinement through model trimming. Model trimming was performed in an attempt to develop a more parsimonious model by removing non-significant paths, one at a time if the deletion was supported at a

theoretical level (Garson, 2009; Kline, 2005). A path was removed by constraining its path coefficient to zero.

Every time a path was removed, a difference test was conducted to examine whether the simpler model was significantly worse than the complex model. These two models are called nested models, referring to two models that are identical except that one of the models constrains some of the parameters (the null or revised model) and one does not have those constraints (the alternative model). A significant test result indicates that the null model becomes parsimonious at the cost of a significant decrease in model fit.

According to a UCLA website ("Introduction to SAS", n.d.), the test for difference between nested models that use the MLR estimator requires special procedures because the typical chi-squared difference test is not valid in this situation. This test compares the log-likelihoods for the null and alternative models rather than the chi-squared values. Different null models were compared with the alternative (or initial) model by using special formula on the website.

The path with the lowest critical ratio in the initial model was the path of "A Caseworker's Knowledge Integration Ability on Staffing" ($t = -0.169$, $p = .866$). Originally, this path was included in the model because it is recommended that paths be drawn among factors unless there is strong evidence of no correlations between the factors. In addition, staffing could affect knowledge integration indirectly even though it was not a direct factor. The insignificant path coefficient suggested that the influence of staffing on knowledge integration was limited. A difference test indicated that the fit of

the simpler model (Revised Model 1) was not significantly worse than the more complex model (Initial Model). Based on the statistical and theoretical reasoning, it was concluded that this revised model was a better alternative to the initial model. For a similar reason for this path, the path of “A Caseworker’s Knowledge Integration Ability on Employee Development” ($t = 0.55$, $p = .582$) was deleted. This revised model (Revised Model 2) was not significantly worse than the initial model.

The next subject to be deleted was the path of “Organizational Effectiveness on the Socio-cultural Dimension” ($t = 1.068$, $p = .268$). This path was the direct effect of the socio-cultural dimension of knowledge management practices after taking into account its indirect effect. A decision was made to retain this path because it was one of the main factors for assessing direct and indirect effects.

The insignificant path of “Organizational Effectiveness on Missing3” was deleted because there was little theoretical evidence that this missing pattern was correlated with the factor. The model without this path (Revised Model 4) was still not different from the initial model. The path of “Organizational Effectiveness on Missing3” was significant but had very minimal effect on the size (the coefficient of .03). After fixing this path as zero, there was no difference between the revised model (Revised Model 5) and the initial model.

The path of “Organizational Effectiveness on the Techno-structural Dimension” was considered for deletion because this coefficient was significant but its effect size was quite small (the coefficient of -.047). Like the path of “Organizational Effectiveness on the Socio-cultural Dimension,” this path was the direct effect of “the Techno-structural

Dimension of Knowledge Management Practices” after taking into account its indirect effect on “Organizational Effectiveness” through the mediator variable. In addition, the difference between the model without this path (Revised Model 6) and the initial model was significant. Therefore, a decision was made to retain this path and stop model refinement at this point.

Table 8 summarizes SEM results of comparing the nested models. The model fits for the nested models are described in detail in the columns between the third through the seventh in the Table. The fit indices for the revised models suggested that they were all in the acceptable range. The structure patterns were also very similar between the initial model and revised models. Overall, Revised Model 4 was the most parsimonious model that was not significantly different from the initial model, meaning that the changes in the model did not change the substantive interpretations of the initial model. Thus, this model was deemed appropriate as the final model used to evaluate the hypotheses.

Table 8. A Comparison of Nested Models

Model	Paths deleted from the initial model ¹	χ^2 / df	CFI	RMSEA	SRMR	Difference test ²
Initial Model		60928.719 / 299	.955	.046	.036	
Revised Model 1	KI on staff	60928.719 / 299	.955	.046	.036	.86
Revised Model 2	KI on staff; KI on Develop	60928.719 / 299	.955	.046	.036	.83
Revised Model 3	KI on staff; KI on Develop ; OE on Ms3	60928.719 / 299	.955	.046	.036	.39
Revised Model4	KI on staff; KI on Develop ; OE on Ms3; KI on Ms3	60928.719 / 299	.954	.045	.036	.06
Revised Model 5	KI on staff; KI on Develop ; OE on Ms3; KI on Ms3; OE on Tech	60928.719 / 299	.954	.045	.036	.001***

¹ OE: Organizational Effectiveness; KI: A Caseworker’s Knowledge Integration Ability, Develop: Employee Development; Ms3: Missing3; Staff: Staffing; and Tech: The Techno-structural Dimension

² Test for difference of the model from the initial model

Factor loadings and the path estimates for the final model are presented in Table 9 and Table 10 respectively. Table 9 shows that all indicator items were loaded significantly on their respective latent variables ($p < .001$) with very high factor loadings. Table 10 indicates that most of the paths in the final model were significant. To test the hypothesized relationships between the factors in the research model, the researcher conducted path analysis. The results of this analysis are summarized in the next section.

Table 9. Factor Loadings for the Final Model

Observed Variable	Measurement Item	Standardized Estimate	Standard Error (S.E.)	Critical Ratio (t-value)	P value
<u>Organizational Effectiveness</u>					
Quality_Service	We are known for the quality of service we provide.	.699	.010	72.072	<.001
Improve_Service	We are constantly improving our services.	.750	.008	89.844	<.001
Goals_Met	Our goals are consistently met or exceeded.	.811	.007	115.153	<.001
Low_Error	We produce high quality work that has a low rate of error.	.754	.009	87.291	<.001
Efficiency	We are efficient.	.746	.009	82.617	<.001
<u>A Caseworker's Knowledge Integration Ability</u>					
Right_Information	The right information gets to the right people at the right time.	.793	.008	99.146	<.001
Act_Intelligently	We integrate information and act intelligently upon that information.	.829	.007	112.442	<.001
<u>The Techno-structural Dimension</u>					
Easy_to_Find	Our computer systems enable me to easily and quickly find the information I need.	.829	.008	101.125	<.001
Data_Presentation	The information available from our computer systems is reliable.	.857	.007	115.509	<.001
Reliability	Our computer systems provide thorough information.	.896	.006	160.401	<.001
Thoroughness	Overall, our computer information systems present data in an understandable way.	.858	.007	118.509	<.001
Support_Decision	Our computer systems help me make better decisions at work.	.798	.009	90.964	<.001
<u>The Socio-cultural Dimension</u>					
Open_Communication	The work atmosphere encourages open and honest communication.	.764	.009	85.209	<.001
Get_Opinion	An effort is made to get the opinions of people throughout the organization.	.690	.011	63.827	<.001
Train_Incorporate	Work groups are trained to incorporate the opinions of each member.	.775	.009	87.203	<.001
<u>The Inter-organizational Dimension</u>					
With_Other	We work well with other organizations.	.839	.008	107.848	<.001
With_Govern	We work well with our governing bodies (the legislature, the board, etc.).	.777	.010	79.169	<.001
With_Public	We work well with the public.	.795	.009	89.394	<.001
<u>Staffing</u>					
Work_Amount	The amount of work I am asked to do is reasonable.	.791	.009	89.304	<.001
Work_Pace	The pace of the work in this organization enables me to do a good job.	.894	.008	110.867	<.001
<u>Employee Development</u>					
Train_Growth	Training is made available to us for personal growth and development.	.904	.006	142.874	<.001
Train_Task	Training is made available to us so that we can do our jobs better.	.922	.006	152.696	<.001
Access_Info	We have access to information about job opportunities, conferences, workshops, and training.	.722	.011	64.737	<.001

Table 10. Path Estimates for the Final Model

Parameter	Unstandardized Estimate	Standardized Estimate	Standard Error (S.E.)	Critical Ratio (t-value)	P value
<i>Organizational Effectiveness ON</i>					
A Caseworker's Knowledge Integration ability	.545	.510	.039	13.037	<.001
The Techno-structural Dimension	-.050	-.046	.015	-3.195	.001
The Socio-cultural Dimension	.055	.062	.044	1.408	.159
The Inter-organizational Dimension	.122	.115	.024	4.819	<.001
Staffing	.232	.294	.019	15.772	<.001
Employee Development	-.064	-.072	.015	-4.899	<.001
Missing pattern 2	-.126	-.074	.018	-4.225	<.001
Missing pattern 3					
<i>A Caseworker's Knowledge Integration Ability ON</i>					
The Techno-structural Dimension	.078	.078	.017	4.658	<.001
The Socio-cultural Dimension	.502	.609	.031	19.474	<.001
The Inter-organizational Dimension	.179	.179	.027	6.55	<.001
Staffing					
Employee Development					
Missing pattern 2	-.151	-.096	.021	-4.596	<.001
Missing pattern 3					

3.2.4 Path Analysis: Testing the Model Structure

Path analysis was conducted with the final model in order to test seven hypotheses about relationships between the factors: Four about the direct effects and three about mediating effects.

3.2.4.1 Hypothesis Testing for Direct Effects

The first part of this path analysis was conducted to test the four hypotheses associated with direct effects in the research model:

Hypothesis 1: There will be a positive relationship between the perceptions of caseworkers with regard to the degree of support provided by the techno-structural dimension of knowledge management practices and their perceived level of knowledge integration ability.

Hypothesis 2: There will be a positive relationship between the perceptions of caseworkers with regard to the degree of support provided by the socio-cultural dimension of knowledge management practices and their perceived level of knowledge integration ability.

Hypothesis 3: There will be a positive relationship between the perceptions of caseworkers with regard to the degree of support provided by the inter-organizational dimension of knowledge management practices and their perceived level of knowledge integration ability.

Hypothesis 4: A caseworker's perceived level of knowledge integration ability will have a positive association to perceived organizational effectiveness after taking account into HRM effects.

The sign and magnitude of the direct effects are represented by path coefficients in Figure 19.

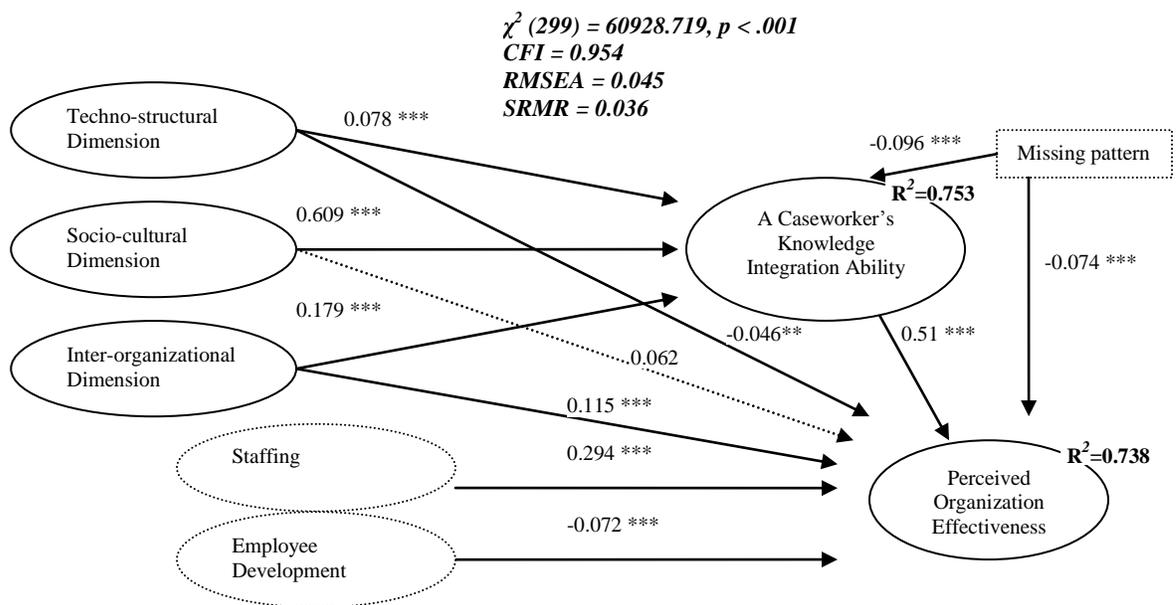


Figure 19. Path Analysis: Results

Table 11 shows the standardized coefficient (β) and the corresponding probability value for each hypothesized path in the model.

Table 11. Path Coefficients for Direct Effects

Hypothesis	Paths ¹	Estimate	S.E.	C.R.	Probability	Comment
H1	Techno-structural -> KI	.078	.017	4.658	<.001	Partially supported
H2	Socio-cultural -> KI	.609	.031	19.474	<.001	Supported
H3	Inter-organizational -> KI	.179	.027	6.55	<.001	Partially supported
H4	KI -> OE	.510	.039	13.037	<.001	Supported

¹ Techno-structural: The Techno-structural Dimension; Socio-cultural: The Socio-cultural Dimension; Inter-organizational: The Inter-organizational Dimension; OE: Organizational Effectiveness; and KI: A caseworker's knowledge integration ability

Hypothesis 1 was supported statistically by the data. The path coefficient between the techno-structural dimension of knowledge management practices and the level of a caseworker's knowledge integration ability was $\beta = .078$ ($p < .001$). This result suggested that this hypothesized path coefficient in the model was statistically significantly different from zero at the 95 percent confidence level. Although this path was statistically significant, in part due to the very large sample size, the strength of the effect represented by the parameter estimate was minimal based on Cohen's criteria for interpreting (less than .1). Therefore, the interpretation of this coefficient is unwarranted, and further accumulation of evidence is needed to confirm this relationship (Kline, 2005).

Hypothesis 2 was about the effect of the socio-cultural dimension of knowledge management practices to enhance the level of a caseworker's knowledge integration ability. Based on its path coefficient ($\beta = .609$, $p < .001$), this group of practices was a strong predictor of knowledge integration based on Cohen's criteria (higher than .5) and the most influencing factor compared to the other dimensions of knowledge management practices.

Hypothesis 3 was also supported from the statistical point of view. The standardized path coefficient between the inter-organizational dimension of knowledge

management practices and the level of a caseworker's knowledge integration ability ($\beta = .179, p < .001$) supported this hypothesis. Like Hypothesis 1, however, the magnitude of its effect size requires further evidence to verify this relationship.

Hypothesis 4 was supported based on the significant path coefficient between the level of knowledge integration ability and organizational effectiveness ($\beta = .510, p < .001$). This result indicated that the level of knowledge integration ability was a strong predictor of perceived organizational effectiveness even after taking account into the effects of the two dimensions of HRM practices (staffing and employee development). Moreover, this factor was a much stronger factor for organizational effectiveness in the model compared to staffing ($\beta = .294$) and employee development ($\beta = -.072$).

3.2.4.2 Hypothesis Testing for Mediating Effects

In Chapter III, this study hypothesized that the level of a caseworker's knowledge integration ability would mediate relationships between three dimensions of knowledge management practices and organizational effectiveness as followings.

Hypothesis 5: The impact of the techno-structural dimension of knowledge management practices on perceived organizational effectiveness will be mediated by a caseworker's knowledge integration ability.

Hypothesis 6: The impact of the socio-cultural dimension of knowledge management practices on perceived organizational effectiveness will be mediated by a caseworker's knowledge integration ability.

Hypothesis 7: The impact of the inter-organizational dimension of knowledge management practices on perceived organizational effectiveness will be mediated by a caseworker's knowledge integration ability.

Although the bias-corrected bootstrapping method was considered the best option for testing these mediating effects, the researcher decided to use the Sobel test because

bootstrapping was not available for the MLR estimator. Given that the violation of sampling distribution of the indirect effect (*ab*) are concerns in a small sample and the Sobel test works well in large samples (Preacher & Leonardelli, 2006), this choice can be justified given the large sample size in the present study. Three hypothesized mediating effects were tested by using the Mplus analytic feature “model = indirect,” which allows the Sobel test of indirect effects. Table 12 summarizes the results of this test.

Table 12. Results of Testing Mediating Effects

Hypothesis	Paths ¹	Sobel Estimate	S.E.	C.R.	Probability	Comment
H5	Techno-structural -> KI -> OE	.040	.009	4.275	<.001	Partially supported
H6	Socio-cultural -> KI -> OE	.311	.030	10.378	<.001	Supported
H7	Inter-organizational -> KI -> OE	.091	.015	6.047	<.001	Partially supported

¹ Techno-structural: The Techno-structural Dimension; Socio-cultural: The Socio-cultural Dimension; Inter-organizational: The Inter-organizational Dimension; OE: Organizational Effectiveness; and KI: A caseworker’s knowledge integration ability

Combined with statistical information from Table 12, the decomposition of effects in Figure 20 provides useful information about Hypothesis 5. The Sobel test of the indirect effect of the techno-structural dimension of knowledge management on organizational effectiveness via knowledge integration ($.078 \times .51 = .04$) showed that this statistic was significantly different from zero at the .05 significance level ($p < .001$) (Sobel test = .04, $p < .001$). This result indicates that the level of a CPS caseworker’s knowledge integration ability mediated the relationship between the techno-structural dimension of knowledge management and organizational effectiveness. Its direct effect after controlling for the mediator was negative (-.046). This negative direct effect contributed to its negative total effect (-.006), which was calculated by summing its

indirect effect and direct effect. Although there is little information about the effect size of Sobel test in the literature, the significant result of the small Sobel test value may be due to the large sample size. Therefore, further studies are needed to confirm this result.

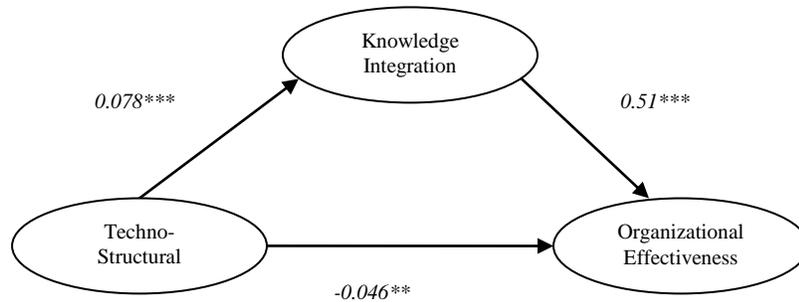


Figure 20. Mediating Model: The Techno-structural Dimension

Figure 21 illustrates the relationships associated with Hypothesis 6. The Sobel test regarding the indirect effect of the socio-cultural dimension of knowledge management via knowledge integration ($.609 \times .51 = .311$) showed that this statistic was significantly different from zero ($p < .001$). With the large Sobel test value (.311) this result supports Hypothesis 6 that a caseworker's knowledge integration ability (mediator) mediates the effect of the socio-cultural dimension of knowledge management on organizational effectiveness. An examination of the relative contribution of the direct and indirect effects suggested that most (83%) of the total effect (.37) was indirect.

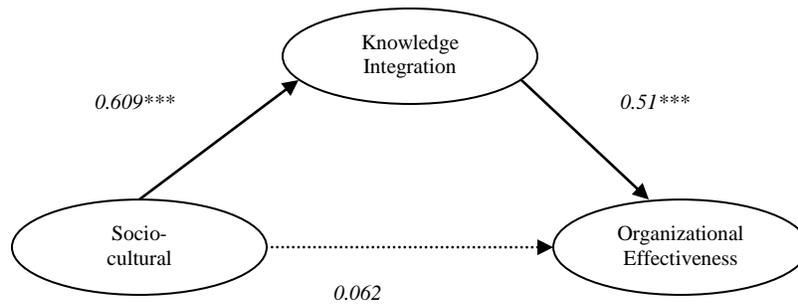


Figure 21. Mediating Model: The Socio-cultural Dimension

Figure 22 shows the results of testing Hypothesis 7. A Sobel test regarding the indirect effect of the inter-organizational dimension of knowledge management on organizational effectiveness via knowledge integration ($.179 \times .51 = .091$) supports Hypothesis 7 about its indirect effect ($p < .001$). The direct effect of this dimension of knowledge management practices after controlling for the mediator was .115. A significant amount (44.3%) of the total effect (.21) was indirect. Like Hypothesis 5, this hypothesis was considered partially supported due to the small Sobel test value.

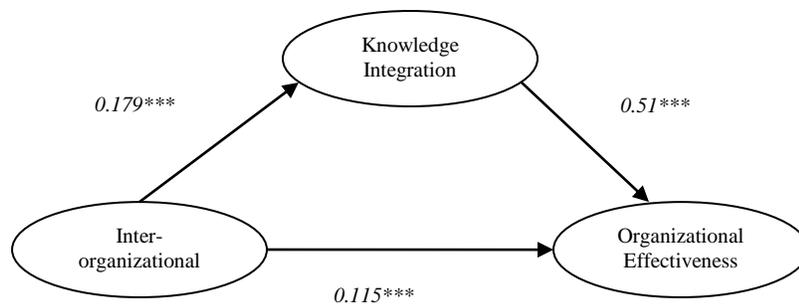


Figure 22. Mediating Model: The Inter-organizational Dimension

4 Hypotheses Testing for Competing Models

The last group of hypotheses to test concerns the usefulness of the process-oriented knowledge management framework that was developed in the present study.

Hypothesis 8: When compared to a direct model that hypothesizes associations between knowledge management practices and perceived organizational effectiveness, a mediation model will improve predictions about perceived organizational effectiveness.

Hypothesis 9: When compared to a direct model that hypothesizes the combined effect of IT resources, inter-organizational communication support, and HRM practices on perceived organizational effectiveness, a knowledge-based and process-oriented mediation model will improve predictions about the perceived organizational effectiveness.

Figure 23 presents the patterns of structural path in these competing models. The first two models (Mediation Model and Direct Model 1) incorporate three predictor variables based on the knowledge management framework developed in the present study.

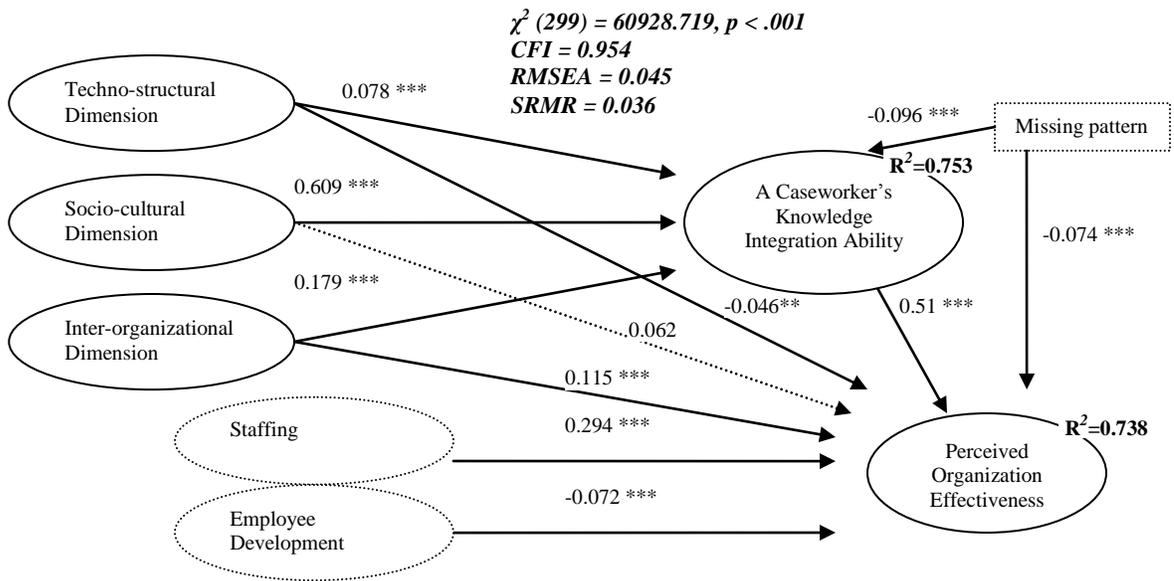


Figure 23-a Mediating Model

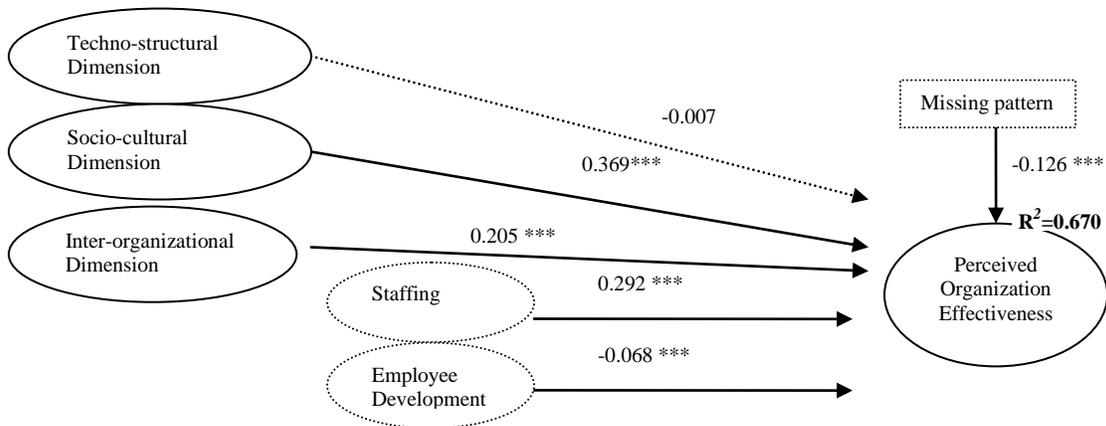


Figure 23-b Direct Model 1

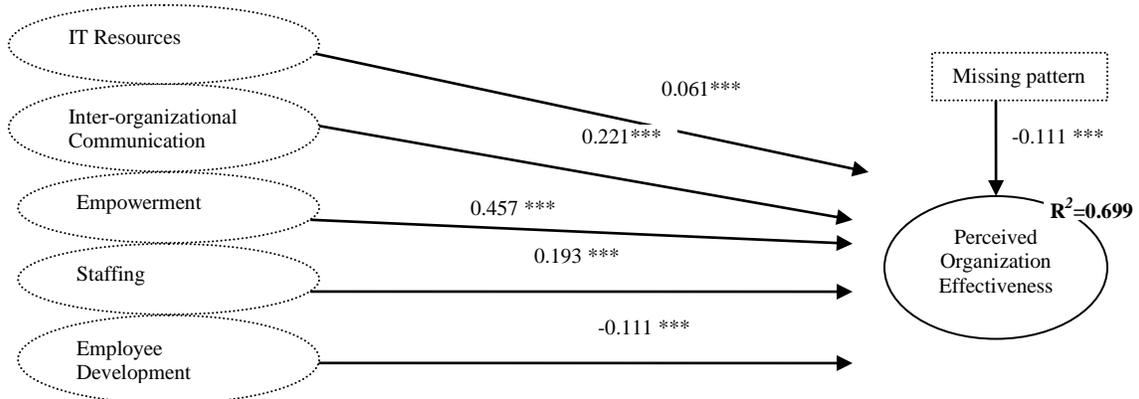


Figure 23-c Direct Model 2

Figure 23. A Comparison of Competing Models

The difference between these two models is whether the mediator was included in the model. Direct Model 2 is an alternative model that embraces some non-HRM practices (such as IT resources and inter-organizational communication) without applying the knowledge management framework. Table 13 presents AIC, BIC, and R-squared values that were used for the purpose of comparing these competing models. The model fit indices were also presented as reference.

Table 13. Fit Indices for Competing Models

	Mediation Model	Direct Model 1	Direct Model 2
χ^2 / df	60928.719 / 299	54872.824 / 252	43549.843 / 189
CFI	.954	.953	.955
RMSEA	.045	.048	.045
SRMR	.036	.038	.034
AIC	269875.554	248649.669	291146.082
Sample-Size Adjusted BIC	270218.031	248954.473	291471.435
R^2 for OE	.738	.670	.699

Note: Mediation Model: the final model chosen in the present study

Direct Model 1: a direct model that eliminates a mediator from the final model

Direct Model 2: a direct model that does not apply the knowledge management framework

Based on the model fit indices for model comparison (AIC and BIC), the first two models that had predictor variables based on the knowledge management framework displayed better model fit than the one that did not (Direct Model 2 with the highest AIC and BIC values), suggesting the usefulness of the knowledge management framework. The AIC was clearly lower for the direct model (Direct Model 1) than the proposed research model (Mediation Model), suggesting that the former fitted the data better than the latter in terms of covariance matrix. This is not consistent with the argument that the

mediation models would explain organizational effectiveness better than one-stage models (Ashworth *et al.*, 2004; Barua *et al.*, 1995; Radhakrishnan *et al.*, 2008).

The squared multiple correlation (R^2) values provided different information about model selection. The research model explained the most variance of organizational effectiveness (73.8%) compared to Direct Model 1 (67%) and Direct Model 2 (69.9%). It means that that the proposed mediation model explained the most variance in organizational effectiveness than the other alternatives did.

Based on these statistics, it is not easy to select one model as the best. While it is not uncommon that different criteria provide conflicting results about model selection, any mechanical judgment based on statistical measures, such as model fit indices, should not override human judgment (Browne, 2000). In addition, SEM is intended to establish statistical significance in the traditional sense (Kline, 2005; Fan & Wang, 1998) rather than find an alternative model based on model fit, model parsimony, model prediction, and theoretical reasoning.

The proposed research model that incorporates a knowledge-based and process-oriented framework reduced some amount of error variance (3.9%) from a model based on the previous studies (Direct Model 2). This model also reproduced the sample variance and covariance better than the other. Although this model had poorer model fit than a direct model, it explained more variance of criterion variables than the other alternative did. Moreover, mediating effects were confirmed by the previous test for mediating effects. These competing models had similar structural patterns. From a theoretical perspective, the knowledge management framework has a practical usefulness

because the framework would guide the development of specific knowledge management practices. Taken altogether, it was concluded that the proposed mediation model was deemed as a better model compared to the other alternatives.

5 Chapter Summary

In order to examine the influence of knowledge management practices on organizational effectiveness in CPS agencies, this chapter evaluated the empirical usefulness of the process-oriented KMS framework that had been developed based on literature review in the previous chapter. This investigation was conducted based on the 2008 SOE survey of CPS caseworkers' perceptions about their work environment in the Texas DFPS.

The first three hypotheses (Hypothesis 1 through Hypothesis 3) were tested to investigate the first stage of the framework: The effectiveness of the knowledge management system (KMS) on its output.

Hypothesis 1: There will be a positive relationship between the perceptions of caseworkers with regard to the degree of support provided by the techno-structural dimension of knowledge management practices and their perceived level of knowledge integration ability.

Hypothesis 2: There will be a positive relationship between the perceptions of caseworkers with regard to the degree of support provided by the socio-cultural dimension of knowledge management practices and their perceived level of knowledge integration ability.

Hypothesis 3: There will be a positive relationship between the perceptions of caseworkers with regard to the degree of support provided by the inter-organizational dimension of knowledge management practices and their perceived level of knowledge integration ability.

In other words, whether three dimensions of knowledge management practices addressing knowledge processes from an STS actually enhanced the level of a CPS caseworker's knowledge integration ability, was tested.

Surprisingly, the test results of Hypothesis 1 suggested that effects of the techno-structural dimension of knowledge management practices were minimal. Its total effect on organizational effectiveness was even negative. Although further studies are needed to verify these statistical results based on the large sample, this finding is consistent with some review studies reporting negative and neutral impacts of IT on organizational effectiveness (Barua *et al.*, 1995; Downing, 2004; Kohli & Devaraj, 2003; Ravichandran & Lertwongsatien, 2005). Possible reasons for this unexpected finding are discussed in the next chapter.

The survey provided strong empirical evidence for Hypothesis 2. Along with the fact that the standardized coefficient of the socio-cultural dimension of knowledge management practices was higher than the other dimensions, this organizational intervention was critical to enhance organizational effectiveness. Another related finding was that the measurement of this intervention was the same as that of empowerment, which has been considered as HRM practices.

Like the Hypothesis 1, there was limited evidence for Hypothesis 3. It means that further study is needed to verify positive impacts of the inter-organizational dimension of knowledge management practices. Based on its standardized coefficient, this intervention seems to be a stronger predictor than the techno-structural dimension.

Testing for Hypothesis 4 was seen in the second stage of the research model: The impact of the output of KMS (the level of a caseworker's knowledge integration ability) on organizational outcomes.

Hypothesis 4: A caseworker's perceived level of knowledge integration ability will have a positive association to perceived organizational effectiveness after taking account into HRM effects.

The testing result for this hypothesis indicated that the level of a caseworker's knowledge integration ability was a strong predictor for organizational effectiveness even after controlling for HRM practices. Its standardized coefficient suggests that it was a stronger factor than HRM practices.

The next three hypotheses (Hypothesis 5 through Hypothesis 7) were about the mediating effects of each dimension of knowledge management practices on organizational effectiveness via knowledge integration.

Hypothesis 5: The impact of the techno-structural dimension of knowledge management practices on perceived organizational effectiveness will be mediated by a caseworker's knowledge integration ability.

Hypothesis 6: The impact of the socio-cultural dimension of knowledge management practices on perceived organizational effectiveness will be mediated by a caseworker's knowledge integration ability.

Hypothesis 7: The impact of the inter-organizational dimension of knowledge management practices on perceived organizational effectiveness will be mediated by a caseworker's knowledge integration ability.

Sobel tests confirmed the mediating effects. These findings were consistent with the argument of some researchers for using mediation models rather than direct models to

evaluate the effect of knowledge management practices on organizational effectiveness (Barua *et al.*, 1995; Edge, 2005).

The usefulness of the research model proposed in the present study was evaluated by comparing it with competing models as stated in the following hypotheses.

Hypothesis 8: When compared to a direct model that hypothesizes associations between knowledge management practices and perceived organizational effectiveness, a mediation model will improve predictions about perceived organizational effectiveness.

Hypothesis 9: When compared to a direct model that hypothesizes the combined effect of IT resources, inter-organizational communication support, and HRM practices on perceived organizational effectiveness, a knowledge-based and process-oriented mediation model will improve predictions about the perceived organizational effectiveness.

Statistical tests provided mixed information about whether the proposed model was a better option compared to a direct model with the knowledge management framework (Hypothesis 8) and another direct model that did not apply knowledge management framework (Hypothesis 9). Based on a consideration of theoretical issues and practical implications, however, it was concluded that the proposed model was more useful than the other competing models. Overall, SEM results supported the potential usefulness of the mediation model using the knowledge management framework developed in the present study. Implications and limitations of these findings are discussed in the next chapter.

CHAPTER V: DISCUSSION

This dissertation study moved away from identifying the needs and barriers that CPS caseworkers face when they try to integrate multiple stakeholders' knowledge across various boundaries. After exploring the three major management approaches covered in previous CPS research and practices – Human Resources Management (HRM), information management, and IT-focused knowledge management, the researcher acknowledged that the recent research trend focusing on knowledge management is relevant here because this approach aims to address the practitioner's knowledge needs and to overcome barriers to meeting these needs.

However, empirical studies that have reported on the negative impact of IT on organizational effectiveness in child welfare and human services organizations (Burton & van den Broek, 2006; Froggett, 1996; J. U. Schneiderman *et al.*, 2007; Tregeagle & Darcy, 2008; Weaver *et al.*, 2003) suggest that previous studies were still limited regard to their understanding of why current organizational interventions have not addressed the needs and barriers more effectively. In order to address this research gap, the present study aimed to answer the question of how CPS caseworkers can be supported by their agency in the integration of knowledge resources within and outside of organizational boundaries, thereby contributing to organizational effectiveness.

An extant literature review identified some limitations in the current research on knowledge management as to the answering of this research question. The current discourse about interventions is still of an information-based perspective, focusing on technology-mediated solutions, while IT inherently has limitations in facilitating the

knowledge processes especially at the pragmatic level. Most of the evaluation studies on knowledge management intervention have used a direct model, and this has limitations with regard to the understanding of the complex relationships between various knowledge management practices and organizational effectiveness.

Firmly rooted in a knowledge-based perspective, the present study proposed a research model with a caseworker's knowledge integration ability as a mediating variable in order to test the effectiveness of a knowledge management system (KMS) from a socio-technical system (STS) perspective. This mediation model was empirically tested by the statistical analysis of a sample of CPS caseworkers in the Texas DFPS as to their perceptions of work conditions in their immediate workplace. Results from the SEM analysis have supported most of the proposed hypotheses and the usefulness of the proposed research model.

This final chapter discusses the results of the study in the following manner. The first section discusses the major research findings from the present investigation. Next, the implications of these findings for current social work practice, research, and education are highlighted. Then, the limitations of the study are outlined, followed by the conclusions drawn.

1 A Discussion of the Major Findings

This section interprets and discusses the major research findings that are helpful to the development of effective knowledge management so as to enhance organizational effectiveness in CPS agencies. The key findings to be discussed in this section include:

- 1) That a CPS caseworker's ability to integrate knowledge is a critical factor in determining organizational effectiveness from the CPS caseworker's point-of-view;

- 2) That the techno-structural dimension of knowledge management practices have a positive but small impact on the level of a CPS caseworker's knowledge integration ability and a negative direct effect on organizational effectiveness;
- 3) That the socio-cultural dimension of knowledge management practices is a critically important factor in attempts to increase the level of a CPS caseworker's knowledge integration ability;
- 4) That the inter-organizational dimension of knowledge management practices is an important factor toward increasing the level of a CPS caseworker's knowledge integration ability;
- 5) That the relative importance of knowledge management practices confirms the STS perspective of KMS presented in this study; and
- 6) That there is multi-collinearity between the socio-cultural dimension of knowledge management practices and the empowerment dimension of HRM practices.

1.1 A Caseworker's Knowledge Integration Ability

The present study found that, from a CPS caseworker's point-of-view, their knowledge integration ability is an important predictor of organizational effectiveness. Moreover, its effect is stronger than that resulting from HRM practices such as staffing and employee development. This finding is consistent with the argument from some child welfare researchers about the importance of knowledge integration ability of caseworkers (e.g., Fitch, 2006; Jones, 1993; Schoech *et al.*, 2002).

It also confirms that a knowledge-based view of the organization that is presented by a knowledge integration researcher (Grant, 1996a) is relevant for CPS agencies. Grant argues that knowledge integration is a key concept for organizational effectiveness in knowledge intensive organizations, and that therefore, it is important for this kind of agency to enhance organizational capacity in order to support knowledge integration. CPS agencies have the characteristics of knowledge intensive organizations, which Grant

has presented in the following manner: Service requires a wide array of specialized knowledge that is distributed among multiple individuals; There is a lack of correspondence among different knowledge agents; and Speed in integrating knowledge is critical in the enhancement of organizational effectiveness.

The present study is an attempt to deepen current knowledge-based discourse in the child welfare field that have focused on knowledge management without having a more deep and thorough understanding of the concept of knowledge integration. In this study, the term knowledge integration refers to a process that takes place in an individual caseworker's mind when he/she integrates distinct knowledge from different sources into their own. As discussed at length at Section 1.4, based on Carlile's insights about different modes of knowledge integration (2004), the present study focused on "the transformation mode of knowledge integration," a concept that involves knowledge processes at the syntactic, semantic, and pragmatic levels, because it is the one that CPS caseworkers normally use. The level of a CPS caseworker's knowledge integration ability is the extent to which a CPS caseworker can successfully integrate external knowledge at these levels. Therefore, results with respect to the importance of knowledge integration ability can be extrapolated to mean that organizational effectiveness from the CPS caseworker's point of view depends on the extent to which they have been able, not only to obtain knowledge of different stakeholders, but also to correctly understand the meanings and successfully integrate conflicting knowledge into coherent new knowledge.

In this study, knowledge integration ability is conceptualized to be a result of the employment of knowledge management practices. The empirical evidence about the

relative importance of knowledge integration ability over HRM suggests that effective knowledge management practices are more important than HRM practices. In addition, the results of the mediation analysis confirmed that a caseworker's knowledge integration ability had a mediating effect on the relationship between knowledge practices and organizational effectiveness. These findings indicate that knowledge management practices should be specifically designed in a way that they enhance knowledge integration.

According to Carlile (2004), an optimal knowledge management strategy that CPS agencies should employ is that of the facilitation of all of the sub-processes of knowledge integration (the knowledge processes at the syntactic, semantic, and pragmatic levels). This can be attained by employing various approaches of knowledge management practices. Given this researcher's argument about the limitations of technology in facilitation at the semantic and pragmatic levels, the present study argued that CPS agencies should employ knowledge management practices that are both techno-structural (i.e., develop efficient computer systems) and socio-cultural approaches (i.e., a policy for encouraging open communication). Based on the argument that inter-organizational knowledge management is an important factor for knowledge integration in an environment where knowledge integration generally takes place across organizational boundaries (Knight & Pye, 2002, 2005), the present research also emphasized the importance of the inter-organizational approaches (i.e., inter-organizational coordination in order to share knowledge among stakeholders).

As a systemic approach to the development of effective knowledge management practices in CPS agencies, the present study proposed a process-oriented Knowledge Management System (KMS) framework. This framework was developed by applying Carlile's insights about the knowledge integration process (2004) to the open system framework that sees KMS as a system of input-process-output (IPO) (Yew *et al.*, 2003). The key to this KMS is the enhancement of the respective organization's knowledge management capability to support a CPS caseworker's ability to process different stakeholders' knowledge (input) so as to integrate it into their own case knowledge (output). According to the discussion of optimal knowledge management strategy, outlined in the above paragraph, the capacity to process knowledge can be enhanced by the implementation of this set of three dimensions of knowledge management practices: the techno-structural, socio-cultural, and inter-organizational. Hence, the following three parts discuss the empirical findings about the effectiveness of these three dimensions of knowledge management practices.

1.2 Techno-structural Knowledge Management Practices

The development of this dimension of knowledge management practices was mainly based on the argument that the major reasons that negative or neutral effects from IT use were found in some IT studies were as a result of IT design failure and the inappropriate approach of evaluating its effect on organizational effectiveness (Barua *et al.*, 1995; Edge, 2005). These researchers have argued that IT may not be able to accomplish its objective if IT is not appropriately designed and implemented to support the core tasks in a given organization. They further have argued that IT effects should be

evaluated with regard to how well they support these tasks (i.e., the output of a certain intervention), rather than on their direct influence on organizational effectiveness (i.e., the outcome of the intervention).

The present study attempted to extend previous IT research by changing the perspective of IT from information-based to knowledge-based, and by incorporating this perspective into the framework of KMS. IT was redefined in the research model as the techno-structural dimension of knowledge management practices that support knowledge integration, with the latter having been identified as a core task for a CPS caseworker. This dimension is regarded simply as part of a KMS whose overall objective is to enhance a CPS caseworker's knowledge integration ability. This dimension of knowledge management practices was developed by applying the IT development principles that Boland and colleagues (1994) argue are helpful, specifically with regard to the enhancement of knowledge integration. The principle includes ownership (e.g., to clarify who is the owner of certain knowledge), easy travel (e.g., to make it easy to navigate across related documents), multiplicity (e.g., to compare differences in knowledge among multiple stakeholders), mixed forms (e.g., to present data in diverse forms, like audio-visual), and emergence (e.g., to display how original ideas have emerged into a decision).

In section 3.1.1 of Chapter II, the researcher argued that Boland and colleague's framework of IT principles would be useful as the techno-structural dimension of knowledge management practices in CPS agencies. The use of this framework was supported by discussing how these principles address knowledge processes not only at the syntactic but also at the semantic and pragmatic levels that Carlile (2004) stresses.

The usefulness of this framework was tested with empirical data in the mediation model where the impact of this dimension of knowledge management practices is separated into two parts: the indirect effect mediated by output (a caseworker's knowledge integration ability) and the direct effect on outcome (organizational effectiveness).

Interestingly, the results are not in reasonably good agreement with the previous arguments. Before discussing the results of this investigation in detail, it is wise to recall that the effect sizes associated with this construct were small, suggesting that these results should be interpreted with caution. The total effect of the techno-cultural dimension of knowledge management practices on organizational effectiveness as perceived by CPS caseworkers in the Texas DFPS was found to be significantly negative ($\beta = -.006$).

The negative total effect of this construct is a finding that is consistent with some previous empirical studies reporting on the negative and neutral impact of IT on organizational effectiveness (Burton & van den Broek, 2006; Froggett, 1996; J. U. Schneiderman *et al.*, 2007; Tregeagle & Darcy, 2008; Weaver *et al.*, 2003). However, this contradicts other research reporting on the positive impact of IT in child welfare settings (Andersen *et al.*, 1994; Schoech, 2002; D. C. Smith & Grinker, 2005). In a dissertation study that used a SOE data set (Huang, 1999), the IT impact on organizational effectiveness in human services had a similarly small but 'positive' effect size ($\beta = .062$). Even considering that the measures of IT and research settings in this study are different from those in the present study, both studies did not find strong evidence for technology-mediated interventions. These results raise a question as to

whether technology development alone is sufficient for workplace reform in CPS agencies.

The mediation model in the present study provided more detailed, useful information about this negative total effect. As expected, the techno-structural knowledge management practices had a positive impact with regard to increasing a CPS caseworker's knowledge integration ability ($\beta = .078$). Based on the argument that IT support contributes to knowledge integration but its benefits are partial (Majchrzak *et al.*, 2005) and the assertion that IT is necessary but insufficient for knowledge management (Hislop, 2002; McDermott, 1999; Walsham, 2001), this small effect had been somewhat expected. Therefore, choosing Boland *et al.*'s framework to develop the techno-structural dimension of knowledge management practices may be a judgment call for administrators and researchers. Given that the application of this framework had a small effect and did not explicitly address the issue of the knowledge process at the semantic level, this framework can be expanded or improved by adding more IT design principles that contribute to improving its effect on knowledge integration.

Interestingly, the negative total effect was caused by its direct effect on organizational effectiveness ($\beta = -.046$) offsetting its positive effect on a caseworker's knowledge integration ability. This finding about the conflicting IT effect on organizational effectiveness may be explained with the argument that there are both positive and negative aspects of IT impact on a workplace (Bresnahan *et al.*, 2002). Burton & van den Broek (2006, 2008) has closely studied the possible negative impact of IT on human service workers and has stated that knowledge management has a

potentially negative influence on performance. In a study based on interview data from social workers in several Australian agencies, these researchers (Burton & van den Broek, 2008) examined professional interactions with, and responses to, changes in their task performance after the introduction of new technologies. Social workers felt that IT did not serve to enhance their work, reporting little discretion over the flow of it and increased tasks in case recording and service evaluation. The belief that IT can reduce workload may be a myth.

These studies about the potential negative impact of IT are useful to help explain why the present study found that techno-structural knowledge management practices had a negative impact on organizational effectiveness. The IT design principles suggested by Boland and colleagues are based on the perspective of those who use the information provided by a computer system. Therefore, a computer system that reflects such principles would be useful for a CPS caseworker as a “user” who tries to integrate knowledge through the system. In the CPS context, however, a caseworker is both an information user and information provider (or input agent). The fact that a respondent can find thorough information from the computer system also means that he/she should input detailed information into it. A heavy documentation load may lead to a lack of time for CPS caseworkers working with clients. Therefore, this kind of system could have a negative impact on organizational effectiveness, even when it increases workers’ knowledge integration ability. It is vital to identify and prevent the potential hazards and negative effects of technology-mediated intervention and increase its positive effect.

The lack of support for the usefulness of applying Boland *et al.*'s framework to enhance organizational effectiveness may indicate that this framework is not suitable for developing the techno-structural dimension of knowledge management practices in the CPS context. However, this lack of support can also be attributed to the possibility that this framework was not properly applied in this study. In this regard, the present study evaluated IT impact based on perceptions of the caseworkers that have used a single state-wide computer system. Therefore, differences in the variance of the factors are presumably due to the disparity in individual workers' perceptions about the same system rather than due to an actual difference in the IT design among different computer systems.

Second, the measurements used in the present study could not exactly reflect the constructs presented by the researcher. Although a new measurement of the techno-structural dimension of knowledge practices was added to the existing SOE survey, it was difficult to customize the questionnaires in a manner that would match with the original construct because the SOE survey was administered to many employees with various backgrounds and designed in order to assess the general aspects of an agency in terms of its strengths and weaknesses. Likewise, the construct of knowledge integration ability could not be properly measured by the following items: "The right information gets to the right people at the right time" and "We integrate information and act intelligently upon that information." Based on this information, it is not clear whether a respondent has the ability to integrate knowledge at the syntactic, semantic, and pragmatic levels.

Third, selection bias may be part of the problem here as well. Hence, the introduction of additional variables may yield quite different results that could otherwise

be found. STS knowledge management researchers (Hislop, 2002; McDermott, 1999; Walsham, 2001) have argued that IT can do little to promote more efficient and effective knowledge management when an unbalanced emphasis on IT has been set up without employing other knowledge management practices to complement its limitations. This synergistic effect may be evaluated better by examining the interaction effects among the three knowledge management practices.

According to the contingency theory, the nature and magnitude of IT benefits is influenced by other organizational design factors, and the success of an IT-enabled process varies according to other knowledge management practices that are utilized, such as a good fit among the IT, corporate culture, business, and HR policies (Schnitt, 1993) and the team's norms in its usage of the IT (Majchrzak *et al.* 2000, Mark 2002). Another potential factor may be whether workers actually use IT in relation to their tasks.

Although a computer system has functionalities that support workers, such as to be able to more quickly find needed information, its influence on outcome may be minimal when it is not well-integrated into actual work processes.

In conclusion, while Boland *et al.*'s framework seems to have the potential to guide IT development to enhance knowledge integration, this would be in a rather incomplete manner. Further studies are needed to expand this framework and to find better research models that explain the complicated associations among the techno-structural dimension of knowledge management, knowledge integration, and organizational effectiveness.

1.3 Socio-cultural Knowledge Management Practices

Unlike the techno-structural dimension of knowledge management practices, for which a specific framework (i.e., Boland Jr. *et al.*, 1994) was applied and tested, the present study did not introduce any specific framework for the socio-cultural dimension. However, it attempted to incorporate the major issue in an STS perspective of KMS, which is the “complementary” interplay between the social and technical parts of KMS. The two practices utilized in this study to measure this dimension (i.e., the encouragement of open communication and the training of employees to incorporate others’ opinions) focus on complementing the most serious limitations of IT use in the CPS context where stakeholders have diverse opinions and interests about the same issue: the lack of capability to facilitate the knowledge process at the pragmatic level.

As hypothesized, the socio-cultural dimension of knowledge management practices was found to be a critical factor toward increasing a CPS caseworker’s knowledge integration ability ($\beta = .609$). Most (83%) of its total effect on organizational effectiveness ($\beta = .37$) was the indirect effect through the knowledge integration ability. Therefore, the discussion about its impact focuses on the association between this intervention and a caseworker’s knowledge integration ability. These findings are consistent with the arguments about the need for socio-cultural knowledge management, such as fostering a better organizational culture for knowledge sharing (Coakes *et al.*, 2002), a more knowledge management friendly culture, as well as improved practice and social networking communities (Comorera & Luzon, 2004). These findings are more convincing and provide more practical implications than such arguments because they

confirm the theoretical argument that CPS agencies should explicitly employ the socio-cultural knowledge management practices that facilitate the knowledge process at the pragmatic level in order to promote the transformation mode of knowledge integration.

Despite the empirical evidence, the study results provide limited practical implications for CPS agencies because the knowledge management practices in this study (i.e., the encouragement of open communication) are general in nature, rather than specific. For better practical implications, researchers should suggest more specific principles that are useful to the development of the socio-cultural dimension of knowledge management practices. Such an attempt has been made. An empirical study (Jarvenpaa & Majchrzak, 2008) applied Boland *et al.*'s framework (1994), which had been originally developed to guide IT development, to the context of dialogic communication (dialogic practices). The dialogic practices include: discussing the sources of ideas and information (ownership), discussing alternative scenarios for a problem (multiplicity), attempting to understand how information changes over time (emergence), etc. The researchers found that the frequency of using these practices by professionals in the field of protecting national security during their communication with others increased the extent to which the workers could understand a given situation; this is comparable to the concept of knowledge integration ability in the present study.

Although the present study did not find strong evidence for the usefulness of Boland *et al.*'s framework in the development of the techno-structural dimension of knowledge management practices, the dialogic practices discussed above may be useful for the socio-cultural dimension in the CPS context. When this framework is applied to

dialogic practices in a face-to-face communication context, its negative impact (e.g., the burden of documentation) is minimal. In further studies, CPS researchers may try to apply this framework or others to the development of specific knowledge management practices in the socio-cultural dimension. The present study contributes to such further research by suggesting that researchers should pay special attention to the facilitation of the knowledge process at the pragmatic level.

It should be acknowledged that the previous discussion of the techno-structural and socio-cultural dimensions has not explicitly addressed the issue of facilitating the knowledge process at the semantic level. The knowledge process at this level can be somewhat facilitated in the environment where caseworkers communicate with others through a computer system, which has a certain informational structure, or where they can clarify word meanings or confusing text during face-to-face communication. However, this limitation should be explicitly addressed in future research in order to develop an improved KMS framework.

1.4 Inter-organizational Knowledge Management Practices

The present study included the inter-organizational dimension of knowledge management practices as a distinct part of KMS, apart from the techno-structural and socio-cultural ones. It has paid attention to the fact that knowledge management at the inter-organizational level is different from that at the intra-organizational one since the types and levels of challenges for each vary (Chen *et al.*, 2007). It would be more challenging to implement knowledge management practices at the inter-organizational level than at the intra-organizational level.

As often occurs, when caseworkers communicate with stakeholders outside of their agency without a shared computer system, simply obtaining any information can be rather challenging. Understanding each other's knowledge is even difficult through face-to-face communication because inter-organizational groups of people may interpret the same knowledge differently and ambiguously due to diverse communication styles, practice sets, and domain schemes among the distinct organizations (Jarvenpaa & Majchrzak, 2005). The difference in political interest between the stakeholders within an organization (e.g., between a caseworker and a program director) may differ from that in the inter-organizational context (e.g., between a caseworker and a client). Without inter-organizational authority-control (formal and informal rules, policies, etc.), a single agency may face significant difficulty addressing and overcoming these barriers.

Considering the unique challenges that CPS caseworkers face during their knowledge integration process in the inter-organizational context, the present study has emphasized that the inter-organizational-dimension of knowledge management practices should be specifically designed to address these barriers. However, the measurement for this construct in the present study (e.g., working well with other organizations, our governing bodies, and the public) was even less specific than that of the socio-cultural dimension. In other words, the information of "working well" does not provide any useful information for developing specific practices. Still, the main reason for the inclusion of this construct measure was to test the hypothesis that this dimension would be a distinct one in the framework of KMS.

The empirical data in this study supported this hypothesis. The inter-organizational dimension was a significant factor toward increasing a caseworker's knowledge integration ability ($\beta = .179$), even after controlling for the effect of the other dimensions. Its total effect on organizational effectiveness was found to be positive ($\beta = .21$). This finding is consistent with the argument that inter-organizational knowledge management is an important factor for knowledge integration in an environment where knowledge integration mostly takes place across organizational boundaries (Knight & Pye, 2002, 2005).

The empirical evidence for including this dimension in a KMS is consistent with the argument of James & Shan (1999), who feel that a KMS consists of the techno, social, and environment sub-systems. The researchers state that the environmental subsystem is composed of elements in an environment where the organization competes or collaborates. In the CPS context, this system may include clients, other agencies, and a host of other outside forces, such as their governing bodies (the legislature, the board, etc.). In this sense, the present study supports the importance of the inter-organizational dimension of knowledge management practices so that CPS caseworkers are able to work well with the public, other organizations, and with the governing bodies.

The mediation analysis in this study provides more useful information about the effect of this dimension of practices on organizational effectiveness. Its indirect effects constituted less than half (44.3%) of the total effect. It suggests that the practices in this dimension are not designed specifically to serve the purpose of employing knowledge management, which is to support knowledge integration. This result is not too surprising,

as the measurement for this dimension of knowledge management practices is not conceptually related to knowledge management. The measurement here was chosen based on the argument that “most” inter-organizational collaboration or communication activities aim to enable stakeholders from diverse settings to share their expertise, ideas, and information across organizational boundaries (Sanders & Roach, 2006; Vulliamy & Sullivan, 2000).

Our data shows that the meaning of “We work well with other organizations” may include something other than the work environment supports caseworkers in integrating knowledge from other agencies. For example, even when a caseworker can successfully integrate the opinions of stakeholders with respect to what is the best service for a client, there is a chance that he/she cannot receive that service for a variety of reasons (e.g., the service providers do not have enough financial resources). Although individual CPS agencies have a limited capability to increase the latter part of collaboration (e.g., the actual service provision), they can improve the former part (e.g., supporting knowledge integration ability) by employing effective inter-organizational knowledge management practices. By doing so, they can prevent any case from being negatively affected by communication problems.

The present study pays close attention to the finding that much, if not most, of the effect of inter-organizational collaboration on organizational effectiveness depends on the extent to which a CPS agency can support their caseworkers’ knowledge integration ability. This “knowledge management oriented” organizational collaboration ensures the continuity of child welfare care by connecting different stakeholders who are scattered

geographically and chronologically. Therefore, the findings discussed in this section are convincing, with regard to the argument that CPS agencies should develop an inter-organizational dimension of knowledge practices that are specifically designed to facilitate knowledge processes at the syntactic, semantic, and pragmatic levels in the inter-organizational communication context.

1.5 The Relative Importance of Knowledge Management Practices

The previous discussion about the three dimensions of knowledge management practices confirms the STS perspective about the KMS presented in the study that each dimension plays a distinctive role in the enhancement of a CPS caseworker's knowledge integration ability. On the other hand, special attention must be paid to the relative importance of these dimensions. The socio-cultural dimension was found to be the strongest predictor, followed by the inter-organizational and the techno-structural dimensions.

This pattern is compared to that found in a dissertation study that was conducted in 1999 using another set of SOE data to examine the relationship between predictors and organizational effectiveness in human service organizations (Huang, 1999). Although Huang's study differs from the present study in terms of the subjects (employees in human service organizations vs. CPS caseworkers, respectively) and measurements, it is worthwhile to pay attention to the similarities and divergences in the pattern between these two studies.

In order to compare these two studies, Table 14 presents the major predictors for organizational effectiveness and their beta values in a model in Huang's study that

includes only significant predictors (p. 122). These predictors are presented along with comparable variables in the present study. The third column in the table presents some comments that are useful in comparing the present study with Huang's. For example, the measurement of Team Effectiveness in Huang's study includes items such as "We are efficient" and "Employee productivity is high." Each item in this construct could be the "result" of employing a certain intervention, suggesting that they are not compatible with the other predictors. Therefore, this construct is excluded from this comparison. The present study includes the item of "We are efficient" in the measurement of Organizational Effectiveness.

Table 14. A Comparison of the Relative Importance of Predictors: versus Huang's Study

Predictor (Beta values) in Huang's study	Measurement item	Comment	Comparable construct in the present study and total effect
Team effectiveness	- "We are efficient" - "Employee productivity is high" - And others	Considered as the result of other interventions => may be more compatible with the measurement of organizational effectiveness	Organizational effectiveness (Dependent Variable)
Working with the public (.275)	- "We are working well with the public"	Related to the inter-organizational dimension of knowledge management practices	Inter-organizational dimension of knowledge management practices (.21)
Communication (.047)	- "We are working well with other agencies" - "We are working well with our governing bodies"	Related to the inter-organizational dimension of knowledge management practices	
Empowerment (.210)	- "Every employee is valued" - "Work groups are trained to incorporate the opinions of the member" - "Work atmosphere encourages open and honest communication" - And others	Similar to the measurement of empowerment in the present study but includes two items used to measure the socio-cultural dimension of knowledge management practices	Socio-cultural dimension of knowledge management practices (.37)
IT availability (.062)	- "Employees have adequate computer resources" - "Computerized information is easily shared among divisions in this organization" - And others	Replaced with IT development principles specifically to enhance knowledge integration ability	Techno-structural dimension of knowledge management practices (-.006)

While the measurement of Empowerment in Huang's study is similar to that in the present study, it does include two items that the present study conceptualizes as The Socio-cultural Dimension of Knowledge Management Practices: "Work groups are trained to incorporate the opinions of the member" and the "Work atmosphere encourages open and honest communication." The fact that these items were loaded into this construct in Huang's study is consistent with the multi-collinearity between these two constructs in the present study.

Huang's study measured the construct of Communication by "We are working well with other agencies" and "We are working well with our governing bodies (e.g., the legislature, the board, etc.)." By combining this construct with the construct of Working with the Public in Huang's study, the present study conceptualized a new construct of the Inter-organizational Dimension of Knowledge Management Practices.

In order to evaluate the impact of IT more correctly, in this study the measurement of IT availability was replaced by the measurement of the Techno-structural Dimension of Knowledge Management Practices. Although these two constructs are considered similar, the new measurement reflects the design principles specifically in order to enhance knowledge integration.

A comparison between the first and the last column provides three discussion points: 1) the strongest predictor differs across the studies; 2) the impact of the techno-structural dimension in these studies has opposite directions; and 3) in both studies, the socio-cultural dimension is a stronger predictor of organizational effectiveness than the techno-structural one.

First, the comparison indicates that the inter-organizational dimension is the strongest predictor of organizational effectiveness in Huang's study while the socio-cultural dimension is the strongest in the present study. This discrepancy may result from the difference in the subjects and measurements used in these two studies. More importantly, this examination indicates that both of these dimensions are critical predictors.

Second, the effect of the techno-structural dimension in these studies moves in opposite directions. The opposite directions in the beta values may be due to the difference between the measurements. This argument is confirmed by comparing Huang's model with one of the alternative models in the present study, which is described under Section 4 in Chapter 4. "IT resources," which is very similar to "IT availability" in Huang's study, yields the positive effect of organizational effectiveness, with the beta value of .061. This value is very similar to the effect size of "IT availability" in Huang's study ($\beta = .062$).

Although this positive association in Huang's study is consistent with the common belief that IT contributes to improvements in organizational effectiveness, this may be attributed to the measurement having more directly asked whether IT is useful for them to conduct their task. In assessing the level of satisfaction with IT, this kind of measurement would be useful for a general survey of organization as conditions like the SOE. However, the results obtained in using this kind of measurement would not provide practical information for organizations that want to improve their knowledge management systems. On the other hand, the present study tested a specific framework of

IT development principles and identified its advantages and disadvantages. This information has useful implications for CPS research and practice in terms of providing a direction for the further development of IT features specifically to support workers' knowledge integration ability.

Third, both studies suggest that the socio-cultural dimension is a stronger predictor of organizational effectiveness than that of the techno-structural one, which has a small effect size. This analysis supports the focal argument in the present study that knowledge management practices in CPS agencies are required to support the transformation mode of knowledge integration. In other words, it is essential to facilitate the knowledge process at the pragmatic level since it is the key process in this mode of knowledge integration. In facilitating this process, it was found that technology has limitations and that socio-cultural approaches are more effective. Therefore, the socio-cultural dimension of knowledge management practices should not be a lower priority than the techno-cultural one in CPS agencies. It should also be noted that technology is insufficient for the support of the transformation mode of knowledge integration, but it is "necessary." Therefore, the techno-structural dimension should be part of a KMS despite the fact that the effect size was found to be small.

1.6 Knowledge Management and HRM

As the last part of the discussion on the major findings, this section interprets a result from the SEM analysis of the measurement model: the multi-collinearity between the Socio-cultural Dimension of Knowledge Management Practices and Empowerment. These two constructs seem to be heavily correlated or could be one concept, at least in

the case when they are based on the perceptions of the CPS caseworkers. This result is consistent with a result from a principle components factor analysis (PCA) conducted in a dissertation study that used a SOE data set (Huang, 1999, p. 91). The following table shows that the new factor of Empowerment after the PCA differs from that of the one that had originally been defined. The new factor includes some items that the present study views as knowledge management practices in the socio-cultural dimension (e.g., that work groups are trained to incorporate the opinions of each member).

Table 15. The Results of a Principle Components Factor Analysis (Huang, 1999)

FACTOR 7: Empowerment	
<i>New Factor</i>	<i>Original Factor</i>
9. Every employee is valued.	18. Employees feel that they must always go through channels to get their work done.*
10. Managers are committed to incorporating cultural diversity.	27. Employees know how their work impacts other employees in the organization.
15. Information and knowledge are shared openly in this organization.	29. Employees seem to be working toward the same goals.
17. The work atmosphere encourages open and honest communication.	30. There is a basic trust among employees and management.
20. Work groups (that group of people that you have daily contact) are trained to incorporate the opinions of each member.	31. Each employee is given the opportunity to be a leader.
21. Work groups receive adequate feedback that helps improve their performance.	32. Employees feel a sense of pride when they tell people that they work for this organization.
26. Employees have an opportunity to participate in the process of strategic planning and goal setting.	51. New ideas suggested by employees are seriously considered for implementation.
28. Decision making and control are given to employees doing the actual work.	54. People who challenge the status quo are valued.
30. There is a basic trust among employees and management.	
31. Each employee is given the opportunity to be a leader.	
37. Employees feel their efforts count.	
40. Employees are given accurate feedback about their performance.	
51. New ideas suggested by employees are seriously considered for implementation	
53. Creativity and innovation in work are encouraged.	
54. People who challenge the status quo are valued.	

Because all of the attempts to solve the multi-collinearity failed and the focus of the present study is on knowledge management, the researcher chose the Socio-cultural

Dimension of Knowledge Management factor and eliminated the Empowerment factor. However, the better way to manage multi-collinearity is to pay attention to multi-collinearity 'prior to' conducting a study and to develop reliable scales in the first place (Grewal *et al.*, 2004). Although this approach could not be used in the present study that used secondary analysis, an in-depth discussion of this issue would be helpful for future research.

The development of reliable scales of organizational management is ideal but not easy. The two constructs presented here have been emphasized in each of the bodies of literature on knowledge management and HRM, respectively, and have been used as main management practices in the field. Still, the finding of multi-collinearity suggests a close relationship between knowledge management and HRM practices. Therefore, some practices are hard to classify as a single kind of intervention. For example, the organizational intervention of encouraging open and honest communication can be viewed as a knowledge management that is mainly concerned about the employee's ability to obtain knowledge from others. CPS caseworkers may perceive the environment for "open and honest communication" as one where "my opinions are reflected in a decision." This organizational intervention can also be viewed as an empowerment practice that is mainly concerned about whether caseworkers feel that they have some control over their jobs and the outcome of their efforts. Some of the management practices that are recommended by some researchers (Coakes *et al.*, 2002) as knowledge management practices (e.g., a maximum devolution of responsibilities, decision making, and a rewarding system) could be considered to be empowerment practices. Given that

the focus of these researchers is on knowledge management, the “rewarding system” here may mean a system where employees can be rewarded specifically for their knowledge sharing activities.

Although the development of reliable scales of organizational management is challenging, it is not impossible. While the two constructs seem similar to each other, they aim to address different areas (i.e., knowledge management to support workers in integrating knowledge from external sources vs. HRM to self-motivate individual employees to achieve certain goals for the organization with their own skills and knowledge). One way to develop reliable scales would be to make the measurement items more specific and clear and to classify the items as a more proper type of intervention. For example, rewarding each individual’s performance can be classified as a HRM practice, while rewarding for knowledge sharing activities can be viewed as the socio-cultural dimension of knowledge management practice.

From a practical point of view, classifying a certain dimension of management practice would not be an important matter. Rather, it is important to avoid omitting important practices by specifying what kinds of needs and barriers should be addressed and how to do so. It is also possible to add another dimension to the existing HRM. Recognizing the close relationship between traditional HRM practices and knowledge management, Oltra (2005) emphasizes the need for articulately defining “knowledge management-related HRM practices” (i.e., knowledge sharing training, inclusion of knowledge management duties in job design, and productive knowledge sharing being considered for pay reviews).

1.7 Summary of the Major Findings

This first section has discussed the major findings of the present study. These findings explain why information-focused knowledge management interventions have not been and will not be useful toward the enhancement of organizational effectiveness in CPS agencies. It also gives justification as to why this kind of agency should develop various knowledge management practices in the techno-structural, socio-cultural, and inter-organizational dimensions in order to facilitate knowledge processes at the syntactic, semantic, and pragmatic levels. The following figure offers an overview of these findings.

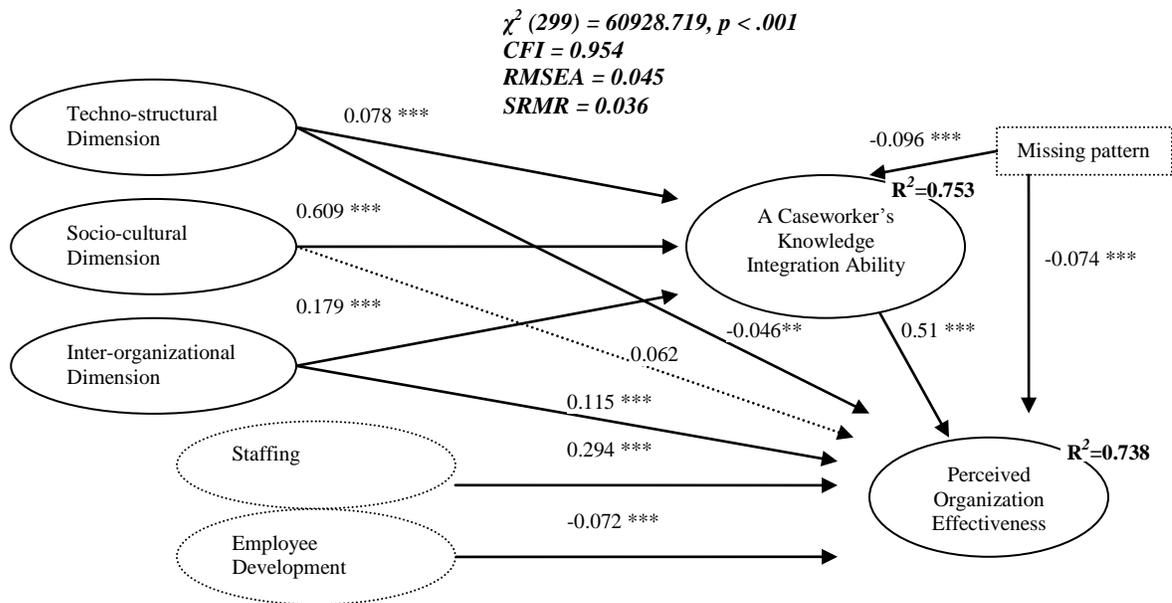


Figure 24. A Graphic Overview of the Major Findings

The usefulness of the proposed research model for the study of knowledge management in CPS agencies also was tested by comparing this model with alternative ones. The empirical evidence noted in Section 4 of Chapter IV suggests that this mediation model is better or comparable to that of the alternative direct models in the

statistical aspect. Moreover, it is also more useful in the practical aspect, providing more detailed information in terms of the effects of certain interventions on output and outcome. This information is also useful for administrators who would like to develop an effective KMS. This finding confirms the recommendation of using mediation models, one that has been offered by many researchers in the fields of organizational effectiveness (Ostroff & Schmitt, 1993; Ugboro & Obeng, 2004), program evaluation (Cozzens, 1997; Rossi *et al.*, 2004), and by information system researchers (Ashworth *et al.*, 2004; Barua *et al.*, 1995; Radhakrishnan *et al.*, 2008).

2 Study Limitations

This section discusses some limitations in the present study, many of which were difficult to address due to the nature of this study — a secondary data analysis. Therefore, caution should be exercised in applying the results of this study to current practice. Recommendations to improve such future studies and research, and with regard to future study needs, are also outlined in this section.

First, the present study used a sample of employees in a single CPS agency in order to test the research model. Therefore, the generalizability of this study's findings to the broader CPS domain is limited. Each subject in the present study is situated in a unique environment that is dependent upon what kind of prior experience they have had, which program they belong to, etc. However, they are affected by similar organizational interventions that are provided by a single agency. Therefore, the model variance may be caused by differences in individual respondents' perceptions, rather than by actual differences in organizational interventions. In order to address this limitation, further

studies will be needed to test the research model by using a sample of caseworkers drawn randomly from different CPS agencies.

Second, the measurements used in this study did not exactly match the constructs posited in the research model. For example, the measurement of the Level of a Caseworker's Knowledge Integration Ability (e.g., "We integrate information and act intelligently upon the information") was stated too broadly to fully incorporate its corresponding concept: that of the degree to which caseworkers perceive that they can integrate external knowledge through knowledge processing at the syntactic, semantic, and pragmatic levels. By including the specific IT development principles that Boland and colleagues think (1994) are critical to enhance knowledge integration, the measurement of the Techno-structural Dimension of Knowledge Management Practices is relatively close to its construct. However, each questionnaire item in this measure could not be stated to match each principle, as then they would not serve the purpose of the SOE survey administered to a wide range of respondents about a general aspect of their workplace. With regard to the socio-cultural and the inter-organizational dimensions, the present study used existing questionnaire items that are considered to represent each construct. Therefore, these measurements do not include specific practices that specifically aim to enhance knowledge integration. Given that a model fit depends on the validity, not only of the structural model but also of the measurement model (Garson, 2009), another study with measurement instruments matched with their constructs may produce different results.

Third, most of the variables in the study are measured by employees' subjective perceptions rather than by objective indicators. Some researchers (Ammenwerth *et al.*, 2003) assert that an evaluation of IT effectiveness should involve both objective data (e.g., time measurement, user acceptance scales, documentation quality measurement) and subjective data (e.g., the perceptions of different user groups). On the other hand, the researchers of a study on federal government agencies (Chun & Rainey, 2005) used only perception-based measurements, asserting that relatively "objective" or quantifiable measures of performance to assess organizational effectiveness of this type of organizations rarely exist. They argued the legitimacy of using perceived measures by reporting positive relations between objective and perceptual measures of organizational effectiveness in previous research.

Campbell (1977) also recommends that organizational effectiveness be measured by having experts in the organization specify what the organizational objectives should be, how they should be achieved, and the degree to which each objective should be satisfied. The present study used the perceptions of an important group of experts in a CPS agency (caseworkers) to measure how successful the agency had intervened in order to achieve their objectives (e.g., knowledge management practices) and the degree to which the objectives had been satisfied (knowledge integration and organizational effectiveness). Although this approach is a legitimate one, it is desirable to verify the findings of this study by conducting others that use somewhat objective indicators (e.g., standardized assessment tools) and perceived indicators that reflect various stakeholders, such as clients and family members.

Fourth, the data analysis involved some violation of the requirements for SEM analysis. For example, the analysis was conducted by treating ordinal variables as continuous variables. Although this approach is not uncommon in social science studies since it is unlikely to result in much practical impact on results (Newsom, 2010), it is always desirable to avoid a violation if possible. Further studies that address the violation of requirements for statistical analysis would increase the validity of the findings.

Lastly, the cross-sectional nature of the present study makes it difficult to suggest the causality with regard to some of the variables of interest. For example, although there is a strong relationship, it is uncertain whether knowledge integration ability is enhanced as a result of organizational practices that encourage open and honest communication. Therefore, future research would be helpful so as to better understand the study's findings when it uses qualitative and longitudinal approaches.

3 Implications

This section discusses the practical implications that have emerged from the major findings in this study. Due to the nature of this study examining the relationships among the variables based on caseworkers' perceptions in the Texas DFPS, the results have direct implications for administrators in this agency. Given that the needs and barriers for CPS caseworkers may not vary significantly across agencies, the implications can extend to administrators in other CPS agencies, researchers, national policy makers, and educators in the CPS field. These implications may also be relevant for social work practice in the other fields, such as child welfare, other protective services, and human services, as practitioners in these fields also face similar barriers when they work with

multiple stakeholders from different backgrounds. The following section outlines the implications for research, practice, policies, and social work education.

3.1 Implications for Research

The major implication from the present study for future social work research lies in its ability to identify major limitations of the current knowledge management research in this field, specifically the focus on technology-mediated interventions and the use of direct research models. This study attempts to fill these research gaps by presenting a mediation model that examines the effectiveness of a process-oriented KMS from an STS perspective.

This mediation process model has partitioned the effect of knowledge management on organizational effectiveness into two components: the direct effect and the indirect effect that is mediated by a caseworker's knowledge integration ability. In terms of organizational intervention, the present study has analyzed a process-oriented KMS based on an open system framework focusing on increasing the knowledge process capability so as to enhance the knowledge integration process. Therefore, it has presented a set of knowledge management practices by utilizing various insights about knowledge processes (Carlile, 2004), IT design principles for enhancing knowledge integration (Boland Jr. et al., 1994), and an STS perspective of KMS (Coakes *et al.*, 2002; James & Shani, 1999; Ng & Li, 2003; Waterson *et al.*, 2002). Moreover, this research model was firmly grounded in theoretical underpinnings and was found useful in its ability to explain complicated associations among IT, knowledge management, knowledge integration, and organizational effectiveness.

In spite of its unique contributions to the domain of knowledge management in social work, the research model and method in this study should be refined and improved by further studies. The major contribution of this study lies in how it can guide future research directions. The researcher recommends that further studies should continue to use the basic framework used in the present study (using a mediation model to evaluate the effect of a process-oriented KMS from an STS perspective, focusing on the organizational capability to facilitate knowledge processes at the syntactic, semantic, and pragmatic levels by using balanced knowledge management practices in the techno-structural, socio-cultural, and inter-organizational dimensions) and address the limitations of this study. This recommendation specifically applies in regard to two areas: 1) the research model and 2) knowledge management intervention in CPS agencies.

First, the empirical evidence for the usefulness of the mediation model in this study implies that future studies should also use a mediation model that includes a process-oriented mediating variable (i.e., knowledge integration) in order to adequately evaluate the effectiveness of knowledge management. The overall usefulness of the research model in the present study supports Barua and colleagues' recommendations of using a mediation process-oriented model (1995) to develop a more targeted and therefore more effective set of knowledge management practices and to properly evaluate the effectiveness of this intervention. This result is consistent with the recommendation of many researchers in the fields of organizational effectiveness (Ostroff & Schmitt, 1993; Ugboro & Obeng, 2004), program evaluation (Cozzens, 1997; Rossi *et al.*, 2004),

and information system researchers (Ashworth *et al.*, 2004; Barua *et al.*, 1995; Radhakrishnan *et al.*, 2008).

Knowledge management researchers (C. Wang *et al.*, 2008) argue that mediation models can lead to a significant improvement over direct models when there is compelling evidence that there is a discernible mediating effect of knowledge integration on the relationship between knowledge management and organizational effectiveness. However, compared to direct models, the research model in this study did not significantly increase the variance of organizational effectiveness from a statistical point of view. This result may be attributed to the relatively small mediating effect of knowledge integration that is associated with the techno-structural and inter-organizational dimensions of knowledge management practices. As discussed earlier, these unexpected results may be because measurements of these constructs did not match their constructs. This problem should be addressed in further research.

Second, the present study has implications for future research in how it can guide empirically-based interventions. In addition to evaluating the effect of an intervention in a more proper way, researchers have the responsibility to provide useful knowledge for practitioners so as to maximize the likelihood of useful invention. In this study, knowledge management is defined as a major management intervention to enhance a caseworker's knowledge integration ability by using a set of knowledge management practices. While the set of practices presented in this study may be used as guidelines in developing practices, they may not be an effective set because they were mostly selected from the existing SOE survey, which is not a knowledge management assessment survey.

Future studies should refine and improve upon this set while maintaining the basic structure of the framework proposed in the present study.

With respect to the techno-structural dimension, Boland *et al.*'s framework of IT development principles (1994) is an alternative tool that has great potential to develop practices within this dimension. Nevertheless, empirical data show that the application of this framework has only a small effect on the enhancement of a caseworker's knowledge integration ability and that it even has a negative effect on organizational effectiveness. If this small effect size is due to limitations in this framework, any improvements in the framework may result in different findings. Therefore, researchers should present a better set of IT development principles, which would be helpful for IT developers to create applications that can increase its positive effect. If Boland *et al.*'s framework is analyzed from a progress-oriented perspective of knowledge integration, this framework is useful in addressing knowledge processes at the syntactic and pragmatic levels, but not at the semantic level. Thus, existing positive IT effects can be increased by adding another principle that addresses the knowledge process at the semantic level (i.e., Common Meanings) to the current framework. Under this principle, IT developers may be more open to and attentive to the need to incorporate a standardized system into their computer system when it is needed (e.g., the risk assessment standards).

The framework can also be improved by adding new principles that reduce any detrimental impact as a result of applying the other principles in the framework (i.e., Efficient Data Entry). As discussed earlier, attempts to increase the capability of IT to enhance a caseworker's knowledge integration ability could also increase their

documentation burden, since they are information providers as well as information users. Practitioners were found to have spent more time documenting case records after a structured case recording system was introduced (Edwards & Reid, 1989). A more recent study also reports that there are an insufficient number of trained personnel available to enter the information in a timely manner (J. U. Schneiderman *et al.*, 2007). Meanwhile, in order to provide better service, social workers want to spend less time on paperwork and more time with clients and family members (Vinokur-Kaplan & Hartman, 1996). Hence, technology should be used to reduce paperwork drudgery and eliminate or reduce unnecessary time traps for its users (Pecora, 2002). Given a mandate to increase the efficiency of data entry, IT developers can develop similar applications to what the Texas DFPS has implemented: a cyber secretary system called SPEAK (Texas DFPS, 2007). Using this system, a case worker records his/her case notes by leaving a voice message. A contractor dictates this message and emails it to the caseworker. The notes can then be edited and uploaded onto the computer system.

As for the socio-cultural dimension, researchers may try to adopt a framework of dialogic practices for knowledge collaboration (Jarvenpaa & Majchrzak, 2008). Therefore, researchers could be able to present a more specific set of practices, including the encouragement of employees to discuss sources of ideas and information (ownership), to discuss alternative scenarios for a problem (multiplicity), to understand how information changes over time (emergence), and so on. This framework, which targets the development of knowledge management practices, may be helpful to resolve the

multi-collinearity problem in the present study and to separate this construct from the empowerment dimension of HRM.

With respect to the inter-organizational dimension, researchers should refine the generic practices in the present study (e.g., working well with the public) into more applicable, specific knowledge management practices. In doing so, the knowledge processes in knowledge integration should be taken into account. These practices include an IT infrastructure for different agencies in order to exchange information, inter-organizational standard systems, and ensuring political equality in communication among stakeholders from different agencies.

In summary, the present study implies that future evaluation studies can make unique contributions to knowledge management research in social work when they continue to use its process-oriented mediation model (with knowledge integration as a mediator variable) and to improve the set of knowledge management practices recommended here. When this kind of evaluation framework is used as a standardized assessment tool to evaluate knowledge management capability across different CPS agencies, it would be useful for benchmarking or comparing the capacity of one agency with another. Given that this would be a challenging task for a single researcher to accomplish, the researcher agrees with Uden and colleagues (2007) in arguing that effective knowledge management research requires an institutionalized network of knowledge researchers working together and managing a shared domain of knowledge.

3.2 Implications for Practice

The major implications of the present study for practice are discussed in two areas: emphasizing the importance of knowledge management in CPS agencies and presenting a KMS framework that is effective in developing knowledge management practices to enhance organizational effectiveness. The importance of knowledge management is supported by the finding that the output of knowledge management practices (knowledge integration) is a much more important factor for organizational effectiveness as compared to HRM practices. Therefore, the researcher agrees with the argument that more attention should be paid to knowledge management in the social work field where HRM has been a major issue of management (M. J. Austin & Kruzich, 2004). Investing in IT development in CPS and child welfare agencies can be viewed as one manner of knowledge management intervention. In this respect, CPS agencies have properly followed the recommendations of researchers in these fields (Fitch, 2006; Schoech *et al.*, 2004) and have paid special attention to knowledge management.

Knowledge management in the field of CPS and related fields such as child welfare and human services organizations has persistently tended to use technology-focused approaches. A study that was conducted a decade ago (Huang, 1999), reported that human service organizations had increased IT operating expenses over time. In a survey study of 203 nonprofit, human services organizations, Schneiderman (2002) claimed that the budget for IT benefits was still too small (less than 40 percent) and many participants of this study (75 percent) reported that they would benefit from investment in information technology. The introduction of and continued innovation of IT have been a

major focus in workplace reforms in the Texas DFPS (Texas Department of Family and Protective Services, 2002, 2003, 2006, 2007). According to a recent report on a program for older youth transitioning out of foster care (Yaroni *et al.*, 2010), additional investment in IT is needed to operate such a program for foster care children with multiple providers.

In identifying previous empirical studies that have reported about the ineffectiveness of IT-mediated intervention in child welfare agencies (Burton & van den Broek, 2006; J. U. Schneiderman *et al.*, 2007; Tregagle & Darcy, 2008), the present study has raised a potentially important question: why are these costly interventions ineffective in enhancing organizational effectiveness in these organizations? An answer to this has been found from the theoretical argument that technology-focused intervention has limitations with respect to addressing the most critical problem for CPS caseworkers, which is the difficulty in facilitating the knowledge process at the pragmatic level. Thus, this should be complemented by including specific socio-cultural practices that specifically address those limitations.

The empirical analysis in this study suggests that the socio-cultural dimension of knowledge management practices is much more important than the techno-structural one, as the latter only has a small (but negative) effect on organizational effectiveness. This indicates that an increased IT budget could result in minimal benefits if administrators do not also pay attention to the socio-cultural dimension of knowledge management practices. This finding is consistent with the more radical argument that a focus on technology without consideration to the social processes is “a recipe for disaster” because

new technologies do not address the complexity of the system effectively (Uden *et al.*, 2007).

Although the techno-structural dimension was not a critical factor in the present study, CPS administrators should continue to pay attention to this dimension of practice because it has great advantages in facilitating the knowledge process at the syntactic level, and this is “necessary” for knowledge processes at the semantic and pragmatic levels. Compared to the socio-cultural dimension, it is relatively easy to increase the positive effect of the techno-structural dimension of practice. Once IT infrastructure has been installed, it is less costly to add useful features. Therefore, an initial investment in such basic IT infrastructure is inevitable. Administrators should pay attention to increasing the positive impact from using IT features and to reducing IT’s detrimental impact.

While the previous section has discussed the responsibility of researchers to keep improving the set of IT development principles in this study, administrators need to ensure that IT developers apply the suggested principles to actual computer features. In regard to the development of an IT that has capacity to enhance knowledge integration, the principles suggested by Boland and colleagues (1994) are relevant, if not complete. Therefore, administrators should continue to develop new features according to such principles when they can see room for improvement. For example, the *Ownership* principle can be applied in a web-based system by giving clients and family members (as opposed to practitioners) access to the system and by filling out assessment surveys or other monitoring documents. As for the *Mixed forms* principle, new technology like Twitter can be incorporated into the computer system and used as an alert system,

providing timely feedback to a certain group of people when services fall outside of an integrity threshold in the system.

Although continuous effort to improve IT is needed, it should be noted that knowledge management is not necessarily a technical problem that can be solved simply by introducing an effective information system (Zarraga & Bonache, 2005). The effect of knowledge management practices in the socio-cultural dimension cannot be achieved simply by implementing an effective IT. This intervention dimension is primarily concerned with how patterns of power and different interests impede knowledge sharing and decision-making. The goal of a practice in this dimension is to facilitate the knowledge process at the pragmatic level so that caseworkers can integrate different facts, opinions, and interests into their decisions. Yet, the successful implementation of these practices is often easier said than done.

Despite such difficulty, administrators should pay a significant amount of attention to the socio-cultural dimension of knowledge management practices because it is a critical factor for organizational effectiveness. Although the practices included in this study (e.g., the encouragement of open and honest discussion) adequately address the major issue (knowledge processing on the pragmatic-level), these generic practices should be refined by future studies and applied in practice. For example, CPS administrators can develop specific practices in this dimension by applying a framework of dialogue practices for knowledge collaboration (e.g. discussing alternative scenarios for a problem, understanding how information changes over time) (Jarvenpaa & Majchrzak, 2008) when future studies find this to be effective.

The present study has also emphasized the inter-organizational dimension of knowledge management practices. Still, these knowledge management practices are difficult for the individual respective agencies to successfully implement due to differences in systems and interests among them. Thus, the implications of the findings associated with this dimension are generally discussed further in the next section.

3.3 Policy Implications

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3.3 Policy Implications

This section discusses how legislation, regulations, and recommendations at the national and regional level can support individual CPS agencies in the implementation of inter-organizational knowledge management. Some intervention at the national and regional level has occurred and diverse legislation has been passed and developed in order to ensure that computer systems in child welfare agencies are nationally uniform information systems (Weaver *et al.*, 2003). For example, the 1986 amendments to *Title IV-E of the Social Security Act* mandated the development of a nationwide database – the Adoption and Foster Care Analysis and Reporting System. *The Omnibus Budget Reconciliation Act of 1993* made funding available for the planning, design, development and installation of statewide automated child welfare information systems.

Under such legislation, the Texas DFPS was funded by the federal government to develop their computer system into a Statewide Automated Child Welfare Information System (SACWIS) (Administration for Children and Families, 2007; Texas Department

Family and Protective Services, 2002; Texas Department of Family and Protective Services, 2006). Each SACWIS should comply with the design mandates in order to serve as a single official automated case management tool or uniform information system used by all of the public and private social workers responsible for case management activities.

This approach is consistent with the recommendation by many researchers for the development of a technology infrastructure to permit inter-organizational knowledge sharing activities (Coakes *et al.*, 2002; T. P. Cross *et al.*, 2005; Darlington *et al.*, 2005; Frost & Lloyd, 2006; Vulliamy & Sullivan, 2000; Wiig & Tuell, 2004) or (Schoech *et al.*, 2002). However, this approach indicates that policy makers have focused on technology issues to address knowledge management at the ‘inter-organization’ level, just as administrators in an individual agency have at the ‘intra-organization’ level. The following section discusses whether such current legislation and regulations effectively address the most important issue of knowledge management: the facilitation of knowledge processes at the syntactic, semantic, and pragmatic levels.

First, the current approach seems to effectively facilitate the knowledge process at the syntactic level, which is a necessary part of intervention. As a design mandate for a SACWIS, all case management information should be entered into the system so that a complete, current, accurate, and unified case management history on all children and families served by the Title IV-B/IV-E State agency is officially held as a State case record. Access to such cases for other human service professionals (such as family courts, schools, medical providers, and providers of services to stabilize families and ensure the

child's well-being) must be provided in order to ensure that interface with other organizations in the fields of TANF emergency assistance, juvenile justice, mental health, adult protective services, and Medicaid can occur. This approach enables a CPS caseworker to obtain necessary information by accessing the official case record that holds the complete case management history of interest.

Because they will create the infrastructure that will allow such key knowledge to be easily transmitted from one place to another, these regulations are essential. However, additional efforts are needed to address a negative aspect of this type of system – the documentation burden that individual workers face in order to make this system hold such a complete case management history. For example, one potential solution would be for a state government to create an effective database of official case records by providing a child welfare agency with financial rewards or additional agency evaluation scores based on the quantity and quality of information that the agency provides for the inter-organizational database.

Second, the current regulations address barriers to the facilitation of the knowledge process at the semantic level. Each SACWIS is required to use standardized forms and therefore be a “uniform” national information system. This means that information in this system is structured in a unified format. Having structured fields in a case record (e.g., a history of involvement with the child welfare system) can assist caseworkers in understanding the case more easily without having to read through the entire document. In addition to this approach for data representation, there are different methods of standardization, including those for terminologies and code values that

specify representing concepts. A legitimate concern here is how these methods square with the complexity of the cases and the plurality of the systems among individual agencies.

Although the medical field may have the same concerns as the child welfare field, researchers in the former field have argued that standardization is necessary for documenting and interchanging client-related records effectively. As in the title of the article “‘Care Record’ seeks continuity, consensus: The time is now, many industry observers agree, for this key clinical information standard” (M. A. Cross, 2005), health practitioners agree that standardization is critical for being able to provide quality health services. Standardization enables healthcare to be more effective by providing efficient access to medical information and client-related information in order to support ‘best practice’ care decisions (Kelder *et al.*, 2008). A wide range of efforts at the national level are currently under development with respect to the establishment of Electronic Healthcare Record (EHR) standards. These include Health Level 7 (HL7) messaging, Clinical Document Architecture (CDA), DICOM (www.dicom.org) and terminologies (Hoerbst & Ammenwerth, 2010).

Similar efforts to achieve standardization of client-related records are needed in the fields of child welfare, social work, and human services. Moreover, given that well-being is defined by the World Health Organization (WHO) as a general term that encompasses physical, mental, and social aspects (Toto & Radley, 2009), such standardization should be established through a collaboration between the medical and social care fields. Electronic links among the respective information systems for those in

CPS, judicial, medical and social service agencies (Schoech *et al.*, 2002) would contribute to enhanced coordination and continuity of care for providers that can exchange client information from different agencies using standards-based models. Since such standardization is difficult to achieve, a government-supported research group must be created in order to conduct rich, in-depth research on standardization matters, including, but not restricted to, how much and in which way information should be structured.

Third, the current technology-focused policy approaches may be ineffective with respect to assisting child welfare agencies to enhance knowledge integration. Considering the limitations of technology in facilitating knowledge processes at the pragmatic level, policy makers should pay close attention to the socio-cultural knowledge management practices in a political approach. The child welfare literature has consistently recommended the use of integrated systems of goal setting and authority for multidisciplinary service delivery (Johnson *et al.*, 2003) and mechanisms for representatives from multi-agencies to yield solutions together (Vulliamy & Sullivan, 2000). While the importance of political approaches has been recognized in the literature, few policy details have as yet been offered. Hence, child welfare policy makers should identify any power inequity in relationships (between professionals-clients, caseworkers-managers, CPS agencies-governing bodies, etc.) and explicitly make policies to help prevent any political power from over-influencing the process of knowledge integration or decision-making.

3.4 Implications for Social Work Education

The present study implies that a caseworker's knowledge integration ability is a critical skill for individual social workers given that this ability affects their performance in case management. Case management is considered to be a major component of the current mainstream of social work (Moore, 1990) and clinical practice (Zoffness *et al.*, 2009). From a systems perspective, a social work caseworker plays the role of coordinator of services by understanding the client's needs in various aspects and by integrating formal systems of care with the activities of families and primary care providers (Moore, 1990). Therefore, the quality of the coordination activities depends on the caseworker's knowledge integration ability.

The importance of knowledge integration ability is recognized by the National Association of Social Work (NASW) that sets ten suggested standards for social work case management (The Case Management Standards Work Group in NASW, 1992). According to these, the social work case manager should "coordinate the delivery of direct services," "be knowledgeable about resource availability," and "treat colleagues with courtesy and respect and strive to enhance interprofessional, intraprofessional, and interagency cooperation on behalf of the client." These standards indicate that knowledge integration is one of the most critical abilities necessary to competently perform case management activities. Good case management starts with the development of solid case knowledge stemming from the knowledge integration of various stakeholders.

Although the importance of knowledge integration for case management has been recognized, current social work education does not adequately conceptualize this ability.

Therefore, more educational attention should be provided to a social worker's knowledge activities by including educational materials about the characteristics of knowledge and its processes and how individual knowledge activities can affect their performance. Social work students should be trained to be active knowledge agents who play an important role, not only as a knowledge user, but also a knowledge provider. Their role as knowledge agents is especially important when a client needs long-term care, which often takes place in the CPS field. In this case, it is important for a caseworker to document case information in an effective way so the caseworker who later takes on the case can understand what has happened to the client. Better education about knowledge integration can motivate social workers to provide additional efforts towards good case management.

In addition, social work students should understand how agencies can support their knowledge integration ability. Educational materials on social work management have paid most of their attention to human resources and financial management and have had minimal content on management information systems and knowledge activities (M. J. Austin & Kruzich, 2004). While it has been noted that an individual agency has limited capability to resolve financial problems, the present study indicates that knowledge management is a more important factor for organizational effectiveness than HRM. Therefore, the researcher recommends that knowledge management should be included as a major management area in educational materials on social work management.

4 Conclusions

The main findings in this dissertation study offer empirical evidence that supports the overarching conclusion: Organizational effectiveness in CPS agencies depends

significantly upon the extent to which they successfully support an individual CPS caseworker's ability to integrate knowledge at the syntactic, semantic, and pragmatic levels. This conclusion is useful in gaining a better understanding of why many technology-mediated knowledge management interventions have been ineffective. From this point of view, the researcher agrees with the argument that in spite of the urgent requests for expanding investment in IT in child welfare programs, a rigorous evaluation should be conducted before undertaking such expansion (Yaroni *et al.*, 2010).

The present study has important implications for this kind of evaluation study in order to ensure that future studies properly evaluate IT and guide further IT development to better increase its effectiveness. The evaluation study should continue along the lines of this study by: 1) shifting the perspective from that of viewing IT as a whole system to that of a part of knowledge management practices; 2) adopting a process-oriented KMS from an STS perspective to develop a set of knowledge management practices designed to facilitate knowledge processes at the syntactic, semantic, and pragmatic levels; and 3) using a mediation evaluation model with knowledge integration as a mediator variable.

Specific recommendations have been made here to refine and improve the set of knowledge management practices. Future studies can continuously make unique contributions by following these recommendations in conjunction with their own rigorous research methods by stating measurements that match their constructs, by using diversifying indicators, sampling caseworkers from different CPS agencies, addressing the violation of requirements for statistical analysis, and by using various types of investigation, such as qualitative and longitudinal approaches.

Appendix

SOE Questionnaires (The Survey of Organizational Excellence, 2008)

1. Demographic Information

Questionnaire Items	Answers
My highest education level	(1) Did not finish High School (2) High school diploma (or GED) (3) Some College (4) Associate's Degree (5) Bachelor's Degree (6) Master's degree (7) Doctoral degree
My race/ethnic Identification	(1) African-American/ Black (2) Hispanic/ Mexican-American (3) Anglo-American/White (4) Asian-American/Pacific Islander/ Native American (5) Multiracial/Other
My annual salary (before taxes)	(1) Less than \$15,000 (2) \$15,000-\$25,000 (3) \$25,001-\$35,000 (4) \$35,001-\$45,000 (5) \$45,001-\$50,000 (6) \$50,001-\$60,000 (7) \$60,001-\$75,000 (8) \$75,000 or more
Years I have lived in this state	(1) Less than 2 (2) 2-10 (3) Over 10
My age (in years)	(1) 16-29 (2) 30-39 (3) 40-49 (4) 50-59 (5) 60+
Persons in my household, including myself	(1) 1 (2) 2 (3) 3 (4) 4 (5) 5 or more
Hours per week employed	(1) Less than 20 (2) 20- 39 (3) 40 or more
Years of service with this organization	(1) 0 (2) 1-2 (3) 3-5 (4) 6-10 (5) 11-15 (6) 15+
I am currently in a supervisory role.	(1) Yes (2) No
I received a promotion during the last two years	(1) Yes (2) No
I received a merit increase during the last two years	(1) Yes (2) No
I am the primary wage earner in the household.	(1) Yes (2) No
There is more than one wage earner in my household.	(1) Yes (2) No
I plan to be working for this organization in two years.	(1) Yes (2) No
I am	(1) Female (2) Male

2. SOE items

From your perspective of your immediate workplace, please indicate how strongly you agree or disagree with the statement. For items in the “organization wide” section, choose a response that you think reflects the organization as a whole. If you do not have any information about a particular statement or the statement is not applicable to you, mark (N/A).

(SD) Strongly Disagree (D) Disagree (N) Feel Neutral (A) Agree (SA) Strongly Agree (N/A) Don't know/Not applicable

Item Text	Construct in this study	Indicator in this study
We are known for the quality of service we provide.	Organizational Effectiveness	Quality_Service
We are constantly improving our services.	Organizational Effectiveness	Improve_Service
Our goals are consistently met or exceeded.	Organizational Effectiveness	Goals_Met
We produce high quality work that has a low rate of error.	Organizational Effectiveness	Low_Error
We know who our customers (those we serve) are.		
We develop services to match our customers' needs.		
My performance is evaluated fairly.		
My supervisor is consistent when administering policies concerning employees.		
Every employee is valued.	Empowerment	Employee_Valued
We work to attract, develop, and retain people with diverse backgrounds.		
We have adequate computer resources (hardware and software).		
Information systems are in place and accessible for me to get my job done.		
Information is shared as appropriate with other organizations.		
The right information gets to the right people at the right time.	A Caseworker's Knowledge Integration Ability	Right_Information
We integrate information and act intelligently upon that information.	A Caseworker's Knowledge Integration Ability	Act_Intelligently
The work atmosphere encourages open and honest communication.	The Socio-cultural Dimension of Knowledge Management Practices	Open_Communication
We feel the channels we must go through at work are reasonable.		
Work groups are trained to incorporate the opinions of each member.	The Socio-cultural Dimension of Knowledge Management Practices	Train_Incorporate

Item Text	Construct in this study	Indicator in this study
Work groups receive adequate feedback that helps improve their performance.		
We have an opportunity to participate in the goal setting process.	Empowerment	Goal_Setting
Decision making and control are given to employees doing the actual work.	Empowerment	Decision_Control
We seem to be working toward the same goals.		
There is a basic trust among employees and supervisors.		
We are given the opportunity to do our best work.	Empowerment	Chance_for_Best
We feel a sense of pride when we tell people that we work for this organization.	Organizational Effectiveness	
The amount of work I am asked to do is reasonable.	Staffing	Work_Amount
We are efficient.		Efficiency
Outstanding work is recognized.	Empowerment	Work_Recognized
There is a real feeling of teamwork.		
We feel our efforts count.	Empowerment	Effort_Count
We are encouraged to learn from our mistakes.		
We have adequate resources to do our jobs.		
We are given accurate feedback about our performance.		
When possible, alternative work schedules (flex-time, compressed work weeks, job sharing, telecommuting) are offered to employees.		
Training is made available to us for personal growth and development.	Employee Development	Train_Growth
Training is made available to us so that we can do our jobs better.	Employee Development	Train_Task
We have access to information about job opportunities, conferences, workshops, and training.	Employee Development	Access_Info
Supervisors know whether an individual's career goals are compatible with organizational goals.		
We have sufficient procedures to ensure the safety of employees in the workplace.		
Our workplace is well maintained.		
Within my workplace, there is a feeling of community.		
The environment supports a balance between work and personal life.		
The pace of the work in this organization enables me to do a good job.	Staffing	Work_Pace
My job meets my expectations.		
We balance our focus on both long range and short-term goals.		
My ideas and opinions count at work.	Empowerment	Opinion_Count

Item Text	Construct in this study	Indicator in this study
People who challenge the status quo are valued.	Empowerment	Challenge_Valued
Work groups are actively involved in making work processes more effective.		
The people I work with treat each other with respect.		
Information is shared as appropriate with the public.		
Favoritism (special treatment) is not an issue in raises or promotions.		
Our employees are generally ethical in the workplace.		
I am confident that any ethics violation I report will be properly handled.		
Harassment is not tolerated at my workplace.		
I am satisfied with the opportunities I have to evaluate my supervisor's performance.		
When possible, problems are solved before they become a crisis.		
We use feedback from those we serve to improve our performance.		
I believe we will use the information from this survey to improve our performance.		
I have regular involvement (once a month or more) in community activities or groups.		
People are paid fairly for the work they do.		
Salaries are competitive with similar jobs in the community.		
Benefits can be selected to meet individual needs.		
I understand my benefit plan.		
Benefits are comparable to those offered in other jobs.		
My pay keeps pace with the cost of living.		
Changes in benefits and compensation have been explained to me during the last 2 years.		
I am satisfied with my continuing education/training opportunities		
I am satisfied with my medical insurance.		
I am satisfied with my sick leave.		
I am satisfied with my vacation.		
I am satisfied with my retirement.		
I am satisfied with my dental insurance.		
I am satisfied with my vision insurance.		
I am satisfied with my holiday benefit.		
I am satisfied with my Employee Assistance Program (E.A.P.).		
Information and knowledge are shared openly within this organization.		

Item Text	Construct in this study	Indicator in this study
An effort is made to get the opinions of people throughout the organization.	The Socio-cultural Dimension of Knowledge Management Practices	Get_Opinion
We work well with other organizations.	The Inter-organizational Dimension of Knowledge Management Practices	With_Other
We work well with our governing bodies (the legislature, the board, etc.).	The Inter-organizational Dimension of Knowledge Management Practices	With_Govern
We work well with the public.	The Inter-organizational Dimension of Knowledge Management Practices	With_Public
We understand the state, local, national, and global issues that impact the organization.		
We know how our work impacts others in the organization.		
Our web site is easy to use and contains helpful information.		
I have a good understanding of our mission, vision, and strategic plan.		
I believe we communicate our mission effectively to the public.		
My organization encourages me to be involved in my community.		

3. Pilot Items that was newly added to the existing SOE

(SD) Strongly Disagree (D) Disagree (N) Feel Neutral (A) Agree (SA) Strongly Agree (N/A) Don't know/Not applicable

Item Text	Construct in this study	Indicator in this study
Our computer systems enable me to easily and quickly find the information I need.	The Techno-structural Dimension of Knowledge Management Practices	Easy_to_Find
Overall, our computer information systems present data in an understandable way.	The Techno-structural Dimension of Knowledge Management Practices	Data_Presentation
The information available from our computer systems is reliable.	The Techno-structural Dimension of Knowledge Management Practices	Reliability
Our computer systems provide thorough information.	The Techno-structural Dimension of Knowledge Management Practices	Thoroughness
Our computer systems help me make better decisions at work.	The Techno-structural Dimension of Knowledge Management Practices	Support_Decision

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