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C2 for Complex Endeavors

**Research Model of Cultural Influences on
Information Sharing via C2 Systems**

Topics: Cognitive & social issues; Network-centric experimentation & analysis;
Multinational endeavors.

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Abstract

Culture has been defined in many ways, but it is principally viewed as the fundamental system of meanings shared by members of a specific society, distinguishing one group or category of people from another. Complex endeavors are characterised by the great diversity of groups and categories of people involved. Collaboration between different nations, different branches and even groups or people from civilian organizations is inevitable. To work together effectively, they must share information. Information sharing is a complex process, even within one culture. Therefore, it can be expected that during complex endeavors, the challenges with information sharing are likely to be exacerbated due to cultural differences.

The purpose of this paper is to propose a research model for experimentation to measure the influences of national, organizational, and professional cultures on information sharing via information technology during complex endeavors. The proposed model extends existing models in the literature. The paper motivates the research by recalling the centrality of information sharing in network-centric operations. A model, extended to cover 21st century military needs, is proposed. A possible programme of experimentation is developed based on the extended research model. The paper concludes by recommending a way ahead.

Keywords: Information sharing, Cross-cultural, Collaborative information behaviour, C2 systems, Information technology.

1. Introduction

Modern expeditionary operations during complex endeavors invariably involve cooperation between different nations, different branches (army, navy, air force, marines, etc.) and even groups from civilian organizations. Since no single nation, branch or individual can acquire the varied and often rapidly changing information, the success of these operations is highly dependent on the quality of shared information. Whatever the form or scale of the operation, there is a need to synchronise activities in time and space. The function of synchronising military activities is known as Command and Control (C2), defined as “*the exercise of authority and direction by a properly designated commander over assigned and attached forces in the accomplishment of the mission. Command and control functions are performed through an arrangement of personnel, equipment, communications, facilities, and procedures employed by a commander in planning, directing, coordinating, and controlling forces and operations in the accomplishment of the mission*” (DOD JP 1-02, 2001). Experts from the different entities involved in the operation have to collaborate to seek, synthesize and disseminate information from multiple domains and resources under multiple stringent constraints. As Sonnenwald and Pierce (2000) state, a diversity of types of information implies that experts in a variety of areas must collaborate during the C2 process to effectively create and execute battle plans. However, during complex endeavors, these experts may come from different countries, different branches, and different disciplines. Each of these entities has its own culture, defined as “*the collective mental programming of the mind that distinguishes one group or category of people from another*” (Hofstede, 2001). Three widely accepted levels of culture exist: national (nation), organizational (branch), and professional (discipline) culture. We can predict that national cultural differences should manifest themselves in combined operations and organizational cultural differences in joint operations. Professional cultural differences should be apparent whenever different disciplines interact. A combination of organizational and professional cultural differences should be manifested in civil-military operations. Therefore it is vital to understand the characteristics of human information behaviour in this context.

A C2 system can be defined as the “*facilities, equipment, communications, procedures, and personnel essential to a commander for planning, directing, and controlling operations of assigned and attached forces pursuant to the missions assigned*” (DOD JP 1-02, 2001). C2 systems are designed specifically to maximize the situation awareness (Endsley, 2000) of the commander and his/her staff by *sharing information* among team members. A shortfall in information sharing will adversely effect collaboration, the quality of information, and the resulting shared awareness, and, ultimately, mission effectiveness. As Siemieniuch and Sinclair (2006) acknowledge, during complex endeavors, C2 systems must deal with a range of organizational systems which come from and operate within different *cultural contexts* and hence exhibit a range of different cultural attributes. Therefore, it can be expected that during complex joint and/or combined endeavors, the challenges with information sharing via information technology are likely to be exacerbated due to cultural differences.

Several authors have identified cultural influences in C2. However, most of them focused on decision making in C2 (Holt, 2003; Klein, Pongonis & Klein, 2000; Lindgren & Smith, 2006; Noble, Sander & Obenshain, 2000; Siemieniuch & Sinclair, 2006) and are not specific to information sharing. There is a large body of research on information sharing across a number of other disciplines. Research stemming from the area of management and organization studies and the area of knowledge management concentrated on cultural influences on knowledge sharing (Ardichvili et al. 2006; Chow, Deng & Ho, 2000; Ford & Chan, 2003; Michailova & Hutchings, 2006; Schlegelmilch & Chini, 2003; Yoo, Ginzberg & Ahn, 1999) and information sharing in a cross-cultural context (Chow et al. 1999; Shin, Ishman & Sanders, 2007; Steinwachs, 1999). Research from the domain of information systems (IS) has begun to investigate how national culture affects a wide variety of issues in the area of IS (Ford, Connelly & Meister, 2003). The proposed theories in these areas however, are not inevitably applicable for information sharing in C2, since they neglect the information technology used and the highly dynamic work context. Research from the information science area (e.g., Kuhlthau, 1991; Wilson, 1999) proposed several frameworks of information behaviour. However, those studies have traditionally focused on the *individual*. The collaborative aspects of human information behaviour have been neglected, suggesting a one-way process in which an individual consults another individual. Group sharing, the more or less systematic collaboration in information acquisition, has received less attention (Hyldegård, 2006; Talja & Hansen, 2006; Sonnenwald & Pierce, 2000). Collaboration information behaviour nevertheless is the case with information sharing in C2.

Collaborative information behaviour is an emerging area of interest and the body of research on collaborative information behaviour has increased in recent years, albeit slowly. Few empirical studies have directly focused on the collaborative dimensions of information behaviour in C2 (Prekop, 2002; Sonnenwald & Pierce, 2000). Sonnenwald and Pierce (2000) investigated information behaviour in the dynamic work context of C2 at the battalion level in the military. They highlighted the importance of dense social networks, or frequent communication between participants about the work context and the situation. Subsequently they emphasized interwoven situational awareness, defined as individual, intragroup and intergroup situational awareness. Situational awareness appeared to facilitate response to dynamic, constraint-bound situations. Finally, they stressed contested collaboration, the phenomenon where team members maintain an outward stance of cooperation but work to further their own interests, sometimes destroying the collaborative effort. They also revealed a continuing necessity of information exchange during work operations. Prekop (2002) studied collaborative information behaviour by observing a C2 capability study group in the military, focusing on the contexts, roles, and patterns of collaborative information seeking. He used a grounded theory approach of a complex, real world, example of collaborative information seeking activity, drawing from the military domain.

He distinguished different information seeking roles. These findings provide valuable insights into intra- and intergroup communication in order to acquire information needed. Cultural influences on the collaborative information behaviour however have been neglected.

There is a lack of research on collaborative information behaviour in a cross-cultural setting, even though its importance is recognized in several areas. Therefore, the main objective of this paper is to develop a research model for collaborative information sharing in dynamic and information rich environments, explicitly taking into account the impacts of cultural contexts at different levels. Accordingly, a three-dimensional focus is adopted: cross-cultural issues; information sharing and its determinants; and collaborative information behaviour.

The paper proceeds by first defining the concepts used in the current research project. Subsequently, research efforts in the area of information behaviour and knowledge management will be reviewed. This section summarizes existing models covering influences on information sharing and models covering the transfer of information. Then the concepts culture and cultural values are explained and placed in the light of information sharing. In the following section we propose a research model. Finally, the paper concludes by presenting a possible programme of experimentation and some future directions.

2. Information Sharing in Network Centric Operations

The current research project focuses on *information sharing* via C2 systems. As Alberts, Garstka and Stein (1999) state, Network Centric Warfare (NCW) recognizes the centrality of information and its potential as a source of power. NCW can be summarized by its tenets, stating that a robustly networked force improves information sharing and collaboration, which enhances the quality of information and shared situational awareness. NCW is not only about technology, it is about people, organizations, and social and cognitive processes. NCW thus refers to operations that are enabled by the network (technology-enabled infrastructure) and by networks (people in collaboration). A distinction can be made with Network Centric Operations (NCO). The fundamental difference is that NCW refers to operations engaged in warfare or military operations, whereas NCO implies a much broader domain than NCW and is not limited to warfare. In our study, we adopt the term NCO since we not only focus on various military units but also on civil organizations. Figure 1 shows the NCO value chain, a useful simplification of the process that leads to situational awareness and mission effectiveness.

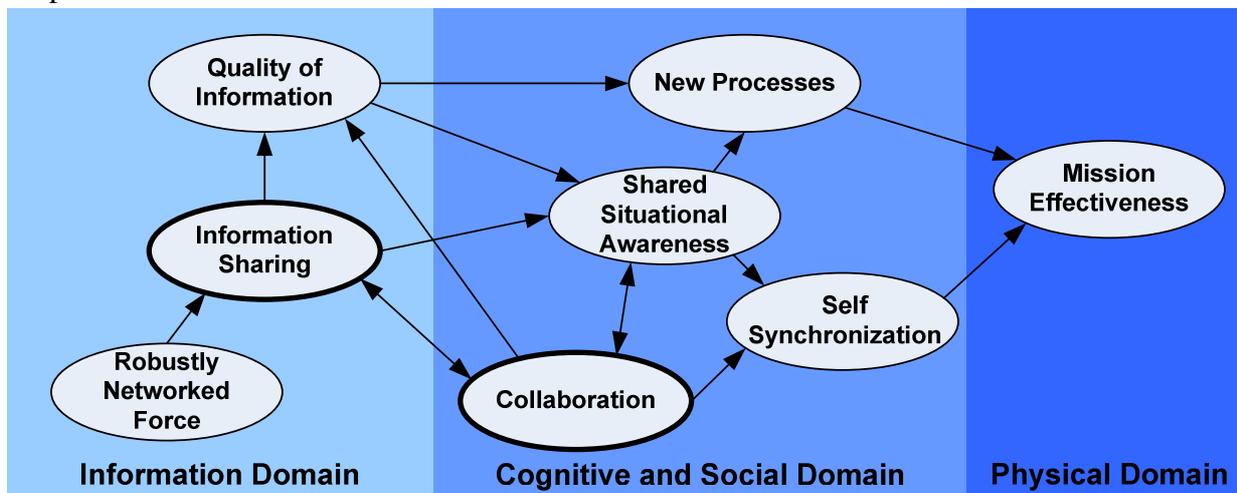


Figure 1: Network Centric Operations Value Chain (From DOD Office of Force Transformation, 2005)

As the figure shows, a shortfall in information sharing will adversely effect collaboration, the quality of information, and the resulting shared awareness, and, ultimately, mission effectiveness. Furthermore, the central role of social interactions (including collaboration) is evident in the value chain. The extent to which entities are able to *collaborate* along with their ability to rapidly and intelligently *share information* are critical in determining overall effectiveness. The following sections will identify and define the concepts used in the current research project: *information*, *information sharing*, and *collaborative* information behaviour.

2.1 Data, Information and Knowledge

Research in both the knowledge management and information science domains following Ackoff (1989) distinguish data, information, and knowledge. *Data* can be defined as a set of discrete, objective facts about events, states past, present or future worlds acquired by units from their environment. Data is raw; it simply exists and has no significance beyond its existence. Information and knowledge are often used interchangeably. Although there is no general consensus on the boundaries of these concepts (De Long & Fahey, 2000), Davenport and Prusak (1998) and Bhagat, Kedia, Harveston & Triandis (2002) emphasize that these concepts are not interchangeable. *Information* concerns patterns that are imbued in data. Data that has been given meaning by way of relational connection. *Knowledge* is the appropriate collection of information. It is created, restructured, or changed from related and unrelated pieces of information, to the extent that the information has the right kinds of signals that, in the mind of the receiver are conducive to the creation of knowledge (Bhagat et al., 2002). Knowledge thus, is broader, deeper and richer than data or information. This distinction is supported by the cognitive hierarchy proposed in Naval Doctrine Publication 6 (NDP 6, 1995). The cognitive hierarchy distinguishes four steps in generating understanding, or situational awareness, the desired end state of the orientation phase of the decision and execution cycle. The first step is gathering *data*, defined as raw signals. Once data is collected from the environment and processed into usable form its called *information*. Information, i.e., processed data, allows generating *knowledge* through cognition. Knowledge then results from analyzing, correlating, and fusing data that have been processed and evaluated as to their reliability, relevance, and importance. The final step is *understanding*, implying situational awareness.

The current research project focuses on information sharing via information technology, C2 systems. Therefore, the distinction between information and knowledge needs a reappraisal. As Davenport and Prusak (1998) state, knowledge derives from information as information derives from data. Information results from interpreting, aggregating, and combining data, employing pre-existing information and knowledge in the process. When the degree of processing reaches a level at which action can be taken, then the result is said to be knowledge. Knowledge than becomes *actionable information*. Both information and knowledge thus are distinguished from data as these concepts are defined as instances of processed data. As soon as data is reported to a C2 system, it thus becomes information because it is always reported along with additional information about its context. The emphasized distinction between information and knowledge then is not relevant anymore, because whether or not a piece of information is actionable is situation-specific, and this is ephemeral. In a C2 system, knowledge is transmitted, stored, and processed using the same technologies and mechanisms as information. Hence, the current research project does not distinguish between information and knowledge, and uses the term information. However, in order to develop a comprehensive research model, both research on knowledge management, and information science and behaviour are reviewed.

2.2 Information sharing, seeking and retrieval

Within academic literature a distinction is made between information sharing and information seeking and retrieval as initiatives of information behaviour or the information process. Steinwachs (1999) characterizes the information process by the transfer of content from the source to the receiver, making use of a selected medium. Szulanski (1996, p. 28) defines transfer as the dyadic exchange between a source and a recipient unit in which the identity of the recipient matters. Moreover, information sharing involves the dual problem of “*searching for (looking for and identifying) and transferring (moving and incorporating) knowledge across organizational subunits*” (Hansen, 1999, p. 83). However, the literature makes a clear distinction between information sharing and information seeking and retrieval. Hansen & Järvelin (2004) emphasize that *information sharing* incorporates both active and explicit and less goal oriented and implicit information exchanges, while *information seeking and retrieval* is defined as active and explicit seeking and retrieval of information for solving a specific task (Hansen & Järvelin 2005). According to these definitional issues, information sharing is thus about the sharing of *already* acquired information, whereas information seeking and retrieval deal with searching *for* information (Hansen & Järvelin, 2004). In this paper, we focus on the concept of information sharing.

2.3 Collaborative Information behaviour

Information sharing is an important component of information behaviour. Several authors (Hyldegård, 2006; Talja & Hansen, 2006; Sonnenwald & Pierce, 2000) acknowledge that research in human information behaviour has primarily focused on the individual in general in relationship to tasks, computer-based information systems, or social situations. Information behaviour activities, like information sharing, information seeking, and information retrieval, are commonly perceived and modelled as *individual* processes. A prevailing assumption is that processes like problem understanding, query formulation and retrieval basically are viewed as an individual activity and that the searcher performing the task is in a rather isolated situation (Hansen & Järvelin, 2005). However, modern information behaviour takes place in collaborative settings. This is also the case in our study. Talja and Hansen (2006) define *collaborative information behaviour* (CIB) as an activity where two or more actors communicate to identify information for accomplishing a task or solving a problem. Recently, research in information science has started to focus on the social dimensions of information behaviour and information seeking, hereby challenging the individual seeking assumption (e.g. Hyldegård, 2006; Prekop, 2002; Sonnenwald, 1999; Sonnenwald & Pierce; 2000, Talja & Hansen, 2006). CIB ranges from sharing accidentally encountered information to collaborative query formulation, database searching, information filtering, interpretation, and synthesis (Talja and Hansen, 2006). Besides focusing on the individual aspects of information sharing, following the efforts from Prekop (2002) and Sonnenwald and Pierce (2000), emphasizing the significance of CIB in C2, we also focus on collaborative information sharing.

3. Existing research models

In order to develop a comprehensive framework, we draw on research from multiple disciplines. The following paragraphs present existing models in the literature on information systems, knowledge management, and information behaviour.

3.1 Determinants of Information sharing

There is a large body of research on the determinants of information and knowledge sharing across a number of disciplines, most of them in management and organization studies, and information science.

Constant et al. (1994) developed an information sharing theory in order to understand the factors that support or constrain information sharing in technologically advanced organizations. According to Constant et al., information sharing is affected by rational self-interest as well as the social and organizational context. Based on the Constant et al.'s information sharing theory, Jarvenpaa and Staples (2000) explored empirically a wider range of antecedents of information sharing via electronic media. They also studied the extent to which collaborative technology is used. Staples and Jarvenpaa (2000) further investigated the determinants of the use of collaborative electronic media for information sharing both within and between organizations and focussed on the individual perceptions of factors that underlie the use of electronic media. Their suggested research model included cultural variables, task and technology related variables and individual attitudes and beliefs. Kolekofski and Heminger (2003) proposed a model that defines the influences on an individual's intent to share information, based upon the theory of reasoned action. Their study explored individuals' beliefs and attitudes about sharing organizational information and highlighted the role of an individual's attitude towards information sharing. Wortel, Grant and Soeters (2007) surveyed the wider literature on information systems, knowledge management, and organizational theory in order to develop a framework of factors that influence information sharing via information technology in a cross-cultural context appropriate for the C2 process. They focused on information and knowledge sharing among individuals, showed that information culture and organizational culture influenced the readiness to use information and communications technologies for sharing information and suggested that in military operations national culture also played a part by influencing security policies and C2 system interoperability. Their suggested framework comprised factors that influence information sharing via information technology in a cross-cultural context. Bhagat et al. (2002) proposed a theoretical framework that also emphasizes the significance of cultural patterns for their potential in moderating the effectiveness of cross-border knowledge transfer. The general form of the models discussed in this paragraph is displayed in figure 2. As can be seen, the concept of information sharing is modelled as a single act that is influenced by several factors.

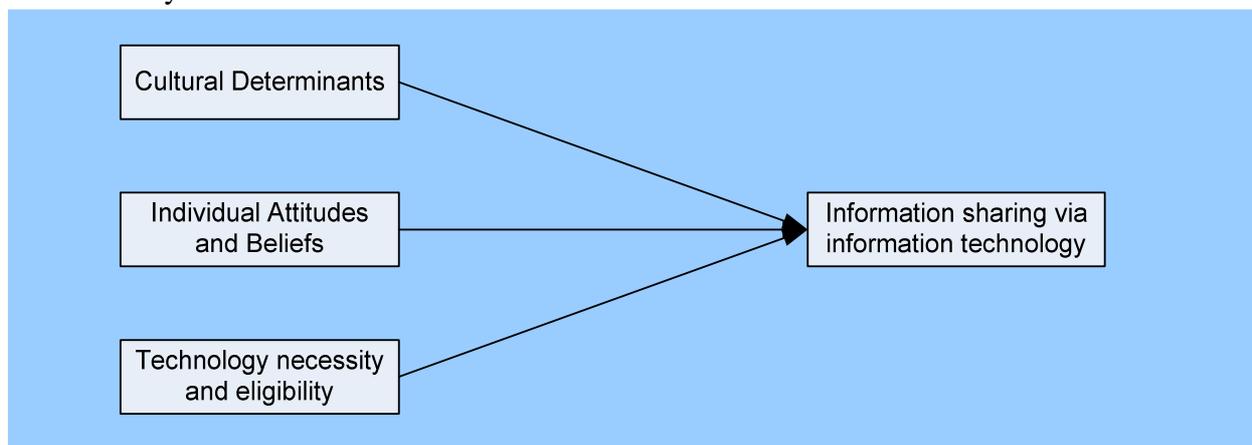


Figure 2: Framework of factors influencing information sharing via information technology.

Although this substantial amount of research contributes to our understanding of the factors influencing information sharing via technology, several deficiencies illustrate the relevance of our proposed model. The theories stated above, regard information sharing as one single entity. As the following sections will reveal, there is a necessity for a breakdown of this entity into different processes or stages. Moreover, information sharing is modelled as an *individual* process, as is also recognized in the information behaviour literature acknowledging CIB. However, as mentioned earlier, information sharing during complex endeavors takes place in a collaborative setting.

3.2 Knowledge and Information Transfer

Most of the research that investigated cultural-specific factors affecting inter-organizational knowledge and information transfer processes conceptualized it as one single act rather than a multi-stage process (e.g. Bhagat et al., 2002; Kostova, 1999; Staples & Jarvenpaa, 2000; Wortel et al., 2007). However, as Abou-Zeid (2005) emphasizes, such conceptualization obscures the role that cultural-specific factors may play in facilitating or inhibiting transfer and sharing activities. Several authors (e.g., Abou-Zeid, 2005; Szulanski, 1996, 2000) recognize transfer as a multi-stage process, distinguishing four separate stages. Usually a distinction is made between the *initiation* and the *implementation* of a transfer. Szulanski (2000) presented a process model of knowledge transfer and factors that are expected to correlate with difficulty at different stages of the transfer. The model is depicted in figure 3 and identifies four distinct stages of transfer: 1) initiation, 2) implementation, 3) ramp-up, and 4) integration. The first stage, *initiation*, comprises all events that lead to the decision to transfer. A transfer begins when both need and the knowledge to meet that need coexist within the organization, possibly undiscovered (Szulanski, 1996). The second stage, *implementation*, begins with the decision to proceed. During this stage, knowledge flows between the recipient and the source and transfer-specific social ties between the source and the recipient are established. Bridging the communications gap by solving potential problems caused by incompatibilities of language, coding schemes, and cultural conventions is part of this stage. The subsequent stage, *ramp-up*, begins when the recipient starts using the transferred knowledge. The final stage, *integration*, begins after the recipient achieves satisfactory results with the transferred knowledge and when this knowledge becomes routinized.

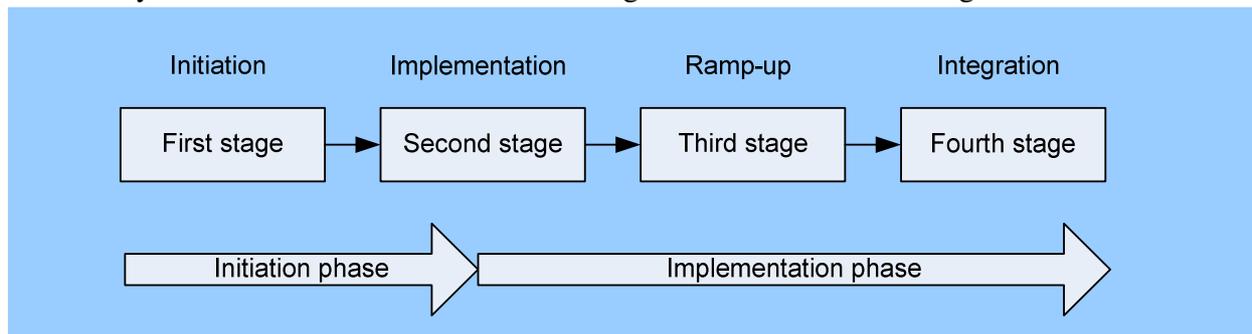


Figure 3: Szulanski's (1996; 2000) Process model of knowledge transfer.

Building on the work of Kostova (1999) and Szulanski (1996, 2000), Abou-Zeid (2005) conceptualized inter-organizational knowledge transfer also as a four-stage process (see figure 4); 1) initialization, 2) inter-relation, 3) implementation, and 4) internalization. The *initialization* stage represents the period in which the prospective recipient becomes aware of the knowledge gap, that is, what the recipient must know versus what the recipient actually knows, or when the source recognizes the knowledge gap. The outcome of this stage is the knowledge transfer decision. The second stage, *inter-relation*, implies constructive dialogues between the source and recipient in order to determine what knowledge is to be transferred, when and to whom, and to identify and solve problems resulting from incompatibility of language, coding schemes, and cultural conventions. The outcome of this stage is the establishment of the necessary knowledge transfer conduits. During the third stage, *implementation*, a transfer coalition at the recipient, a selected group of actors who are in charge of the transfer process together with the experts in the domain of transferred knowledge unpack the newly acquired knowledge, reinterpret what they acquire, and then share tacit knowledge about their observations. The final stage, *internalization*, conveys the taken-for-granted status of the knowledge acquired from the source, being explicit, tacit or both. This status is reached when the recipient achieves satisfactory results with the transferred knowledge.

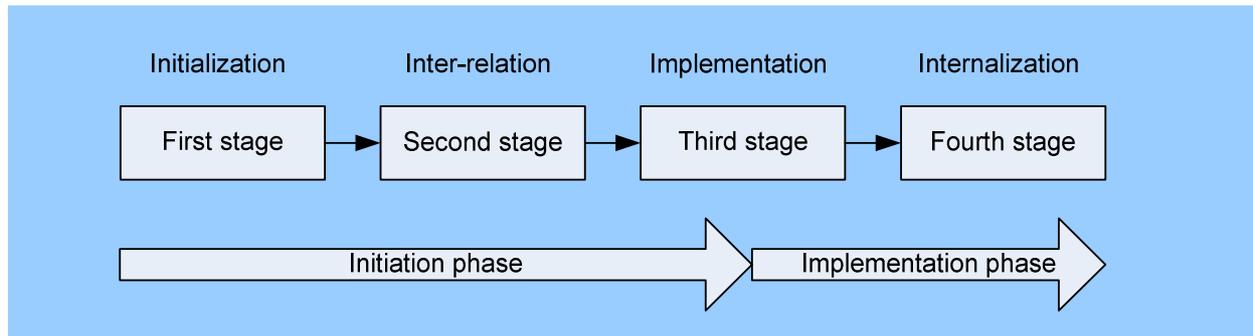


Figure 4: Abou-Zeid's (2005) Culturally aware multi-stage model of inter-organizational knowledge transfer.

Figure 3 and 4 depict the general lay-out of the knowledge transfer models. Modeling information transfer like this implies one-off sharing. Furthermore, a clear distinction can be seen between the initiation phase and the implementation phase. As can be seen, the initiation phase in Abou-Zeid's model covers more stages of the transfer process than this phase in Szulanski's model does. The general expectation is that factors that affect the opportunity to share are more likely to predict potential difficulties during the initiation phase, whereas factors that affect the execution of the transfer are more likely to predict difficulties during subsequent implementation phases (Szulanski, 2000).

Besides the distinction of stages in the transfer process, the knowledge management literature additionally distinguishes three main initiatives in knowledge and information behaviour: 1) generation, 2) mobilization, and 3) application (Abou-Zeid, 2002). *Generation* includes all processes by which new knowledge is generated within the organization. This initiative implies information seeking and retrieval. *Mobilization* comprises all processes that aim at increasing the visibility or accessibility of generated knowledge or information by sharing it or transferring it from one bearer (the knowledge provider, owner or source) to another (the knowledge seeker or recipient) through space of time. *Application* encompasses processes by which knowledge is implemented or internalized.

These models offer valuable input for the development of our information sharing research model. Nonetheless, these models assume one-off sharing or transfer of knowledge. Information sharing during complex endeavors implies a recurring nature because of the dynamic and information rich environment. Furthermore, the use of information technology or electronic media to share information is not incorporated.

3.3 Scope of the paper

Now that we have discussed the definitional issues, and the models that will serve as building blocks for our research model, it is important to make a clear distinction between the several stages and initiatives mentioned. Our focus will be on *mobilization*. That is, the mobilization of information by the *source* of the sharing process. As defined earlier, information sharing is about the sharing of *already* acquired information. Mobilization activities typically cover the internalization and inter-relation stages of the four-stage transfer models. In essence, these first two stages cover the time from when the source acknowledges the need for information sharing until the real practice of sharing, the *pushing* of information. After these stages, information has been shared with the recipient(s) and the process for the source, or the transferring part of the information sharing process, recurs. The last two stages are outside the scope of our model because during the information implementation and institutionalization stage the source has generally abandoned the sharing process.

4. Culture and Information Behaviour

The following section will provide a framework for understanding culture and cultural value orientations. Furthermore, the notion of culture as a determinant of information sharing will be discussed.

4.1 Definition

Culture has been defined in many ways, but it is principally viewed as the fundamental system of meanings shared by members of a specific society (Hofstede, 1984; Schwartz, 1999). A widespread accepted definition of culture is provided by Hofstede (2001), who defines culture as “*the collective mental programming of the mind that distinguishes one group or category of people from another*”. Three widely accepted levels of culture exist, each of which could individually and collectively influence the cultural value orientations exhibited by an individual, team, organization or system (Helmreich & Merritt, 1998; Siemieniuch & Sinclair, 2005): national, organizational, and professional levels of culture. National differences concern nationality and thus should manifest themselves in combined operations. Organizational cultures concern the different branches and are thus expected to manifest during joint operations. Professional cultural differences should be apparent whenever different specialisations or disciplines interact. A combination of organizational and professional cultural differences should be manifested in civil-military cooperation. In this research project we will focus all three levels of culture.

4.2 Cultural value orientations

Different cultures will emphasize different values, that is, what is important to one culture at one time may not be important to another culture. Cultural differences in values have been identified through a number of multi-nation researches, whereby the value patterns have been plotted on cultural dimensions. Hofstede (1984, 2001) pioneered and elaborated the study of various national cultures in an attempt to find where cultures stood on several dimensions. These dimensions have provided a basis for many subsequent studies, although reviewers have noted limitations on its continuing validity (Smith, Peterson & Schwartz, 2002). Consequently, Schwartz presented a theory on the types of values on which cultures can be compared, using data from 76 countries from around the world. Schwartz (1999, 2006) views culture as the rich complex of meanings, beliefs, practices, symbols, norms, and values prevalent among people in a society and suggests that cultural value orientations evolve as societies are confronted with basic issues or problems in regulating human activity. These value orientations are defined as concepts or beliefs about desirable end states or behaviours that transcend specific situations, guide selection or evaluation of behaviours and events, and are ordered by importance in relation to one another to form a system of values (Schwartz, 1992).

The cultural value orientations distinguished by Schwartz (1999, 2006) comprising three polar cultural value dimensions: 1) embeddedness versus autonomy; 2) hierarchy versus egalitarianism; and, 3) mastery versus harmony. *Embedded* cultures stress the importance of social relationships and identification with the larger group. Individuals are viewed as embedded in the collectivity. *Autonomous* cultures, on the contrary, emphasize the advisability of individuals to pursue their own ideas, directions and experiences. This dimension converges to a considerable degree with what is better known as Hofstede’s (2001) individualism/collectivism dimension. *Hierarchy* cultures rely on hierarchical systems and accentuate the importance of social power and wealth whereas *egalitarian* cultures emphasize equality, social justice and responsibility. This dimension is relatively closely related to Hofstede’s power distance. *Mastery* cultures stress the importance of ambition and entrepreneurship in order to master and direct the natural and social environment.

Harmony cultures, on the other hand, emphasize the importance of harmoniously fitting into the environment. This dimension shows a conceptual resemblance with Hofstede's masculinity/femininity dimension, although empirical data show that the two dimensions are not identical. There is also a certain, albeit not very large, convergence with Hofstede's uncertainty avoidance dimension. All levels of culture, that is, national, organizational and professional can be explained using these value orientations.

Because of the widespread acceptance and its explanatory power, the cultural value orientations identified by Schwartz (1999, 2006) will be used in this culture-level research project in order to explain potential differences in information sharing behaviour during complex endeavors. We propose that these value orientations influence information sharing initiatives.

4.3 Culture and Information sharing

Systematic research focusing on knowledge sharing (Ardichvili et al. 2006; Chow et al., 2000; Ford & Chan, 2003; Michailova & Hutchings, 2006; Schlegelmilch & Chini, 2003; Yoo et al., 1999), information sharing (Chow et al. 1999; Shin et al., 2007; Steinwachs, 1999), and information systems (Ford et al., 2003) in a cross-cultural context is scarce. The majority of these studies adopted Hofstede's (1984, 2001) cultural dimensions in order to explain potential differences in information sharing behavior, revealing that culture is a major determinant of information sharing. However, they all regarded information sharing as one single act whereas we stress the importance of a conceptualization acknowledging multiple processes. A useful and often cited framework, for studying cultural influences on knowledge sharing is De Long and Fahey's (2000) diagnoses of cultural barriers to knowledge management within an organization. They distinguish four areas in which cultural determinants affect information behaviour: 1) culture shapes assumptions about which knowledge is *worth generating*, important, or valuable; 2) culture defines structure and mediates the relationships between levels of knowledge, identifying which knowledge is *worth sharing*; 3) culture creates through rules and practices the context of *social interactions* for transferring knowledge; and, 4) culture shapes the decision-making processes by which knowledge is translated into *action*, or implementation. These four areas appear to coincide to some extent with the four stages of the transfer models (Abou-Zeid, 2005; Szulanski, 1996, 2000) presented in the previous sections. De Long and Fahey's framework is therefore highly appropriate for the development of our proposed multi-stage model.

By linking Schwartz's (2006) cultural value orientations to the findings presented above we could subsequently state some preliminary assumptions. For example, that cultures high on embeddedness and low on autonomy may have fewer difficulties with sharing in certain phases of the process. Or that cultures high on hierarchy may have more vertical information sharing, subsequently promote the concept of stove piping, referring to a mindset that does not expand beyond one's own nation, branch or discipline. Or that cultures high on mastery may have less sharing initiatives. These assumptions however require further examination, especially because we do not regard information sharing as a single act.

Regarding the purpose of the current research project, we consider areas 1, 2, and 3 from De Long and Fahey's (2000) framework as relevant. Since our focus is on the sharing behaviour of the *source*, area 4 is not relevant as the source in the current research project by then has handed over the sharing process to the receiver. Our proposed models builds on the framework provided by De Long and Fahey and the findings of the studies cited in this section.

5. Proposed research model

The previous sections have focused on four topics: 1) *Determinants* of information sharing; 2) Knowledge and information *transfer*; 3) *Collaborative* information behaviour; and, 4) *Culture* and cultural values. The theories and models reviewed in the previous sections enabled systematic studies in their fields of research. As these findings emphasize, socio-cultural determinants affect information behaviour and the use of information technology in various ways. This section provides a multi-stage research model for collaborative information sharing behaviour via information technology in dynamic and information rich environments, extending literature on information behaviour, knowledge management, and cross-cultural studies. The model explicitly takes into account the impacts of cultural contexts at different levels (national, organizational and professional) at different stages of the information sharing process. The model acknowledges the following key propositions:

- 1) information sharing is a *multi-stage* act instead of one single entity;
- 2) information sharing in dynamic environments is continuously *recurring* instead of one-off;
- 3) *culture implies multiple levels* (national, organizational and professional);
- 4) modern information behaviour is *collaborative* instead of individual; and,
- 5) information is shared via *information technology* or electronic media.

The proposed research model is depicted in figure 5. As emphasized in the previous sections, we focus on the *mobilization* of information by the *source* of the information sharing process. As the figure shows, collaborative information sharing in a cross-cultural context is modelled as a series of nested fields. The actual act of information sharing forms the core of the model, surrounded by its affecting determinants. Culture may be defined as the general influencing factor. As culture is a multi-level phenomenon its impact on collaborative information sharing has to be studied at different cultural levels (Helmreich & Merritt, 1998; Siemieniuch & Sinclair, 2005; Kostova, 1999). In conformance with the Schwartz (1999) theory, these three levels can be described and predicted in terms of the set of values that distinguishes one entity (nation, branch, or discipline) from another at certain level of analysis. The different levels of culture form the first field of the model. The subsequent field depicts the proposition that information behaviour in C2 takes place in a collaborative work environment (Prekop, 2006; Sonnenwald & Pierce, 2000). The core of the model represents the actual information sharing act, consisting of four phases or processes. As we focus on information sharing in dynamic environments, and acknowledge the one-off sharing limitation of the classical knowledge transfer models, all phases are expected to have influence on each other, emphasizing information sharing as a continuously recurring process. The preliminary relations depicted in figure 5 provide an *initial* attempt to conceptualize the stated key propositions. The four sub-processes of information sharing are not assumed to occur in a linear sequence, because of the highly dynamic environment. Empirical research has to establish the directions of the relations and validate the framework

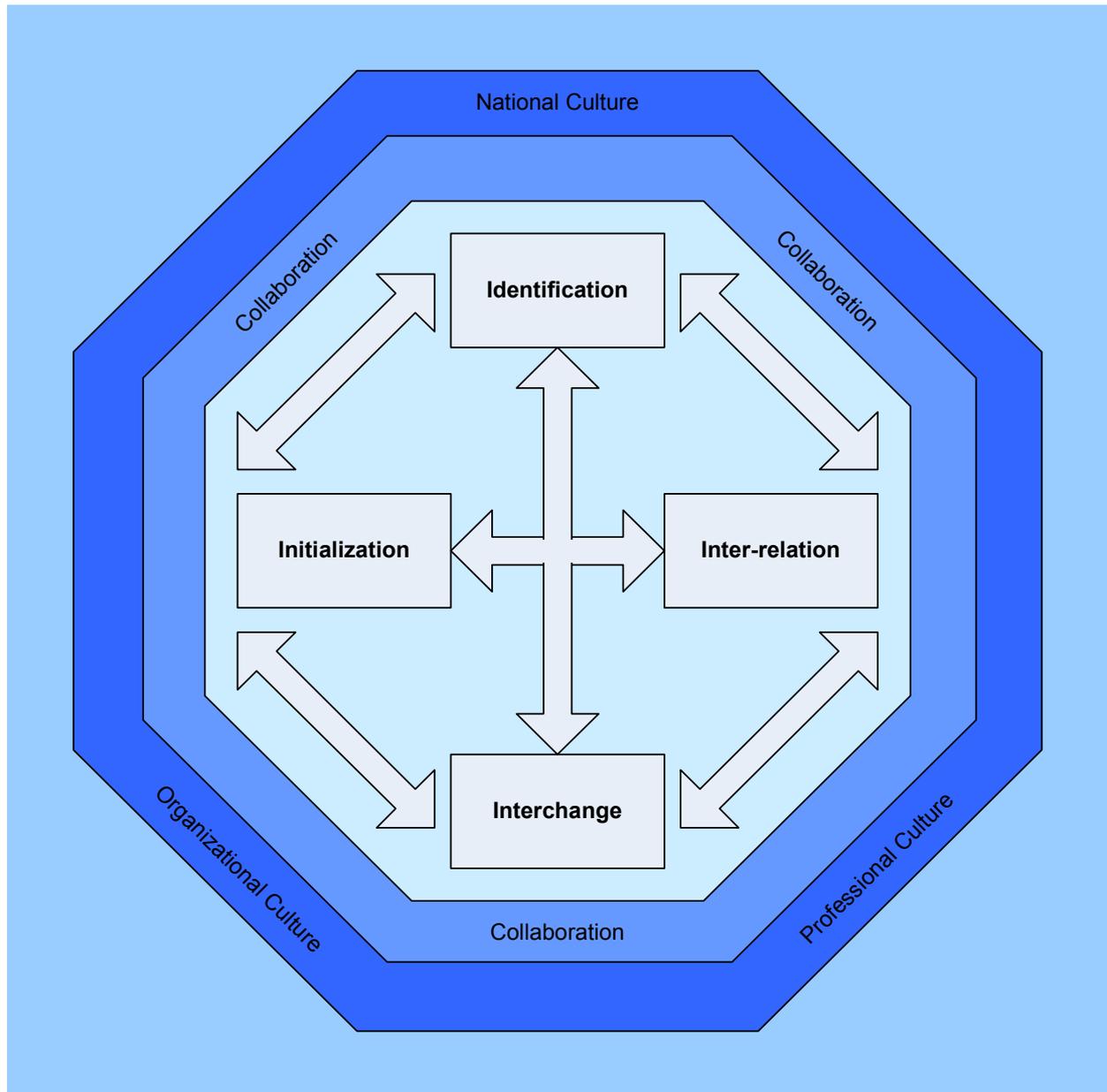


Figure 5: Proposed multi-stage research model for collaborative information sharing via information technology in dynamic and information rich environments.

The first process, *initialization*, (to some extent analogous with Szulanski's (1996; 2000) initiation, and Abou-Zeid's (2005) initialization stage) represents the phase in which the source becomes aware of the information gap of the recipient(s) in its environment. That is, what the recipient(s) should know according to the source in order to accomplish their tasks in the operation. Research (Chow et al. 2000; De Long and Fahey, 2000; Steinwachs, 1999) emphasizes that culture heavily influences what is perceived as useful, important or valid knowledge. Culture thus shapes what a group defines as relevant information, and this will directly affect which information a unit focuses on. This stage is concerned with the valuation of information, that is, *which information is perceived worth generating for recipients*.

Then, *identification* follows. Research (De Long & Fahey, 2000; Staples & Jarvenpaa, 2000; Wortel et al., 2007) demonstrates the importance of ownership of information. Culture embodies all the norms, or rules, about how information is to be distributed between the organization, its members, and its peer organizations.

Culture thus dictates what information belongs to the source, what information remains in control of individuals or subunits of the source (De Long and Fahey, 2000) and what information is shared, or, on the contrary, is *not* shared with recipients. This may also have to do with security issues. This phase thus concerns the selection of information that is intended to be shared, that is, *what information may or may not be shared with recipients*. These first two stages of the information sharing process conform to Hansen's (1999) definition of information sharing, with the first part of the dual process involving looking for and identifying information.

The following two phases concern the actual *moving* of the information, the second part of the dual process in Hansen's definition. *Inter-relation* (relatively comparable with Szulanski's (1996; 2000) implementation, and Abou-Zeid's (2005) inter-relation stage), concerns the selection of potential recipient(s) of the information by the source. The organizational context for social interaction is established by culture (e.g., De Long and Fahey, 2000; Ford & Chan, 2003; Michailova & Hutchings, 2006; Shin et al., 2007; Steinwachs, 1999). This signifies that culture affects the selection of recipients with which interaction takes place. Three dimensions of interactions affected by culture then can be distinguished (Abou-Zeid, 2002; De Long and Fahey, 2000): vertical interactions (within the own nation, branch or discipline; e.g., stove piping), horizontal interactions (between countries, branches or disciplines), and, special behaviours that promote sharing. This stage is concerned with the selection of recipients or interaction partners, that is, *the information selected will be shared with whom*.

The final process of the cycle, *interchange*, completes the information sharing act. We focus on information sharing via technology. Abou-Zeid (2005) and Szulanski (2000) acknowledge potential difficulties resulting from incompatibility of language, coding schemes, protocol and cultural conventions. This assumption thus is especially relevant for our proposed model, implying information sharing via information technology. Staples and Jarvenpaa (2000) identified a variety of perceptions that underlie the use of information sharing via technology. Furthermore, Huber (2001), Kolekofski & Heminger (2003), and Staples and Jarvenpaa (2000), showed that culture influences the readiness to use information technologies for sharing information. Moreover, Steinwachs (1999) and Ardichvili et al. (2006) revealed cultural influences on the preferred information channel to be used. This is highly relevant for information sharing via information systems in complex endeavors, considering the variety of C2 systems. Culture in this phase may be influencing preferred protocols, communication channels, coding schemes, etc. Furthermore, as also suggested by Wortel et al. (2007), security policies and interoperability issues may be influenced by culture. Interchange thus concerns *how and what information technology will be used for sharing information*.

6. Conclusions and future directions

The main objective of this article was to develop a research model for collaborative information sharing in dynamic and information rich environments, explicitly taking into account the impacts of cultural contexts at different levels. First, we motivated the relevance of the research project by recalling the centrality of information sharing in network centric operations. Subsequently we identified and defined the concepts relevant for the study. Information sharing was defined as a dyadic exchange between a source and a recipient unit. The focus of our research project was restricted to the mobilization of information by the source unit of the sharing process, the pushing of information. Then, existing research models on sharing and determinants of sharing in related scientific areas have been presented along with their limitations considering their applicability for information sharing during complex endeavors.

After that, a framework for understanding culture at different levels as well as the notion of culture as a determinant of information sharing was discussed. Finally, a multi-stage research model, extended to cover 21st century military needs was proposed, explicitly taking into account the impacts of cultural contexts at different levels at different stages of the collaborative information sharing process.

In order to empirically examine and validate the proposed research model, a possible programme of experimentation will be developed. Initially, in an effort to develop theory to help to fill the current lacuna on information sharing via technology in a cross-cultural context, research hypotheses will be formulated based on an extensive literature review and the proposed research model. Subsequently, a qualitative methodology will be employed in order to gain a deeper understanding of information-sharing processes during complex endeavors and to enable the refinement of the research hypotheses and the proposed research model. Based on observations and in-depth interviews with experienced C2 staff, and adopting one or multiple case studies, data will be gathered. Finally, the impact of cultural differences on information sharing via C2 systems will be investigated by a combination of observations, scenario-based interviews, experiments and a quantitative study. The combination of these methodologies permits data triangulation (Baker, 1999) and provides the opportunity to understand human information behaviour via C2 systems during complex endeavors using multiple types of data and data from multiple sources. The research project is in close cooperation with the NATO C2 Centre of Excellence and the Dutch Army C2 Support Centre. Data gathering will take place during simulated battle exercises in a multi-national, multi-service and multi-disciplinary military environment.

The aim of this research project is to advance understanding of the factors that facilitate or impede information sharing via information technology in dynamic environments. Along with its scientific relevance, findings of the research project will be significant for forces and civil organizations participating in complex endeavors. Some practical insights are worth mentioning. If socio-cultural differences are established, then entities participating in complex endeavors will need to be aware of the problems that may arise and how to overcome them. Results and recommendations from the current project should be woven into training and educational programs across countries and branches so that all levels of future decision makers gain awareness of the impacts of cultural differences, particularly in information sharing and in the C2 process. Regarding the development of C2 systems, developers would be able to develop future C2 systems so as to take socio-cultural influences into account. Furthermore, the results may also be applicable in analogous domains. In conclusion, the findings of the current research project will provide a richer understanding of collaborative information sharing via technology, enabling the support of information sharing activities in network centric operations.

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