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Gender Influences on Information Sharing in Civil-Military Operations

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Abstract

Civil-military operations are examples of collective endeavours in which military forces from different nations and services must collaborate with non-military organizations, involving national, professional, and organizational cultural differences. Sharing of information in civil-military operations is crucial, because accurate information is essential for effective Command and Control (C2). Van den Heuvel (2008;2009) has shown that information sharing is influenced by cultural differences.

Female personnel play increasingly a vital part in such operations. Military forces as well as civil partners may include female personnel and be led by female decision makers. Hence, it is also necessary to consider gender differences.

The scientific literature shows that there are gender-based differences in leadership style and in preferences for support using Information and Communication Technologies (ICT). This suggests that the designers of C2 systems need to take these differences into account. Acceptance of female participation and leadership in executive teams, as well as differences in communication in a socio-technical context, influence the process of information sharing and collaboration in civil-military operations. The purpose of this paper is to contribute towards the understanding of C2 systems by exploring gender influences on information sharing, primarily based on an analysis of the relevant literatures.

Introduction

Civil-military operations are collective endeavours in which military forces collaborate with non-military organizations, such as government ministries, international organizations (e.g., United Nations (UN) agencies), Non-Governmental Organizations (NGOs), commercial suppliers, and the media. Collaboration takes the form of a *coalition*, defined as a group of three or more legally autonomous organizations that work together to achieve not only their own goals, but also a collective goal (Provan & Kenis, 2007). Coalition partners need to share information to find their place in the coalition, to prepare plans collaboratively, to synchronize their actions, to evaluate what they have achieved, and to negotiate changes in their relationships with other coalition partners. We define *information sharing* as the process of making information available to other individuals, teams, or organizations in the coalition, where *information* is a set of explicit data objects that is acquired or generated, identified, stored, retrieved, and/or exchanged by coalition partners¹.

The diversity of organizations within a civil-military coalition means that collaboration is hindered not only by space and time, but also by cultural differences, where *culture* is defined as “the collective programming of the mind that distinguishes the members of one group or category of people from another” (Hofstede, 2001, p.9). Hofstede identifies five dimensions of culture: power distance, individualism versus collectivism, masculine versus feminine, uncertainty avoidance, and long- versus short-term orientation. Helmreich & Marriott (1998) make a distinction between national, organizational, and professional cultural differences.

¹ In this paper we make no distinction between data, information, and knowledge.

General de Kruif (2010) illustrates these cultural differences by describing a day in the life of a Royal Netherlands Army platoon on patrol in Afghanistan in the following words²:

“The Dutch platoon commander consults American maps before leaving the camp, which is defended by Slovaks. Outside, he makes contact with an Afghan army unit and Afghan policemen, led by mentors from Australia and France. A few kilometres further on, under the protection of Belgian F-16 fighter aircraft, a soldier steps on an improvised explosive device. He is evacuated by an American helicopter with a Dutch nurse on-board, who gives him blood from a British blood-bank. On arrival at the camp, he is operated on by a Singaporean surgical team, and successfully stabilized. Thereafter, he is flown in a Canadian C-130 transport to Kandahar airbase, where Romanian nurses prepare him for a second operation by an American surgical team. Canadian and Danish nurses supervise his recovery over the next few days, after which he is flown back to Eindhoven in The Netherlands in a British transport aircraft.”

As this citation shows, national differences in culture are the most obvious ones, and have attracted extensive study in a variety of scientific disciplines. Less obviously, organizational and professional cultural differences are also present. For example, the citation mentions three types of organization: armies, air forces, and police. It also refers explicitly or implicitly to a wide variety of professions: infantry soldiers and commanders, map-makers, policemen, fighter pilots, helicopter pilots, nurses, blood-bank administrators, surgeons, short- and long-range transport pilots, air traffic controllers, and air base personnel.

In previous work, we have studied information sharing in multi-cultural military coalitions (Van den Heuvel, Grant & Soeters, 2008; Van den Heuvel, Van Ettinger & Grant, 2009; Van den Heuvel, 2010; Grant & Van den Heuvel, 2010). Culture influences information sharing in two ways. Firstly, culture influences the propensity to share information at the organizational and individual levels. Secondly, it influences information sharing indirectly through the cultural influence on the choice of ICTs that mediate the sharing of information. In our research we are particularly interested in information sharing by means of C2 systems under Network Enabled Capabilities (NEC).

What is not mentioned at all in De Kruif's (2010) description are the gender differences, i.e., the differences between the characteristics of the two sexes. Most readers, upon reflection, will probably realize that, in reading de Kruif's description, they assumed that the nurses (whether Dutch, Romanian, Canadian, or Danish) were women. The other professionals will have been assumed to be men. This is because there are professions that are traditionally associated with one gender or the other. Nursing is traditionally women's business.

However, these traditional associations are changing. For example, in Western nations the medical and legal professions are changing, with the majority of university students in these professions now being women. Increasingly, female personnel play a vital part in civil-military operations. Since the end of the Cold War, many Western military forces have found it increasingly difficult to meet their personnel needs by recruiting men only. Initially, female personnel were restricted to supporting roles and disciplines, such as administration, logistics, and medicine. More recently, female personnel may be found in the front-line. The pilots in de Kruif's (2010) description could easily be women. It is even conceivable that the injured soldier was a woman. In Afghanistan it is a cultural affront for a man to question women or to search women's quarters. For this reason, many patrols include women soldiers or officers, exposing them to the same risks as men.

² Second author's translation from the Dutch original.

These developments mean that military forces invariably include female personnel and may well be commanded by female officers. Civil partners may also employ female staff or be led by female decision makers. Hence, it is necessary to extend our research to the influence of gender differences on information sharing in civil-military operations, and on information sharing by means of network-enabled C2 systems in particular. As for the culture, there are two ways in which gender influences information sharing. Firstly, gender is known to influence leadership and followership, which has consequences for the C2 process. Secondly, gender is known to influence the way in which ICTs are used. In combination, these two influences have potential implications for the design and use of ICT-based C2 systems.

The purpose of this paper is to contribute towards the understanding of the design and use of C2 systems by exploring gender influences on information sharing in civil-military operations. Our research is not limited to gaining operational benefits by the removal of gender-related hindrances, e.g., by changing negative attitudes or providing C2 tools that are gender-sensitive. We must also be alert to gaining benefits by deliberately exploiting gender diversity to gain an operational advantage, e.g., by modifying the C2 process and C2 systems so as to apply gender-specific strengths suited to the prevailing situation.

It should be noted that gender difference is not the same as Hofstede’s (2001) masculinity versus femininity dimension of culture. The latter relates to certain characteristics at the level of a national culture. An example is the importance of maintaining relationships (i.e., the culture is more feminine inclined) versus task completion (i.e., the culture is more masculine inclined). Hofstede’s dimension appears to be based on historical normative assumptions about the differences between the sexes (Rosser, 2006). As Hofstede et al (2010) point out, masculinity versus femininity refers to the relative importance that is placed on the ego versus the relationships with others. Their research shows that in feminine countries (such as in The Netherlands or Scandinavia) values like modesty and caring for others are perceived important for men and women, while in masculine countries more emphasis is placed on assertiveness and the ego and caring for others is seen as a less important value. (Hofstede et al, 2010). By contrast, gender differences in leadership and ICT preferences exist regardless of whether the country is (in Hofstede’s terms) masculine or feminine. Most importantly, individuals and teams can differ widely in characteristic from the “average” for their nationality or gender.

This paper contains five sections. The next section proposes a theoretical framework based on a preliminary search of the relevant literature aimed at identifying themes where gender differences could influence the C2 process and/or ICT-based C2 systems. These themes are then translated into research questions (RQs). The third section describes our research method and philosophical stance. The fourth section presents the preliminary results to the RQs obtained from our literature survey. The final section draws conclusions and identifies where further research is needed.

Theoretical Framework

The theoretical framework consists of two sections. The first part leads to the identification of a number of cultural dimensions, which might impact information sharing. These cultural dimensions for information sharing are summarized in Table 1. In the second part the focus is on identifying a number of cultural dimensions and sub-dimensions for information sharing in general and gender differences in information sharing in particular. These cultural dimensions and sub-dimensions are presented in Table 2. Subsequently, the research questions for our research are formulated.

Information can be shared on different levels, like an individual level, a cultural level within an organization, a cultural national level, or a professional level. However, an integrated understanding of information sharing at individual, cultural (national and organizational), and professional levels is also important (Van den Heuvel & Grant, 2009). These levels are considered in the following section in relation to information sharing in order to identify themes that might be influenced by gender. The identified national cultural dimensions that might impact gender differences are summarized in the first table,

Research shows that personal factors influence participation in collaborative media (Jarvenpaa & Staples, 2000) and in information sharing (Nsiberano, 2009; Wittenbaum et al, 2004). Authority as well as similarity evoke trust (Perloff, 2003), whereas differences in experiences, assumptions, prejudices, and goals influence what information, in what way, and how much information individuals are willing to share (Davenport & Prusak, 1997). Furthermore, users of ICTs are not a homogeneous group (Sterling et al, 2007). Therefore, it is possible that gender differences could influence information sharing on the individual level as well as on the team level.

Wittenbaum et al (2004) argue that information exchange is a motivated and strategic process to satisfy goals. Motivation appears to be a critical theme in information sharing. In this regard, Keller's (1988) ARCS model could be useful in the context of this paper. The ARCS acronym stands for the dimensions Attention, Relevance, Confidence and Satisfaction. This model for motivation in learning is based on a number of psychological and motivational theories and concludes that each of the dimensions in the model needs to be sufficiently present in order to motivate the learning process. It is plausible that the dimensions of this model could be applied to explain some of the motivation needed for effective information sharing, as follows: Attention (what information is recognized and perceived), Relevance (what information is relevant in the context and could assist in achieving the goals), Confidence (is the context secure and trusted enough, is there enough pre-knowledge and self efficacy to deal with the information successfully), and Satisfaction (are the goals achieved by dealing with the information and was the experience of sharing information satisfying).

Information has power aspects. Jealousy over resources and political battles frustrate the sharing of information in a number of organizations (Constant et al, 1994; Davenport & Prusak, 1997; Broos, 2007). Individuals sometimes deliberately select or deny information (Davenport & Prusak, 1997). ICTs make it easier to selectively share information with certain members of the team. Often information is shared with similar members in teams, since similarity evokes trust (Perloff, 2003). Social comparison processes also play a role in sharing information (Festinger, 1954). This could explain part of the discussion bias, in which shared information is favoured over information that is not shared by all members of the team (Wittenbaum et al, 2004). The organizational culture also influences attitudes about information sharing (Constant et al, 1994; Davenport & Prusak, 1997). Often individuals create and control information and sometimes regard the information as a source of owned power. However, when this information is regarded as owned by the organization, sharing is improved (Rosenberg, 2006). Clear overall strategies for the use and sharing of information within organizations improves integrated and cooperative working (Haines & Dunn, 2003). Oliver (1990) further emphasizes that common goals and motives for reciprocity emphasise collaboration and coordination among organizations and that this aspect might be more important than power and control.

Perception of the expertise of other team members is an important contributing factor in evaluating the importance of information. Research shows that leaders repeat more information than other team members (Wittenbaum et al, 2004), thus reinforcing the perception that that information is more commonly shared. Wittenbaum et al (2004) also found in their research that group decision quality is improved when participants share all the

information they have. Interestingly, when disagreements exist on the best option then better decisions are made.

Traditional command structures are changing in current civil-military operations. National cultures influence these structures. Differences in national cultures with respect to corporate business and communication are identified in extensive longitudinal research conducted by Hofstede (1997; 2001), Schwartz (2006), and Trompenaars & Hampden-Turner (1998). There is overlap between the identified dimensions, for example the Individualism index (Hofstede, 1997), the Individualism versus Communitarianism of Trompenaars & Hampden-Turner (1998) and the Autonomy versus Embeddedness of Schwartz (2006). The dimensions identified by Trompenaar & Hampden-Turner appear to fit better with the theme information sharing in relation to gender influences. For example their dimension ‘Specific versus diffuse communication’ appears to resonate a possible gender difference. For the purpose of this paper a selection and combination has been made from the national cultural dimensions identified by Hofstede (1997), Schwartz (2006) and Trompenaars & Hampden-Turner (1998), based on the apparent link with information sharing and with the anticipated influence on gender differences. These identified national cultural dimensions are adapted and defined for the purpose of this paper as illustrated in Table 1. Although predominant differences in certain national cultures exist, individual differences within those national groups are also present (Schwartz, 2006).

Table 1. National cultural dimensions for information sharing.

National cultural dimensions for information sharing	Stipulated definition or variation adapted from Hofstede (1998), Schwartz (2006) and Trompenaars & Hampden-Turner (1998)
Perception of status	Varies between the authority primarily tied to one’s job and accomplishments (achieved status) or the ascribed status by the group (social power) for example through observed expertise (Trompenaars & Hampden-Turner, 1998; Schwartz, 2006).
Egalitarianism versus hierarchy	Indicates the acceptance of hierarchal allocation of fixed roles to regulate interdependence versus acceptance of equality and cooperation to regulate interdependence (Schwartz, 2006; Hofstede, 1997).
Focus on tasks & procedures and mastery versus relationships and harmony	Indicates if the primary focus is on rules and tasks and mastery or on relationships and harmony (Trompenaars & Hampden-Turner, 1998; Schwartz, 2006).
Specific versus diffuse communication	Indicates if the communication is primarily direct and to the point or appearing evasive (Trompenaars & Hampden-Turner, 1998).
Affective versus neutral communication	Indicates if the culture is primarily emotionally expressive or emotionally detached and objective in both verbal and non-verbal communication (Trompenaars & Hampden-Turner, 1998).
Individualism versus collectivism	Indicates if individuals are allowed to operate independently from the group or if they are primarily used to function collectively, thus forming a unified in-group with collective goals (Hofstede, 1997; Schwartz, 2006).

Differences also exist between professional organizations. In a military organization, traditionally male characteristics are valued more highly than in civilian organizations. An investigation by Commission Staal et al. (2006) emphasized the importance of utilizing the

potential of women as role models in the military context in the Netherlands, arguing that females have a positive influence on the task and living climate in a military environment and that this contributes to social leadership. Also, in areas like Information Operations there is an increased functional need for diversity, as well as, cooperation and sharing information across a number of disciplines (Armistead, 2004). However, traditional gender role expectations might influence acceptance of leadership in the military especially in the higher ranks and traditionally male functions, and thus could hinder information sharing.

Arun & Arun (2002) recognize culture as one of the factors that influence information sharing using ICTs. Cultural determinants of information sharing behaviour via C2 information technologies that are identified by Van den Heuvel et al (2009) are summarized in an Identification, Inter-relation and Interchange (I3I) model with three dimensions that make information sharing between individuals and organizations possible. The first dimension is *Identification*, which includes value of information, share ability and information ownership. The second dimension is *Inter-relation* where the focus is on anticipated reciprocity, relational trust and perceived relational characteristics. And the third dimension is *Interchange* which includes aspects like perceived usefulness, perceived ease of use as well as system trust. These three dimensions are also an important focus in the theoretical framework to conduct the literature review for gender differences in information sharing using ICTs. The dimension inter-relation has primarily a focus on attitudes and relations and therefore the themes ‘gender and leadership’ as well as ‘gender and cooperation’ are considered here.

Although Identification and Interchange could be approached from a primarily functional and technical level, like ease of use and information security, those dimensions also contain attitudinal and relational aspects. Ease of use could be influenced by confidence in using ICTs and the technical aspects around system trust like information security. Perceived information security and information security awareness could influence information sharing amongst partners, with gender differences being a moderating variable.

A summary of the theoretical framework that directed the research questions for our further literature review is presented in Table 2. This theoretical framework is adapted from a combination of sources like Van den Heuvel et al (2009) and Keller (1988), as well as the national cultural dimensions for information sharing as stipulated earlier in Table 1.

Table 2. Cultural dimensions and sub-dimensions for information sharing.

Cultural dimensions for information sharing	Aspects (sub dimensions)
Confidence	Confidence in using ICTs; Perceived ease of use.
Attention	Differences in observing and processing of information; Different preference of media.
Communication	Specific versus diffuse communication; affective versus neutral communication.
Inter-relation	Leadership; Perception of status; Power aspects; Focus on tasks & procedures versus relations; Relational trust; Reciprocity; Individualism versus collectivism (is it more satisfying if the individual is successful or the team?)
Identification of information	Identifying quality of information, Perceived usefulness and relevance.
Interchange	Share ability; system trust; information security awareness.

Translating these themes, we pose our top-level research question as follows: How do gender differences influence information sharing at the individual and team levels in civil-military operations, where information sharing occurs by means of ICT-based C2 systems?

For the purposes of this literature survey, we decompose the top-level research question into the following detailed research questions:

RQ1: *What are the gender differences relating to confidence in ICT systems that could influence information sharing?*

RQ2: *What are the gender differences in observing and processing information?*

RQ3: *What are the gender differences relating to communication that could influence information sharing?*

RQ4: *What are the gender differences relating to Inter-relation that could influence information sharing?*

RQ5: *What are the gender differences relating to Identification of information that could influence information sharing?*

RQ6: *What are the gender differences relating to Interchange that could influence information sharing?*

Research Method and Philosophical Stance

The relevant literature has been identified by searching different disciplines for publications on the gender influences on leadership and on information sharing behaviour. We preferred publications in socio-technical contexts in general and in civil-military operations in particular. A multi-disciplinary approach is important, because C2 systems are socio-technical systems (Armistead, 2004). Van den Heuvel et al (2009) also argue that an integrated understanding of information sharing in an international context should include multiple perspectives. They observe that existing research is often focused either on the individual level or on the organizational level. Multi-level research is needed. By analogy, the influences of gender differences on information sharing should be described at multiple levels and from different perspectives to obtain a comprehensive insight.

The dominant philosophical stance in this paper is critical realism as described by Benton & Craib (2001). It is assumed that cognitive practice could be about an objective world and aspects that exist independently of consciousness and social structures. However, the surface appearance of those aspects in a socio-technical context could be misleading since beliefs and personal realities influence our behaviour. In the context of this paper, the assumption is that attitudes that hinder information sharing could be adjusted since attitudes consist of cognitive, emotional and behavioural aspects (Robbins & Coulter, 2008). Research results could contribute to awareness of gender differences, which in turn could influence thoughts as well as emotions associated with these differences and as a consequence a change in behaviour might be expected in professional organisations. In this way human knowledge systems could remain subjective and are therefore more seen as a process than exact objects. Tension thus exists between a model of objective scientific knowledge and the appreciation of the cultural and historical variability of this knowledge. It follows that critical reflection in a socio-technical context remains essential to overcome misleading appearances and to contribute to human self-emancipation (Benton & Craib, 2001).

The research results were obtained by searching the literature in accordance with the dimensions for information sharing using ICTs as presented in Table 2 (Confidence, Attention, Communication, Identification, Inter-relation, and Interchange), as well as underlying aspects like leadership, perceived power, and trust. The preliminary results are discussed in the following section.

Results of Literature Survey

RQ(1): What are the gender differences relating to confidence in ICT systems that could influence information sharing?

In the literature a number of differences are identified. Firstly, gender differences are identified related to access to ICTs (Nsibirano, 2009; Jensen, 2007). Nsibirano (2009) observes that women in developing countries experience access problems to ICTs. However, Jensen (2007) claims that women in general are disadvantaged with respect to ICTs, both as users and designers of information systems, thus claiming that access problems are not exclusive to some developing countries. Gender differences are also found in the way ICTs are used, for example males use computer-mediated knowledge management systems more often than females (Taylor, 2004). Furthermore, experience in using ICTs correlates positively with a number of information competencies like participation in the learning organization, knowledge management systems, and communities of practice (Broos, 2007). Technology facilitates what we do, but it can also constrain what we do. As such technologies are interrelated with human capabilities (Edmundson, 2005).

Confidence plays a role in how and how much the information systems are used. In Broos (2007), female officers indicated that they were less confident in using ICTs and that they evaluated their own competence in using ICTs in the work environment significantly lower compared to male officers with assumed equal experience and backgrounds. The expectation is not that female users are less competent compared to male colleagues, but that they have less self confidence in using ICTs (Arun & Arun, 2002; Fox, 2006; Meyers, 2006). Rosenberg (2006) suggests that they require some assistance in using ICTs in the work environment. However, in highly masculine-oriented disciplines like Computer Science, little gender-related difference in skills and confidence in using ICTs has been reported (Wasburn & Miller, 2006). Broos (2007) and Venkatesh et al (2000) showed that confidence influences the adoption of ICTs. It appears as if a number of factors could thus influence the ‘shareability’ of information.

RQ(2): What are the gender differences in observing and processing information?

Hoag (2008) claims that the evidence mounts for gender-related differences on the structure and function of the brain. Geiger & Litwiller (2005) also found some gender related physiological differences in spatial working memory that could influence information sharing, for example in the way in which different types of information are processed like text and diagrams and the value that is assigned to these presentations of information. Gender differences are also found in the value that is assigned to different presentations of information as well as in assigning meaning to symbols (Rosser, 2006). Rafi et al (2008) showed in their research that male students gained more from spatial visualization training in interaction-enabled virtual environments and animated-enhanced virtual environments compared to traditional training methods. By contrast, female students seemed to benefit from having spatial visualization training irrespective of the method used. Using identified differences, such as physiological differences in processing information constructively could indicate a need to investigate which performance support works best in which situation (Rosenberg, 2006). These differences could also contribute towards a more complete situational awareness, since different perspectives might complement each other (Van den Brink & Brouns, 2006).

RQ(3): What are the gender differences relating to communication that could influence information sharing?

Research shows that men communicate more to the point and focus on total information whereas women use more narratives in their communication (Anderson et al, 2006). National cultural dimensions like ‘specific versus diffuse communication’ and ‘affective versus neutral communication’, might moderate the effects of such gender differences. Similar gender differences are also found in online communication (Awad & Ragowsky, 2008). Chai (2009) found differences in knowledge sharing in social networks, and Gefen & Straub (1997) found differences in communication via e-mail.

RQ(4): What are the gender differences relating to Inter-relation that could influence information sharing?

An important keyword in the willingness to share information is trust (Davenport & Prusak, 1997; Free, 2005; Perloff, 2003). Leaders need to create the trust required to facilitate information sharing in a network-centric environment (Free, 2005; Chai, 2009). This trust is also based on the perception of the effectiveness of a leader and on the leader’s willingness to share the power that is inherent in information sharing (Perloff, 2003). Oliver (1990) conducted a meta-analysis on inter-organizational relationships and found that reciprocity is affected by relative or comparative properties of participants and their degree of congruence with each other. Gender differences might influence the perception of reciprocity, and this should be an area of further research. Research from Lin (2008) seems to indicate that the need for power-prestige on expressive ties, meaning cooperation to support others is stronger for women, whereas the need for power-prestige on instrumental ties, meaning cooperation to achieve a specific goal, is stronger for men.

Empirical studies about gender differences in assessment centres relating to leadership effectiveness, show consistently few differences (Wasburn & Miller, 2006; Eagly et al, 2003). Some research indicates that female leaders focus slightly more on participation and relations compared to male leaders (Yukl, 2010; Van Engen & Vinkenbunrg, 2005; Stoker, 2007). However, research consistently shows that followers evaluate female and male leaders differently based on different role expectations (Looney et al, 2004; Eagly & Johnson, 1990; Van Engen & Vinkenbunrg, 2005; Boyce & Herd, 2003; Hall et al, 1998). Such normative expectations might also influence female leadership behaviours (Apfelbaum, 1993). Yet, various literatures indicate that diversity enhances quality, innovation, and productivity (Van den Brink & Brouns, 2006), since different perspectives guided by a variety of experiences enhances the collective endeavours.

RQ(5): What are the gender differences relating to Identification of information that could influence information sharing?

Female users of ICTs use information systems with a preference for relations and socialization strategies and a higher value on the use of e-mail compared to their male colleagues (Chai, 2009; Gefen & Straub, 1997). Gender differences have a significant effect on perceived usefulness of some ICT systems (Taylor, 2004). Taylor’s research shows that gender affects the use of knowledge management systems in the sense that women find these less useful than men.

Some research results hint towards a gender bias in the perception of value of information (Rosser, 2006). Seemingly we have passed the days that female authors need to use male pseudonyms in order to get published, but surprisingly since double-blind peer reviews are used in a number of scholarly journals, an increase in the acceptance of female authors are reported (Wenneras & Wold, 1997). Fisher et al (2008) showed in this respect that anonymity and perceived equality increased acceptance in online environments and consequently

contribute to female adaptation of online learning. These examples indicate that certain attitudes could affect and even hinder information sharing.

RQ(6): What are the gender differences relating to Inter-change that could influence information sharing?

According to research of Feng-Yang Kuo et al (2007) there are gender differences in dealing with online privacy issues in the sense that women appear generally more concerned for their own privacy as well as the privacy of others. This is confirmed by Chai (2009) who also found that female students are more likely to display information privacy protection behaviour compared to male students.

Conclusions and Further Research

This paper contributes towards the understanding of the design and use of Command & Control (C2) systems by exploring the scientific literature on gender influences on information sharing in civil-military operations. Like culture, gender influences ICT-based C2 systems both directly and indirectly. The direct influence stems from gender differences in the use of information and communication technologies. C2 systems are influenced indirectly through gender differences in leadership style and in what followers expect from their leaders.

The literature was surveyed for publications on the gender influences on leadership and on information sharing behaviour. A theoretical framework for the literature survey was constructed from the cultural dimensions and sub-dimensions for information sharing. We preferred publications in socio-technical contexts.

Our results suggests that there are gender differences in access to ICT and in the ways in which ICT is used. Confidence in ICT plays a role in these differences. Gender differences are also found in the value that is assigned to different ways of presenting information. This may be apparent in C2 systems that present the current situation in the operational area graphically, because male users gain more from training in spatial visualization.

Research shows that men communicate more specifically, while women use more narrative. This suggests that C2 systems could be designed to better suit female users by incorporating tools that support the sharing of information in narrative form, such as chat. Similar differences are found in online communication, in social networks, and in email.

The gender bias found in the perception of the value of information could negatively impact the weight given to situation reports made by women. Perhaps the gender of the person making a report should be left unspecified.

The literature survey reported in this paper makes a contribution to the scientific knowledge on the design and use of C2 systems by identifying the influence of gender differences. This is increasingly important as more women personnel are involved in civil-military operations, both as leaders and as followers. We recommend that the effects specific to C2 systems should be studied in more detail, using empirical methods where possible.

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