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Share to Win: Unraveling Information Sharing in Dynamic Coalitions

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SHARE TO WIN: UNRAVELING INFORMATION SHARING IN DYNAMIC COALITIONS

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Abstract

Information sharing is increasingly recognized as the most essential requirement for success in modern military and civil-military coalitions. Coalition operations consist of information systems characterized by highly dynamic and information rich environments, large varieties of information technologies deployed, and great diversities of individuals involved. Although all of these individuals have to 'share to win', extensive information sharing still appears to be the exception rather than the rule. Individuals tend to hoard information for various reasons. Extant research explored individual information sharing behaviour and the use of information technologies for sharing from various perspectives. This paper emphasizes the need for a multidimensional conceptualization of individual information sharing behaviour by integrating different perspectives. I argue that an individual's decision to engage in information sharing is determined jointly by a cognitive, a social-psychological, and a technological dimension, and label these dimensions Identification, Inter-relation, and Interchange, respectively. I employ two multiple qualitative case studies involving data from real-world information sharing drawn from the military domain to develop a multidimensional model for the assessment of individual information sharing behaviour. The proposed model enables a systematic identification of this highly complex and challenging process. This identification is a first step in assessing the multifaceted phenomenon of information sharing in complex socio-technical systems. Implications for theory and practice are discussed, and future research directions are proposed.

Keywords: Information sharing; Information technology; Dynamic coalition; Information systems.

1 INTRODUCTION

In modern coalition operations, accurate and timely information is critical to successful collaboration, shared awareness, and mission effectiveness. Information is unevenly distributed through the coalition. Therefore, a key challenge is identifying and moving essential information from the source, where it is generated or resides, to the receiver, where it is required for use. The International Security Assistance Force (ISAF) is an example of a current military coalition operation in Afghanistan. Civil-military disaster relief operations after the Indian Ocean Tsunami and Hurricane Katrina were also dynamic coalition operations. These coalitions are dynamically formed and temporary. Coalition members consist of a great multiplicity of different nations, organizations, and individuals operating geographically dispersed in information rich and dynamic environments. They may have never worked together before, and may not expect to work together again as a coalition. Nevertheless, they are characterized by high levels of interdependence. These notions raise challenging issues with respect to collaboration and the sharing of information. New information constantly becomes available, but is often collected separately by the different members involved. However, their close operational interdependence requires the information to be shared. Therefore, collaboration and information sharing between all the different nations, organizations, and individuals comprising the coalition is inevitable in order to successfully conduct operations. The larger, more geographically dispersed, and time critical the coalition operation is, the higher the importance of sharing adequate and timely information across national and organizational boundaries becomes. It is this sharing of information that is considered critical to mission success in current and future dynamic coalitions.

Modern coalition operations are technologically advanced. Large varieties of information technologies (ITs) are deployed to enable collaboration and to acquire, to process, and to share information. Advances in ITs have vastly increased the possibilities for the sharing of information within coalition operations. National, organizational, and coalition information systems are available to enable information flows. ITs significantly enhance information sharing by lowering spatial and temporal barriers and by improving access to the information required. However, technology is only one component of complex socio-technical systems, as are modern dynamic coalitions. Introducing new technologies does not inevitably result in significant improvements in information sharing. Even if the technical capabilities are available, technology alone does not per se increase information sharing. Cognitive and social-psychological factors can also be powerful barriers to effective information sharing. Therefore, it is important to acknowledge that information sharing is a multidimensional phenomenon.

The objective of this paper is to advance the understanding of individual information sharing behaviour. By reviewing the literature, I first identify three different dimensions of information sharing. Then, by drawing on data from two qualitative multiple case studies, I identify a set of determinants along these dimensions. Finally, I propose the outline of an integrated, multidimensional model of individual information sharing behaviour that is grounded in the data from these case studies.

2 CONCEPTUAL BACKGROUND

Information and information sharing are pervasive concepts. Organizational and information systems literature generally refer to information as a desirable resource and to information sharing as a desirable behaviour. In this paper, I define information as *a data object that is generated and can be identified, stored, protected, moved, and retrieved by individuals in a coalition*. Accordingly, information sharing is defined as *the process of making information available to other individuals in the coalition*. This sharing can be done via direct communication, or indirectly via some information repository. A dynamic coalition consists of an information system supported by a variety of ITs. The system is centred upon communication and information sharing between individuals. Individuals can decide whether or not to engage in information sharing and ITs may be used for performing some of the sharing.

2.1 Insights from existing literature

Extant research explored individual information sharing behaviour and the use of ITs for sharing from various perspectives. Diverse theories and conceptual models are available. One perspective builds on social exchange theory (Kelley & Thibaut, 1978). Constant, Kiesler, and Sproull (1994) advanced a theory of information sharing in order to understand the determinants that support or constrain information sharing in technologically advanced organizations. The grounding in social exchange theory implies that social exchanges of information are similar to economic exchanges in the sense that there is an expectation of some future return for sharing. Unlike economic exchanges, there is no understanding of the value of what has been shared, and no clear expectation of the exact future return. Based on the Constant et al.'s information sharing theory, Jarvenpaa and Staples (2000) explored the antecedents of collaborative technology for information sharing both within and between organizations. The research model they proposed included cultural variables, task and technology related variables and individual attitudes and beliefs. The Theory of Reasoned Action (Fishbein & Ajzen, 1975) offers another perspective on information sharing. Based upon the Theory of Reasoned Action (TRA), Kolekofski and Heminger (2003) proposed a model that defines the influences on an individual's intent to share information. TRA proposes that an individual's behaviour is determined by his or her intention to perform the behaviour and that this intention is, in turn, a function of attitude toward the behaviour and the social environment. Kolekofski and Heminger's study explored individuals' beliefs and attitudes about sharing organizational information, highlighting the role of an individual's attitude towards information sharing. Bock, Zmud, Kim and Lee (2005) also employed TRA, augmenting it with extrinsic motivators, social-psychological forces, and organizational factors in order to develop an understanding of the factors supporting or inhibiting individual's sharing intentions. A final perspective on information sharing explores the use and adoption of information technologies. Davis, Bagozzi and Warshaw (1989) extended the Theory of Reasoned Action by developing a theory of technology acceptance focusing on individual acceptance of technology. Davis et al.'s Technology Acceptance Model (TAM) theorizes that an individual's behavioural intention to use a technology is determined by two beliefs: perceived usefulness and perceived ease of use. Following TAM, information sharing via ITs is supported when these beliefs are fulfilled. Venkatesh and Davis (2000) extended this theory by including constructs spanning social influence processes and cognitive instrumental processes in order to explain technology usage. Goodhue and Thompson (1995) developed a general theory of task-technology fit (TTF), emphasizing the interactions between the task, the technology, and the individual. TTF advocates the congruence between task requirements, individual abilities, and the functionality of the technology, implying that information sharing is supported if the functionalities of the IT match the information sharing requirements of the individual.

2.2 Multidimensionality of information sharing

The research discussed explored a variety of determinants that support or hinder individual information sharing behaviour from various perspectives. However, despite its universally recognized importance, an understanding of information sharing that integrates the multiple perspectives is lacking. In this paper, I emphasize the need for integration and stress that an individual's decision to engage in information sharing is determined jointly by a cognitive, a social-psychological, and a technological dimension. I label these dimensions *Identification*, *Inter-relation*, and *Interchange*, respectively: Individuals perceive information as important or valuable in different ways (e.g. Constant et al., 1994; Jarvenpaa & Staples, 2000). Diverse norms, rules, and procedures determine how information is to be distributed among individuals within and between organizations, what information belongs to the source organization and what information remains under the control of individuals. Accordingly, I define identification as *the selection and valuation of information that may or may not be shared with coalition partners, or with assigned individuals representing these coalition partners*. Identification addresses individual attitude related factors toward information. Furthermore, the context for social interaction affects information sharing (e.g. Bock et al., 2005; Kolekofski & Heminger, 2003). The concerns regarding the development and maintenance of sharing relationships

are influenced by the context in which interactions between individuals take place. I label this dimension *inter-relation*, defined as *the selection and valuation of the recipients as coalition partners, or as assigned individuals representing these coalition partners*. Inter-relation is concerned with social-psychological related factors influencing information sharing behaviour. Finally, the readiness to use information technologies for sharing information and the attitude toward these ITs differ among individuals (e.g. Jarvenpaa & Staples, 2000; Kolekofski & Heminger, 2003; Venkatesh & Davis, 2000). Moreover, the individual preferences regarding the IT to be used may be different. Consequently, I label and define *interchange* as *the selection and valuation of the technology used for sharing information with coalition partners, or with assigned individuals representing these coalition partners*. Interchange involves technology related factors affecting information sharing behaviour.

Identification, Inter-relation and Interchange jointly exert influences on an individual's decision to engage in information sharing. The three dimensions are interdependent. I propose that information sharing only occurs when *the conditions for I1, I2, and I3 are fulfilled and coexist within the individual*. Thus, for instance, individuals may be willing to identify and inter-relate, but the effort of using the information technology for interchange may be too great. A barrier to information sharing then stems from the IT used, rather than from the unwillingness to share. Conversely, unwillingness to identify or inter-relate may undermine the utility of information technologies.

3 METHODS

The study reported here is designed to identify the determinants underlying an individual's decision to engage in information sharing behaviour along the three dimensions. In spite of their grounding in influential theories of social-psychology and information systems, the models discussed were not inevitably regarded applicable to information sharing in dynamic coalitions. Consistent with the aim of this research, to develop a new model of information sharing, an in-depth case research strategy was followed (Yin, 2003). I employed a two-stage qualitative research strategy. First, a pilot multiple case study was conducted. The purpose of the pilot study was to verify to what extent the determinants found in the literature were applicable to the complexity of real-world dynamic coalitions. Subsequently, the actual case study was conducted to identify determinants that are lacking from the literature but that are pertinent to the information systems under investigation. As the literature suggests (e.g. Dubé & Paré, 2003; Yin, 2003), case study research is particularly useful when the phenomenon of interest is of a broad and complex nature. Engagement in information sharing is such a phenomenon. I followed an exploratory approach (Yin, 2003), as the research to date does not lend itself to the complexity and exceptional circumstances represented by modern coalition operations. The unit of analysis in all cases was individual engagement in information sharing.

3.1 Research Context

The first stage took place during a series of two large-scale Command Post Computer-Aided Exercises (CPX/CAX) of the NATO Response Force (NRF). The NRF is a technologically advanced, high readiness, multinational coalition organization consisting of a headquarters (HQ), and land, air, sea and special forces components. The exercises involved approximately 600 personnel, representing the full spectrum of NATO nations. The HQ and the different components deployed geographically dispersed on different locations across Europe. Information exchange within and between the HQ and the components occurs via a large variety of ITs. Information sharing and the appropriate use of ITs for sharing are of vital importance to achieve success. The NRF facilitates *coalition* warfare through *technology transfer* and *information sharing* (Bialos and Koehl, 2005). This made the NRF a highly appropriate case site for the pilot study. The second stage, the actual case study, consisted of NATO research and development (R&D) organizations. To identify generally applicable determinants of individual engagement in information sharing in dynamic coalitions, I sought insights from as many viewpoints as possible and based on as many coalition operations as possible. Therefore, I applied three case selection criteria: First, the case organizations needed to be able to provide expertise on

information sharing and on the *use of ITs for sharing* in technologically advanced coalition operations. Second, to generate a theory of information sharing applicable across different types of coalitions, the organizations needed to be able to provide expertise on information sharing in a multiplicity of *different coalition operations* (e.g. Afghanistan air/land coalition versus Horn of Africa maritime coalition). Third, the organizations needed to be able to provide informants originating from *multiple nations* and affiliated with *different services* (e.g. army, navy, air force) in order to be able to generalize the findings. Consequently, I selected four organizations; ACT C4I (Allied Command Transformation Command Control Communication Computers and Intelligence) and C2CoE (Command and Control Center of Excellence), both implying subject matter expertise on *information sharing* and *the use of ITs for sharing*; and CJOS CoE (Combined Joint Operations from the Sea Center of Excellence), and JAPCC (Joint Air Power Competence Center), both implying expertise on *a variety of coalition operations*.

3.2 Data Collection

In the first stage, data was collected during two ten-day site visits to Naples (Italy) and Ulsnes (Norway) in respectively November 2007 and May 2008. Data collection took place at the HQ of the NRF, the main junction of information exchanges. The method used relied on participant observation (DeWalt & DeWalt, 2002). During the visits, I observed exercise participants, visited relevant sections, conducted observations in operations centers, and attended several briefings and meetings. In addition, I had frequent informal conversations with exercise participants. I asked participants what they perceived to be the factors enabling or hindering information sharing in the current NRF coalition operation, and the factors pertaining to the use of ITs for sharing. After both pilot cases, data was analysed and case reports were composed. The results of the pilot study were used to develop an interview protocol for the actual case study. Data in the second stage was collected using interviews. In total, 47 formal semi-structured interviews were conducted from October 2008 to May 2009 with SMEs affiliated to one of the four organizations. All interviews were conducted at the organization sites in respectively Norfolk (Virginia), Ede (The Netherlands), and Kalkar (Germany). Interviews were private and face-to-face, ranging in length from 35 minutes to 90 minutes, with an average of 60 minutes (as requested beforehand). Interviews at each organization continued until data collection reached saturation, that is, when the insights provided by additional interviewing were judged to be insignificant. I applied two criteria for the selection of informants: First, informants needed to be able to provide subject matter expertise on information sharing, on the use of ITs, or on dynamic coalitions. Second, informants needed to represent multiple nationalities and services. The final sample of informants represented thirteen different nations and five distinct services (army, navy, air force, marines, and special forces). Informants' ranks ranged from captain to major-general, with the average being major or lieutenant-colonel. Tenures varied from 14 to 40 years. Informants each had diverse functional expertise. Operational experience ranged from experiences in more static operational environments as multinational HQs and Operations Centers, to experiences in a variety of expeditionary coalition environments, covering operations in the Middle-East, the Former Republic of Yugoslavia, Liberia, Iraq, the Horn of Africa, and Afghanistan. The protocol based on the results of the pilot study guided the interviews. The specific purpose of the interviews was to learn as much as possible about informant's concerns, successes, observations, and opinions regarding information sharing and the use of ITs for sharing. Informants were asked to base their questions on their current area of subject matter expertise and on their own operational experiences. The interviews began with brief backgrounds and professional histories of the informants. After this introduction, I proceeded with asking the informants to elaborate in general on information sharing, the use of ITs, and dynamic coalitions. This open question enabled informants to share their insights on the different topics in an unaided way. Then, a detailed set of open-ended questions guided the interviews. Although all interviews followed the same semi-structured protocol and therefore covered the same broad topics, the possibility to explore areas of special significance to an informant in depth (e.g. because of functional expertise or specific experiences) was maintained.

3.3 Data analysis

Although data collection and data are presented chronologically in this paper, analysis was conducted in parallel to data collection (Corbin & Strauss, 2008; Eisenhardt, 1989). Out of the 47 interviews, 35 interviews were audio recorded. Audio recording of the remaining 12 was not possible due to security regulations or because the informant did not allow us to. All interviews were transcribed and coded. The computer assisted qualitative data analysis software (CAQDAS) package Atlas.ti was used to assist in managing, coding, and analysing the data. Analysis of the data was conducted in several steps following techniques recommended by Corbin and Strauss (2008) and Miles and Huberman (1994). Data analysis proceeded from raw interview data to emerging concepts to final determinants. Multiple coding techniques, matrices, and descriptive displays were used. Analysis was highly iterative. I constantly compared concepts that emerged from the data with determinants from the literature that informed this research (Eisenhardt, 1989). In order to ensure that the final determinants were relevant and significant across multiple informants, I used continuous within-case comparison, followed by cross-case comparison. Ultimately, I surfaced a set of nine final determinants and three moderating factors that were significant across the entire data set.

4 RESULTS

Drawing on the data analysis, I found support for the proposition that an individual's decision to engage in information sharing is determined jointly by a cognitive, a social-psychological, and a technological dimension, as illustrated by the following comments: *"Technology should not be driving information exchange. Information exchange is based on the willingness to share. If the willingness to share information exists, technology should not be a barrier anymore"* (R30) and *"The largest problem (lack of information sharing) is not technology...information sharing consists for twenty percent of technology and eighty percent of behaviour"* (R27). But also: *"Technology is a very powerful solution if you don't want to share information"* (R34). The determinants identified from the data can be categorized along the three dimensions identified from the literature.

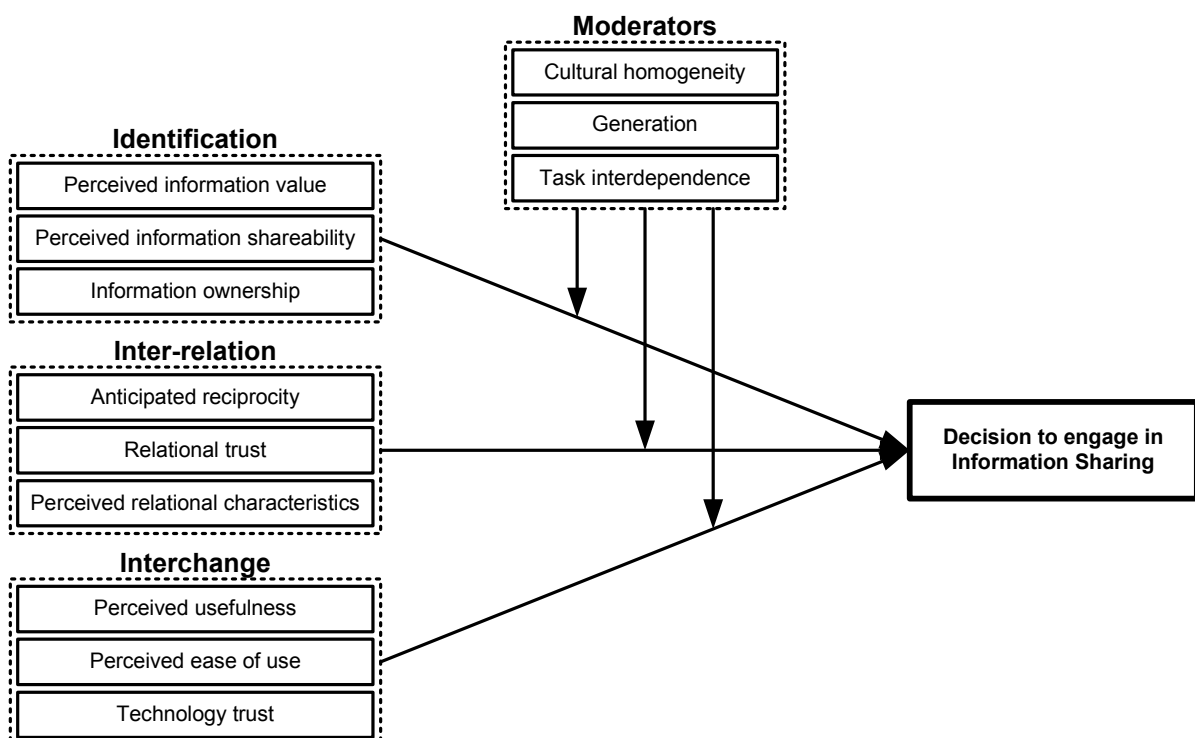


Figure 1. The I3I Model of Information Sharing.

Together with the moderating factors, they form the outline of a model of information sharing that I have termed the *I3I model of information sharing*. A visual representation of the model is depicted in figure 1. The dimensional determinants and moderating factors are presented below, illustrated with comments respondents provided. Respondents are codified as R1 to R47.

4.1 Identification

The first dimension addresses individual attitudes and belief related factors toward information. It is divided into three determinants: perceived information value, perceived information shareability, and information ownership:

4.1.1 *Perceived information value*

Despite the importance of mutually sharing information, information is still perceived as being a valuable asset. Individuals may be less willing to share information easily if the perceived value attributed to that information is high. The importance of adequate information, and the value attributed to individuals who possess this information imply a notion of power around information. Valuable information is perceived as a source of power within coalition organizations as emphasized by a high-ranked officer: *“Information is the same as money. It gives me power, it gives you power. So I want to share it, but I do not want to share it for free. ... So in a lot of cases ... information was used to pay information you got from someone else. It was trade, it is trade... The currency of a military is not money but is power. So information is money, or information is power, that is the same”* (R16). Value and power around information serve as an instrumentality of the sharing of information. If individuals perceive that power comes from the value of the information they possess, it is likely to lead to information hoarding instead of information sharing because sharing may lead to a loss of power.

4.1.2 *Perceived information shareability*

Dynamic coalitions are characterized by the large diversity of national and organizational coalition members involved. In addition to their common goal, each of these members may exhibit different national or organizational interests. Furthermore, the temporariness of dynamic coalitions implies that coalition partners can be allies in one operation, and adversaries in another. These notions raise challenging issues with respect to the security and classification of information. To avoid risks of unauthorized disclosure, all coalition members often determine their own disclosure policies, security directives and classification procedures. As one informant described: *“And if we are willing to share that information, do we have the opportunity or do we have the possibility to share? Not from the technical side but ... do policies allow us to do it? So even if there is willingness to share information, there may be cases where it is not possible to share because policies don't allow us to do so. And most of the times when you see effective information sharing that is because of people, I would say, are violating those policies to make it happen because they believe it is required”* (R24). Differences in these policies, directives and procedures may hamper effective information sharing across individuals.

4.1.3 *Information ownership*

Constant et al. (1994) proposed that information sharing is affected by organizational norms of property rights. Beliefs of ownership relate to whether information created by an individual is believed to be owned by the coalition or by the individual. Coalitions have a need for managing information at a collective level, whereas individuals have a need for using information as a component of their individual power base. Consequently, contradictory incentives to share information and to withhold it can exist simultaneously. Sharing information that individuals possess makes them feel needed and appreciated by providing them a sense of competence or control over their environment. I also found that individuals might be reluctant to share information for fear of losing ownership, illustrated by the following comments: *“Information is an important resource. Therefore ownership of information is seen as ... important. The ownership of information gives a positional advantage”* (R34) and

“Because obviously, the more information you have... within your organization, the more favorable it will be” (R37). Individuals thus might be reluctant to share information for fear of losing ownership. Conversely, if individuals perceive that their professional success is related with the information they share, this information will be shared more easily.

4.2 Inter-relation

Besides factors involving the information itself, social-psychological related factors affect the information sharing process. The subsequent dimension, inter-relation, is characterized by three determinants: anticipated reciprocity, relational trust, and perceived relational characteristics.

4.2.1 Anticipated reciprocity

Information is viewed as a valuable and powerful asset that should not be shared heedlessly. Following Bock et al. (2005), an anticipated reciprocal inter-relation represents an individual's desire to maintain ongoing relationships with other individuals, specifically with regard to information provision and reception. However, temporariness of dynamic coalitions often implies the lack of such relationships of reciprocity, generally formed by continuous processes of information exchanges. Reciprocity is considered to be a significant determinant of information sharing, as emphasized by two informants: *“So information has a value. And if I give information, I want to get something back. Because I paid, I invested a lot of money to get the information”* (R12) and *“We trade information, information sharing is a trade. I give you something, if you give me something”* (R34). Individuals involved in information sharing processes anticipate being able to acquire or benefit from the value created by their involvement and are motivated to share information with the anticipation that the same value of information will be received in return.

4.2.2 Relational trust

When facing decisions to what extent valuable information is shared with whom, judgments about the trustworthiness of the recipients become relevant. Trust is a broad and multi-faceted concept that has been widely studied in many disciplines. The data revealed that regardless of any formal information sharing procedures or requirements information will not be shared without trust in the recipient: *“Trust is paramount because trust will get you over the policy and politics hurdles. Personal trust is essential”* (R23) and *“You have to know that the information you share is in good hands (R34)”*. Trust is considered of critical importance to the development of information exchange relationships, and it evolves through mutually satisfying exchange interactions.

4.2.3 Perceived relational characteristics

The sharing of information, especially of valuable information, requires some sort of relationship. Information sharing then becomes a function of the kind of relationship the source has with the recipient. Relational characteristics involve the hierarchical disposition and the strength of relational ties. The hierarchical disposition of the relational tie implies the power and status of the information source compared to the recipient, i.e. their relative positions in the formal structure of the organization. Strong relational ties are important for sharing valuable information across boundaries and may surpass hierarchical dispositions. As one officer stated: *“When you have to share information, and when some of this information is critical and crucial ... you have to know the people you work with... if you have a good social network, information sharing is not so difficult”* (R38). The need for strong ties emphasizes the importance of a social network among individuals and the existence of informal information sharing.

4.3 Interchange

The final dimension, interchange, models the behavioural intention to use an information technology for the sharing of information as a function of three attitudinal determinants of individuals: perceived usefulness, perceived ease of use, and technology trust.

4.3.1 Perceived usefulness

Davis et al. (1989) and Venkatesh and Davis (2000) showed that the perceived benefits of using an effective and efficient IT encourage individuals to use it. The data reveal that individuals may not be inclined to use certain technologies for sharing information if they believe the technology does not help them in their information sharing task. As two SMEs reflected on information sharing performance when using a particular technology: *"People avoid certain systems because they feel they probably create more work than help"* (R1) and *"So it is making the technical side support the information exchange. And not make it difficult"* (R21). If an individual believes that using the technology will not help in the sharing of information, then information may not be shared.

4.3.2 Perceived ease of use

In time-critical and information-rich contexts, the effort that an individual may allocate to the various activities for which he or she is responsible is a finite resource. Perceived ease of use (c.f. Davis et al., 1989) refers to an individual's perception that using the system would be free of effort. One informant described this as follows: *"It all has to do with the easiness of the technology to be accepted. If a technology is so easy, intuitive ... to understand, than it is more used and the acceptance is much bigger"* (R9). Accordingly, a high degree of difficulty associated with using a certain technology for sharing information may be a barrier to information sharing.

4.3.3 Technology trust

Even if an IT is perceived as useful and easy to use, it may not be used if an individual believes that it is untrustworthy or not robust. Risks associated with unauthorized disclosure, information leakage, and potential breakdowns of the technology affect whether and how users use technologies for sharing. Individuals who distrust the technology may be disinclined to utilize it for the purpose in which it was originally designed. That is protecting and defending the information that is being shared via this technology. Two informants described this as follows: *"If I want to pass classified information over a network, I have to trust the network, the technology... that the network and the technology are safe... I have to trust the network that it works... That it is up and running all the time when I need it..."* (R10) and *"You really need to trust a technology when you get dependent on it... Technology always can break"* (R16). Individuals thus might be disinclined to share information if they do not trust the technology.

4.4 Moderating factors

In addition to the determinants of individual information sharing behaviour, the data also revealed three factors that are found to moderate the influence of these determinants:

4.4.1 Cultural homogeneity

Modern dynamic coalitions invariably involve individuals from a great multiplicity of different nations and organizations. Each of the individuals involved represent their own culture. Information flows are closely intertwined with culture. Cultural differences exert an impact on the effectiveness and efficiency of information sharing. Cultural homogeneity, i.e. a shared (national and/or organizational) culture, enables information sharing. The more homogenous or similar a group, the easier to share information, as illustrated by the following statements: *"It depends on background how you think about information sharing. Backgrounds shape perspectives on information sharing"* (R32) and *"If*

you have more similarities it is easier to work together and to share information” (R10). Accordingly, language was also seen as increasing homogeneity and as important in moderating differences: “You have to start off trusting another. If you get to know the people around you, with the different cultural backgrounds and different language skills, which is also an important issue... you have to overcome those issues to communicate and build trust” (R1). Cultural and language homogeneity are found to moderate the effects of the information sharing determinants and increase the willingness to identify, inter-relate, and interchange.

4.4.2 Generation

Generation, or age, is also found to moderate information sharing behaviour. Drawing on TRA (Fishbein & Ajzen, 1975), individuals may employ the knowledge they gained from prior experience to form their intentions regarding information sharing and the use of technologies for sharing. This is supported by the data. Generational differences are intertwined with differences in (military) education. As one (senior) officer describes: *“The young people are more willing to share rather than the old. And this is not something you can change so easily. I am not saying that it happens always, but most of the times. Age is an important factor in this area ... The education received by the military people in the past has nothing to do with the education of the young people nowadays. Sharing was not an objective at all. ... And the idea was not to share whatever what was not really essential to share. Something completely the opposite to what we have now” (R5). Thus, younger individuals are perceived to be more willing to engage in identification, inter-relation, and interchange.*

4.4.3 Task interdependence

A final moderating variable is task interdependence, defined as the extent to which an individual depends on other individuals to perform a task effectively. Following previous research (e.g. Goodhue and Thompson, 1995; Jarvenpaa and Staples, 2000), and supported by the data, a positive relationship exists between task interdependence and the motivation to share and use ITs. As one informant stated: *“We are always going to be in coalition operations now, we have to share that information ... and other nations are bringing in information that we don’t have ... because we are now interdependent, you are more willing to share information” (R47). The more interdependent an individual’s work is on others, the higher the needs of reciprocity are, and therefore the more likely the individual is to share. Individuals in dynamic coalitions whose work depends highly on others, including information they need, will have a higher degree of identification, inter-relation and interchange.*

5 DISCUSSION

Information is a crucial resource in modern coalition operations. Individuals involved in dynamic coalitions have to *share to win* to be successful. As stated by one informant *“The risk of not sharing nowadays is higher than the risk of sharing” (R5). However, information is not always widely shared and used. This hoarding of information runs counter to the requirements of modern coalition operations. Although modern ITs provide the promise of significantly increased information sharing, this is not unarguably the case. Concerns individuals have regarding the selection and valuation of the information itself, of its recipients, and of the technology used, jointly determine the decision whether or not to engage in information sharing. The objective of this paper was to advance the understanding of the factors that underlie an individual’s decision to engage in information sharing. By drawing on a qualitative multiple case study, I revealed determinants along three dimensions. Taken together, these determinants and their moderating factors, suggest the outline of a model that I have termed the *I3I model of information sharing*. The objective was not to delineate all inherent determinants of information sharing. However, because of its grounding in real-world empirical data, I believe that the I3I model can be seen as a robust first step in explaining variance in information sharing at the individual level. Understanding the process of information sharing at the individual level, is one step toward a better understanding of information sharing as a whole in complex socio-technical systems.*

5.1 Implications

Several implications for both researchers and practitioners are worth mentioning. The study was designed to generate a new model, not to test existing ones. Disentangling information sharing behaviour enables a more comprehensive understanding of this behaviour in socio-technical systems. Such an understanding may enhance our accuracy in assessing the phenomenon of information sharing that has been difficult to assess in the past. While the separate importance of each of the three dimensions has long been recognized across various research disciplines, their simultaneous effects have yet to be explored and assessed empirically. Scholars investigating information sharing may have to integrate perspectives from multiple disciplines. Hence, research from different disciplines, e.g. the organizational and information systems domains, may gain from greater interaction. Along with its scientific relevance, findings from the research project will be significant for both military as non-military organizations. The I3I model indicates that information sharing is more successful when multiple dimensions are assessed before IT based solutions are implemented. Commanders and practitioners that are trying to achieve efficient and effective mutual information sharing may focus their efforts on activities that will have the greatest impact on increasing the sharing of information. Systematical assessments along the three dimensions may suggest specific actions to change the different factors most likely to hamper information sharing. Results from these assessments can be woven into training and educational programs across entities involved in current and future operations. Furthermore, the dimensional determinants are affected by their organizational contexts. The stronger the influence of the organizational context, the less likely an individual's information sharing behaviour is driven by individual factors, and more likely to be driven by organizational factors. Commanders and practitioners need to create a context supportive for information sharing. Moreover, information sharing may be forced to a certain extent. Policies and procedures need to be reconsidered and implemented appropriately as they are important in improving information sharing.

5.2 Limitations and future directions

This paper draws on data collected as part of a large ongoing research project on information sharing in multinational military organizations. The project proceeds with exploring the validity of the proposed model by conducting field studies in real-world dynamic military coalitions in Europe and Afghanistan. Moreover, this paper explored information sharing at the *individual* level. However, it is important to acknowledge that information sharing is a multilevel phenomenon, as the context for information sharing is provided by *organizational* level conditions. To completely disentangle information sharing in dynamic coalitions, the research projects further proceeds with employing a multilevel investigation of information sharing in dynamic coalitions.

Nevertheless, a number of limitations and future directions may be mentioned. A first limitation concerns the organizations and population under investigation. This study was conducted with military officers experienced in technologically advanced coalition organizations. Findings may not inevitably be applicable to other organizations or comparable socio-technical systems. In order to generalize the model, it would be interesting to investigate a broader cross-section of technologically advanced, geographically dispersed organizations. Future research could address this caveat by relying on research designs incorporating samples from different sectors. Another limitation resides in the data collection methods employed. The data consisted of reflective interviews and therefore relied on individual perceptions. The use of alternative methods of data collection in future studies would increase the validity of the findings. Empirical research, both qualitative and quantitative, is advocated to address this limitation and to validate and explore the proposed model. Furthermore, although all of the determinants I proposed in the model may be separate and adequate explanatory determinants of information sharing, the decision to engage in information sharing is commonly based on multiple determinants. Moreover, the I3I model suggests relationships between determinants. The development of causal relationships was beyond the scope of this paper. Future research may enable causal inferences between the separate determinants. A final direction resides in comparing the dimensional

determinants across cultures. The aim was to generate a generally applicable theory of information sharing. Therefore I did not control for national and organizational sub-cultures (e.g. country x versus country y, or army versus air force). Modern coalition operations involve a range of culturally (national and organizational) heterogeneous entities. Future research may focus on to what extent the dimensional I3I determinants vary for different cultures, and how this affects information sharing across cultural boundaries.

In conclusion, I believe that the study presented in this paper contributes to the understanding of the factors underlying an individual's decision to engage in information sharing. I hope that the findings may serve as a first step toward more integrated ways of assessing the multifaceted phenomenon of information sharing in complex socio-technical systems.

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