3 Toward a Measurement Model of KMS Success

3.1 Introduction

This chapter focuses on establishing research models and developing hypotheses. Chapter 2 proposed two research questions from a review of knowledge and knowledge management literature, providing a solid basis for further study. This chapter operationalizes the research questions by developing KMS success research models and associated research hypotheses. Chapter 3 begins with a review of existing KMS research frameworks, leading to a socio-technical framework of KMS, portraying KMS in organizations from a socio-technical perspective. Following by a discussion of structuration theory and adaptive structuration theory (AST), an AST-based KMS research model is established to represent the system-to-value chain of KMS. Through a comprehensive review of information systems success theories and models, several key determinants to user acceptance and use of KMS are identified out and included in the AST-based KMS research model, resulting in an expanded AST-based KMS success model. Finally, a set of research hypotheses is derived from the KMS success models.

3.2 KMS Research Frameworks Review

Research frameworks play a critical role in guiding research in a number of fields, including management research (Snow and Thomas 1994; Gallupe 2001). According to Gallupe (2001), the benefits of a good framework include:

- Providing the researcher with a new perspective on the phenomenon being studied.
- Establishing boundaries around the phenomenon being studied.
- Identifying the major components that make up the object under study, so that relationships can be examined and new knowledge generated.
- Identifying the 'gaps' in the knowledge where potentially productive areas of research exist.

A literature review demonstrated that a number of research frameworks were proposed to guide research into KMS. These include (Alavi and Leidner 2001; Gallupe 2001; Wenger 2001; Alavi and Tiwana 2003):

- The knowledge practices framework for KMS.
- The KM process framework for KMS.
- The community-oriented framework for KMS.

These are briefly discussed below.

3.2.1 Task-related Frameworks for KMS

Gallupe (2001) proposed a knowledge practices framework for KMS, which focuses on the use of KMS to support knowledge management practices. The framework examines the roles of KMS in supporting knowledge management practices in two dimensions. The first dimension involves processes (problem recognition, problem solving) to be supported by KMS, the second dimension addresses the class of problem (new or unique, previously solved) to be solved by means of KMS (Gallupe 2001). The combination of the two dimensions results in a matrix consisting of four types of knowledge management practices that may be supported by KMS (See Table 3.1) (Gallupe 2001).

Class of Problem / Problem Process	New/Unique	Previously Solved
Problem Recognition	Encouraging Serendipity (1)	Mentoring & Training (4)
Problem Solving	Knowledge Creation (2)	Knowledge Acquisition (3)

Source: (Gallupe 2001)

Table 3.1 Knowledge Practices Framework for Knowledge Management Systems

According to Gallupe (2001), the "*encouraging serendipity*" entry refers to the recognition of new or unique problems through purposeful knowledge creation and sharing. The activities related to these practices include environmental scanning, passive searching, and dialogues. The KMS functions that support these activities include online forum, chat rooms, online search engines, web crawler and messaging systems (Gallupe 2001; Tsui 2003). Knowledge creation practices refer to the creation of knowledge for solving new or unique problems. Relevant practical activities include knowledge forums, communities of practice, and structural brainstorming (Gallupe 2001). KMS functions that support these practices include online communities of practice, online discussion

forums, collaboration tools and electronic brainstorming (Nonaka and Reinmoeller 2000; Alavi and Leidner 2001; Gallupe 2001; Andriessen, Soekijad et al. 2002; Alavi and Tiwana 2003). The activities in the knowledge acquisition quadrant deal with codification, storage and retrieval of knowledge. The KMS functions that support these activities include knowledge repositories/database systems and knowledge maps (Davenport and Prusak 1998; Tiwana 2000; Alavi and Leidner 2001). The mentoring and training quadrant refers to the transfer and sharing of knowledge to enable recognition of previously solved problems. The knowledge management practices in this quadrant involve mentoring programmes and formal training and education programmes (Gallupe 2001). The functions of KMS to support these practices include intranets (Gallupe 2001), computer-based training systems (Alavi and Tiwana 2003), and online knowledge yellow pages (Davenport and Prusak 1998).

A similar task-related framework for KMS is proposed by Wagner (2004). This framework is based on a similar task classification (e.g., in Gallupe's framework, task is classified into new/unique types and previously solved types; in Wanger's framework, task is represented as ad-hoc types and repetitive types). Wanger's framework takes the knowledge source into account. It combines the two types of tasks (ad-hoc and repetitive) with the two types of knowledge sources (centralized and distributed). KMS are categorized according to their task-knowledge source-technology-fit mode (Wagner 2004). Wagner's framework results in four basic categories of KMS applications (Wagner 2004). For instance, knowledge repository and document management systems may best suit repetitive tasks in a centralized knowledge context, while conversational technologies, such as email and discussion forum, would be more suitable for ad-hoc tasks with a distributed knowledge source (Wagner 2004).

Both frameworks provide a novel and useful perspective for categorising KMS and research into KMS. However, people as users of KMS and a distributed knowledge source should be explicitly included into the frameworks. In addition, organizational structure and environment should also be taken into account. Gallupe (2001) noted that the knowledge management practices framework fundamentally represents an information systems perspective.

3.2.2 The Knowledge Management Processes Framework

Knowledge management is a dynamic and continuous organizational phenomenon involving a series of distinct but interdependent knowledge management processes (Davenport and Prusak 1998). The knowledge management processes framework proposed by Alavi and Leidner (2001), suggests that KMS can play a variety of roles in support of organizational knowledge management processes, and can be studied by examining their impacts on knowledge within each process. Knowledge management processes include knowledge creation, knowledge storage and retrieval, knowledge transfer or dissemination, and knowledge application (Davenport and Prusak 1998; O'Dell and Grayson 1998; Alavi and Leidner 2001; Smith and McKeen 2003). Furthermore, Alavi and Tiwana (2003) suggested a framework to categorise knowledge management technologies, which corresponds to the above-mentioned four knowledge management processes. Table 3.2 summarises the knowledge management technologies and the corresponding knowledge management processes supported by these tools.

	Knowledge Management Processes			
	Creation	Storage and Retrieval	Transfer	Application
Information Technology Tools	E-learning Collaboration support systems	Data warehousing and data mining Repositories	Communication support systems Enterprise information portals	Expert systems Decision support systems

Source: adapted from (Alavi and Tiwana 2003)

Table 3.2 Information Technology Tools for Support of KM Processes

Knowledge creation involves developing new tacit and explicit knowledge, which can be novel and/or renewal of existing knowledge (Nonaka and Takeuchi 1995; Alavi and Leidner 2001). KMS can play a significant role in facilitating new knowledge creation by supporting the organizational knowledge creation environments (Nonaka and Reinmoeller 2000). With regard to the conditions and environments for knowledge creation, Nonaka, Toyama, and Konno (2001) suggest that there are four types of "ba" (i.e., places for practice) for fostering knowledge creation in organizations. According to Nonaka, Toyama, and Konno (2001), different types of "ba" correspond to different mode of knowledge creation, such as:

- Originating "ba" corresponds to the socialization mode of knowledge creation.
- Interacting "ba" corresponds to the externalisation mode of knowledge creation.
- Cyber "ba" corresponds to the combination node of knowledge creation.
- Exercising "ba" corresponds to the internalisation mode of knowledge creation.

For instance, IT capabilities can be used to establish an efficient virtual space of interaction to enable and enhance the combination of explicit knowledge; information systems designed for support of collaboration and communication processes can facilitate teamwork, communication and dialogue between individuals and thereby enhance the opportunities for socialization and externalisation of knowledge; Intranets and e-learning provide individuals with the advantages of rich information and efficient information access that in turn may help individuals interpret, absorb, and utilize information, and result in new individual tacit knowledge (DeTienne and Jensen 2001; Alavi and Tiwana 2003); Community-oriented technologies can help in developing personal relationships and the sharing of experience and insights that may help create personal tacit knowledge (Wenger 2001). In addition, KMS may improve the quality and frequency of knowledge creation by facilitating online forums and virtual collaboration spaces where organizational members can establish dialogue, construct and share beliefs, express new ideas, share ideas and perspectives, confirm consensual interpretation, and work on collaborative problem-solving (Alavi and Leidner 2001).

Knowledge storage/retrieval may be one of the most mature applications of IT to knowledge management (Davenport, De Long et al. 1998; Davenport and Prusak 1998; Mertins, Heisig et al. 2001). For example, information/knowledge repositories are used for storing and managing large volumes of structured and unstructured information which may be dispersed (Stein and Zwass 1995; Rollo and Clarke 2001); case-based reasoning technologies are used for storing context-specific and situated knowledge; experts locators are used for locating expertise held by experts and for locating expert systems for storing and retrieving codified human knowledge (Davenport and Prusak 1998). KMS can increase the degree of information integration and the speed at which organizational knowledge can be accessed across time and space (Davenport and Prusak 1998; Pan and Scarbrough 1998).

The knowledge transfer process involves knowledge transfer to individuals, between

individuals and with knowledge repositories (Alavi and Leidner 2001; Alavi and Tiwana 2003; Malafsky 2003). Knowledge transfer is also referred to as knowledge flow, and it is knowledge flow that enhances organizational knowledge creation and creates value for organizations (Sveiby 2001). Knowledge transfers can be carried out through impersonal channels (e.g., computer networks and knowledge repositories) or personal channels (personal networks)(Davenport and Prusak 1998; Alavi and Leidner 2001). Which channel is more efficient and effective for the knowledge transfer in question depends upon the characteristics of knowledge being transferred (Davenport and Prusak 1998; Alavi and Leidner 2001). For explicit knowledge transfer, impersonal channels are more efficient, whilst personal channels are more efficient and effective for tacit knowledge transfer (Davenport and Prusak 1998).

Knowledge management systems can greatly enhance knowledge transfer in firms (O'Dell and Grayson 1998; Hayes and Walsham 2003). Alavi and Tiwana (2003) identified communication support systems and enterprise knowledge portal as two types of the most relevant IT applications for knowledge transfer. Communication support systems in the forms of email, discussion forum, and audio/video conferencing systems provide not only fast electronic communication channels through which people can exchange ideas, insights, and experience with peers efficiently, but also the opportunities for organizational members to build and extend their personal networks (e.g., internal social networks) which would benefit from tacit knowledge transfer (Andriessen, Soekijad et al. 2002). An enterprise knowledge portal provides organizational members with a convenient one-stop entry point to access important and relevant knowledge and information stored in a variety of repositories, increasing utilization of the information and knowledge (Malafsky 2003; Tsui 2003).

The organizational value of knowledge lies in its application to the taking of effective action by individuals and groups in organizations (Pfeffer and Sutton 2000). According to Alavi and Leidner (2001), KMS can support knowledge application in a variety of ways, for example:

- By providing a cost-effective way to access and utilize relevant information and knowledge (Davenport and Prusak 1998).
- By embedding knowledge into organizational routines, computerising working

procedures, and automated organizational routines such as work-flow systems(Davenport and Prusak 1998).

- By facilitating the capture, updating, and accessibility of organizational directives (e.g., technical manuals, standards and policies) (Borghoff and Pareschi 1998).
- By increasing the size of individuals' social networks (Ogata, Yano et al. 2001).
- By making organizational information and knowledge accessible across time and space (Alavi and Leidner 2001; Alavi and Tiwana 2003).

Expert systems in the forms of rule-based, case-based, and decision support systems are suggested as examples of KMS which can support and enhance knowledge application (Davenport and Prusak 1998; Alavi and Tiwana 2003; Tsui 2003).

The knowledge management process framework emphasized that the four KM processes are essential to effective organizational knowledge management, and identified relevant IT systems for support of the processes. However, this framework does not explicitly address people (as user of KMS), tasks and organizational structures as important contingent factors related to the role of KMS in organizational knowledge management. Furthermore, the knowledge processes could be the outcome of the dynamic interaction of KMS, people, tasks, and organizational structures (Spender 1996), but the knowledge management process framework fails to reflect the phenomenon.

3.2.3 A Community-oriented Framework for KMS

A community of practice is a group of people from different organizations or organizational units, who share a common interest in a certain knowledge domain, and develop their shared practice and knowledge by interaction on problems, solutions, and insights (Wenger and Snyder 2000; Wenger 2001).

According to Wenger (2001), three critical characteristics differentiate communities of practice from other communities (e.g., communities of interest (Wenger and Snyder 2000)), namely:

- Knowledge domain, in that a community of practice is centred on a knowledge domain of shared interest.
- Engagement, which is the community of practice formed by people engaging in joint activities and discussions, helping each other, and sharing information.
- Practice, in that members of a community of practice develop a shared repertoire of resources, such as experiences, stories, tools, and methods (Wenger 1998).
- Communities of practice provide an effective way to create new knowledge and share tacit knowledge (i.e., experience and insights) (Andriessen, Soekijad et al. 2002; Wenger, McDermott et al. 2002).

The community-oriented framework suggests a novel perspective for research into KMS. The aims of the community-oriented framework are to examine and help understand the role of KMS in terms of supporting communities of practice (Wenger 2001). According to Wenger (2001), the community-oriented framework addresses thirteen fundamental elements of successful communities of practice which can be affected by technology. These are time and space (presence and visibility, rhythm), participation (variety of interactions, efficiency of involvement), value creation (short-term value, long-term value), connections (connection to the world), identity (personal identity, communal identity), community membership (belonging and relationships, complex boundaries), and community development (evolution, active community-building)(Wenger 2001).

Table 3.3 summarises the features of knowledge management systems and corresponding community-oriented activities supported by these tools.

A brief explanation of the elements of the community of practice noted in Table 3.3 follows.

"Presence and visibility" focuses on reminding people of communities, and on making communities, their members, and their activities more visible. People are more likely to interact if they know who is online and who is doing what. KMS to support this function need to have features such as directory and indexing, profiling and instant messaging (Berlage and Sohlenkamp 1999).

"Rhythm" highlights the fact that communities exist in time. It is necessary to have a

rhythm of events to reassert their existence over time (Wenger 2001). In order to support rhythm, the KMS needs to have functions such as scheduling, calendar, invitations and reminders.

Elements of CoPs	Typical technical features of KMS
Presence & visibility	Directories of communities, Member directories, Instant messaging, Presence awareness
Rhythm	Calendar, reminders, virtual conferences and meetings
Interactions	E-mail, discussion forums, web tours, online meetings, collaborative spaces
Efficiency of involvement	Portals, content filtering and ordering, subscriptions, achieving of interactions
Short-term value	Lists of FAQ's, databases of answers, intelligent access to experts, brainstorming facilities, forums for getting help
Long-term value	Repositories for knowledge, search mechanisms, discussing boards, subgroup spaces
Connections to the world	News, directory of external experts, links to other sites, library of references, external events
Personal identities	Profiles, reputation and ranking, preferences, personal history, private places
Communal identity	Virtual communal places, a distinctive look and feel, community news
Belonging & relationships	Personal profiles, support mentoring relationships, support private interactions and interpersonal relationships
Complex boundaries	Differential access rights, lurking facilities, public areas & restricted community space, subspaces, nested features
Evolution: maturation & integration	Have enough features to support maturation, flexibility in configuration
Active community building	Logs & statistics for monitoring, polling and voting facilities, health indicators

Source: (Wenger 2001)

Table 3.3 The Community Elements and Typical Features of KMS

At the core of communities of practice is participation (Wenger 1998; Smith and McKeen 2003). Participation involves two critical processes, "interactions" and "efficiency of involvement" (Wenger 2001). It is through the purposeful and meaningful interactions between people that the shared practice can be built. Easy participation can help attract people to the communities of practice. In order to support the knowledge-generating interactions, the KMS needs to provide multiple channels and forms of interactions, such as e-mail, discussion forums and collaborative problem-solving (Wenger 2001).

"Efficiency of involvement" refers to the ease of use of the KMS. Some technical features of KMS can simplify the use of KMS such as integration with work systems, personalized knowledge portals, automatic content filtering and ordering, and subscriptions (Wenger 2001). However, ease of use may refer to users' experience in using the KMS.

Value creation is the biggest concern in cultivating a community of practice (Wenger, McDermott et al. 2002). Communities of practice thrive on the value they deliver to their members and to the organization. According to Wenger (2001), the short-term value delivered by a community of practice includes quick access to information, help with problem-solving, and access to expertise. The functions of KMS involved in delivering short-term value include lists of FAQ's, databases of answers, intelligent access to experts, brainstorming facilities, and forums for getting help with problems (Wenger 2001). The long-term value of communities of practice derives from a sense of accumulation over time (Wenger 2001). Examples of long-term value include documents, processes and tools, and best practices. The technical features of KMS involved in delivering long-term value include repositories of artefacts, taxonomies, search mechanisms, and project spaces for practice-development projects (Wenger 2001).

External connections provided by communities of practice are one of the sources for value creation (Wenger and Snyder 2000). "Connections to the world" permits members to get access to leading-edge information and knowledge in the broader world. Professionals need to update their knowledge regularly, and the communities of practice can extend the members' networks of connections. The KMS can provide the necessary facilities such as news, directory of external experts, links to other sites, and library of references, for members' to access to external experts and information (Wenger 2001).

Identity plays a critical role in the community life. As a crucial aspect of participation, members' personal identities have been shaped and developed by their participation. Members' "personal identities" reflect the members' learning trajectories in communities of practice over time (Wenger 1998; Wenger, McDermott et al. 2002). Personal identities involve personal passion, competence, areas of specialization, various roles of people play in the community, and multi-membership (Wenger 2001). In order to create a visible identity and to access their communities in personalized ways, the KMS needs to have features such as personal profiles, personal portals, personal records of participation, reputation and ranking, and private places (Wenger 2001).

A community of practice has its own "communal identity" (Wenger 1998). A sense of place, whether physical or virtual, can help a community develop an identity. The other

factors which can make contributions to the development of a communal identity include a distinctive style, the reputation of the community, success stories, value to the organization, clarity about domain and sense of mission, and personal passion (Wenger 2001). In order to create a visible communal identity, the KMS needs to provide a virtual communal place for participation and a customisable interface with varying levels of control for the community coordinator (Wenger 2001).

Two important components related to community membership are "belonging and relationships" and "complex boundaries" (Wenger 1998; Wenger, McDermott et al. 2002). An organization member develops deep relationships with other members by engaging in joint-learning practices (Wenger 1998). The facilities of KMS for supporting "belonging and relationships" include personal profiles, support of private interactions and interpersonal relationships and management of mentoring relationships. As boundaries around a community of practice are both unavoidable and useful, it is important for communities of practice to manage their boundaries (Wenger 1998). Managing community boundaries involves control and management of multiple levels and types of participation, sub-communities, and peripheral participation (Lave and Wenger 1991; Wenger 1998). The features of KMS which can support community boundary management include access rights control mechanisms and nested spaces and subspaces (Wenger 2001).

As a community of practice evolves over time, it is important for a KMS to be able to evolve along with the community. Therefore, flexibility in configuration of the KMS is an essential feature of a KMS (Wenger 2001). In addition, to support communities of practice, a KMS must offer a variety of administrative tools to monitor and configure the use and effectiveness of the community space (Wenger 2001).

Communities of practice are critical instruments in creating, maintaining, and transferring knowledge (Wenger, McDermott et al. 2002; Smith and McKeen 2003). Technology is recognized as a key enabler of communities of practice (Andriessen, Soekijad et al. 2002; Smith and McKeen 2003). The community-oriented framework provides a useful lens for exploring KMS in terms of supporting communities of practice. There are a number of technology products relevant to communities of practice in the market, but the perfect product for a general community-of-practice

platform does not exist (Wenger 2001).

In summary, although the above-discussed framework provides a novel approach for research into KMS from a particular perspective, this framework mainly focuses on the issue of community of practice and relevant support technologies. As a result, its application may be limited.

3.2.4 Summary

In reality, KMS are complex, dynamic, evolving organic systems, closely interrelated with organizational elements and processes (e.g., people, tasks, organizational structures, and environments). Thus, the above-reviewed models cannot completely capture the true spirit of KMS dynamics (Spender 1996). In order to examine and understand the changing role of KMS within organizations, a combination of socio-technical system theory and structuration theory becomes essential (Spender 1996). Accordingly, it is anticipated that socio-technical system theory can portray a comprehensive picture of the current status of KMS in organizations (in a horizontal way), and structuration theory can provide a longitudinal perspective to reflect the evolution and development of KMS in organizations (in a vertical way).

3.3 A Socio-technical Framework for KMS

As discussed in Chapter 2, KMS in organizations is a complex phenomenon which needs to be investigated systematically (Spender 1996). Spender (1996) suggests that socio-technical system theory can provide a useful, systematic and balancing view (technology and human) for dealing with organizational knowledge (KMS) issues.

3.3.1 Socio-technical System Theory

The socio-technical system (STS) approach is widely recognized as a systematic method for organization design and for achieving optimisation of both the social and technological subsystems of an organization (Ryan and Harrison 2000). From the viewpoint of a socio-technical system, an organization is seen as a work system with two interdependent subsystems, a social subsystem and a technical subsystem. The social subsystem refers to the relationships among people and the attributes of these

people such as values, beliefs, skills and attitudes; the technical subsystem is concerned with the processes, tasks, and the technology needed to conduct the tasks (Bostrom and Heinen 1977). These two interrelated subsystems constitute a dynamic and evolving organization system (Spender 1996).

As a new paradigm of work, the socio-technical system approach originates from a study of productivity decline in the British coal industry, undertaken by scholars at the Tavistock Institute, London in the early 1950's (Taylor and Felten 1993; Fox 1995; Coakes 2003). Their findings suggested that:

> *"...most of the industry's problems had resulted from the introduction of significant changes in the technical aspects of production without adequate attention to their appropriateness for a particular physical environment or their impact on social structure and needs" (Fox 1995, p.92).*

Thus, the researchers identified the need for a socio-technical system approach in which an appropriate social change could be made together with the new technical changes, so as to effectively blend the requirements of both the technical and social subsystems, and to achieve a joint optimisation (Fox 1995; Coakes 2002). A socio-technical system approach has been suggested for the design and development of information systems (Bostrom and Heinen 1977; Avison and Wood-Harper 2003; Coakes 2003).

Although the socio-technical system approach (STS) has achieved significant success in the design and redesign of well-defined linear work systems characterised by programmed tasks and a sequential conversion process of "input" to "output" (Taylor 1993), it may fail to deal with complex and non-linear work systems characterised by entwined multiple-conversion processes (Fox 1995). For example, in non-linear work systems, it could be difficult to separate different conversion flows into well-bounded entities and identify an explicit input point, which could bring practical difficulties to the use of socio-technical system approaches and tools (Fox 1995). As most of knowledge work and knowledge-intensive organizations are considered as complex and non-linear work systems (Drucker 1999; Schultze 2000, 2003), adaptation and further development of STS concepts, approaches and practices are needed for such systems (Fox 1995).

The socio-technical system approach has been developed, and new techniques, such as cause maps and social networks analysis, have been integrated into the socio-technical systems methodology (Taylor and Felten 1993; Fox 1995). The socio-technical system approach can be applied to knowledge work design (Taylor and Felten 1993). These knowledge work systems may comprise non-linear knowledge-creating technologies and information and knowledge-processing systems (Taylor and Felten 1993).

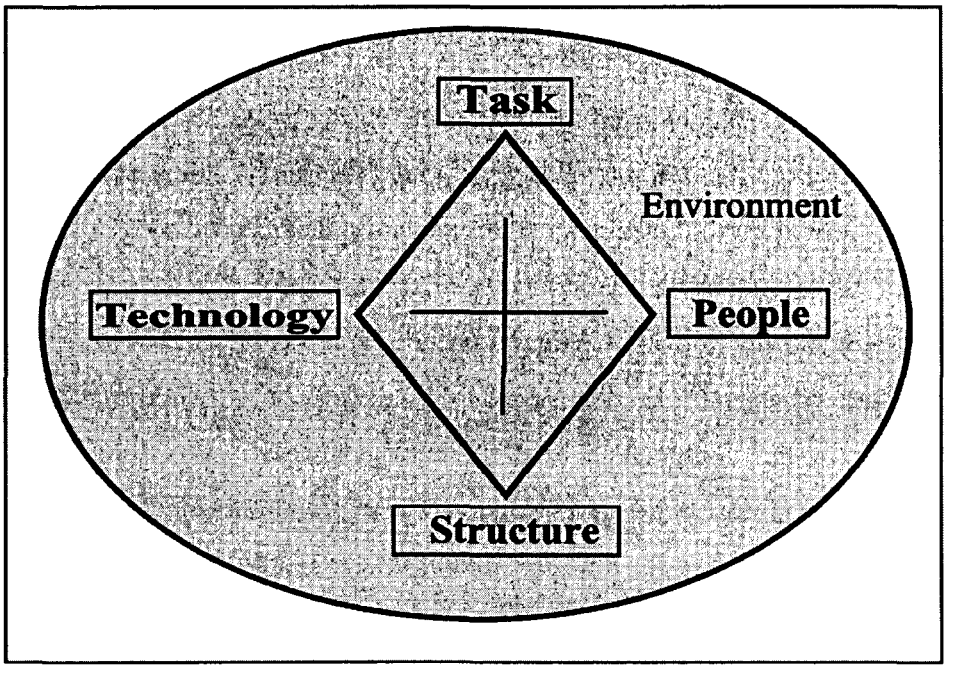
Recently, the socio-technical system approach has been extended to the knowledge management domain, such as interpreting and understanding of knowledge management success (Pan and Scarbrough 1998; Pan and Scarbrough 1999), communities of practice (Yi 2002), and IT-based knowledge system design (Coakes 2002; Ericsson and Avdic 2002).

3.3.2 A Socio-technical System Framework for KMS

On the basis of the diamond model of technology and organization proposed by Laudon and Laudon (2000), which relates the technology to task, people, and organizational structure, a five-component socio-technical model for knowledge management was proposed for studying knowledge management and knowledge management systems in organizations (Coakes 2002) (see Figure 3.1). Coakes (2002) argued that people and task are linked to the external world by such technologies and systems as the Internet, extranets and supply chain management, while the environment affects how an organization can be structured and what value the technology can be to an organization.

However, the five-component socio-technical model is not a useful framework for studying KMS, as it lacks detail. By combining the knowledge-based dynamic theory of the firm (Spender 1996), previous studies of knowledge management (e.g., knowledge work and knowledge networks), and the five-component socio-technical model (Coakes 2002), a new socio-technical framework of knowledge management systems is proposed and shown in Figure 3.2. The suggested socio-technical KMS framework captures not only the core organizational knowledge management components (i.e. technology, people, and networks), but the dynamics (i.e., interactions and evolutions) between these components as well. In addition, the proposed socio-technical KMS framework can serve as a useful platform for reviewing and integrating previous relevant studies, and help to identify the 'gaps' in KMS research and potentially

productive research areas, and also provide a foundation for future research.



Source: (Coakes 2002)

Figure 3.1 The Five-component Socio-technical Model

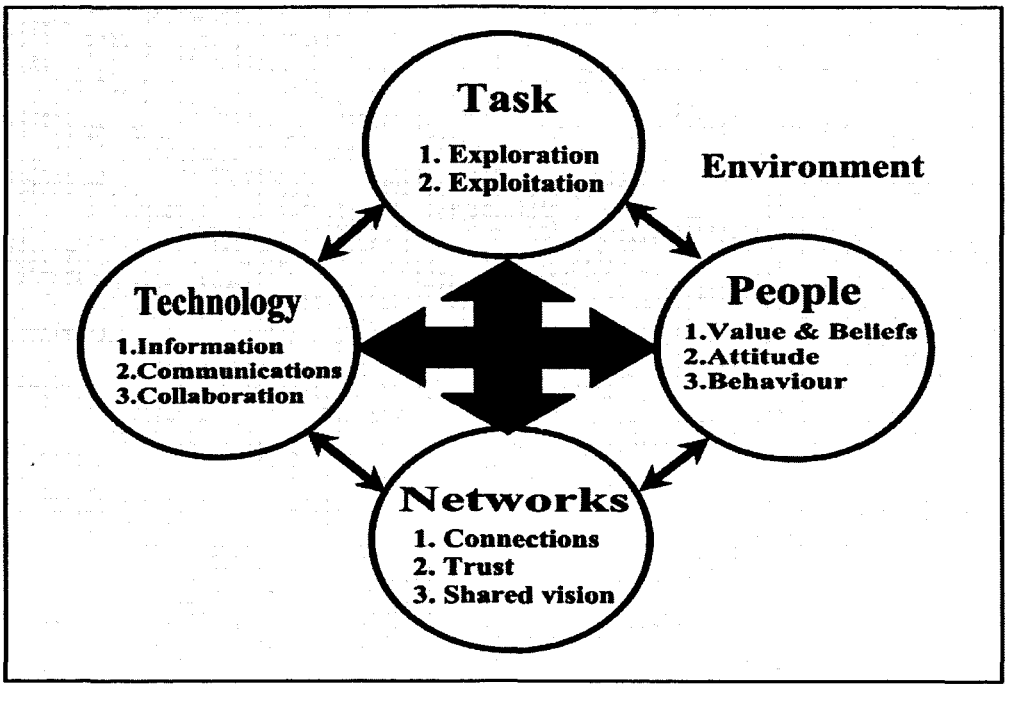


Figure 3.2. A Socio-technical Framework for Knowledge Management Systems

The suggested socio-technical KMS framework, shown in Figure 3.2, consists of five components and ten relationships between the components. The five components with their specific attributes are briefly described as follows:

Work-related tasks are characterised into two categories in terms of their relations to the types of knowledge involved in the problem solving (Hansen, Podolny et al. 2001). The exploration task involves the focal actor or organization being faced by a novel problem which cannot be solved by the existing expertise of the focal actor and so requires creating and/or acquiring new knowledge in order to solve the problem. In contrast, the exploitation task can usually be completed by means of the existing expertise of the focal actor and/or the competence base in an organization. According to Hansen, Podolny et al. (2001), most of the knowledge for the exploration task is likely to be tacit, while most of the knowledge for the exploitation task is likely to be explicit. Thus, for the exploration task, knowledge creation and new knowledge acquisition are the key issues for problem solving, whereas, in the case of the exploitation task, knowledge sharing and reuse are more important for effective and efficient problem-solving (Gallupe 2001; Hansen, Podolny et al. 2001).

Technology-based knowledge management systems can be classified into two categories, information-related technology systems and interaction-related technology systems. Typical information-related technology systems include content management systems (Tiwana 2000; Wagner 2004), data warehousing and data mining, information and knowledge repositories (Davenport and Prusak 1998; Alavi and Tiwana 2003), and information portals and search engines (Wagner 2004). Typical interaction-related technology systems include communication and collaboration support systems (Alavi and Tiwana 2003), conversational technology systems (Wagner 2004) and e-learning (Alavi and Tiwana 2003).

The people component refers to the knowledge workers (Drucker 1999; Horibe 1999) who use the knowledge management technology in their daily work. They are the end-users of the knowledge management systems, and the value of a KMS depends on how people actually use it. People are an integral part of KMS success (Davenport and Prusak 1998). The productivity of these end-users depends on their expertise and experience, and their information and knowledge seeking and processing capability

(Poston and Speier 2005). Thus their knowledge orientation such as value, beliefs, attitudes, and behaviours towards knowledge management play a significant role in their knowledge sharing, communication and collaboration with colleagues using KMS (Hansen, Podolny et al. 2001; Sveiby and Simons 2002). For instance, Poston and Speier (2005) suggested that the types of employee typically using KMS (e.g., experienced senior vs unexperienced junior) might have different capabilities for justifying the quality of information and knowledge they obtain, which in turn would affect their use of KMS. Moreover, in an empirical study, Sveiby and Simons (2002) found that the collaborative climate (defined as a knowledge culture, which includes the values, beliefs and assumptions that influence the behaviours and willingness to share knowledge) tends to improve with age, education level, and managerial role, showing that the user's personality affects the use of knowledge management systems.

One of the most significant elements in knowledge management, networks, are mainly concerned with informal organizational network structures, which can be personal or impersonal, computerized networks and/or social connections among employees. Examples of such informal organizational structures include computerized social networks (Wellman 1996; Wellman 2001), informal personal social networks(Krackhardt and Hanson 1993; Cross, Parker et al. 2001; Cross, Borgatti et al. 2002; Van Wijk, Van Den Bosch et al. 2003), communities of practice and communities of interests (Wenger and Snyder 2000). The most important attributes of networks are network ties, trust and norms, and shared vision (Nahapiet and Ghoshal 1998; Tsai and Ghoshal 1998).

Environment refers to the internal and external knowledge ecology, while internal knowledge environment addresses organizational collaboration (Sveiby and Simons 2002), and knowledge-related policies and cultures(Davenport and Prusak 1998). The external environment surrounding an organization includes external relationships between a focal organization with external world, such as stakeholders, allies and competitors (Sveiby 2001; Van Wijk, Van Den Bosch et al. 2003).

There are ten pairs of possible mutual relationships existing among the five components. These are the people-task, people-network, technology-task, technology-network, people-technology, network-task, environment-task, environment-technology,

environment-people, and environment-network relationships.

Since organizations could not survive being separated from the environment in which they are embedded, the relationships between environment and other components are considered important to organizational knowledge management and the study of knowledge management systems. Some research has been conducted to explore these issues (Lind and Zmud 1995; Sveiby and Simons 2002). While environment could be considered as a critical influencing agent to the use of knowledge management systems in organizations, it, therefore, should not be treated equally as important as the other four components in the socio-technical framework for KMS (see figure 3.2). In addition, environment is a complex composite construct, referring to a lot of factors, and its relationships with other components could be very complicated too. Strategically and practically, it may not be a good idea to include environment component into an exploration study, and the environmental impacts could be left for the later research. Consequently, at this research stage, only six of these relationships will be addressed, and described briefly as follows:

"People-task" refers to the interdependency between individual personality, knowledge structure, interests, and task characteristics. People with different personality, knowledge and experience may prefer or be suitable for different types of tasks (Sveiby 1997). For example, some people prefer challenging jobs (i.e. the exploration task), while others may prefer routine work (i.e. the exploitation task).

"People-network" refers to the dynamic relationships between people and their networks. Social network analysis suggests that people with different types of personal relationships and positions in their networks enjoy different information and knowledge benefits, which, in turn, may affect their work achievements (Burt, 1992, 1997; Hansen, 1997). For example, weak ties may benefit the people with exploitation tasks, while strong ties may benefit the people with exploration tasks (Hansen, Podolny et al. 2001).

"Technology-task" refers to the dynamic and evolving relationship between technology and the tasks to be supported by the technology. For instance, in information system research, the task-technology fit model suggests that the fit between technology and

tasks has significant impact on the usage of the technology and the user's performance (Goodhue 1998). In knowledge management research, Gallupe (2001) classified knowledge management systems based on task types (new/unique vs previously solved). Similarly, Wagner (2004) differentiated knowledge management systems by types of tasks (ad-hoc or repetitive).

"Technology-network" refers to the dynamic and evolving relationship between technology and social networks development. Research has shown that technology can play a significant role in facilitating social network development (Blanchard and Horan 1998; Ogata, Yano et al. 2001; Wellman 2001; Wenger 2001; Verwijs, Mulder et al. 2002). Some authors, however, are suspicious of the exact role of technology plays in facilitating social networks (Cohen and Prusak 2001).

"People-technology" refers to the dynamic and evolving interdependent relationships between technology and its users. Previous studies on information systems show that there exist mutually close relations between information systems use and the characteristics of its users, such as values and beliefs, attitude, and computer training and experience (Davis 1986, 1989; Goodhue 1995). While the features or structures embedded in the information systems affect users' choice and use of information systems, the individual characteristics of end-users affect the use of information systems, and the users' use of information systems recreates the information systems (Davis 1989; DeSanctis and Poole 1994; Orlikowski 2000; Lamb and Kling 2003; Venkatesh, Morris et al. 2003).

"Task-network" refers to the relationships between the types of tasks and the network structures and attributes. Exploitation tasks benefit from loose networks, while close networking around the focal actors is helpful for exploration tasks (Burt 1997; Hansen, Podolny et al. 2001).

In sum, the socio-technical framework for KMS highlights a tight interplay between technical infrastructures, tasks, knowledge workers, social networks and the organizational knowledge environment, and gives a comprehensive picture of the current status of KMS in organizations from a viewpoint of systematic configuration and optimisation. The socio-technical framework can be useful for interpreting the role

of KMS in organizations, guiding the deployment of information technology systems for supporting organizational knowledge management, and jointly optimising the technology systems with individuals' working systems and environments.

As KMS are characterised as dynamically re-configurable and highly inter-networked systems (Wenger 2001), the features, usefulness, and usage of KMS are dynamically changeable depending on the contexts of use (Orlikowski 2000). Therefore, the socio-technical KMS framework needs to be complemented by longitudinal and temporal views of KMS (Roberts and Grabowski 1999). Structuration theory, being inherently dynamic and grounded in ongoing human action, provides a useful framework for studying the dynamic process of information systems development, deployment and use in organizations, and their changing impact on organizations (Orlikowski 1992; DeSanctis and Poole 1994; Majchrzak, Rice et al. 2000; Orlikowski 2000; Callaghan 2002). Therefore, it is necessary to develop a research framework based on structuration theory to examine the process of evolution-in-use of KMS and its effects on organization and organizational knowledge management to complement the socio-technical framework of KMS. In preparation, the next section reviews the application of structuration theory and model to information systems research.

3.4 A Review of Structuration Theory Applied to Information Systems

Structuration theory involves studying social processes that address the reciprocal interaction of human actors and structures of organizations (Giddens 1984; Orlikowski 1992). From a structurational perspective, human actions are enabled and constrained by structures which may be the result of previous actions. Structuration theory provides a framework to embrace both the objective and subjective conceptions of information systems in organizations, and has been used to study organizational adoption of information technologies (Orlikowski 1992).

3.4.1 The Structurational Model of Technology (Orlikowski 1992)

Orlikowski (1992) saw technology in organizations as a social phenomenon. They suggested a structurational model of technology, which addresses two important concepts: duality of technology and interpretive flexibility (Orlikowski and Robey 1991).

Duality of technology recognises technology as

- Physically constructed by actors, working in a given social context, and
- Socially constructed by actors, through ongoing interaction with the technology in a given institutional context.

Interpretive flexibility of technology refers to the extent that users of a technology are involved in constructing the technology physically and socially during the processes of design, development, deployment, and use. While the duality of technology allows us to see technology both as a physical structure (static and stable), and as an evolving phenomenon (dynamic and fluid), interpretive flexibility is influenced by characteristics of the material artefacts, such as specific hardware and software features, the characteristics of human agents such as belief, attitude, experience, motivation and behaviour, and the characteristics of the context such as social relations, institutional forms, task assignment and resource allocation. As a core concept of the model, interpretive flexibility plays a significant role in analysing and interpreting the interaction between technology and organization. For example, as an "open-ended" technology, information technology could have greater interpretative flexibility than other productive technologies, which in turn may reinforce or transform organizational forms (particularly structural configurations), over time.

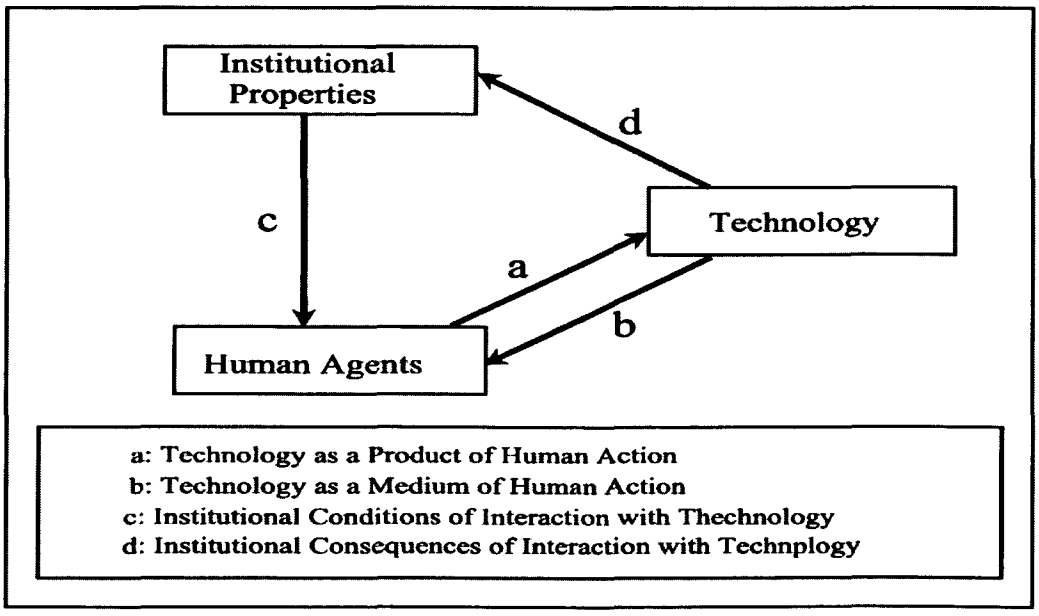
The structurational model of technology consists of human agents, technology, and institutional properties of organizations (Orlikowski and Baroudi 1991; Orlikowski 1992). The human agents include technology designers, users, and decision-makers. The technology refers to the material artefacts mediating task execution in the workplace. The institutional properties of organizations include

- Organizational dimensions such as structure, strategies and culture, communicational modes, operating procedures and quality control, and
- Environmental situations such as government regulation, competitive forces, professional norms and socio-economic conditions.

Among the three components, four types of influences have been identified:

- Technology is posited as an outcome of specific human actions such as design, development, appropriation, and adaptation.
- Technology enables and constrains human action through the provision of facilities, interpretive schemes, and norms.
- Institutional properties influence human agents in their interaction with technology through resource allocation, organizational control and policies, norms, incentives and motivation.
- The adoption of technology affects the institutional properties of an organization by reinforcing or transforming the existing institutional properties of an organization.

The structurational model of technology is shown as figure 3.3 (Orlikowski and Robey 1991; Orlikowski 1992).



Source: (Orlikowski 1992)

Figure 3.3 Structuration Model of Technology

The structurational model shows key aspects of the technology, and suggests typical relationships and interactions surrounding technology development and use. Although the model does not deal with detailed technological features, it provides a useful framework to propose and investigate causal associations related to the mutual interaction between technology and organizations. Orlikowski (1992) noted, however, that the premises of the structurational model oppose undue determinism, and encourage

an interpretive approach to examination and understanding of the interaction between technology and organizations (DeSanctis and Poole 1994).

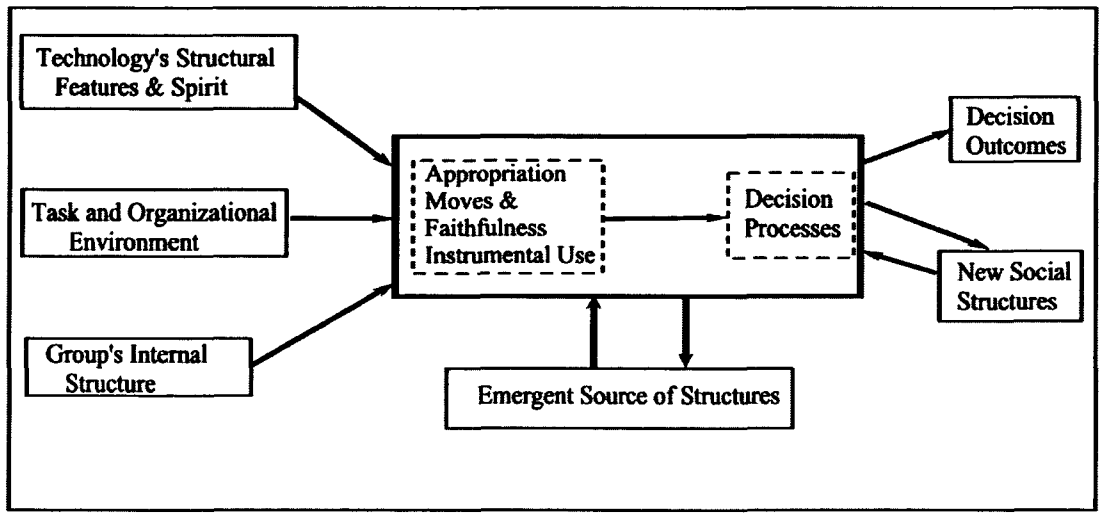
3.4.2 Adaptive Structuration Theory (AST) (DeSanctis and Poole 1994)

DeSanctis and Poole (1994) suggested adaptive structuration theory (AST) as a framework for studying variations in organization change that occur as advanced information technologies are used. In their definition, advanced information technologies refers to a set of information technologies which enable information dissemination, communication, collaboration, and multiparty participation in organizational activities, such as electronic messaging systems, collaborative systems, group decision support systems, executive information systems and groupware systems. Most of these systems are characterised as sets of loosely bundled capabilities and can be implemented in many different ways (e.g. "open-ended" and re-configurable systems) (Gopal, Bostrom et al. 1993; DeSanctis and Poole 1994; Chin, Gopal et al. 1997). AST suggests that advanced information technologies trigger adaptive structurational processes which, over time, can lead to changes in the rules and resources that organizations use in social interaction, which, in turn, are the key determinants of social outcomes such as decisions, new social structures and relationships.

Structuration and appropriation are two core concepts of AST. Structuration is here seen as the process of bringing the rules and resources from an advanced information technology or other sources of structure into action. As a result, social structures are produced and reproduced. Appropriation refers to the immediate, visible actions that evidence deeper structuration processes. According to AST, organizational actors interacting with the advanced technologies result in emerging structures in action, adaptation of technology structures, an interplay between these two types of structures, and, finally, lead to organizational change (DeSanctis and Poole 1994).

A summary of the Adaptive Structuration Model is as figure 3.4, which describes the deployment and use of group decision support system (GDSS) in an organizational context (DeSanctis and Poole 1994; Chin, Gopal et al. 1997; Majchrzak, Rice et al. 2000). According to DeSanctis and Poole (1994), three sources of structure, i.e., the technology, task and organizational environments, and the group's internal structure, are identified as pre-existing conditions that form the context in which the GDSS was

implemented and used, and through appropriations of the technology, affects the group's decision processes and decision outcomes.



Source: (DeSanctis and Poole 1994)

Figure 3.4 Summary of Adaptive Structuration Model

The figure is briefly explained below.

Any advanced information technology can be described and studied in terms of its structural potential, i.e., its specific structural features (i.e., the specific types of rules and resources, or capabilities, offered by the technology) and spirit (i.e., the general intent with regard to the values and goals underlying the specific structural features). With a variety of spirit and structural feature combinations, different forms of social interaction are encouraged by the technology. Task and organizational environment refers to the nature of the task and the organizational setting such as corporate information, modes of conduct and cultural beliefs. The group's internal structure includes styles of interacting and the dominant style of leadership. As these three major structures are applied, the outputs become additional, emergent sources of structures. For example, information generated by entering data into a GDSS becomes another source of social structure (DeSanctis and Poole 1994).

DeSanctis and Poole (1994) note that assessment of the appropriation processes is at the heart of the AST framework. This involves documenting exactly how technology structures are being invoked for use in a specific context (Chin, Gopal et al. 1997). Users actively choose structural features from among a large set of potential features,

and decide how technology structures are used. These appropriations can be analysed for

- Their moves, namely to directly use the structure, relate the structure to other structures, to constrain the structure, and to express judgements about the structure,
- Their faithfulness or unfaithfulness, namely the extent to which the choice and use of technology features fits with the technology's spirit, and
- The instrumental uses of the technology, and users' attitudes toward appropriation (Gopal, Bostrom et al. 1993; Chin, Gopal et al. 1997; Majchrzak, Rice et al. 2000).

As the technology features of advanced information technology are appropriated for facilitating people interaction in a given context, new social relationships may emerge by people interaction. For instance, Wellman (2001) indicated that the use of Internet (e.g., participating in online discussion fora) will result in computerized social networks. Furthermore, a faithful appropriation of GDSS may improve decision processes by expanding idea generation and more even participation by members in expressing their opinions, which in turn will lead to the desired outcomes (DeSanctis and Poole 1994). According to the AST (DeSanctis and Poole 1994), the impacts of the technology on organizational changes depend upon the structural potential of the technology, how the technology and other structures (such as tasks, internal organizational systems and the external organizational environment) are fitted with each other, how technology is appropriated by organization members, and what new social structures and relationships are formed over time.

In sum, AST has advanced the structurational model of technology (e.g. Orlikowski 1992) by

- Refining structurational concepts in the realm of advanced information technologies.
- Integrating concepts related to the structural potential of advanced information technologies with structuration concepts.
- Demonstrating how structuration can be studied by an empirical program of

research.

In addition, by recognizing the structural potential of advanced information technology, AST emphasizes technology use as a key determinant of technology impact, and provides an explanatory and predictive cause-effect model of advanced information technology system use and technology-induced organization change for empirical study. AST can be studied at multiple levels, including the micro level (e.g. dyads), the global level (e.g., groups, departments), and the institutional level (e.g., organizations) (DeSanctis and Poole 1994).

In summary, the AST was considered an appropriate base for establishing a KMS research model for studying KMS and their influence on the outcomes of organizations and on the organizations themselves. Detailed discussion of the model is provided in the next section.

3.5 An AST-based Success Model of KMS

As suggested by Orlikowski (2000), the structurational perspective on technology, being inherently dynamic and grounded in ongoing human action, may have considerable analytic advantages in explaining the consequences associated with the use of new and advanced information technology. Therefore, structurational theory provides a sound theory base for studying KMS and its impacts on individuals and organization.

Based on the adaptive structuration model, a construct model is proposed for evaluating knowledge management systems success and their impacts on organizations. The model, referred to as an AST-based KMS Success Model, is shown as Figure 3.5.

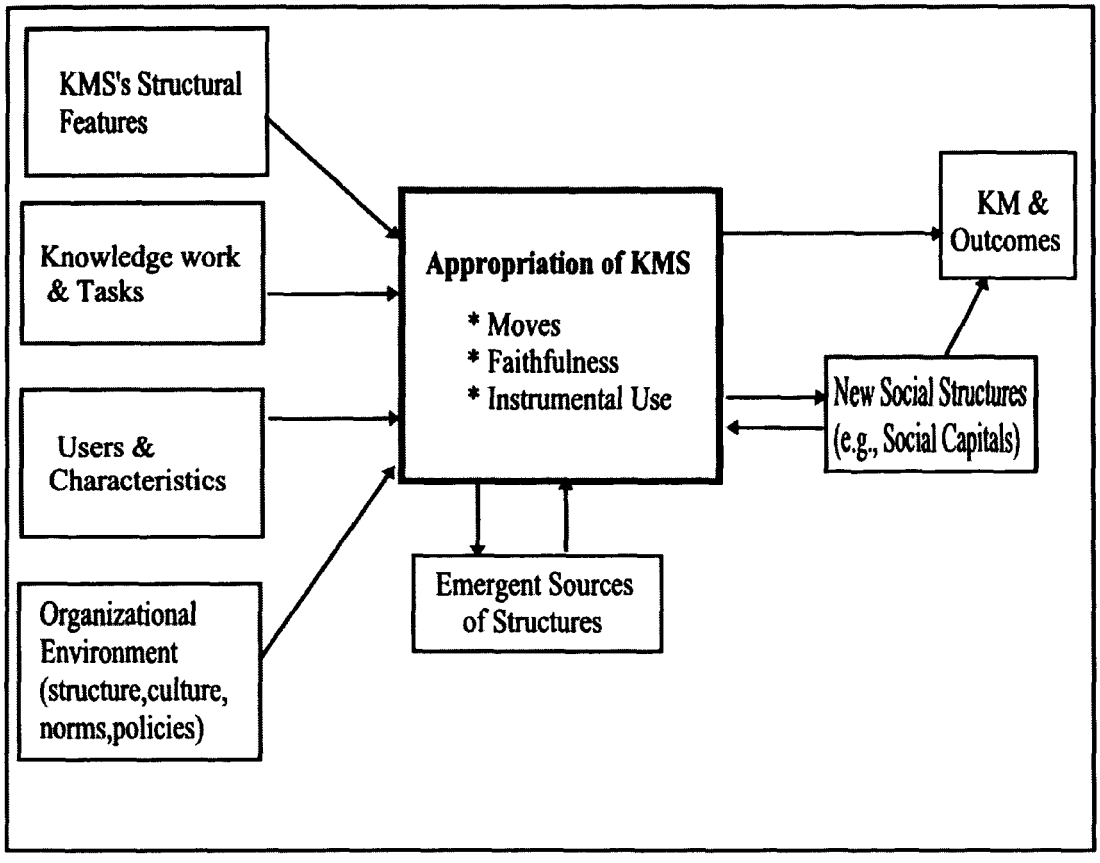


Figure 3.5 An AST-based KMS Success Model

The components of the model are discussed in the following sub-sections.

3.5.1 The Structural Features of KMS

A KMS is implemented and used explicitly to support and enhance the organizational knowledge management (Gallupe 2001). There is no single technology in a KMS. The term KMS usually refers to a set of loosely bundled capabilities and a mixture of multiple technical tools, which can be implemented and integrated in many different ways (Borghoff and Pareschi 1998; Tiwana 2000; Alavi and Leidner 2001; Wenger 2001; Alavi and Tiwana 2003).

In section 2.6.3, KMS was classified into two categories, namely information-related technology systems and interaction-related technology systems. Popular information-related technology systems in practice include content management systems (e.g. document management systems) (Tiwana 2000; Wagner 2004), information and knowledge repositories (Davenport and Prusak 1998; O'Dell and Grayson 1998; Alavi and Tiwana 2003), information portals and search engines (Tsui 2003; Wagner 2004),

and expert locators (yellow pages) (Davenport and Prusak 1998). Typical interaction-related technology systems include email, discussion forum (Wagner 2004), video conferencing systems (Davenport and Prusak 1998), virtual shared project teams and virtual communities (Wenger 2001).

3.5.2 Knowledge Work and Individual Characteristics

Knowledge work refers to the nature of work undertaken by the knowledge workers who are assumed to be the end-users of KMS. Although the concept of knowledge work is applied without definition in research and practice (Schultze 2003), it usually refers to information-intensive tasks, that is the work inputs and outputs are high in information content (Straub and Karahanna 1998; Schultze 2003). Other attributes typically associated with knowledge work include mobility, flexibility, teamwork, computer-mediation, and application of esoteric and theoretical knowledge (Drucker 1999; Schultze 2000; Schultze 2003).

According to Schultze (2003), knowledge work phenomena can be interpreted from different perspectives. For instance, from an economic perspective, knowledge work is closely associated with knowledge creation and transfer, and mainly deals with tacit knowledge, which is not easily transferable (Horibe 1999; Sveiby 1999; Morris 2001). In this view, knowledge work is characterized by theoretical knowledge, high creativity, and high social and intellectual skills (Schultze 2003).

The work practice perspective sees knowledge work as being based primarily on knowledge workers' activities and practices (Schultze 2003). According to Davenport, Jarvenpaa et al. (1996), knowledge work activities and practices include knowledge creation, acquisition, packaging and application. Hansen, Podolny et al. (2001) describe knowledge work in terms of the knowledge available to the tasks at hand. For example, exploration tasks are specific to the focal actor and to those other people in the organization who require new knowledge creation. Exploitation tasks mainly involve utilization of the existing knowledge of the focal actor and/or of the organization. Knights, Murray et al. (1993) define knowledge work as networking (Skyrme 1999), which highlights the key role of social capital in knowledge work. In addition, knowledge work can also be characterised by non-routineness, i.e., the absence of analysable search behaviour, and dependence on other people or other organizational

units (Goodhue and Thompson 1995).

The individual characteristics of end-users of a KMS can affect their appropriation of KMS, and in turn, the outcomes of use of the KMS. The related characteristics of an individual include commitment (Naito 2001), gender (Gefen and Straub 1997), age (Sveiby and Simons 2002), education level (Sveiby and Simons 2002), individual skills and abilities (Moffett, McAdam et al. 2003; Venkatesh, Morris et al. 2003), training (Venkatesh, Morris et al. 2003), computer experience (Venkatesh, Morris et al. 2003), and motivation (Moffett, McAdam et al. 2003; Venkatesh, Morris et al. 2003).

In sum, knowledge work involves the production and re-production of information and knowledge (Schultze 2003). The production and re-production of information and knowledge is frequently accomplished through communication and collaboration among knowledge workers through communities of practices (Wenger and Snyder 2000; Thomas, Kellogg et al. 2001; Wenger, McDermott et al. 2002). The roles of knowledge workers, as the end-users, are important to the use of KMS.. "*The roles of people in KMS are integral to their success*" (Davenport and Prusak 1998, p129).

3.5.3 The Organizational Environment

The organizational environment refers to such organizational matters as hierarchy, policies, corporate information (DeSanctis and Poole 1994; Majchrzak, Rice et al. 2000), and the organizational culture, as well as the external environment surrounding an organization. The external environment includes the relationships between the organization and stakeholders, allies and competitors (Sveiby 2001; Van Wijk, Van Den Bosch et al. 2003). Of these organizational environmental factors, organizational culture has the most significant impact on knowledge management and on knowledge management systems success.

Organizational culture is viewed as a shared mental model that influences how individuals interpret behaviours and how they themselves behave. It is made up of shared values and beliefs, norms of behaviours, unwritten rules and procedures, and work practices (Liebowitz 1999; De Long and Fahey 2000; Kayworth and Leidner 2003). Organizational culture shapes members' perceptions and behaviours (De Long and Fahey 2000).

Organizational culture has been identified as one of the critical factor in knowledge management (Davenport, De Long et al. 1998; O'Dell and Grayson 1998; Liebowitz 1999; De Long and Fahey 2000; Kayworth and Leidner 2003). Organizational culture affects what knowledge is examined, acquired and internalised (De Long and Fahey 2000), how organization members interact with each other, and attitudes towards the knowledge management initiatives such as the implementation and use of knowledge management systems (Alavi and Leidner 2001). Effective knowledge management practice requires a culture that fosters and rewards the creation, sharing, and use of knowledge (Davenport and Prusak 1998). Knowledge management initiatives may fail for a variety of cultural reasons, including value conflict, lack of suitable norms, lack of trust, knowledge hoarding and bad relationships between organization members (De Long and Fahey 2000; Kayworth and Leidner 2003).

Organizational culture and its impacts on the organization can be studied by examining an organization's subcultures from different perspectives (Hofstede 1998). For example, Denison and Mishra (1995) suggests that there are four underlying traits of organizational culture within organizations, namely involvement, consistency, adaptability, and mission. While adaptability and involvement involve traits related to an organization's capacity to change, mission and consistency are more likely to contribute to the organization's capacity to be stable and controllable. Hofstede et al (1990) identified six clear and mutually independent dimensions of those organizational practices which are the visible part of organizational cultures. These subcultures consist of:

- Process versus results oriented.
- Employee versus job oriented.
- Parochial versus professional.
- Open versus closed system.
- Loose versus tight control.
- Normative versus pragmatic (Hofstede 1998; Kayworth and Leidner 2003).

To understand how organizational culture affects knowledge management processes, it is important to understand the impacts of subcultures (De Long and Fahey 2000). According to De Long and Fahey (2000), organizational subcultures, that is distinct sets

of values, norms, and practices exhibited by specific groups or units in an organization, play a crucial role in the interpretation and understanding of the knowledge management activities at the level of organizational units and workgroups. De Long and Fahey (2000) further indicate that different subcultures often lead to different views of knowledge and important knowledge, which, in turn, often lead to miscommunication and conflict between functions, as subcultures apply different criteria in valuing knowledge. It is suggested that the organizational cultures characterised by change and flexibility will favour the new knowledge creation and application processes, whereas the cultures characterised by stability and control may hinder the processes (Kayworth and Leidner 2003). Open cultures will encourage knowledge sharing among organization members, because a climate of openness and trust permeates the organization (O'Dell and Grayson 1998). In contrast, closed cultures can be expected to limit and block the knowledge flow within organization. In addition, compared with the professional cultures and job-oriented cultures, parochial cultures and employee-oriented cultures may have a greater tendency to transfer knowledge among organizational members (Kayworth and Leidner 2003).

In sum, organizational culture affects organizational knowledge management initiatives by shaping members' perceptions of knowledge and knowledge-related behaviours in four ways.

- Firstly, organizational culture and subcultures influence what is perceived as useful, important, or valid knowledge by an organization (De Long and Fahey 2000).
- Secondly, organizational culture influences the relationships between levels of knowledge, that is what knowledge belongs to the organization and what knowledge remains in control of individuals and subunits.
- Thirdly, organizational culture and subcultures influence the organizational context for social interaction, that is, the norms and practices represented by cultures determine the environment within which people communicate and shape how people interact.
- Fourthly, organizational culture and subcultures influence an organization's ability to interpret information reflecting the external environment, which shapes creation and adoption of new knowledge.

3.5.4 Emergent Sources of Structure

Emergent sources of structure involve: (DeSanctis and Poole 1994).

- Technology outputs, including data, text, or other results produced by technology.
- Task outputs, the results of operating on task data or procedures.
- Environmental outputs, the results of applying knowledge or rules drawn from the environment (DeSanctis and Poole 1994).

Since technology structures are applied in organization interaction, they are produced and reproduced, i.e., renewal forms of technology features, or "technologies-in-practice" (Orlikowski 2000) are enacted when users engage recurrently with a technology. As "open-end", dynamically re-configurable, user-programmable, and highly inter-networked technologies (Alavi and Leidner 2001; Wenger 2001), knowledge management systems evolve over time after being implemented.

The new forms of structures may emerge continually along with the KMS, evolving by reproducing technology structures, or blending technology structures with other structures (e.g., task outputs and environmental outputs) (DeSanctis and Poole 1994).

According to DeSanctis and Poole (1994), once emergent structures are used and accepted, they may become institutions in their own right and the change is fixed in the organization. However, new forms of structure are produced and reproduced from emergent sources of structure as the changing technology, task, and environmental structures are applied during the course of social interaction (DeSanctis and Poole 1994).

In sum, information and knowledge is entered into, produced, and accumulated within KMS along with the use and evolution of KMS over time. As a significant emergent structure, information and knowledge carried by KMS plays an important role in the use and success of KMS. On one hand, rich and high quality information and knowledge may encourage people to use KMS more; on the other hand, people may discard a KMS due to the quality and quantity of knowledge and information owned by the system. Consequently, information and knowledge owned by KMS could be considered as one

of the most significant emergent structure emerged in the process of use of KMS, and the information quality could be an important variable to cause the use and success of KMS.

3.5.5 Appropriation of KMS

The immediate, visible actions that evidence deeper structuration processes are called appropriation of technology (DeSanctis and Poole 1994). In the case of knowledge management systems, appropriation of KMS structures is evidenced by organization members:

- Making their own judgements about whether to use or not use certain structures (such as to affirm or negate their usefulness).
- Directly using a KMS structure (such as performance-related usage).
- Relating or blending a KMS structure with another structure (e.g., the structures in the task or environment), or
- Interpreting the operation or meaning of a KMS structure.

Appropriations are characterised by DeSanctis and Poole (1994) and Chin, Gopal et al. (1997) as

- Faithfulness, the extent to which KMS structures provided to organization members are used in a manner consistent with the values and goals underlying the KMS.
- Instrumental uses, the reasons or purposes for which organization members elect to use technology and other resources, and
- Attitudes, the views on using the KMS held by organization members.

Among the aspects of appropriation of technology, attitudes set the tone for the application of technology and, in some measure, whether the organization members pursue these applications with sufficient vigour and confidence for them to suceed (DeSanctis and Poole 1994). Attitude is considered as a multidimensional construct involving (DeSanctis and Poole 1994):

- The extent to which organizational members are confident and relaxed in their use of the technology.
- The extent to which organization members perceive the technology to be of value to them in their work, and

- Their willingness to become competent at using the technology.

Apart from technology structures and task and environmental characteristics, factors which might influence how organization members appropriate available structures include (DeSanctis and Poole 1994):

- Members' style of interacting,
- The extent of members' knowledge and experience with the technology structures,
- The extent to which members believe that other members know and accept the use of the structures, and
- The extent to which members agree on which structures should be appropriated.

Appropriation analysis and measurement are at the heart of AST application (DeSanctis and Poole 1994; Chin, Gopal et al. 1997; Salisbury, Chin et al. 2002). According to DeSanctis and Poole (1994), appropriation analysis examines how technology and other sources of structures are brought into human interaction through discourse at one of three general levels: micro, global, or institutional. Appropriation analysis documents exactly how technology structures are being invoked for use in a specific context in order to shed light on the more long-term process of adaptive structuration (Majchrzak, Rice et al. 2000). The appropriation analysis can be conducted by qualitative or quantitative methods. Qualitative methods of appropriation analysis are however considered to be complex, time-consuming, and sometimes impractical to apply (Chin, Gopal et al. 1997). Some work has been put into the development of instruments for measuring appropriation processes. For example, Chin, et al (1997) developed and tested a scale to measure faithfulness of appropriation. The constructs "*ease of use*" and "*perceived usefulness*" (Davis 1986; Davis 1989; Davis, Bagozzi et al. 1989) were used to measure the attitude dimension of appropriation (Gopal, Bostrom et al. 1993; Chin, Gopal et al. 1997).

In sum, for the case of KMS, the appropriation of KMS could include a set of relevant constructs, e.g.., KMS use (directly using KMS structure), task-technology fit (relating a KMS structure with another structure), perceived usefulness (instrumental uses and attitudes), perceived ease of use (attitudes), and social norms (influencing factors).

3.5.6 Social Capital as New Social Structure

AST proposes that the use of advanced information technology will result in new social structures or enhance existing social structures (DeSanctis and Poole 1994). Social capital can be considered as one of the significant new social structures and is important for enabling and facilitating KM through the use of KMS (Blanchard and Horan 1998; Lesser 2000).

The concept of social capital, taken from sociology, is being widely used by organization and management researchers to help explain such phenomena as:

- Product innovation and value creation (Tsai and Ghoshal 1998).
- Managers' incomes (Meyerson 1994).
- Career success (Seibert, Kraimer et al. 2001).
- Venture capital investments (Sorenson and Stuart 2001).
- The formation of the inter-organizational networks among biotechnology firms (Walker, Kogut et al. 2000).
- Knowledge transfer (Hansen 1997; Reagans and McEvily 2003).
- Employee turnover (Droege and Hoobler 2003).
- Tacit knowledge diffusion (Droege and Hoobler 2003), and
- The creation of intellectual capital (Nahapiet and Ghoshal 1998).

In the literature there are a number of definitions of social capital developed by researchers from various social science disciplines such as sociology, economics, political science and organization studies. According to Adler and Kwon (2000, 2002), however, the existing definitions of social capital fall into three broad types.

The first type, referred to as the bridging view, focuses primarily on social capital as a resource located in the external linkages of a focal actor, i.e., '*the brokerage opportunities in a network*' (Burt 1997, p.335). In this case, the definition of social capital involves two elements, the structure of the relationship networks, and the resources that can be accessed through such networks (Burt 1992; Lin, Cook et al. 2001). In contrast to the bridging view, the second type of view of social capital, referred as bonding views, focuses primarily on the collective actors' internal characteristics which

emphasise that the social capital of a collectivity (e.g., a group, a division, an organization, a community, a nation, so forth) is embedded in the linkages among individuals, or units within the collectivity.

With regard to the third type of social capital, some social capital studies involve both the external linkages of a collective actor, such as linkages to other divisions or firms, and the fabric of its internal linkages among individuals or groups (Nahapiet and Ghoshal 1998; Adler and Kwon 2002). For these studies, the definitions of social capital are worded so as to be neutral on the external/internal dimension. Adler and Kwon (2002) suggest that which viewpoint should be adopted depends on the research questions to be explored and the unit of analysis to be exploited in the study. For the purposes of this research, in which the analysis will be conducted at the individual level, the following definition of social capital is considered appropriate:

> *"As the sum of the actual and potential resources embedded within, available through, and derived from the network of relationship possessed by an individual or social unit. Social capital thus comprises both the network and the assets that may be mobilized through that network."(Nahapiet and Ghoshal 1998, p.243).*

With regard to the source of social capital, there are two distinctive perspectives in previous social capital research. While some research locates the source of social capital in the structure of the ties of social network (Burt 1992, 1997), other work emphasises the content, such as shared norms and beliefs, embedded in the ties of social network as the source of social capital (Adler and Kwon 2002). Adler and Kwon (2000) proposed a conceptual model to integrate previous research on the source of social capital. The model comprises three dimensions: network, shared norms, and shared beliefs. The network dimension refers to the social networks among individuals, groups, and organizations. The shared norms refer to the behavioural embeddedness created and leveraged through relationships. The shared beliefs refer to shared strategic vision, systems of meaning and background, which allows participants to communicate their ideas and to make sense of common experiences. However, these three dimensions are mutually interdependent, although each of them makes a distinct contribution to the formation of social capital.

Similarly, Nahapiet and Ghoshal (1998) studied the dimensions of social capital in the context of creation of intellectual capital. In their paper, they identified structural, relational and cognitive dimensions as the three major dimensions of social capital. The structural dimension addresses the overall pattern of connections between actors, which emphasises the presence or absence of network ties between actors, network configuration measured by density, connectivity and hierarchy. The relational dimension focuses on the content of the network ties, i.e., those assets created and leveraged through relationships, such as norms, trust and trustworthiness. The cognitive dimension of social capital refers to those resources which provide shared interpretations, languages and codes, and system of meaning among actors. In an empirical study of social capital, Tsai and Ghoshal (1998) measured social capital and tested the relations between social capital and value creation under the definition and structure of social capital suggested by Nahapiet and Ghoshal (1998).

As the fundamental element of social capital, networks play a significant role in organizational knowledge management by providing channels for information and knowledge flow that, in turn, enable knowledge creation and sharing (Skyrme 1999; Cohen and Prusak 2001). Networks in business contexts appear in a variety of forms which can be divided into two categories, namely formal and informal networks (Monge and Contractor 2001). Formal networks refer to imposed networks, such as computer networks and the organizational structure reflected in the organizational chart. Informal networks refer to informal, naturally occurring networks, such as social networks and communities of practice (Prusak and Cohen 2001; Wenger, McDermott et al. 2002). Both formal networks and informal networks can be intra-organizational networks and/or inter-organizational networks. For instance, joint ventures and strategic alliances are two examples of formal inter-organizational networks. Research has shown that networks can help firms and/or individuals to gain access to rich information and knowledge, to facilitate knowledge sharing, and to foster knowledge creation (Cross, Parker et al. 2001; Van Wijk, Van Den Bosch et al. 2003). As most knowledge is in tacit form, it is especially important for organizations to utilize the tacit knowledge held by their employees, in order to achieve the organizational objectives (Droege and Hoobler 2003). Among the networks, social networks such as relationships between colleagues provide an efficient and effective way to find and share tacit knowledge and

drive collaboration (Lesser, 2000).

Social networks refer to social connections between individuals, groups and organizations. From this perspective, all organizations can be viewed as social networks, and their environments are also networks of organizations (Van Wijk, Van Den Bosch et al. 2003). In social network theory, the actors' structural and relational embeddedness in the network are two important perspectives. While structural theory stresses the role of positions of actors (i.e., structural embeddedness) in the network (Burt 1992), social capital perspective emphases the role of relations between actors and among actors (i.e., relational embeddedness) (Portes 1998; Coleman 2000). The actors can be individuals, groups or organizations.

Multiple types of social networks have been identified in organizational contexts. These include (Krackhardt and Hanson 1993; Cross, Parker et al. 2001; Hansen, Podolny et al. 2001; Cross, Borgatti et al. 2002):

- Communication networks (Monge and Contractor 2001).
- Advice networks (Cross, Borgatti et al. 2002) .
- Problem-solving networks (Cross, Borgatti et al. 2002).
- Knowledge networks(Hansen 2002) .
- Access networks, and
- Trust networks(Cross, Borgatti et al. 2002) .

However, these different social networks types can also be viewed as a set of attributes of a social network, which includes communication, advice, problem-solving, access and trust. These attributes describe a social network from different perspectives. For example, a social network with features of communication and trust suggests that the actors in the network often talk to other actors and trust each other; a network with features of problem-solving and access suggests that the actors in the network help each other in solving problem at work, and that help is available in a timely fashion (Cross, Borgatti et al. 2002).

From the information and knowledge perspectives, these networks are critical for the sharing of knowledge (both tacit and explicit knowledge) by actors and the effective and

efficient collaboration between actors. As mentioned before, knowledge sharing and collaborative problem solving plays a critical role in promoting and enhancing knowledge creation (Van Wijk, Van Den Bosch et al. 2003).

Social network analysis is the major method and instrument for analysing social networks (Wasserman and Faust 1994). It involves applying a set of relations to an identified set of entities (Wasserman and Faust 1994; Monge and Contractor 2001). With regard to the different units of analysis (i.e., the individual level, work group level, division level, and organization level), the entities in social network analysis can be people, work groups, divisions or entire organizations. Relations are central to social network analysis because they define the nature of the connections between people, work groups, divisions, and organizations. Relations possess a number of important properties, such as strength, stability, symmetry and transitivity (Brass 1995). The typical social network measures consist of measures of ties (e.g., the number of ties, tie strength, indirect links, symmetry, frequency and complexity), measures assigned to individual actors (e.g., degree, range or diversity, closeness and centrality) and measures used to describe entire networks (e.g., size, connectivity, density, symmetry and transitivity) (Brass 1995; Monge and Contractor 2001).

In sum, people develop particular personal relationships through a history of interactions. It is through these interactions that people can share information and knowledge, and collaborate with each other. Relational embeddedness, as a feature of network ties, describes the kind of relations that actors have, such as trust and trustworthiness (Arnold and Kay 1995; Blanchard and Horan 1998; Adler and Kwon 2000), norms and sanctions (Coleman 2000), obligations and expectations (Burt 1992; Coleman 2000), and identity and identification (Nahapiet and Ghoshal 1998). For the purpose of knowledge sharing, a key attribute in this cluster is trust and trustworthiness, because it affects the bandwidth of the information and knowledge networks (Sveiby 2001).

Social capital is considered as a suitable indicator for the social structures of KM for several reasons.

Firstly, it highlights the social networks between people, which are beyond formal organizational structure, and are significant for information and knowledge sharing

(Hansen 1997; Cross, Borgatti et al. 2002; Van Wijk, Van Den Bosch et al. 2003), problem solving (Cohen and Prusak 2001), and individual performance (Krackhardt and Hanson 1993; Cross, Borgatti et al. 2002; Cross and Prusak 2002)

Secondly, the trust component of social capital is accepted as a critical relational feature of an individual's connections with other people (Jarvenpaa and Leidner 1999), which has a important impact upon the knowledge sharing (De Long and Fahey 2000) and collaboration activities between people (Arnold and Kay 1995; Kayworth and Leidner 2003).

Thirdly, the shared vision component of social capital is considered important to organizational members (Nonaka and Takeuchi 1995; Naito 2001), facilitating the collaboration and knowledge-sharing between them (Davenport and Prusak 1998; Nahapiet and Ghoshal 1998; O'Dell and Grayson 1998).

3.5.7 Summary

The AST-based KMS success model reflects the main components (i.e., KMS, users, tasks, networking structures, environments), and interrelations outlined in the Socio-technical Framework for Knowledge Management Systems (see section 3.3), and highlights the main "cause and effect" relations for KMS operation, and the key outcomes resulted from the use of KMS in organizations. This model is important for studying KMS in a organizational context as it reflects the true nature of KMS and its use as an open-ended, dynamic evolutional system, and more importantly, it provides the rationale for exploring KMS-induced social capital.

However, the components of AST-based model still need to be further articulated in order to assist empirical investigation. Alavi and Leidner (2001) suggest that research on KMS success could benefit from a study of information systems success. Accordingly, the following section provides a comprehensive review of IS success models to further complement the AST-based KMS model and so to produce a testable KMS success research model.

3.6 A Review of IS Success Models

Researchers have long been interested in evaluating and assessing the success of IS in organizational contexts (DeLone and McLean 1992; Garrity and Sanders 1998;

Callaghan 2002; DeLone and McLean 2003). For example,

- Bailey and Pearson (1983) studied IS success based on system quality, information quality, and user satisfaction.
- Franz and Robey (1986) focused on user involvement, organizational context, and measuring IS success by the perceived usefulness of IS.
- Fuerst and Cheney (1982) measured decision support systems success by frequency of use.
- Doll and Torkzadeh (1988) dealt with the development of an instrument for measuring the satisfaction of users who directly interacted with a specific application.
- Davis (1989) developed the technology accept model (TAM) that suggests that perceived usefulness and perceived ease of used are two determinants of user acceptance of IS.
- Doll, Hendrickson et al. (1998) reported a confirmatory research on the TAM.
- Goodhue and Thompson (1995) highlighted the importance of the fit between information systems and users' tasks in achieving an individual performance impact from information system.
- DeSanctis and Poole (1994) suggested adaptive structuration theory (AST) for examining the role of IS in organizations as the outcomes of multiple structures (including structural potential of IS) interaction and appropriation of technology features.

Several IS success models have been suggested in the literature. Among them are

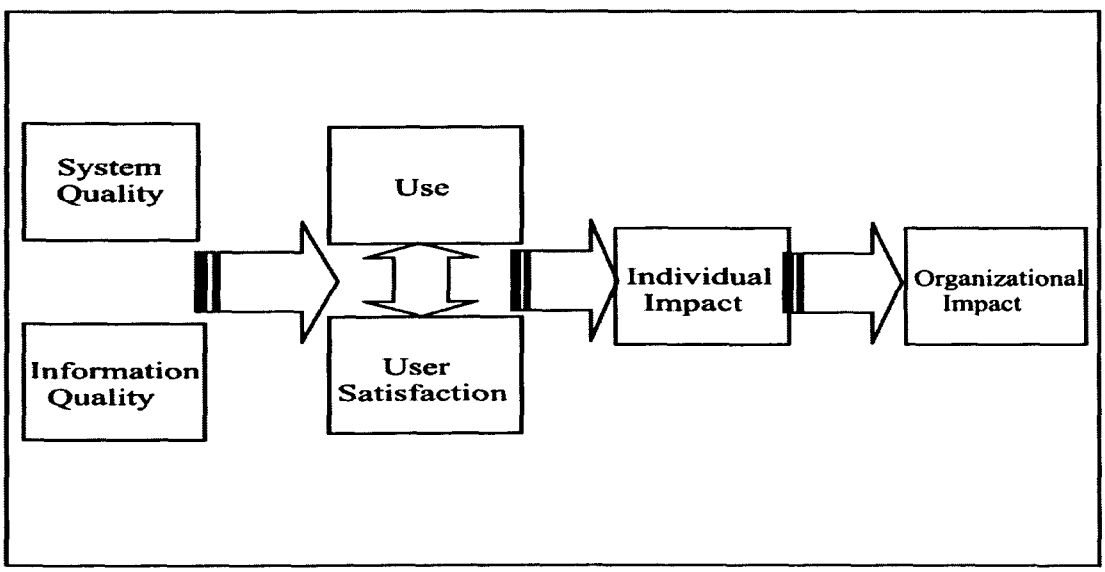
- The DeLone and McLean Model (DeLone and McLean 1992; DeLone and McLean 2003).
- The technology acceptance model (TAM) (Davis 1986; Davis 1989; Venkatesh and Davis 2000; Venkatesh, Morris et al. 2003).
- The technology-task fit model (TTF) (Goodhue and Thompson 1995).
- The system to value chain model (Doll and Torkzadeh 1991; Doll and Torkzadeh 1998).
- Adaptive structuration theory (AST) (Orlikowski 1992; DeSanctis and Poole 1994; Orlikowski 2000).

These models are reviewed in the following sub-sections.

3.6.1 The DeLone and McLean Model

DeLone and McLean (1992) proposed a multidimensional IS success model for reviewing and categorising a large amount of empirical research on IS success measurement from seven IS publications. This model has six major dimensions of information systems success, namely system quality, information quality, use, user satisfaction, individual impact, and organizational impact.

The essence of the model is the model of communication by Shannon and Weaver (1949) and Mason (1978), which suggests that the output of an information system can be measured at different levels such as the technical level (e.g., production vs. system quality), the semantic level (e.g., product vs. information quality), and the effectiveness level (e.g., receipt vs. use, influence on recipient vs. user satisfaction and individual impact, and influence on system vs. organizational impact). The DeLone and McLean Model is depicted as Figure 3.6.



Source: (DeLone and McLean 1992)

Figure 3.6 DeLone and McLean IS Success Model

The DeLone and McLean Model furthers advances research on IS success in several ways. It consolidates previous research on IS success measurement, presents a more integrated and systematic view of the concept of IS success, highlights six critical

success factors and lays down a solid basis for further empirical and theoretical study (DeLone and McLean 1992; Ballantine, Bonner et al. 1998).

The DeLone and McLean Model had aroused criticism (Ballantine, Bonner et al. 1998). Firstly, it has an underlying logic problem, in that the categories and model were based on the analogy of communication process theory (Shannon and Weaver 1949; Mason 1978) without significant discussion of their underlying epistemology and logic. The proposed sequence of dependence from system and information quality to information system use and satisfaction to information impacts can give a misleading impression of how to ensure a successful information system.

Secondly, it suffers from cause and effect confusion. There are two interrelated questions which remain unanswered in the model: what is (are) the dependent variable(s), and what is (are) the independent variable(s). DeLone and McLean claimed that the six critical IS success factors were dependent variables, but they also suggested that these factors can be causally related (DeLone and McLean 1992). For example, the suggestion that individual impact is dependent upon user satisfaction may not be the case; it is more likely that user satisfaction is an effect of the system's impact on the individual.

Thirdly, the model is incomplete in that it misses several fundamental factors, such as user involvement (Seddon and Kiew 1994) and the characteristics of task and individual users (Goodhue and Thompson 1995). In additional, empirical findings confirm some of the causalities identified in the model but do not confirm others (Seddon and Kiew 1994; Bonner 1995).

Fourthly, the model is based on studies before 1988, which means that subsequent innovation in IT/IS, IS success measurement and applications are not considered.

The original DeLone and McLean Model has been refined, expanded, and revised. For example, Bonner (1995) added people elements, such as user quality, to the model. Ballantine, Bonner et al. (1998) examined the original model critically, and proposed a revised 3-D model IS success by re-structuring DeLone and McLean's taxonomy, and by separating success into three fundamental levels: the technical development level, the

deployment to the user, and the delivery of business benefits. Ishman (1998) introduced user involvement, user participation, and perceived equity as independent variables, and tested the DeLone and McLean Model at an individual level in a cross-cultural environment. Myers, Kappelman et al. (1998) expanded the DeLone and McLean Model with two additional factors, service quality and workgroup impact. Garrity and Sanders (1998) revised the DeLone and McLean Model with a socio-technical consideration, and delineated four dimensions of information systems success, task support satisfaction, decision making satisfaction, quality of work-life satisfaction, and interface satisfaction.

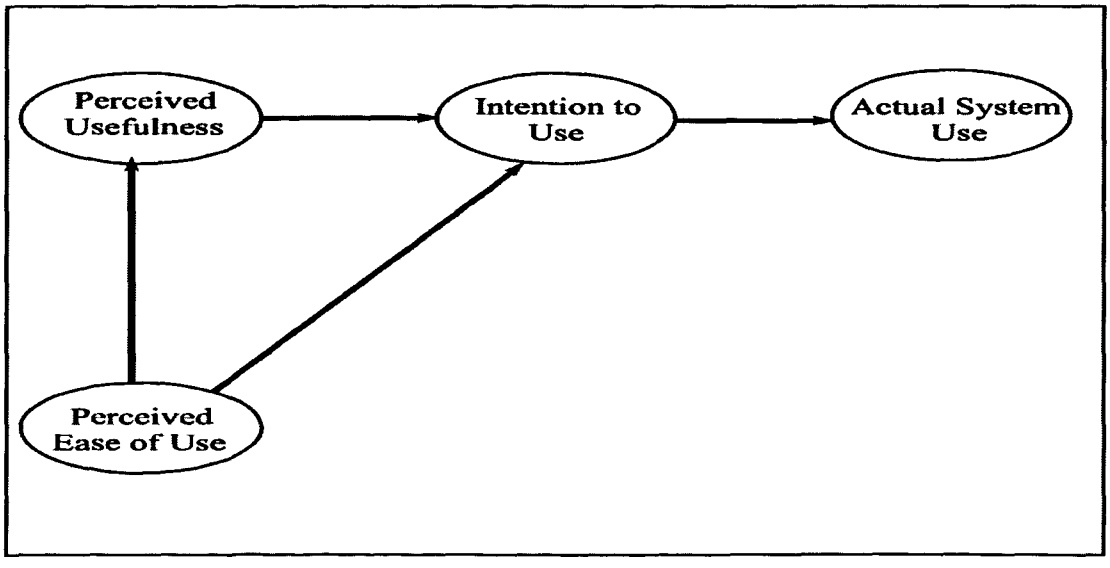
DeLone and McLean (2003) updated their model based on a ten-year (1993-2002) literature review of over 100 relevant research publications from IS journals since their model was first published. The review suggested that the original model and the proposed relationships among the IS success constructs are supported strongly by the cited empirical studies. Moreover, their analyses highlighted system use as a key construct in evaluating IS success, and recommended using a multidimensional measure for system use, such as Doll and Torkzadeh (1998), instead of using simple usage measures. In addition, their analysis also found that information quality had a strong association with system use, and strongly encourage researchers to include information quality measures as a critical construct in evaluating advanced information technology applications success, such as e-commerce (DeLone and McLean 2004). They also extended their model adding service quality as an independent variable.

The DeLone and McLean Model provides an holistic view of IS success, and is still in the progress of evolution. Several parallel models have been developed, and offer potential for the study on IS success in organizations.

In sum, DeLone and McLean Model could make contributions to KMS success study by providing essential logic chain relationships among the 'core' constructs, and highlighting the importance of information quality in evaluation of advanced information systems, such as KMS. Furthermore, it also affirms the necessity of using a multidimensional measure for system use to replace the simple system usage measurements in IS success study.

3.6.2 Technology Acceptance Model (TAM)

Davis (1986) proposed a technology acceptance model (TAM) for exploring and explaining the behaviour of computer usage. The essence of the model is the theory of reasoned action (TRA), one of the most influential theories of human behaviour, which has been used to predict a wide range of behaviours (Ajzen and Fishbein 1980). A revised TAM was proposed after empirical testing and post hoc analysis of the original model (Davis, Bagozzi et al. 1989). The core constructs of TAM consist of perceived usefulness (PU) and perceived ease of use (PEOU) (Davis 1989). The concept model of TAM is depicted as Figure 3.7.



Source: (Davis 1989)

Figure 3.7 Technology Acceptance Model (TAM)

Perceived usefulness is defined as:

> *"The degree to which a person believes that using a particular system would enhance his or her job performance" (Davis 1989, p. 320).*

Perceived ease of use is defined as:

> *"The degree to which a person believes that using a particular system would be free of effort" (Davis 1989, p. 320).*

Substantial theoretical and empirical support has been shown for the technology acceptance model. TAM has proven to be successful in predicting and explaining usage across a variety of information systems (Davis 1989; Adams, Nelson et al. 1992; Chin and Todd 1995; Straub, Limayem et al. 1995; Szajna 1996; Igbaria, Zinatelli et al. 1997; Doll, Hendrickson et al. 1998; Lucas and Spitler 1999). In addition, TAM integrates the findings of a large number of IS researchers (Davis, Bagozzi et al. 1989).

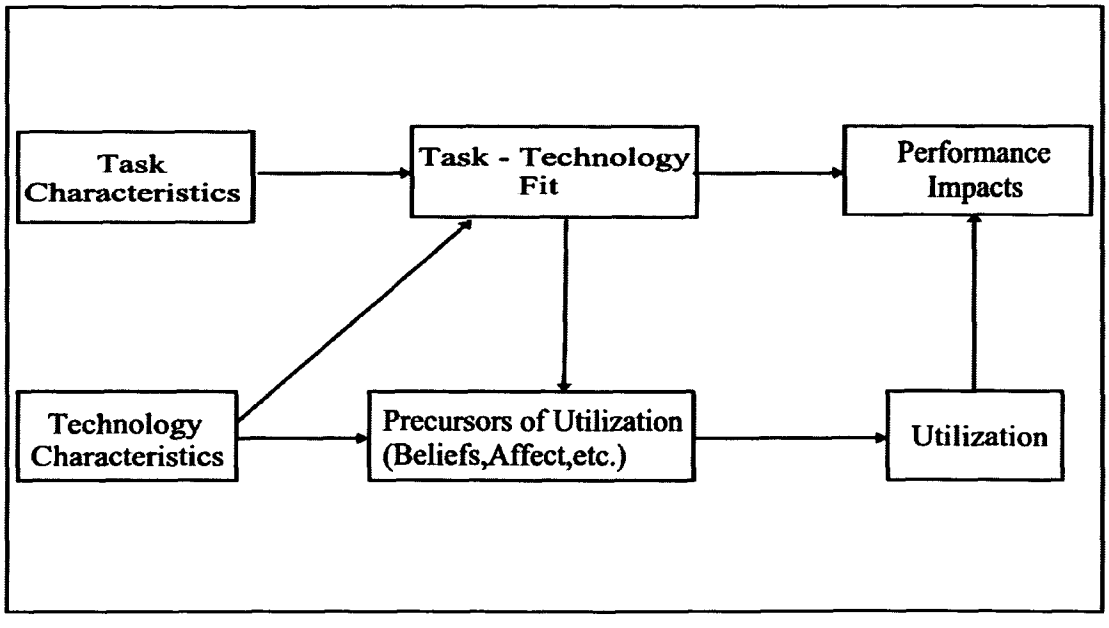
TAM has been extended. For example, Gefen and Straub (1997) extended the TAM model by adding gender to it. Lucas and Spitler (1999) developed a prediction model of workstation use in a field setting by extending TAM with constructs of social norms and user performance. TAM2 was proposed as a theoretical extension of the TAM (Venkatesh and Davis 2000), introducing social influence and cognitive instrumental processes into TAM for explaining perceived usefulness and usage intentions.

Although perceived usefulness and perceived ease of use have shown significant associations with IS usage, the research results may depend on how system use was measured (Adams, Nelson et al. 1992; Szajna 1996). For example, Straub, Limayem et al. (1995) suggested that PU and PEU may be related to perceived or self-reported use rather than actual system use. In addition, research also suggests that it is necessary to distinguish between voluntary use and mandatory use of a system, because PU and PEU may have little influence on overall levels of use in the latter case, though they may influence measurements such as user satisfaction (Adams, Nelson et al. 1992). In practice, TAM is also presented in pre-implementation versions and post-implementation versions, as the key factors PU and PEOU have different roles in different situations (Szajna 1996).

In sum, the TAM model confirms theoretically and empirically the perceived usefulness as one of key determinants to end-user's acceptance and use of IT. The TAM also articulates the sequence from perceived ease of use to perceived usefulness to system use in a context of post-implementation, which could be included into the KMS success study.

3.6.3 Task-Technology Fit (TTF) Model

Whilst the TAM model does not explicitly address the issues of the impact of IS on performance, it assumes that more utilisation is always better. However, this may not always be the case. For example, utilization of a poor system would not improve performance. As a poor system may be utilized extensively due to social factors, habit, ignorance or just availability, it is argued that the major reason for the negative impact of IS on performance may be poor task-technology fit (Goodhue and Thompson 1995). In order to better understand the linkage between information systems and individual performance, an evaluation model combing utilization and task-technology fit construct, referred as the TTF Model, was proposed as Figure 3.8.



Source: adapted from (Goodhue and Thompson 1995)

Figure 3.8 Task-Technology Fit Model of IS Success (TTF)

At the heart of the TTF Model is the assertion that for an information system to have a positive impact on individual performance, the IS must be utilized and must be a good fit with the tasks it is supposed to support (Goodhue and Thompson 1995). The TTF model highlights the importance of the fit between technologies and users' tasks in achieving individual performance impacts from information systems (Goodhue 1995; Goodhue and Thompson 1995; Goodhue 1998).

The essence of the TTF model is the Technology-to-Performance Chain (TPC) which addresses the way in which technologies lead to performance impacts at the individual

level (Goodhue 1992).

The task-technology fit (TTF) construct is defined as:

> *"The degree to which a technology assists an individual in performing his or her portfolio of tasks" (Goodhue and Thompson 1995, p. 216).*

In fact, TTF is the correspondence between task requirements, individual abilities, and the functionality of the technology. The TTF model has been tested empirically with two US companies (Goodhue and Thompson 1995). The results show that TTF has stronger explanation potential on performance impact than on utilization. However, strong evidence also suggests that performance impacts are a joint function of utilization and TTF (Goodhue and Thompson 1995).

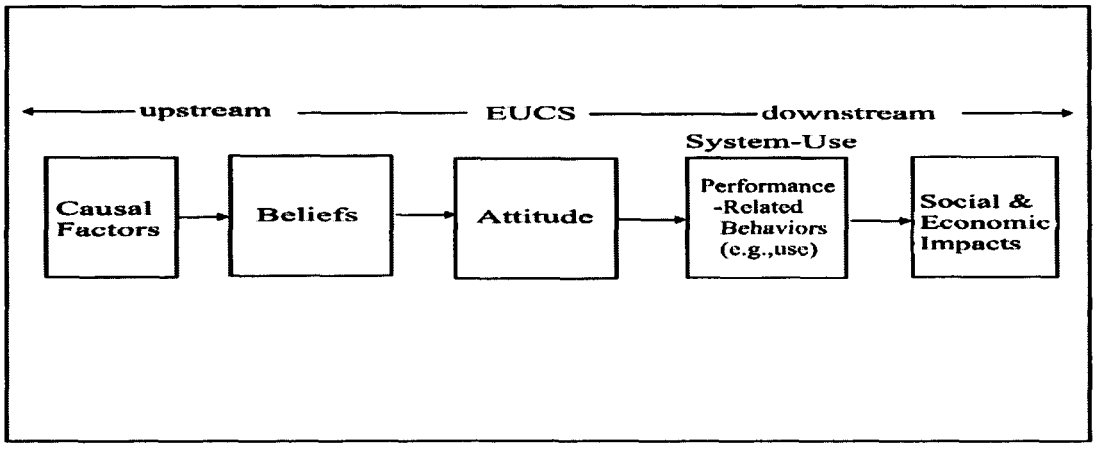
TTF is a powerful construct in the study of information systems use and impacts. In addition to the studies of user evaluation of TTF and its impact on individual performance (Goodhue 1995; Goodhue 1998), the TTF construct was used for predicting effective group support systems (GSS) use and GSS effectiveness (Zigurs and Buckland 1998; Zigurs, Buckland et al. 1999). Dishaw and Strong (1999) combined TAM and TTF to study usage of a maintenance software tool, and the analyses confirm the direct effect of the TTF construct on utilization of the software tool. Nance and Straub (1996) investigated individuals' IT usage choice with the TTF construct, and the results show that TTF strongly influenced users' IT choices.

The TTF model has some important limitations. It is difficult to measure the TTF construct with a simple and well-accepted instrument (e.g. like the instrument for perceived usefulness) due to the complex and multi-faceted nature of the TTF construct. TTF is application-specific and task-specific, making it difficult to develop measures that are generally applicable to a variety of systems and tasks. In addition, there is weak empirical evidence supporting the proposition that user evaluations of TTF are a function of both systems characteristics and task characteristics. Furthermore, empirical evidence only shows mixed results on the causal link between TTF and utilization, and this needs further investigation (Goodhue and Thompson 1995).

In sum, the TTF has been designed to synthesize task requirements, individual abilities, and technology system features for a specific IT application in a variety of use situation, which would be well suitable for enriching the AST-based KMS success model.

3.6.4 System to Value Chain (SVC) Model

Doll and Torkzadeh (1991) argued that end-user computing satisfaction (EUCS) is an important theoretical construct, because of its potential for helping to discover both forward and backward links in a causal chain, referred as the System to Value chain (SVC) model (Figure 3.9).



Source: adapted from (Doll and Torkzadeh 1991; Doll, Hendrickson et al. 1998)

Figure 3.9 System-to-Value Chain Model

The System-to-Value chain describes a sequence of system success constructs. The end-user computing satisfaction construct is a pivotal construct in the system-to-value chain model, linking the upstream research domain and the downstream research domain (Doll and Torkzadeh 1991). While EUCS is a dependent variable for evaluating the effectiveness of design and implementation activities (i.e. IS success in design and implementation stages), it can also serve as an independent variable for predicting system usage, which, in turn, triggers social and economic impacts (Doll and Torkzadeh 1991; Doll and Torkzadeh 1998).

The potential of IT depends on how it is used in practice (Doll and Torkzadeh 1998). In the system-to-value chain, system-use is recognized as the central construct that links user satisfaction with social and economic impacts. Doll and Torkzadeh (1998) highlight the importance of re-conceptualisation of system usage, by arguing that the potential of the system-use construct depends on how it is conceptualised and operationalized. Melone (1990) suggested that system use needs to describe the performance-related usage behaviours that reflect how IT is actually used in organizations. However, IT applications such as management information systems (MIS)

are implemented and used to perform a variety of functions (e.g., inventory, service customers, and transaction processing) and serve various purposes (e.g., decision making, coordination of work activities, and information/knowledge sharing) in organizational contexts, which would probably result in very complex contextual performance-related usage behaviours. Therefore, it is unlikely that any one taxonomy of performance-related behaviours will be appropriate for all purposes and applications. To be applicable for a specific IT application in a specific use situation, the construct would have to be rethought and redefined (Doll and Torkzadeh 1998).

System-use has been considered as a major factor in determining the social and economic impacts of information technology (Doll and Torkzadeh 1998). Although significant effort has been put into developing system use measures, most of them are simple, uni-dimensional instruments, such as

- Hours of usage (Ettema 1985).
- Frequency of requests for specific reports (Benbasat, Dexter et al. 1981).
- Frequency of use (Culnan 1983).
- The percentage of time that DSS are used in decision-making (Barki and Huff 1985).

These are clearly inadequate to express complex performance-related behaviours. Doll and Torkzadeh (1998) indicated that multidimensional system-use constructs are needed; they have inherent advantages in explaining and predicting the diverse social and economic impacts of IT at the levels of individual, workgroups, and organization. A multidimensional system-use construct that identifies key performance-related usage behaviours could provide a set of independent or mediating variables to explain and predict the downstream social and economic impacts of IT on work, whether usage is voluntary or mandatory.

In sum, the system-to-value chain sheds light on the multidimensional system-use construct, which can be expected to have a key role in the study of KMS success.

3.6.5 Summary

This section has presented a comprehensive review of four main information systems success models and their extensions. The DeLone and McLean Model focuses on an integrated and systematic view of the concept of IS success with six critical measurements of IS success. The TAM articulates two critical determinants that enable user to accept and use information technology. The TTF model contributes the IS success research and practice with a new significant independent variable – Task-Technology Fit. The system-to-value chain model highlight the critical importance of a multidimensional performance-related information technology use construct in IS success measurement.

Furthermore, the DeLone and McLean Model also articulates the cause-effect relationship between information quality and system use. The TAM evidences the sequential cause-effect relationships from (perceived) ease of use to perceived usefulness then to systems use. The TTF model demonstrates the direct effect of TTF on both perceived usefulness and system use. The system-to-value chain model urges to use a multidimensional performance-related system use construct to replace simple system usage constructs in IS success study. These models have their own contributions to the development of KMS success model.

The socio-technical model of knowledge management systems (see Figure 3.3) captures not only the core organizational knowledge management components (i.e. technology, task, people, network, and environment), but, more importantly, the dynamics (i.e., interactions and evolutions) between these components as well. The model highlights a set of critical relationships in KMS research, such as task-technology, people-technology, technology-networks, environment-technology, and provides the theoretical rationale for integrating the results of IS success studies into KMS success research.

As being discussed in sub-section 3.5.5, appropriation of KMS could be composed of (perceived) ease of use, perceived usefulness, task-technology fit, social norms, and performance-related use of KMS. Accordingly, the AST-based KMS success model can be extended to comprise Perceived Usefulness and Perceived Ease of Use constructs (Davis 1989; DeSanctis and Poole 1994), social norms (Lucas and Spitler 1999), the TTF construct (Goodhue 1998) and information quality (DeLone and McLean 1992;

DeLone and McLean 2003) as fundamental determinants of a user's acceptance and performance-related use of KMS (Doll and Torkzadeh 1998). Individual and environmental factors may moderate the cause-effect relations between the independent variables and the dependent variable in the model.

3.7 Research Model and Hypotheses Development

The extended AST-based KMS success model is presented in this section, and followed by a set of hypotheses derived from the research model.

3.7.1 An expanded AST-based KMS Success Model

The expanded AST-based KMS success model is presented as Figure 3.10.

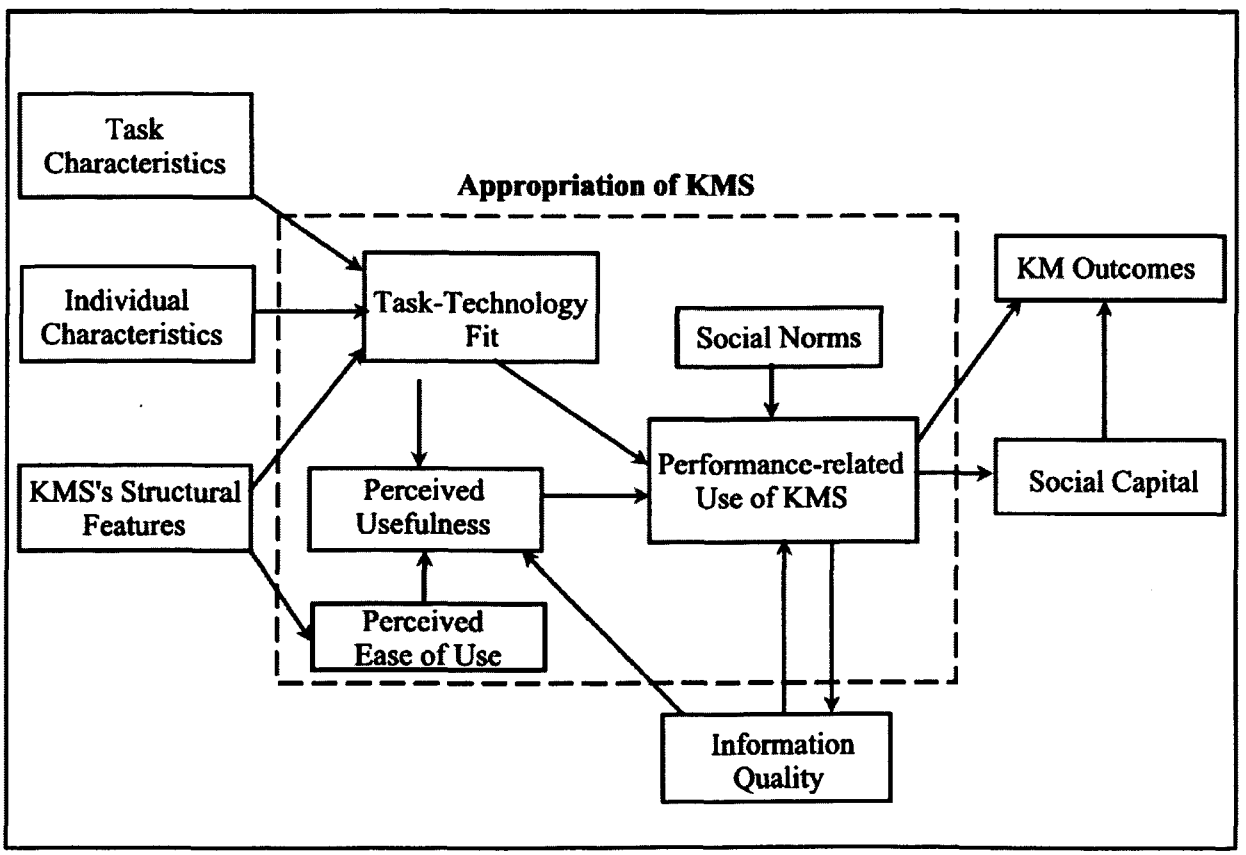


Figure 3.10 An Extended AST-based KMS Success Model

Appropriation of KMS is defined as the degree to which end-users actively select how KMS structures and facilities are used in practice (DeSanctis and Poole 1994). As discussed earlier, the appropriation of KMS is multidimensional (DeSanctis and Poole 1994). Hence, based on previous research on AST and IS success, the conceptual

structure of appropriation of KMS, which comprises perceived usefulness, perceived ease of use, technology-task fit, information quality, social norms, and KMS use, is suggested for this study and is shown as Figure 3.10. In addition, the "Emergent Source of Structures" (see Figure 3.5) has been replaced by "Information Quality" construct (see Section 3.5.4 for details). Meanwhile, three independents, i.e., KMS's structural features, Knowledge work & Tasks (re-termed as "Task characteristics" in Figure 3.10), and Users & characteristics (re-termed as "Individual characteristics" in Figure 3.10) have been remained un changed. The Organizational environment has been ignored deliberately here since the environment variable has been left for future study (refer to Section 3.3.2 for details).

It is worth noting that the appropriation of KMS reflects a sufficient synthetisation (or combination) of the original concept of appropriation of IT systems (DeSanctis and Poole 1994) with the key KM components and the associations among the components articulated in the socio-technical framework of KMS (see section3.5).

According to Goodhue and Thompson (1995), the TTF conceptually and theoretically captures the correspondence between task characteristics, individual characteristics (e.g., commitment, capabilities) and functionality of the technology system. As a result, the TTF delineates three basic pairs of the interacting dynamic relationships between task, technology, and people.

As an aspect of organizational knowledge culture, social norms depict the interacting relationships among the organizational environment, KMS, and people, because it represents some aspects of organizational knowledge management policy and popular behavioural norms toward knowledge management systems within organizations.

Information quality represents an emergent source of structure as the cause and effect of appropriating KMS. Along with the use of KMS, the KMS will produce information as part of the results of the appropriation of KMS; on the other hand, the quality of existing information resources of KMS will affect the further appropriation of KMS. The two-way arrows between information quality and the appropriation of KMS highlight the two-way dynamic interacting relationships between the appropriation of KMS and information quality.

The remaining relationships, such as technology-network, people-network, task-network, and environment-network, are also represented indirectly in the model. For instance, the people-network relationship is delineated through the mediating constructs, TTF and appropriation of KMS.

While the perceived usefulness of KMS and perceived ease of use of KMS delineate knowledge workers' attitude towards the KMS, the performance-related use of KMS represents the instrumental use of KMS (see section 3.7).

Several individual characteristics and organizational factors should also be included in the research model as important moderators, affecting relationships between constructs (not showed in the Figure 3.11). Previous research on information systems suggests that gender, education level, age, and IT experience (Gefen and Straub 1997; Venkatesh, Morris et al. 2003) may be critical individual characteristics, and that organizational size and unit size (Rogers 1991) are significant organizational factors for user acceptance and use of information and communication technology (ICT), and thus for KMS.

So far, a theoretical KMS success model has been established, derived from a combination of socio-technical framework of KMS (see Section 3.5) and adaptive structuration theory (AST) (see section 3.6 and 3.7). The model gives a more accurate picture of the way in which KMS functions in organizations and therefore provides a strong theoretical basis for further evaluating KMS success.

3.7.2 Development of the Hypotheses

The theoretical KMS success model is a complex model and need to be reduced to permit empirical testing in this study. As suggested by Goodhue (1998), user evaluations of IS can be taken as a surrogate measure for TTF, which involves measuring the degree to which an organization's information systems and services meet the information needs of knowledge workers (as end-users of KMS). User evaluations of the IS construct are considered useful for the study of KMS for several reasons. First, user evaluation of IS is designed to meet a need for evaluating the overall information systems and services provided in an organization, not the individual applications (Goodhue 1998). A KMS usually involves a variety of distinct information technology

systems, rather than individual applications. Second, the KMS is designed to support knowledge work, which is characterized as the production and reproduction of information (Collins 1997; Schultze 2000; Kleinman and Vallas 2001; Schultze 2003). According to Goodhue (1998), the user evaluations of IS composes of two sub-constructs,

- Information content quality, and
- Information services quality.

Thus, the TTF in this context can be equated to the information quality construct. Furthermore, the aim of this study is to examine the impact of KMS on social capital. Consequently, the KM outcomes variable can be omitted. As a result, a reduced KMS success research model, called KMS success Model I, is presented as Figure 3.11.

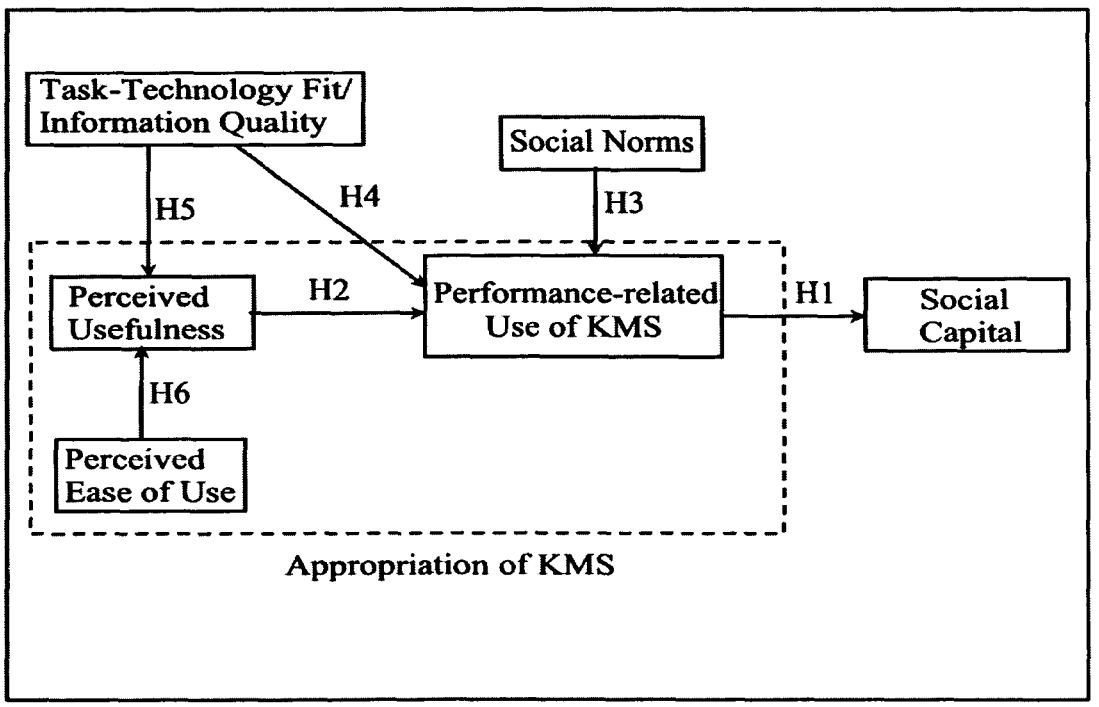


Figure 3.11 KMS Success Model I

The research model I of KMS Success, with six constructs, proposes that a KMS affects organizational knowledge management by changing the knowledge work environment, i.e., creating or renewing specific knowledge management-oriented social structures or social capital, instead of acting upon knowledge management processes directly (Von Krogh, Ichijo et al. 2000; Nonaka, Toyama et al. 2001; Sveiby and Simons 2002). Although the original AST model suggested that there was a complex recursive

relationship between appropriation of IS and new social structures, the complex two-way recursive relationship between appropriation of KMS and social capital is simplified as a one-way linear cause-effect relationship in the research model, as the goal of this research is to evaluate the effect of a KMS. A similar simplification is made to the two-way recursive relationships between appropriation of KMS and information quality.

The KMS success research model I (see Figure 3.11) highlights a set of cause-effect relationships between constructs. Based on model I, a set of hypotheses can be developed for this study. For simplicity, the development of hypotheses will ignore the effects of moderators. The moderator relationships are retained in the model for later study.

The Performance-related Use of KMS and Social Capital Development

The purpose of this study is to evaluate empirically the role of KMS in creating and renewing knowledge management-oriented social structures. As discussed in details in Section 3.7.6, it is arguable that social capital can be a suitable indicator of organizational social structures for organizational knowledge management. Based on the social capital definition given by Nahapiet and Ghoshal (1998), the effects of KMS use on the social capital refer to the extent to which the KMS use influences personal social capital as a whole, as well as its three components.

AST proposes that new social structures could emerge or existing social structures could be enhanced, as the rules and resources of information technology are appropriated in a given context and then reproduced in people's interactions over time (DeSanctis and Poole 1994). For instance, in an experimental research on computer-mediated communication (CMC), Walther (1995) has found that CMC enhances social interactions, which may lead to a more intimate and sociable relationships between users over time (Hinds and Kiesler 1995). Wellman (1996) also suggests that use of Internet results in the emergence of social networks among the users. Accordingly, the following hypothesis is proposed.

H1: The performance-related use of KMS will have a significant positive influence on the social capital, i.e., the performance-related use of KMS will enhance user's social

capital.

The performance-related use of KMS focuses on enabling knowledge creation and sharing so as to help knowledge workers fulfil their work tasks efficiently and effectively. As discussed in Chapter II, organizational knowledge creation and sharing are complex processes, involving a pair of interacting activities: participation and reification (Wenger 1998; Wenger, McDermott et al. 2002). Participation refers to connection and interaction with people, while reification addresses codification of knowledge and utilization of relevant codified information and knowledge. Consequently, KMS can support the participation and reification through interaction-related (communication and collaboration) usage and information-related usage. As indicated by Wenger (1998), participation and reification interplay; as participation results in knowledge to be objectified, the utilization of the objectifications will enhance the participation. Social capital will mainly be affected by people interactions, hence, the interaction-related use of KMS is hypothesized to have direct effects on social capital, and the information-related use of KMS will support the interaction-related use of KMS.

There are associations among the three dimensions of social capital (Nahapiet and Ghoshal 1998; Tsai and Ghoshal 1998). Expansion of the structural dimension of social capital (personal social networks) may stimulate more communication and social interaction. More communication and social interaction among the users of KMS results in more knowledge and information sharing, improving mutual understanding and thus promoting the level of trust among the users (Creed and Miles 1996; Tsai and Ghoshal 1998). Meanwhile, more communication and social interaction among the users of KMS helps to create a common point of view, and therefore results in an increase of shared vision (Davenport and Prusak 1998; Cohen and Prusak 2001). Furthermore, the development of common values and shared vision among the users of KMS may encourage the development of trusting relationships (Tsai and Ghoshal 1998). Based on above discussion, the hypothesis H1 can be broken into following sub-hypotheses.

H1a: The information-related use of KMS will have a significant positive influence on the interaction-related use of KMS.

H1b: The interaction-related use of KMS will have a significant positive influence on the user's personal networks expansion.

H1c: The interaction-related use of KMS will have a significant positive influence on trust building between colleagues.

H1d: The interaction-related use of KMS will have a significant positive influence on shared vision with colleagues.

H1e: The expansion of personal networks will have a significant positive influence on trust building with colleagues.

H1f: The expansion of personal networks will have a significant positive influence on shared vision.

H1g: Shared vision will have a significant positive influence on trust building with colleagues i.e., a higher level of shared vision will result in a higher level of trust between user and other colleagues.

Determinants of User Use of KMS

As suggested by literature, Perceived Usefulness (PU) is a major antecedent to utilization of information systems (Davis 1989; Lucas and Spitler 1999; Venkatesh, Morris et al. 2003). For example, people tend to use IS if they believe that the IS would improve their productivity and make their work life easier. Hence, in the context of KMS, the following hypothesis can be stated:

H2: The perceived usefulness of KMS will have a significant positive influence on the performance-related use of KMS.

As mentioned above, the performance-related use of KMS consists of two dimensions. Therefore, the H2 can be decomposed into two sub-hypotheses.

H2a: The perceived usefulness of KMS will have a significant positive influence on

information-related use of KMS.

H2b: The perceived usefulness of KMS will have a significant positive influence on interaction-related use of KMS.

Social Norms is considered as another important antecedent to people's acceptance and use of information systems (Lucas and Spitler 1999). As a member of an organization, a person would inevitably be influenced by the opinions of managers and peers regarding the usage of IS (Lucas and Spitler 1999; Venkatesh, Morris et al. 2003). In a field study of broker workstations, Lucas and Spitler (1999) defined social norms as:

> *"Perceived support by management and peers in using workstations" (and) "desire to please management and peers by using workstations" (p.298, my addition in brackets).*

In this study, these definitions of social norms will be used. The social norms construct can be viewed as having two dimensions, namely perceived support from management and peers in using KMS, and the desire to please management and peers by using KMS. Therefore, the following hypothesis and the sub-hypotheses are proposed:

H3: The social norms regarding use of KMS will have a significant positive influence on performance-related use of KMS.

H3a: The perceived support from management and peers in using KMS will have a significant positive influence on information-related use of KMS.

H3b: The perceived support from management and peers in using KMS will have a significant positive influence on interaction-related use of KMS.

H3c: The desire to please management and peers by using KMS will have a significant positive influence on information-related use of KMS.

H3d: The desire to please management and peers by using KMS will have a significant positive influence on interaction-related use of KMS.

The Task-Technology Fit (TTF) construct is at the centre of the Technology-to-Performance Chain (TPC) model, which represents the way in which technologies lead to performance impacts at the individual level (Goodhue and Thompson 1995; Venkatesh, Morris et al. 2003). As suggested by the TPC model, TTF would theoretically have a positively impact on the utilization of information technology systems and an individual's work performance. In empirical research on software tools utilization Dishaw and Strong (1999) found a significant direct positive relationship between TTF and the actual utilization of the software tool. In another empirical test of the TPC model, however, no significant direct relationship between TTF and utilization was found (Goodhue and Thompson 1995). Several possible explanations have been suggested for the conflicting results; for example it may have been due to problems in the conceptualization of utilization (Goodhue and Thompson 1995). This relationship will be tested in this research. As mentioned above, in the context of KMS applications, the user evaluations of IS (i.e., TTF) can be replaced by information quality (Goodhue 1998). As mentioned in section 3.8.1, DeLone and McLean (2003) highlight the proven strong association between information quality and system use. Therefore, the following hypothesis is proposed:

H4: Information quality will have a significant positive influence on the performance-related use of KMS.

According to Goodhue (1998), the information quality composes of two dimensions, i.e., information content quality and information services quality. Hence, hypothesis H4 can be broken into following sub-hypotheses.

H4a: The information content quality will have a significant positive influence on information-related use of KMS.

H4b: The information services quality will have a significant positive influence on information-related use of KMS.

Although there is no evidence to confirm a significant relationship between perceived usefulness and TTF/information quality, it is expected that a good fit between information system functionality and the tasks to be supported by the information

system will be interpreted by a user as a high degree of usefulness of the information system for the tasks. Furthermore, previous studies of IS suggest that user's perceived usefulness would be affected by information quality and information services quality (DeLone and McLean 1992, 2003). Accordingly, the following hypotheses can be expected.

H5: The information quality will have a significant positive influence on the perceived usefulness of KMS.

H5a: The information content quality will have a significant positive influence on perceived usefulness of KMS.

H5b: The information services quality will have a significant influence on perceived usefulness of KMS.

The TAM proposed a parallel effect of perceived usefulness and ease of use on IS usage. However, Davis (1989) has found that perceived usefulness mediates the effect of ease of use on IS usage, and suggested that:

> *"Ease of use may be an antecedent to usefulness, rather than a parallel, direct determinant of usage" (p.334).*

Similar results have also been observed in a series of empirical studies (Adams, Nelson et al. 1992; Straub, Limayem et al. 1995; Gefen and Straub 1997). Therefore, the following hypothesis is proposed:

H6: The ease of use of KMS will have a significant positive influence on perceived usefulness of KMS.

In sum, a set of theoretical hypotheses for further investigation has been developed so far. These hypotheses can be classified into two classes, i.e., global hypotheses and sub-hypotheses. The sub-hypotheses can be represented in KMS success research model II in Figure 3.12.

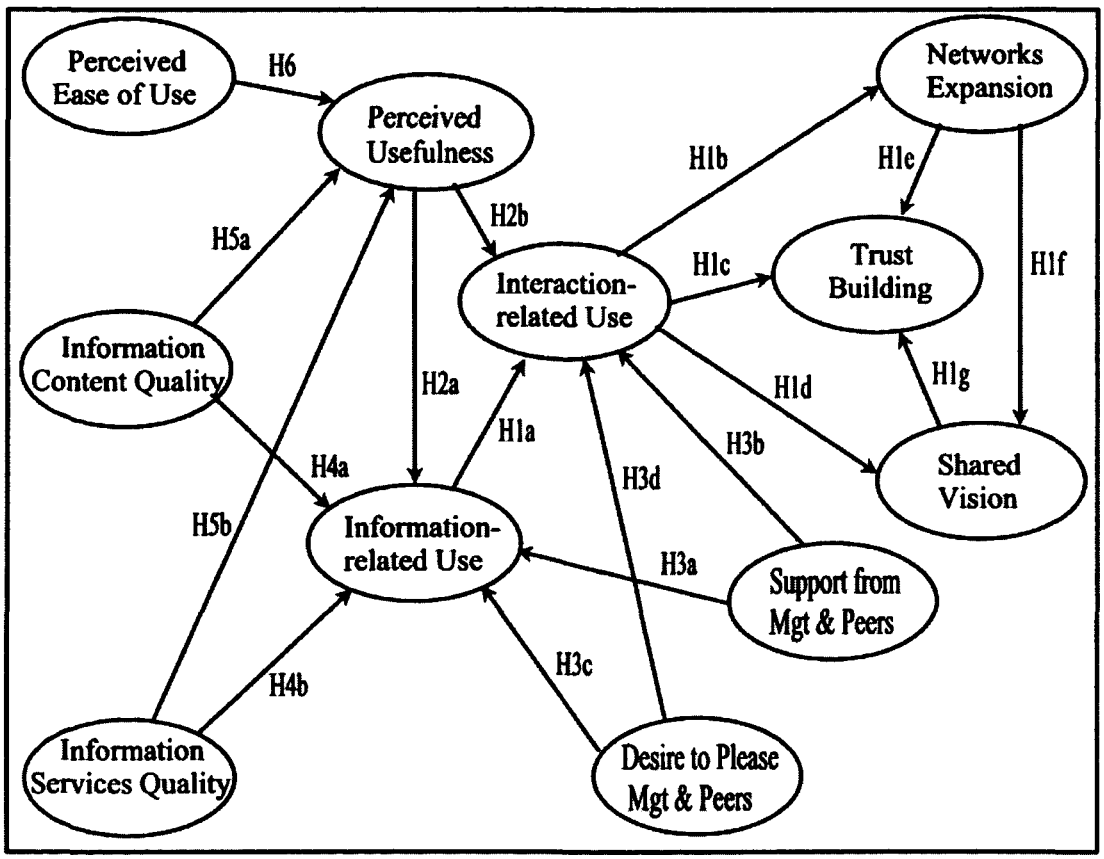


Figure 3.12 KMS Success Model II

The Function-related Use of KMS

Eight selected KMS functions (see Section 2.5.3) were examined in this study. These functions comprise email, video conferencing, shared documents/knowledge repositories, information and knowledge distribution, expert locators ('yellow pages'), online discussion forums, virtual communities, and virtual teams/collaboration. These functions are the most popular knowledge management tools used by organizations (Mertins, Heisig et al. 2003).

Function-related use of KMS refers to the extent to which a set of select functions of KMS is used by a user in his/her daily work. The function-related use of KMS can be used as alternative to KMS usage to replace the performance-related use of KMS in examination of the same nomological network. As the aim of this study is to explain and predict the use and effects of KMS in organizations, using this alternative KMS usage concept may enhance the reliability and robust of the findings (Straub, Limayem et al. 1995). As a result, a set of similar hypotheses can be generated with the function-related

use of KMS, which is represented as KMS Success Research Model III (Figure 3.13)

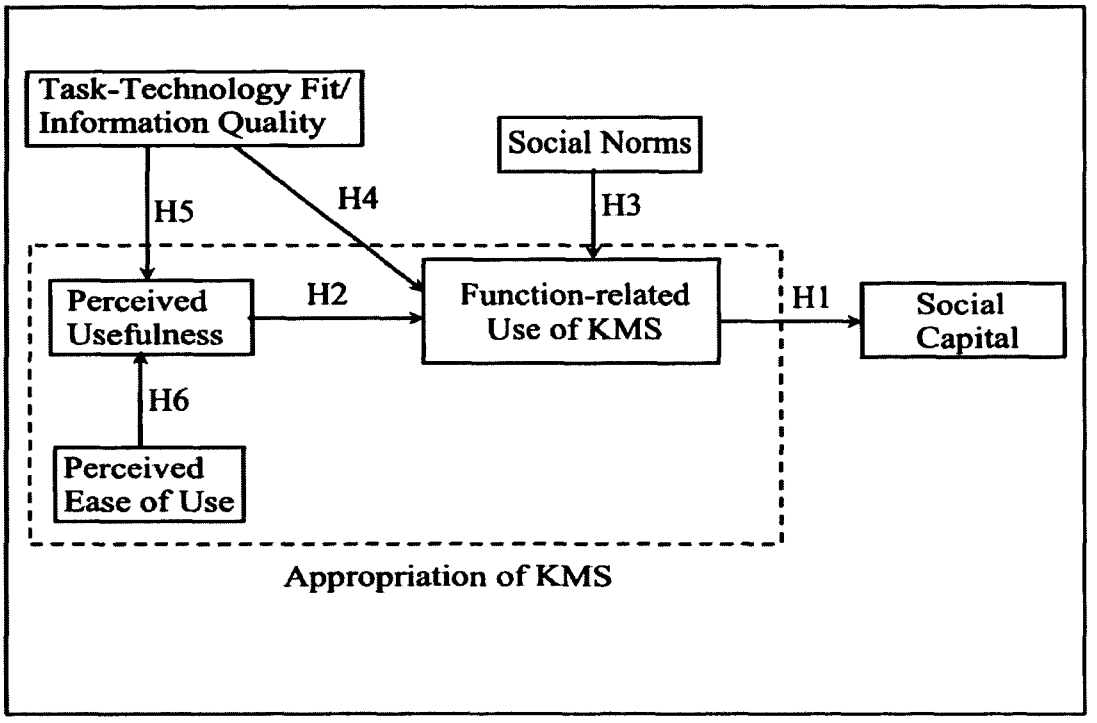


Figure 3.13 KMS Success Model III

It is worth noting that there is no fundamental difference between the KMS Success Model I and KMS Success Model III except for the different KMS use constructs employed. In fact, the two models can be unified as one single model with a proxy of KMS use construct. The model has been separated into two models only for the convenience of analysis and comparisons.

3.7.3 Summary

The AST-based KMS Success Model has been expanded to include a set of constructs for assessing KMS success from a social capital perspective. Three KMS success research models have been derived from the expanded AST-based KMS Success Model, and six global hypotheses and seventeen sub-hypotheses have been developed in this section.

A summary of the hypotheses can be found in Table 3.4.

Hypothesis	Independent Variable	Dependent Variable
H1	**Performance-related use of KMS**	**Development of Social Capital**
H1a	Information-related use of KMS	Interaction-related use
H1b	Interaction-related use	Personal networks expansion
H1c	Interaction-related use	Trust building
H1d	Interaction-related use	Shared vision
H1e	Personal networks expansion	Trust building
H1f	Personal networks expansion	Shared vision
H1g	Shared vision	Trust building
H2	Perceived usefulness of KMS	Performance-related use of KMS
H2a	**Perceived usefulness of KMS**	**Information-related use of KMS**
H2b	Perceived usefulness of KMS	Interaction-related use
H3	**Social Norms**	**Performance-related use of KMS**
H3a	Support from management and peer	Information-related use of KMS
H3b	Support from management and peer	Interaction-related use
H3c	Desire to please management and peers	Information-related use of KMS
H3d	Desire to please management and peers	Interaction-related use
H4	**Task-Technology Fit/Information Quality**	**Performance-related use of KMS**
H4a	Information content quality	Information-related use of KMS
H4b	Information services quality	Information-related use of KMS
H5	**Task-Technology Fit/Information Quality**	**Perceived usefulness of KMS**
H5a	Information content quality	Perceived usefulness of KMS
H5b	Information services quality	Perceived usefulness of KMS
H6	**Ease of use**	**Perceived usefulness of KMS**

Source: developed from the literature.

Table 3.4 A Summary of Research Hypotheses

3.8 Summary – KMS Success

This chapter established the KMS research models and developed testable hypotheses. In order to approach the research questions set out in Chapter 2, three knowledge management systems research frameworks have been reviewed briefly, enhancing the understanding of current KMS research.

Socio-technical systems theory was used to portray the complex phenomenon of KMS in organizations. As a result, a socio-technical framework for KMS has been established, approaching KMS from a socio-technical perspective and highlighting the vital components of organization system related to knowledge management systems, such as people, task, organizational structures, and environment, and the critical relationships between KMS and these components.

In order to reflect the status of KMS-in-use, an AST-based KMS model has been

developed, shedding light on the use and evolving processes of KMS in organizations, and representing the system-to-value chain of KMS.

A detailed review of IS success models was used to identify critical determinants to KMS use, and as a result, an expanded AST-based KMS success model was established which identified the key determinants. Although the socio-technical framework and the AST-based KMS model can be used for the study of KMS in organizations separately, they are better used complementarily. As the socio-technical framework portrays a systematic picture of KMS in organizations, the AST-based model reflects the longitudinal view of use and evolution of KMS in a post-implementation organizational context. In additional, the socio-technical framework and the AST-based model may be appropriate in different stages of life cycle of KMS. For example, the socio-technical framework may better serve the early stages of life cycle of KMS, such as deployment and implementation stages, while the AST-based model for KMS is more useful for studying the use and evolution of post-implement KMS in organizations. However, both of these need to work together to construct a comprehensive and complementary view of KMS in organizations (Spender 1996).

Based on the extended AST-based KMS success model, a set of research hypotheses has been suggested for further study.

The next chapter, Chapter 4, will be dedicated to the issue of research methodology and data collection.