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This report summarizes a literature study pertaining to research on decision-making in groups, carried out as part of the project 807 SLADI (Battlefield Digitization – consequences for command and operation). It addresses the question of size, member characteristics, communication, decision-making under risk & uncertainty, time, group polarization, group think, stress, cognition, and natural as opposed to ad hoc groups.
The advantages and disadvantages of different group characteristics are discussed and evaluated in light of the literature, lending some suggestions as to what seems to define an optimal decision-making group. Suggestions point in the direction of medium size groups (5-7), heterogeneity and equality of group members, and decentralized communication. As groups increase in size (8-10), they are, nevertheless, found to benefit from leadership, albeit a democratic and task focused leadership. Furthermore, the availability of information, and adapting it, along with task and technology, to human cognitive function and capacity, is found to be important for the group performance. Finally, training people together as teams rather than employing ad hoc groups proves advantageous under various conditions, especially under those characterized as emergency situations.

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1 INTRODUCTION

One of the aims of the project SLADI (Battlefield Digitization – consequences for command and operation), is to be able to designate and describe which are the best ways to organize people in the future military organization, given the potentials conferred by the technological development. From the field of psychology, this entails a host of different areas to consider, such as problem-solving and decision-making at the group level, communication in computer networks, structure and organizational culture, the affordances of national culture, management and leadership, decision-making under stress, and various individual-level concerns like personality, intelligence and attitudes. The aim of this paper is to consider the former; understanding group processes as a basis for efficient decision-making, and consider its consequences for subsequent organizational choices. The conclusions of this paper are intended to help narrow down the organizational possibilities at the group level. This will be a basis later to be employed in concordance with knowledge from other fields in the continuation of the project SLADI.

Decisions at all levels of the military organization are per definition made by people in social environments. This organization is furthermore dependent upon being able to make many, both high quality and high-speed decisions. It therefore seems useful to glimpse into the research from the realm of group processes. This encompasses both the question of group size and related topics pertaining to decision-making. Still within the field of group processes, associated knowledge from the disciplines of cognitive psychology and communication will be included in order to obtain a fuller understanding of the subject matter.

The psychological research on groups stems mainly from laboratory experiments with ad hoc groups, signifying groups of people that have no common history of working together. Nevertheless, there is *some* research based on natural groups, often referred to as teams (e.g., Orasanu & Salas, 1993). This research will be treated under chapter 10, and is intended to offer a more comprehensive understanding of the potential and differences of teams or natural groups as compared to the more studied ad hoc experimental groups.

2 THE QUESTION OF SIZE

The question of size is an important area to understand within the area of group processes and decision-making, in turn lending valuable understanding of advantageous ways to organize people. Should one organize people into small groups or large groups? Is there an optimal group size for making decisions? What are the advantages and disadvantages of different group sizes?

There is an abundant literature on group processes within the field of social psychology. However, within the scope of this literary review, one can only hope to scratch the surface.

As early as in 1932, Shaw observed that groups generally outperformed individuals. In a later comprehensive literature review, Hill (1982) found the same to be true. Thus, indications of the benefits of entrusting groups instead of individuals with different tasks and responsibilities go far back. However, there are no clear answers as to what constitutes the optimal group size. There are, nevertheless, indications as to what effects size may entail for problem-solving and decision-making processes[1].

In general, there is substantial variability in the findings across studies as to the relationship between group size and group performance (e.g., Cummings et al., 1974; Littlepage, 1991). This seems to be partly attributable to differences in task characteristics, member roles and characteristics, spatial arrangements, and subsequent group processes. What seems to be clear, is that although more group members add informational and ideational value to the group, the added numbers also add coordination and motivational losses (Steiner, 1972). Littlepage (1991) studied groups of two, five and ten persons. He concluded that it is difficult to determine the optimal group size, as he found it to depend both on the characteristics of the task and of the participation likely to occur. However, in the disjunctive task[1] situation, there was very little difference in the performance of the 5 and 10-person groups, although the 10-person group *did* perform a tad bit better. Thus, this suggests that not much may be gained from increasing the size of the group to above 5 persons. Although, as also indicated in this article, the gain from adding more members to a group is highly dependent on whether the new member brings in new knowledge or not – making it a question of information value.

In a military context, it seems that the demand for added informational value is accounted for in the composition of the decision-making group known as the staff[2]. In this group, each member represents a different area of function, thus making informational value inherent to the very selection and number of group members.

In line with Littlepage, Hirokawa and Scheerhorn (1986) point to the importance of the information basis available to the group for the quality of the group decision. Research by Stasser et al. (1989) and Cruz et al. (1997) further indicate that small groups tend to share the information they have more consistently than do large groups (i.e. 3-person and 6-person groups in the former, and 4-person and 8-person groups in the latter study). In groups, and specifically in large groups, there is often a problem when members generally share a substantial amount of information; unshared and new information is then often left unsaid or also simply ignored. Hence, even though larger groups may benefit from a larger pool of information, they are also more prone to faulty group processes in terms of not bringing up new information as well as

[1] The label, disjunctive task (e.g., Steiner, 1972; Wilke & Knippenberg, 1996) is often employed in the literature referring to the type of tasks in decision-making experiments. It indicates that the end product of the group process is not simply the *sum* of the efforts of the group members (which would be labelled an additive task).
[2] The staff functions as an advisory group for the commander. They develop plans and courses of action (decisional options).

discarding what the majority is uninformed of[3]. This may furthermore explain why studies often come to different conclusions as group size is regarded. Still, if one takes this into account when designing larger groups, it is proposed that the adverse effects of large groups can be avoided by making sure that the groups are heterogeneous, so that the motivation to share information is not lost. The advantage of heterogeneous groups for disjunctive tasks has additionally been underlined by Steiner (1972).

In general, meta-analyses comparing findings on group processes from the laboratory with studies from the field show that there are few differences (Locke, 1986). For instance, Haleblian & Finkelstein (1993) studied a pool of 47 companies in their natural environments. It was revealed that the companies with large top management teams performed better than those with small top management teams[4], thus supporting the findings of Littlepage & Silbiger (1992), presented right below, whilst opposing those of Cruz et al. (1997), presented above.

Due to the apparent differences in findings pointed to here, it is essential to look at what *small* and *large* teams actually denotes in the different research. The *average* group size was less than four in the teams studied by Haleblian & Finkelstein, which is the same group size as Cruz et al. (1997) defined as *small*. This could mean that the differences in numbers indicated by the terms "small" and "large" in the literature, to some extent may explain the apparent differences in findings. Furthermore, these findings indicate that there is no linear relationship between group size and performance on decision-making and other disjunctive tasks. This is in line with Steiner's (1972) prediction of a curvilinear relationship between group size and effectiveness. Thus, in light of this and the other research presented under this headline, maybe 2-3 persons are too few, whilst 8 are too many to achieve top functioning of a group. From this, one could hypothesize that the optimal group size may be around 6 persons, which is also comparable to the findings of for instance Littlepage (1991), presented above.

The literature reviews and empirical studies by both Steiner[5] (1972) and Cummings et al. (1974) support this conclusion. Cummings et al. proposed that medium sized groups of 5-7 persons might be optimal, in terms of avoiding the disadvantages of both too small and too large groups and at the same time exploit the advantages. It was pointed to that larger groups produce solutions of greater quality as well as doing this more rapidly, and that smaller groups reach consensus more easily. Smaller groups were also found to take more advantage of having all equal members, that is, having no leader in the group, something that was less of a disadvantage in bigger groups, which compensated some of their coordination losses through having a leader. This finding is contrary to the stance argued for in military literature, which does not seem to question the necessity of leadership, even in smaller groups (e.g., Druzhinin, 1972; Forsvarets stabsskole, 2000; Snyder,1993). The need for, and focus on, leaders, seems generally strongly underlined.

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[3] In general, there is a consistent finding that shared information is more likely to be mentioned in a group situation than unshared information, as well as the shared information being more likely to be discussed as well as retained for further consideration in the group (e.g., Stasser & Titus, 1987; Stasser et al., 1989; Stasser & Vaughan, 2000).
[4] Average team size was 3.39, with a standard deviation of 1.46. The organizations' real sizes were controlled for.
[5] For instance, Steiner found there to be a critical size limit at 8-10 people, at which size the groups started to experience a high degree of coordination difficulties.

Closely linked to the question of information value pointed to above, relating to the research of Littlepage (1991), is the question of whether or not the group is proficient at recognizing relevant information that group members add. In other words, is expertise actually recognized? Bottger (1984), among others, have demonstrated that recognition of expertise is important for effective decision-making. Littlepage & Silbiger (1992) likewise concluded that recognition of expertise is an important component of group performance, and that it is furthermore augmented by group size[6]. Some of the difficulties linked to recognizing expertise may lie in the finding that expertise does not relate much to participation or amount of talking in the group. For instance, a previous study by Littlepage et al. (1991) found participation to be related to confidence, dominance, and extroversion – whilst not to expertise.

Moreover, in the study by Littlepage & Silbiger (1992), increasing equal participation did not lead to increased recognition of expertise[7], further suggesting that the unequal participation common to most decision making groups, is not what is detrimental to group performance. The research by Littlepage et al. (1995) demonstrates that groups may *attempt* to base decisions on expertise, although, they are not proficient in recognizing real expertise. Rather, they rely on heuristics like amount of talking (which in turn was related to confidence and dominance), reason and autocracy. However, these heuristics were not found to be related to actual expertise. This is generally in line with previous research, as that presented above, although there seems to be some variation in the degree to which amount of talking can be related to actual expertise (e.g., Bottger, 1984; Regula & Julian, 1973). These differences in findings were attributed to a difference in the difficulty of the tasks that the groups were given in the different experiments. Additionally, previous studies have demonstrated that people may also rely on heuristics like status (e.g., Kirchler & Davies, 1986), and power (e.g., French & Raven, 1959), when trying to recognize expertise.

Sjödin (1979) researched into how groups of different ability levels may have variations in their ability to take advantage of group work. They found that groups of higher ability level individuals benefited more from group work than did groups of medium and lower level ability individuals. Also, there was a significant interaction between performance level and group size, in terms of the groups with higher ability individuals being able to profit more from additional group members (i.e. augmented group size). Thus, one could hypothesize that in order to benefit from organizing people in larger groups, one should also look at the individual characteristics of the group members, as their ability level.

It is further interesting to relate this to the findings presented above, of group performance not being influenced by *actual* experts but by whom the group *think* is the expert (Littlepage & Silbiger, 1992; Littlepage et al., 1995). The research by Littlepage et al. (1995) further demonstrated that both individual performance measures and the ability to recognize expertise were related to group problem-solving performance. Although this is not stated, it is perhaps possible to hypothesize, in line with the findings of Sjödin (1979), that group individual ability level influences the ability of the group to recognize expertise. Thus, instead of concluding that

[6] In their study they looked at groups of 1, 2, 5, and 10 members.
[7] This is in line with Stasser's (1988) finding from computer simulated research using the *Discuss* modell, which was developed on the bases of the information flow found in the group discussions studied by Stasser & Titus (1985).

groups *generally* often fail to exploit their expertise, one should perhaps rather conclude that groups *not* consisting of high ability persons fail to exploit their expertise, pointing in the direction of making sure that groups intended to rely on their expertise also have persons with above average ability level.

The research by Bottger & Yetton (1988) further adds to the understanding of the relationship between group[8] performance and expertise. In general terms, they found support for group performance being a function of the available resources in the group (i.e. expert members) and the strategies the group adopt for their use (i.e. employing the knowledge of their expert members). More specifically, they found, what Steiner called coordination losses, to be dependent on composition effects. That is, if at least two[9] persons or the majority of the group members were proficient at recognizing the optimal solution, no process losses occurred. However, if the expert were alone, process losses occurred as a function of the conflict management behavior, in terms of the outcome depending on whether the group was effective in managing the split in opinions within the group. When the majority was in the wrong, there were found significant performance losses. And finally, in groups where members had poor knowledge of the task, decisions were comparatively poor. Hence, in line with the other research presented above, group performance ultimately depends on its members.

The research by Bottger & Yetton also adds an explanation as to why Sjödin found groups consisting of higher ability members to be more proficient at recognizing expertise, and thus benefited more from the group situation than did groups with low or medium ability members. This indicates that it is simply a question of the majority not opposing the experts, as well as there being a minimum of two persons who have the expert knowledge. Thus, the groups without higher performing members naturally have less probability of containing more than one person with the necessary knowledge than would groups with only higher performing individuals.

Furthermore, Bottger & Yetton expands the understanding of why Cruz et al. found heterogeneity to be essential for a group to be able to benefit from additional members. If the group is too homogenous, chances are that there will be a majority that opposes the one(s) with the expert knowledge.

In the research from a natural environment by Haleblian & Finkelstein (1993) (also referred to above), it was further shown that high CEO dominance was equally detrimental to success as was a small management team. This was found to be true in turbulent high discretion environments, that is, organizational environments characterized by change, where the latitude of action given to top management was of some importance. This may be understood to be further supporting the findings quoted above, in terms of group performance on decision-making and problem solving tasks being a question of idea generation, information sharing, as well as recognition of expertise. Bigger groups add more ideas through more experts (e.g., Hirokawa & Scheerhorn, 1986) and a cooperative leader facilitates the sharing of ideas and information as well as recognition of the expertise, which this research demonstrated to be most

[8] There were 21 groups consisting of 4, 5 and 6 members in their study.
[9] The importance of the dyad has been especially underlined in Davis' social decisions scheme (SDS) model, which has had considerable impact on small group research in the past 25 years (Davis, 1973; Levine, 1999).

important in turbulent contexts. The value of a cooperative leader is further underlined by the work pointing to how status and role is influencing the group processes (e.g., Kirchler & Davies, 1986; French & Raven, 1959), as a person having the role and status of a leader may more readily be seen as an expert and consequently be allowed to decide whom to listen to.

The research finding by Haleblian & Finkelstein seems to be particularly relevant as regards the military organization, since, even more so than *their* organizations of focus, this is an organization designed primarily to operate under what can be called extremely turbulent situations, where the latitude of action may be equally great (although, depending on the situation and where you are in the hierarchy). Based on the findings of Haleblian & Finkelstein, that high CEO dominance was equally detrimental to success as was a small management team in turbulent high discretion environments, it may be hypothesized that both small decision-making groups with any leader and any group with a dominant top leader in the military organization, may not function good enough under conditions of war or operations involving some turbulence.[10] This is not to say that the organizations researched by Haleblian & Finkelstein are similar to a military organization, just that the tendency revealed in this research indicate that this could be an interesting area for further research.

The hypothesis made above opposes much of the military literature (as also indicated previously). It is difficult to find literature that does not acknowledge a need for leadership. Indeed, the need for empowered leaders is not seldom seen as a matter of fact (e.g., Druzhinin & Kontorov, 1972; Forsvarets stabsskole, 2000; Snyder,1993). On the other hand, the topic of leader dominance is treated critically by for instance van Creveld (1985). Based on the differences between the cases (military versus civil organizations) in the literature as well as on the differences in conclusions pointed to here, it could be a fruitful ground for further research both to question whether there always is a need for a leader in all groups and which role the leader should assume in a group decision-making situation.

3 COMMUNICATION

As indicated in the previous chapter, understanding the communication between group members is integral to the understanding of the group decision-making process. Communication is therefore seen as a direct part of the interaction between members of decision-making groups. Steiner (1972) indicated that communication becomes increasingly difficult as group size is enlarged. This is based on his own findings as well as on a review of previous research. He proposed a critical size of 8-10 persons; whereto added members lead to a sharp decline in available communication channels actually employed. Above this size, groups are found to divide into subgroups or adopt a polarized pattern of interaction. This harmonizes well with the findings quoted in the preceding chapter, concerning the optimal group size.

Shaw (1964, 1981) found a main differentiation between centralized and decentralized communication networks. The former indicates a group of people where communication is channelled through one or a few persons. The latter indicates that communication is more freely

[10] This may further be linked to findings of appropriateness of types of leaders. Artistic personality types have been found to be better problem solvers than engineering types (Myers-Briggs type indicator: e.g., Gryskiewicz et al., 1995). However, there is a question of how well this type functions under stress as opposed to the other. Thus, one ought perhaps go for a mix of these two types of leaders to ensure maximum capacity under varying conditions.

dispersed within the group or network. The latter has been found most efficient in more complex decision-making and problem-solving situations[11].

In line with this, Carletta et al. (1998) found research to indicate that groups with equal authority members make better and more innovative decisions than groups where the authority is placed with one person. This is probably because the individual with authority automatically dominates and controls the discussion, thus preventing a more efficient decentralized interaction. The advantage in avoiding group leadership, presupposes that the group is kept relatively small, because, comparing with the findings by Steiner (as well as those presented under chapter 2), it seems clear that as groups augment in size, communication is increasingly difficult. As the group size increases, especially as it reaches 8-10 persons, leadership becomes more advantageous as a means to improve the coordination of the group communication. Indeed, Carletta et al. concluded that as groups become larger, they naturally begin to behave more like groups with an authority person, even though there is no externally designated leader[12]. Thus, Carletta et al. supports Steiner's finding of larger groups tending towards a polarized pattern of interaction. Seen together with Steiner's finding of larger groups alternatively tending to divide into subgroups, it seems clear that; the larger the group, the bigger the difficulties in coordinating communication.

However, as pointed out in chapter 2, when there *is* a leader, there are better results with democratic leaders than authoritative leaders (Haleblian & Finkelstein, 1993). This seems to corroborate the findings of Carletta et al., in terms of indicating that the more restricted the communication in a group (created by any leader, and especially an authoritative leader), the less efficient is the decision-making process.

4 DECISION-MAKING UNDER RISK AND UNCERTAINTY

The research tradition in social psychology, pertaining to how people make decisions in resource dilemmas, gives some insight into some of the bases upon which people build their decisions in situations that are unclear. By manipulating people's access to information about the actions of other group members as well as the effects of their actions, it has been found that people's decisions are dependent upon information for social comparison and situational outcome understanding respectively (Biel & Gärling, 1995). Thus, uncertainty about these points of reference, influences people's subsequent decisions. Furthermore, research by Aquino & Reed (1998) found that communication and information about situational aspects were essential also for the cooperation of the group.

Individual differences become increasingly evident where such points of reference are missing. That is, people with a predominantly prosocial value orientation make decisions benefiting the group more than themselves, whereas people with a predominantly egotistical value orientation

[11] However, such empirical evidence has only had impact on *parts* of the military literature (e.g., van Creveld, 1985). Druzhinin & Kontorov (1972) claims centralized organizational communication to be advantageous and a matter of fact, although there is presented no evidence in support of their claims.

[12] In this respect, it should be noted that such effects might also be culture dependent. It seems plausible that cultures favoring flatter organizations and more collective values (i.e. low Power Distance and Collectivism: Hofstede, 1991) than the Anglo-American referred to here, are more capable of equal member group interaction in larger groups, whereas the opposite could be expected for more hierarchic individualistic cultures.

make decisions benefiting themselves more than the group (e.g., Biel & Gärling, 1995). This is furthermore in line with cross-cultural studies on differences in value orientations (e.g., Hofstede, 1991; Schwartz & Bilsky, 1990), in terms of value orientations in turn being culture dependent. For instance, based on Hofstede (1991) people in so-called collectivist cultures would be expected to have more prosocial values than would people in individualistic cultures, who would be expected to have comparatively more egotistical values. Furthermore, individual differences in risk-taking attitudes are expected to influence how much an egotistical value orientation will affect the decision-making; the more risk-seeking individuals will behave more egotistically than the risk-avoiding individuals (Biel & Gärling, 1995).

Whether people have information about the intensions and decisions of other group members evidently depends upon the communication within the group. In line with the other research presented here, Biel & Gärling found communication to be better in small groups than in large groups, hence suggesting that the individual decisions of group members are more dependent upon the other group members in small groups than in large groups. This seems also to be in line with the group polarization effect, in terms of showing that people's decisions made within a group always will be influenced by the opinions of the other group members (explanations of this effect given in chapter 6).

These indications may in turn be related back to the findings of Haleblian & Finkelstein presented in chapter 2. The reason why they found management teams to make better decisions than individual CEOs, may be that there is a predominance of individuals in such top positions with risk-taking attitudes, thus making it advantageous to use a group for decision-making purposes. In other words, using a group for decision-making may limit risky decisions by introducing limiting group norms. This would not be contrary to the group polarization effect, provided that the CEO represents *more* risk-taking attitudes than the majority of the decision-making group. If, however, the CEO is assumed to be *less* risk-taking, it should imply, from the group polarization literature, that the decisions made by the group are more risky, thus making it a question of whether it is advantageous to make risky decisions or not. The research by Houghton et al. (2000) does, however, suggest that less risky decisions are the better decisions in an organizational context[13].

Research by Tversky & Kahneman (1974) and Kahneman et al. (1982) further suggests that people may well also ignore statistical information about risk and uncertainty when making decisions. They point to that people are more liable to base themselves on heuristics than on rules of probability. That means that people are for instance more liable to be afraid of travelling by plane than by car, because the power of a plain crash as an example is much more salient in the human mind than is the statistical evidence pointing to that the probability of being hurt or dying in a car accident being unquestionably bigger. This effect is further supported by research

[13] This is rather contrary to the suggestions made by manoeuvre theory (e.g., Forsvarets stabsskole, 2000). Manoeuvre theory, as described by Forsvarets stabsskole (2000) underlines a need for action in general and a need for risky decisions in particular. More specifically, it advocates for the importance of taking "calculated risks" (Forsvarets stabsskole, 2000, p48). Furthermore, it is posited that leaders should possess a willingness to take risks. It is, however, somewhat difficult to discern the empirical basis for this stance from this literature. Are there strong empirical findings to support the theory or is it more based on established beliefs? Seen together with the research by Houghton, it seems plausible that the relationship between risk-taking and the successfulness of the mission could be represented by an inverted-u type relationship. Such a hypothesis would be interesting for further research.

in cognitive psychology.

In summary, it seems clear that communication and information is essential for group decision-making. A lack of it seems to produce more egotistical decisions, although there are individual differences to that effect.

The consequence of this for the question of military organization is in the lines of securing good informational distribution, especially for those in decision-making positions, as well as securing good lines for communication with other decision-makers. This enhances a more realistic understanding of the situation and the available resources, thus, for instance preventing an over-consumption of resources, additionally also ensuring some restraining of individuals more inclined towards egotistical and/or risk-taking behavior.

5 HIGH-SPEED DECISION-MAKING

Eisenhardt & Bourgeois (1988) and Eisenhardt (1989) researched into what facilitates good decision-making in high velocity environments, such as the computer industry. Thus, this research gives a better understanding of what facilitates high quality fast decision-making. This should be a highly relevant area to understand for the military organization. Even though such findings should be of some interest to consider, it should be clear that no direct comparison between these types of organizations is intended.
Eisenhardt & Bourgeois (1988) found high quality decision-making to be linked to fast decisions, decentralized power and a low focus on politics (i.e. ways in which executives enhance their power to influence decisions). Indeed, politics were found to be closely linked to autocratic CEO behavior. Politics produced poor performance due to: being time consuming, distracting from the tasks at hand, and restricting the information flow within the organization. The latter was found to further produce faulty perceptions about the opinions of others, thus also creating a communicational problem. Through these negative effects, decision time was also increased.

Eisenhardt's next study expands on these findings through a primary focus on the speed of the decision-making process. As in the former study, speedy decisions were also the best decisions. Additionally, they found CEOs making speedy high quality decisions to be better informed, use more alternatives, and include their management team. Thus, also in line with the former study, democratic leadership was found to be essential. This is furthermore comparable to the study by Haleblian & Finkelstein (1993), referred to in chapter 2, in terms of linking successful decision-making to democratic leadership as well as larger management teams rather than small ones. Seen together, these findings further underline the general finding from experimental social psychology; pointing to groups providing a better basis for solving problems and making decisions than individuals.

As indicated previously (chapter 2), military literature and praxis seem to differ somewhat on this point (e.g., van Creveld, 1991, 1985; Snyder, 1993). Even though the group is employed for help in the process of creating *options* for how to solve a problem, the leader is seen to be the only person who can actually *make* the decisions. This should therefore be an interesting area for further study.

6 GROUP POLARIZATION

Group polarization is also a well-known finding from social psychology. It is denoting that groups tend to make collective decisions that are more extreme than the average of the pooled individual opinions going in the same direction. In other words, decisions made by groups tend to be more extreme than what would be expected from the average individual. Brown (1988) point out four main explanations as to why this is so. First, there is the general finding that groups usually follow the opinion of the majority (e.g., Davies, 1973; Laughlin, 1980). Second, social comparison leads people to present their opinions comparably closer to what is expressed by the majority of the other group members (e.g., Festinger, 1954). That is, they conform to what they understand to be the group norm. This is further closely linked to the third explanation given by Social Identity Theory (e.g., Hogg & Abrams, 1988), which implies that people identify with the group to which they belong and thus feel more complied to express what they understand to be representative of their group norms. Finally, there is the case for persuasive arguments (e.g., Burnstein & Vinocur, 1977; Steiner, 1972), pointing to the purely informational value of the arguments presented within the group. Thus, the more information in a certain direction, the more people will feel sure about what is the correct decision, therefore making their group decision become more extreme than the average decision opinion.

The group polarization effect is consistently found in laboratory studies, although evidence from the field is less unambiguous (Brown, 1988). One explanation offered to this effect is that the groups that did not produce any polarization had existed for some time and had considerable experience in dealing with the issues that they were handling. Thus, since this polarization effect is hardly a sought-for effect, it seems that established groups that are proficient in their tasks are superior. This may be due to several reasons, as indicated by Brown (1988), such as established norms about the decision issues as well as established group structure and procedures.
These findings are clearly in line with those presented under the previous headline, in terms of underlining the positive effects gained from having people work together in established groups rather than in ad hoc groups. Thus, from the point of view of organizing the military, it seems further emphasized that one should strive for stable groups of people working together.

7 A MODEL OF THE DECISION-MAKING PROCESS: GROUPTHINK

It is beyond the scope of this literary review to go into details here, rather just identify some important issues that the model points to. The groupthink model defined by Janis (1972) is probably the most well known of the group decision-making models. Its success has largely been attributed to its intuitive appeal (e.g., Aldag & Fuller, 1993), since it is primarily relying on famous historical cases and anecdotal evidence from many studies. It describes faulty group processes leading to faulty decisions. The faulty group processes described include an overdirective rather authoritative leader coupled with a homogenous and hence too cohesive group. The model has often been criticized, as well as recognised. There has generally been more support for Janis' finding relating to the authoritative leader than to the cohesiveness of the group members (e.g., Brown, 1988).

Furthermore, Aldag & Fuller (1993) examines ways in which to improve the model by adding items such as task characteristics, group type, political norms and motives, and leader power, to mention but a few. Their model consists of four parts in a flow-model: three main antecedent

determinants (decision characteristics, group structure, and decision making context), emergent group characteristics, decision process characteristics, and outcomes. This model is primarily descriptive and could probably function as a checklist when examining group processes.

When adopting this learning to a military context, it seems essential to underline the importance of ensuring democratic leadership as well as avoiding homogeneity of group members, since this have been found to have positive effects on the quality of decision-making also elsewhere (see chapters 2 and 10). The practice in the military organization of composing staff members from different functional areas seems to be a way of seeking to obtain such heterogeneity. However, the group members may otherwise be quite homogenous as a result of the education system and system of advancement within the organization (see e.g., Syversen, 2001). Additionally, the group think literature indicate that one should be aware of the effects on the decision-making process of such elements as context, group structure, task demands, and group norms – transferable also to a military context.

8 GROUP DECISION-MAKING IN SITUATIONS OF STRESS

The article by Rau (1994) demonstrates how teamwork can have a stress compensating effect, as opposed to working alone. This was found to be particularly true in activities that involved high emotional strain. This should be an especially relevant finding for a military organization, as high emotional strain is what working with decisions under conditions of crisis and war is. Indeed, the Department of the Air Force, USA (1991) underline in their doctrine, the importance of the group in reducing combat stress (see also van Creveld, 1991).

Linked to this are findings from the peacekeeping work in Kosovo (Laberg, 2000). In this research, it was revealed that many soldiers demonstrated impaired decision-making capabilities as a result of stress caused by the situation. And if working in teams has a beneficial effect on this, it would clearly be a purposive organizational choice. Thus, it would seem that working in decision-making teams have beneficial effects for the military organization.

9 COGNITION

From the point of view of cognitive science, Houghton et al. (2000) supports the findings described above on the group polarization effect (chapter 6). They found that the cognitive biases[14] of small numbers[15] and the illusion of control[16] found for individuals can be enhanced in a group decision-making situation.

This can also further explain the findings of Rau (1994) presented in chapter 8. Houghton et al. (2000) found that the lowered risk perception in individuals through cognitive biases sometimes is enhanced in the group decision-making situation. This could be one of the reasons why Rau found the group situation to be stress reducing as compared to the individual situation. Thus, faulty human cognitive processing in terms of lowering risk perception to below real risk, which

[14] Cognitive biases are systematic information-processing shortcuts that result in faulty judgments; for instance through cognitive categories or schemata (Fiske & Taylor, 1991).
[15] Indicates that the cognitive method of sampling, favors special instances over general tendencies.
[16] Indicates that people think they have more control over situations than what they in reality have.

Houghton et al. underlined could have damaging effects on decision-making for business leaders (see chapter 4), can in another setting actually have a positive effect. This could for instance be true for a military organization, which per definition is intended to operate under high stress situations. It would be logic to assume that a stress reducing effect could be purposive, by for instance lowering the risk perception of the individuals involved. However, it is of course not purposive to have decision makers who are willing to take too big risks. In order to avoid this, it would probably be a good idea to look at individual differences in this respect, avoiding individuals with lower than normal risk perception, found to be typical for high sensation seekers (Horvath & Zuckerman, 1993).

Grinyer (2000) writes from an operational research perspective, looking at some ways to combine knowledge from operational research with cognitive models. In general, he proposes that it is necessary to map the beliefs of top management, in order to understand how they will be able to use the information from analytical analyses for strategic management (including market analyses, etc). This is deemed to be especially important in complex, uncertain situations. He proposes some practical guidelines for doing this, consisting of collecting the individual perceptions of managers, analyzing them, and submitting them to a group discussion. This is based on methods developed by practitioners, which Grinyer found to be supported by cognitive research as well as research on group decision-making. Based on cognitive research, it seems quite logic that it is important to take into account how people think, in terms of how they base their decisions on prior beliefs and cognitive categories or models which may or may not be purposive in the current situation. The question of cognitive models become especially important to consider in situations of high stress (thus particularly relevant for the military organization), because people rely increasingly more on cognitive shortcuts in situations of high stress, due to cognitive capacity being reduced by multiple simultaneous cognitive demands (Fiske & Taylor, 1991).

This may be further related to an article by Roch et al. (2000), which is pointing to that lowered cognitive capacity leads to less task-relevant thoughts; evidently important to have in mind for the understanding of decision-making in high-stress situations. The cognitive processing was found to be more based on heuristics in the condition of high cognitive loads than in the condition of lower cognitive loads. An effect of this was that there were more individual differences in the low cognitive load situation, because people then had the capacity to decide through more systematic cognitive processing which choices to make. In the high load situation, people just followed what they assumed to be the social norm. Thus, one could also expect differences between different cultural groups to be most salient in high cognitive load situations, since different cultures have different values and norms for social behavior (e.g., Hofstede, 1991). From such a point of view, one could expect cultural differences to be more accentuated under stress or situations of high cognitive load, which should be especially relevant for the international military operations within NATO. Since it is plausible that international military operations will be an area of increasing focus for the Norwegian military organization, cultural understanding at the group level may thus be of equally increasing importance.

The model employed to describe individual cognitive processes may also be used to describe the group process itself involved in the decision-making. This serves to improve the ability to pinpoint where what takes place in the decision-making process. For instance, after a non-successful decision has been made by a group, one may through this be able to say at what stage

the faulty decision-making process occurred; that is, was it at the attention, encoding, storage, retrieval, or decision stage of the group process (Duffy, 1993). Duffy (1993) further uses this as an aid to understand how to improve the team decision-making: by defining the link for, and influence of, organizational design on the group decision-making process, by providing a tool for designing and evaluating the group support technologies, and by specifying the best ways to train teams in decision-making.

Organizational design affects the group decision-making process in many ways. Duffy points to how organizational structure and setting influences team cognitive strategies in the decision-making process. Although less in depth, organizational design, as described by Duffy, bares resemblance to what others call organizational culture (e.g., Hofstede, 1991; Schein, 1992); it underlines the influence of such variables as centralization of control, degree of cooperation, team size, and member proximity. In line with Duffy's cognitive point of view, Hofstede defines culture as "the collective programming of the mind" (p.5, 1991), underlining how culture has a profound influence on people's cognition. This is in line with the results from the ROLF project presented below (see chapter 10), as well as offering an additional explanation to their finding of organizational hierarchy and consequent roles of the individual group decision-making members being most defining for how the members interacted (Artman & Persson, 2000).

Group support technologies have been found to give both positive and negative effects on the decision-making process (Duffy, 1993). The main finding is that there must be a fit between the needs of the social context and the technology offered; there is no point in giving a group information-overload nor information which cannot be employed given the social factors provided by the context organization. There has also been found a trade-off between maintaining communication with remote teammates and completing local task responsibilities (Duffy, 1993). This is further supported by the findings from the ROLF project (expanded upon in the subsequent chapter); the information and communication possibilities that team members had with subordinates in the outside context proved counterproductive for the local group decision process (Artman & Persson, 2000). In cognitive terms, people have a limited information-processing capacity, and will not necessarily make better decisions with more information available.

The importance of *training teams in decision-making* has been described by Means, Salas, Crandall & Jacobs (1993) in cognitive terms, while the next chapter further expands on this relating specifically to research from natural settings. Means et al. found the training of meta-cognitive skills and task and context-relevant decision-making training to be the most efficient types of team decision-making. Normative decision training models[17] were found to have a very limited (i.e. limited to the class-room) or non-existing effect (Means et al., 1993). This latter type of training was not found to transfer to real-life settings at all. From a cognitive point of view, the encoding and retrieval processes easily explain this; people have limited information-processing capabilities and thus depends on so-called *faulty processes* in order to deal with the demands of the situation. Thus, Means et al. (1993) found a need to train people in what they are actually going to do, hence providing for the necessary availability in the retrieval process, and for a general awareness of the group decision-making processes, thus making people aware of

[17] Normative models of decision-making, refers to what is often named "classical decision theory". This is ideal decision-making based on probability models of what is the best decision from a statistical point of view.

how the group context affects them. This finding is supporting the conclusion of Orasanu & Salas (1993), who presents findings of how team decision-making training needed to be of relevant tasks in the relevant social context in order to be of any value (see chapter 10).

10 NATURAL GROUPS AND THE FINDING OF GROUP PROCESS GAINS

As referred to above, many theories, such as Steiner's, have focused on process losses in group-decision making situations. However, some interesting findings of the opposite kind, process gains, have also been found (e.g., Brown, 1988; Hill, 1982). Brown found this to be most typical in studies of natural groups that are rather stable and not ad hoc as those in the laboratory studies. Brown points to findings indicating that there can be instances where groups perform beyond their individual capacity and rather facilitate each other's performance. This is thought to be an effect of people being able to give an extra effort within groups that matter to them psychologically in situations where the outcome of the group process is important for the group as a whole. Theories of social identity further explain such findings (e.g., Hogg & Abrams, 1988); when group members have a shared identity linked to the group, it becomes vital for their feelings of self-worth that their group performs well.

The consequence for a military organization would be to strive for the creation of teams that are allowed a common history. This is furthermore underlined in military literature. For instance, the doctrine of the Department of the Air Force, USA (1991: page 20) accentuates that "..fighting effectively depends on unit cohesion,..". Additionally, it underlines that ".., World War II studies rediscovered the immense effect group socialization dynamics could have on performance.".

Also, ensuring that people have a shared identity within the organization, and especially within teams working together, should accordingly have positive effects on the results of a military organization. Indeed, Shamir et al. (2000) found identification with the unit to be the strongest predictor of perceived combat readiness[18]. However, it is important that there is a common identity within the whole organization, and that this is stronger than the identification with sub-groups. This is because, as well explained by social identity theory, if the sub-groups are seen as more important to the individuals, there is a danger of counterproductive behavior ensuing, as it facilitates intergroup competition and conflict (for more on this see Sherif et al., 1961). The problems of non-integrated sub-cultures in organizations have been well described by Martin (1993) and Martin & Siehl (1983).

10.1 Research on team decision-making

Orasanu & Salas (1993) presents a good review of research on team-decision making in complex natural environments. Their main argument is that established groups, which they call teams, generally outperform ad hoc groups. The research referred to is mainly from studies of cockpit-crews in emergency situations and studies of military decision-making. Hence, the research should prove very suited for the purposes of the project SLADI. Orasanu & Salas have pointed to what identifies teams that make good decisions under extreme conditions such as

[18] The other predictors were: soldiers' experience, leader's tenure, leader's confidence in the unit, soldiers' confidence in the leader, and unit discipline.

emergencies, where both correct action and time are crucial for the survival of themselves and others.

First, in order for a team to perform effectively, they need to be trained as teams in the tasks they are going to perform (e.g., Hackman, 1988). However, it has been underlined that if one wants the team to be able to handle emergencies, they need to be trained in how to deal with such unexpected situations. If drilled only in routine situations, people will have problems when facing the unexpected. Training is also a prerequisite for creating groups with a common history, thus acquiring the advantages, as mentioned right above, of the shared identity and feeling of belonging found in established groups.

This leads to the second point, concerning the advantage of a team developing so-called shared mental models. This means that, through training, team members acquire a common understanding of each other's knowledge, skills, behavior, and needs. It has been found that teams who have a common understanding of how to handle the emergency, including such knowledge as who knows what within the team, handle such situations much more successfully. In other words, the team members have clarified their roles in relation to each other, and thus avoid some of the problems with ad hoc groups pointed to above (e.g., Steiner; 1972), concerning the process loss due to coordination problems.

Third, Orasanu & Salas point to research that have found teams engaging in explicit communication to outperform teams that do not. This is supported by the research on communication in ad hoc groups, as presented above (chapter 3). Further in line with this research is the finding, for instance from the cockpit studies by Chidester et al. (1990), that captains creating a more democratic environment for communication were more effective. This is clearly also corroborating the findings by Haleblian & Finkelstein (1993) and Eisenhardt (1989), on the advantage of cooperative leadership (presented in chapter 2 & 5 respectively). Finally, pressure to conform, typical for cohesive groups, was identified by Orasanu & Salas as a source of failure in group decision-making. Pressure to conform was found to produce false consensus (i.e. when people falsely believe that all the others are in agreement with own opinions) and pluralistic ignorance (i.e. when group members do not raise their voice out of the belief that they are the only one who thinks differently). The research on the faulty decision-making process called groupthink (Janis, 1972), as presented above (chapter 7), also supports this conclusion. Furthermore, this is in line with the findings pointing to that heterogeneity of the decision-making group is advantageous (e.g., Steiner, 1972).

In sum, it seems clear that the findings from research on team-decision making in complex natural environments, as presented by Orasanu & Salas, gives good indications of the advantages of training people in decision-making teams. This gives the advantage of shared identity, shared mental models, as well as better communication. Finally, it was pointed to the good effect of not submitting the team to pressures to conform and of democratic leadership.

10.2 Team decision-making in a military command and control situation with the introduction of new technology

Sundin & Friman (2000) presents research papers resulting from a Sweedish project called ROLF 2010 (The Mobile Joint Command and Control System 2010), focusing on the introduction of new technology in a military decision-making situation. The aim has been to develop technological tools that will improve the information, communication, cooperation, and allow for more flexible and creative decision-making in a network-centric warfare situation (Brehmer & Sundin, 2000).

Experiments were conducted with senior officers (6-8), who made up the decision-making group. Within what was called the Mobile Joint command and Control System, they were introduced to new technological equipment allowing for a common visual representation for all the team members, thus aiming to promote creative and reflective discussions where the team members would become less constricted by formal rank. However, it was demonstrated that organizational and hierarchical constraints made the decision-making group unable to take advantage of the possibilities of the new technology (Artman & Persson, 2000). The group still worked according to the rules set by the established organizational structure and norms of interaction. One did not achieve the close cooperation and inclusive discussions one had expected from introducing this tool. Rather, the commander was still the one to define the situation and solution, as well as deciding when and who were to speak. In other words, the organizational culture had a predominant effect on how people interacted in the team, and the technology only a minor influence. Indeed, this is concordant with Hackman (1988), who identified the organizational context as the most defining factor for the performance of real teams.

The results presented from the ROLF project, however, are the observed effects in one group from within one organization observed at a set place and time. If employed over time, it is possible that the technology would lead to some changes in the way that the group members interacted and exploited the advantages of the technology. Nevertheless, research on organizational culture suggests that the norms of conduct within an organization are very stable, and that one needs to introduce both radical organizational changes *and* physical and technological changes simultaneously, in order to have a fair chance at obtaining real changes in how people interact within the organization (e.g., Hofstede, 1991). At the same time, such changes should be sensitive to, and reflecting of, the established organizational culture, in order not to create a clash, yielding counterproductive behavior from the organization's members (e.g., Hofstede, 1991).

Thus, it seems advisable for organizations wishing to develop better routines of interaction and decision-making, to make the necessary organizational changes at the same time as they introduce new technology, as well as respecting the existing organizational culture. The goal of this project (SLADI), to suggest simultaneous organizational and technological changes for a better future military command and control system, is therefore well supported by prior research.

Furthermore, it was found that team members primarily focused their time and energy on communicating with their subordinates out in the field (Artman & Persson, 2000). This was

done on their individual computers. The knowledge resulting from this external communication was what each team member presented at the common sessions. Consequently, each member possessed unique and complementary information. However, the sharing of this information was not prioritised, and there were no questioning from the others. Hence, it seemed clear that the main focus of the team members was towards their group outside the command and control unit, and that this was with whom they identified. This was found to be negative for the decision-making job they were supposed to do in the command and control team.

It is most interesting to question the reasons for this. Did they feel largely superfluous in the command and control team due to the strong dominance of their commander? Assuming that the leader dominance is based in the organizational culture, it seems only logic that the team members in their roles as leaders for their own sub-groups would assume the same dominant role relative to *their* subordinates, as the commander did in relation to them.

The next question is whether this norm of conduct imbedded in the organizational culture is productive or counterproductive for an efficient decision-making process. The literature, as presented above (see chapters 2, 5, and this one), indicates that this is rather counterproductive. It has been found that leader dominance leads to poorer group decisions, as it, for instance, entails a narrowing down of idea generation, information sharing, recognition of expertise, and hence also the decision options (Eisenhardt, 1989; Haleblian & Finkelstein, 1993; Orasanu & Salas, 1993), as well as leader dominance being the primary reason for the erroneous decision process known as groupthink (see chapter 7; Brown, 1988; Janis 1972). This also corresponds well with the views presented by the authors Artman & Persson (2000).

Another finding from the ROLF 2010 project was that people did not exploit the technical equipment the way it was intended. More specifically, instead of using the sophisticated computerized map the equipment afforded, people individually produced static maps with simplified notation, which they subsequently presented to the others. Due to the simplification and the idiosyncratic nature of these maps, the other team members were often confused.

It is not difficult to see how this behaviour is based on prior experience. People tend to simplify their environment into something they are familiar with and thus more readily can make sense out of (e.g., Fiske & Taylor, 1991). Therefore, learning how to employ new equipment is essential for it to become an aid and not an obstacle. And in order to use it efficiently, a lot of training is indeed required, making the employment automatic, in order for people to use their cognitive capacity to the *tasks* they need to solve and not to the understanding of the working of the equipment (e.g., Fiske & Taylor, 1991; Orsanau & Salas, 1993). Another question is of course whether the new technological equipment were fitting the needs of the users at all. It is quite possible that the problem will reside even after a significant amount of training, if the equipment is not well adapted to its users and their needs. People can be adaptable and learn, however, only within the limits of their cognitive and attentional capacity (see chapter 9 for more on this).

11 SUMMARY AND CONCLUSIONS

From the above, it should be clear that groups generally outperform individuals, much because

one person rarely can have the best knowledge in all areas. The group as a decision-making unit allows a larger informational basis, both in terms of prior knowledge and current focus. Additionally, the group provides emotional support, like reducing the stress level of decision-makers. This is of importance for the military organization, since the work they are intended to do naturally includes highly stressful situations. According to such findings, an organization based on team decision-making is a good idea.

As far as group size is concerned, it appears from the above presented research, that a mid-range group size of about 5-7 persons gives the most advantages. One will then avoid the pitfalls of small groups, such as having, a too small informational basis, lower proficiency at recognizing expertise, and an elevated risk of being too homogenous. The pitfalls of large groups will also be avoided, like the increased communicational problems, and the coordination and motivational losses. This is well summarized in Steiner's model of a curvilinear relationship between group size and output.

This should imply an advantage of choosing an organization of people where decision-making takes place in mid-size teams. This ought to allow the best possible flexibility to perform different types of problem-solving, in terms of, allowing sufficient member heterogeneity, hence also obtaining a good platform of knowledge, proficiency to recognize with whom the best knowledge is, and the upkeep of motivation and good communication.

It was indicated that groups of a medium or small size, might do best without a leader. Communication is then more decentralized, facilitating the sharing of information within the group. Nevertheless, when groups reach a size of 8-10 people, there are indications of beneficial effects from the introduction of a group leader for the coordination of member contributions. For best results, this leader should be democratic. This is in order to prevent a thwarting of the information-flow, secure the inclusion of good ideas, keep up the motivation to participate, thus also avoiding the pitfalls of groupthink. Additionally, it was shown that decision-making is both better and faster with leadership that is both democratic and focused on the task rather than on political motives.

Combining this with the findings on group size, it appears most advantageous that decision-making is performed by leaderless groups of 5-7 persons. However, if there are other more momentous reasons for keeping the group-size somewhat larger than this number in an organization, the evidence speaks in favour of the introduction of a democratic leader.

This leads to the question of more individual level considerations. The above implies a benefit of the selection and training of democratic individuals both for membership, and, if deemed necessary due to group-size, leadership, in decision-making groups. There were also indicated advantages of having individuals low in risk-taking attitudes and individuals with a prosocial value orientation (as opposed to an egotistical value orientation), in order to ensure decision-making that is favourable for the many.

Furthermore, the research presented above demonstrates that the heterogeneity of group members and their capability level also is highly important in order to ensure proficient group informational processing, such as the recognition of expertise. It should therefore be important for an organization to select individuals of a high ability level and with a variation in

background and knowledge, thus securing the decision-making quality.

Additionally, it seems important to underline that group decision-making is not different from individual decision-making, in terms of how the available information is actually used. People tend to base themselves more on heuristics than on rules of probability, a tendency that have been shown to increase with the stress and cognitive demands of the situation. This is important to bear in mind when designing the technological information systems to be employed in decision-making situations.

There were also pointed to some negative effects of group processes. Evidence from research on cognition suggests that a group situation may enhance individual cognitive biases. This is nevertheless not a strong finding, and it would seem plausible that homogeneity of the group members is a precondition for this to happen. The cognitive bias of lowered risk perception was also found to have possible adaptive effects, through the lowering of cognitive and emotional stress, which in turn could limit the cognitive capacity. The lowered cognitive capacity due to high cognitive demands was found to result in an augmented use of heuristics and thus culture based norms, which was seen to be able to produce an effect on the collaboration with individuals or groups from other national cultures. In a NATO context, this would mean that one ought to be aware that groups in international operations should be well trained within the field of cultural understanding and acceptance.

The group polarization effect pointed to denotes that groups might make more extreme decisions than would individuals. However, this has been found to be less apparent in established groups. The advantage of established groups is further supported by research showing that such groups achieve more process gains than losses. That is, established groups have more routines that can help avoid communicational problems, as well as providing a sense of belonging and shared identity that promotes the motivation to give an extra effort. This should call for the organization of people in stable groups, and rather avoid ad hoc groups for decision-making purposes.

Research from natural environments further indicate that there are clear advantages of training teams in task- and context-relevant decision-making. The building of shared mental models and explicit communication were shown to be important factors of success. Such findings were additionally supported by cognitive research, which underlined the importance of task- and context-relevant training and the non-transferability of normative decision-making training models to real-life situations. Research from natural environments further underlined the importance of having democratic leadership and heterogeneous group members, thus creating an environment less prone to pressures to conform.

There were also pointed to some important issues regarding the introduction of new technology in a group decision-making situation. From cognitive research, it was pointed out that people's information-processing capacity needs to be taken into consideration, as well as ensuring a fit between user, context, task, and technology. In addition, a trade off was found between local and peripheral task focus, due to limited cognitive capacities. These findings were corroborated and exemplified by research from a military command and control situation (the Rolf-project). From this setting, a misfit between user, context, and technology was found to produce an incapacity to use the technological equipment as intended. The organizational context, in terms

of norms of behavior, obstructed the intended effect of the technological equipment. Also, the users were either too untrained in the use of the equipment or the equipment was simply ill suited for normal human cognitive functioning, in order for them to be able to exploit the advantages of the technology. It was suggested that, in order to obtain any real changes in how people cooperate, one needs to introduce *both* organizational and technological changes sensitive to the existing organizational culture.

12 SUGGESTIONS FOR FURTHER RESEARCH

There are evidently vast possibilities for further research based on the literature presented in this report. The intension with this final chapter is to point out some areas that seem to be of particular interest for the aims of the project SLADI.

Some of the psychological research presented here has been found to add new dimensions to understandings within the military domain. Indeed, there are some directly opposing points between these traditions.

Perhaps the question of leadership is the most prominent. As indicated in this report, the need for leadership is often underlined in military literature. However, psychological research on group decision-making suggests that groups actually do better without a leader, at least if kept at a small to medium size (i.e. 7 members or below). This ought to be a fruitful basis for further research. Can one have military decision-making groups without a leader? Will these be more or less advantageous? Are there situational constraints to such findings? If so, in what situations would it be favourable with a leader and when would it not?

More specifically, one may look at the staff and their role as an advisory group in the Norwegian Defence organization of today. Do we always need group leaders? Could the staff make the decisions themselves? Would they make poorer or better decisions than their leader? What does the leader possess that they do not?

Closely linked to this is the question of what *sort* of leadership that would be advantageous. What role should the leader assume? According to the findings presented here, leaders should be democratic and not dominating. Is this a reality in our military organization? Are contraindications and disagreements easily heard? How can the organizational culture and subcultures be described according to such practices?

Furthermore, what is good leadership in a military understanding? Does the military organization favor something else than what is found advantageous in the research presented here - like strong leaders? Does strong mean the same as dominant, and what is the difference between dominant/strong and autocratic leadership in a military context? Are there important differences depending on context?

For the majority of research topics presented in this report, conflicting points of view between the domains of military literature and psychology were not identified. This does nevertheless not preclude many of these research areas from having much potential for further research in the SLADI project.

First, relating to group size, it was concluded that mid-size decision-making groups appeared to be most advantageous. It could be interesting to understand how this *has* influenced military organization, as well as how it *should*. For instance, it seems that the number of people in the staff is somewhat influenced by such findings. However, is this always taken into account? And what about other groups?

Second, heterogeneity of group members was linked to many advantages in decision-making situations. It would be interesting to find out whether this is really obtained in the Norwegian Defence organization of today. For instance, is the composition of the staff substantially heterogeneous through their representing different organizational units (areas of function)? Or are they too homogenous as a result of the system of advancement and having only one single educational system - thus narrowing down their points of view?

This can be linked to the organizational culture and subcultures, which is both created and sustained through the organization's functions and educational system. The question is whether the system in the military organization of today is serving its purpose best the way it is now, or whether a change may be advantageous. The manner in which to achieve this is an essential question to follow.

Third, the question of using teams (i.e., groups trained together) as opposed to ad hoc groups, is another important question for the military organization and the SLADI focus. All research quoted in this report build a strong case for the advantages of using teams. Has the Norwegian Defence organization taken such research into account? It rather seems that they mainly employ ad hoc groups. It would be interesting to find out more about why and to what extent this is done. Is it done to facilitate the organizing on paper, while forgetting that teams have been found to produce better results?

Such questions are strongly linked to training, a fourth point. Is there a substantial amount of training included? Ad hoc groups will necessarily also need more training time for a specific job than established teams. And if the job includes the use of new technology, the need is even greater, both in terms of learning how to use it as well as learning how to cooperate through it or around it. The literature is uniform on this point, without training there will be much poorer results. Is this well understood?

Furthermore, as far as technology is concerned, training may not be enough. That is, if the technology is poorly fitted to human cognitive functioning or to the organizational norms and behaviour (processes), training cannot change such a situation. The question is whether the technological equipment employed in our military is well adapted to its users and purpose, and if not, what should be done in order to correct this? And how should one plan for the future in order to achieve a better fit?

Finally, training also relates to culture, both organizational and national. In situations of stress, people have been found to rely more on heuristics and thus have less of their normal cognitive ability to understand the actions of people from different cultures. Is this a focus in the education and training of the military personnel? Is it in line with an increased focus on international work? If so, does it achieve its goal?

In sum, there are many questions to pursue from the angle of group processes and decision-making. This has been an attempt to outline some initial questions that appear to be important for SLADI from the research presented in this report. These questions may finally be summarized into the five main areas of *leadership* (when it is needed and of what sort), *group composition* (such as size, heterogeneity and culture), *group history* (team versus ad hoc), *group training* (how long and of what sort), and *technology adaptability* (for instance to human cognition and organizational culture).

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