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COALITION COMMAND AND CONTROL IN THE NETWORKED ERA

Good Sensemaking is More Important than Information for the Quality of Plans

COGNITIVE DOMAIN ISSUES
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Abstract

Good sensemaking is assumed to be central to military command. So is high quality information. This paper presents an experimental study investigating the effect of amount of information on the quality of the produced plans. It was also tested if plan quality could be predicted from the quality of the sensemaking process. Army captains served as participants. The task was to produce a part of a brigade order within six hours. The participants worked in 16 teams of 5-7 individuals, with one team member acting as brigade commander. Eight of the teams received full information about the location of all enemy units (as would be the case in a fully developed network enabled defense), while the remaining eight teams received the amount of enemy information that might normally be expected. The characteristics of each team's sensemaking process were assessed from video recordings of their planning sessions. The quality of their plans was judged by military experts. The quality of the sensemaking process predicted the quality of the plans well, but plan quality was unaffected by the amount of enemy information. Apparently, good sensemaking is more important to military command than high quality information.

Good Sensemaking is More Important than Information for the Quality of Plans

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Several recent discussions point to sensemaking as a central process in command and control (C2). This is hardly surprising: sensemaking is defined as the thinking people perform in order to decide how to act in the situations they encounter (Weick, 1995), which is obviously what C2 is all about. What is surprising is there are so few studies of sensemaking in C2. One possible explanation is that no methods have been developed to measure the quality of sensemaking. This paper proposes such a model, based on a model of collective sensemaking. The model rests on a distinction between processes and products in C2 and aims at characterizing the *process* of sensemaking.

Sensemaking

There exist two perspectives on sensemaking within the C2 research community:

One perceives sensemaking as an understanding process applied to some awareness of the elements in the situation (situation awareness[2], SA, Endsley 1994, 2004); that is *sensemaking = SA + understanding*. This bottom-up notion is endorsed by the majority of the military command and control research community (Alberts & Hayes, 2003; CCRP & AIAA TC IC^{2}S, 2001; Leedom, 2001).

The other perspective, endorsed by Weick (1995), following James (1907), stresses the importance of top-down processing, originating with the sensemaker's goals. Thinking is always performed for some purpose, and this purpose directs our attention to information deemed relevant to this purpose. Information that is not perceived to be relevant is generally ignored, however present it may be (Brehmer, 2006).

These two perspectives lead to different predictions regarding the usefulness of information:

According to the first perspective, dominated by bottom-up processing, more information would produce better situation awareness. Better situation awareness would lead to better understanding that would, in turn, lead to better plans and orders.

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[2] It seems as if only the first level of SA, perception of elements in current situation, is referred to, excluding the second level, comprehension of current situation (equal to understanding), and the third, and last level of SA, projection of future status (Endsley, 1994).

The more information, the better, is the assumption following from this conception of sensemaking. This is obviously the thinking behind much of the information technology that is now introduced in C2.

According to the second perspective, dominated by top-down processing, the goal determines what information is required. There is a need for information, up to a certain point, but enough is enough. The prediction from this conception of sensemaking is that more information leads to better sensemaking up to a point, where the effect levels off, and additional information is of little or no benefit. Most important, information cannot substitute for efficient sensemaking (Brehmer, 2006).

In the present study, the predictions of these perspectives are put to test.

Processes and Products in the DOODA loop

Brehmer (2006) argues for the importance to distinguish between functions, processes, and products. A number of functions (sensemaking, information collection, and planning) need to be fulfilled in order to achieve military command. Different processes can be performed to achieve the functions, and the results from these processes are various products. If functions, processes and products are treated as similar entities, which is frequently occurring, confusion is bound to abound (Brehmer, 2006).

The DOODA loop is the model of C2 organizing the research reported on here. A process-product version of the DOODA loop (Brehmer, 2006) is described in Fig. 1. The mission is a product, and the input to the sensemaking process. The product of the sensemaking process, a course of action (COA), is the input to the planning process. The products from the planning process are plans and, ultimately, orders (Brehmer, 2006).

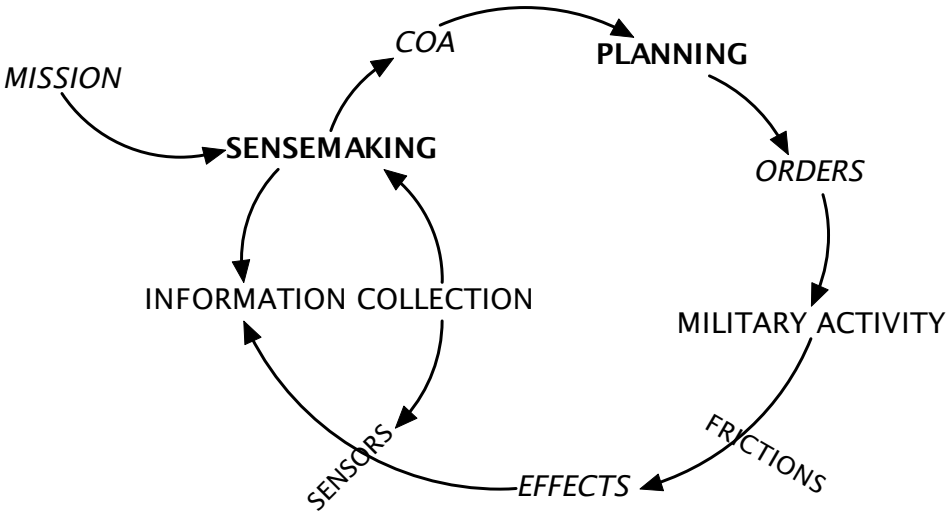

Fig 1. The DOODA-loop (adapted with permission from Brehmer, 2006)

Sensemaking in Military Command and Control

As mentioned above, the *sensemaking = situation awareness + understanding* view has been the dominant view within the military command and control community. In a recent book from the American Department of Defense, sensemaking is described as all thinking related to the operation performed by units subordinate to the command level (Alberts & Hayes, 2006). It is explicitly declared that: "(i)n the definition of sensemaking provided here, the cognitive and social processes that are involved in C2 are not included" (Alberts & Hayes, 2006, p. 65). We are, however, primarily interested in the sensemaking performed in military command and control.

Military sensemaking is an ongoing process. When a mission is received the first task is to understand the mission (what is requested), then to understand the preconditions for solving the mission (relevant aspects of the situation at hand, available resources, restrictions, enemy capacity, etc.), and to find a (best possible) way to solve the mission given the preconditions. These tasks are initiated, but not necessarily performed, in the aforementioned sequence. During the sensemaking, going back and forth among these tasks are commonplace (see Fig. 2). In essence, a command team transforms the acquired mission into missions for the subordinate units. This process is the focus of the present study.

The sensemaking process does not end there, however. As recently mentioned, sensemaking is ongoing, and once actions are taken, the task of assessing the outcome and how the situation evolves begins. Is there a need to reconsider the course of action taken or are there any nice opportunities offered? This continues until the mission is completed. In the present study, however, we address only the initial stage of the sensemaking process.

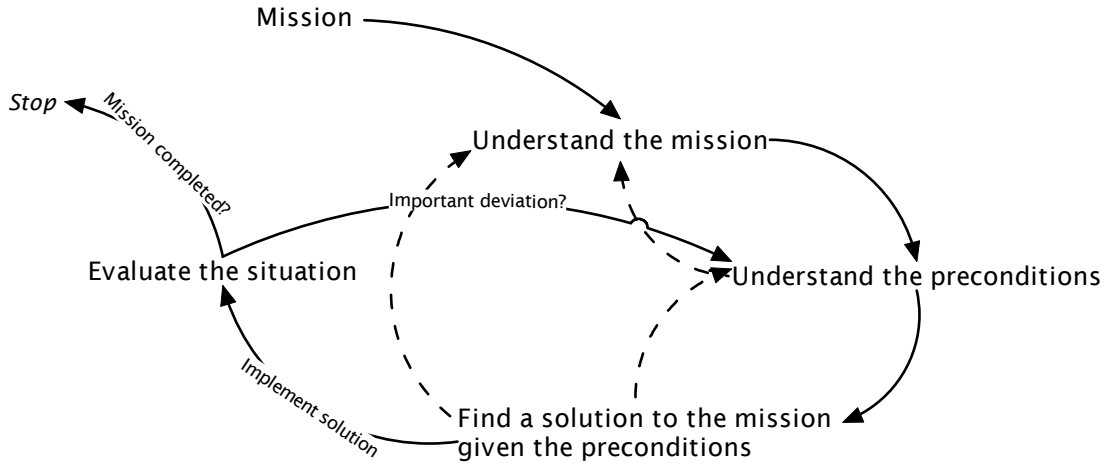

Fig. 2 The sensemaking process

Factors Affecting Sensemaking in C2

The model in Fig. 3 describes factors presumed to affect sensemaking in a military command team, that is, it focuses primarily on collective sensemaking. It is based on Weick's (1995; Weick & Sutcliffe, 2001) sensemaking framework, together with the DOODA loop (Brehmer, 2006), and considers the individual team members as well as

the command team as a unit. It also treats the commander as an individual serving a specific function.

In military staff work, each and every member arrives at his or her view of what is possible to achieve in the situation, an *individual sense*. This takes place in interaction with the other staff members. Sensemaking is never a truly individual activity. Information and opinions are exchanged, individuals influence, and are influenced by, the other members. Together a command team creates a more or less clear and elaborate *shared sense*. The commander has a special role here, because it is he or she who ultimately decides on the course of action, and thus what sense is to be made of the situation. In the model, this is called the *commander sense*.

The sense formed by an individual team member is shaped by his or her function in the staff, and from the perspective implied by that function. An air force officer's attention focuses on different aspects of the scenario than an officer from the navy or the army. How good function related sense he or she makes depends on his function related knowledge.

To arrive at a good and high degree of shared sense, is probably facilitated by a high *degree of shared knowledge*. The more each member of the command team has to explain to, and teach, the others to convey his or her own understanding, the slower and more cumbersome the process, because it requires explicit communication where implicit understanding should have been enough if the team members had a greater store of shared knowledge.

It is assumed that, if the command team members generously share their views with one another, and engage in discussion, this will have favorable effects on the quality of both shared and individual sense, and will further the quality of the course of action eventually decided upon. Therefore, a social climate that invites *interaction* is assumed to be important. Interaction is, for the most part, easier between people who know each other. They are then, in all likelihood, familiar with each other's manner of speaking, feel more at home with each other, and are probably more comfortable with expressing their opinions, than they would be among strangers. Important questions related to the social climate and interactions within the teams are: if everybody is listened to, if everybody does his or her best to contribute, if all views are seriously considered, and if the team members feel safe to express their opinions. It is assumed that affirmative answers to these questions imply better sensemaking.

For each individual member of the command team, it is the mission in combination with the individual's task-related knowledge and function in the command team that determines what information is attended to. Information is supplied to the team as incoming intelligence, reports, factual information, etc., the team members contribute to the available information themselves, and they choose among the available information what is relevant to their present task. The (preliminary) sense, arrived at individually, and as a consequence of the collaboration among team members, serves to direct further search for information.

The commander has been assigned a mission and given resources to accomplish it, as well as certain restrictions such as rules of engagement. The staff supports him or her. The role taken by the commander, and whether he or she takes part in the work, most certainly has an impact on the sensemaking process. The effect may be positive

because the commander generally has more knowledge and experience than the members of his or her command team. If the commander does not encourage free exchange of ideas, and demands submission by the team members to his or her own views, this is assumed to have a negative effect.

The behavior of military officers during staff work is regulated by the staff ethics. For a military officer, it is both a right and a responsibility to voice his or her objections and opposing views if he or she has any. Once a decision is made by the commander, however, the officers shall be loyal to, and do their best to contribute to, the decided course of action (Försvarsmakten, 1996).

How the commander *organizes the work* in the command team is likely to affect the sensemaking process and its outcome (the broken line in Fig. 3). The commander is the (sole) individual who has the complete picture of the scenario. Therefore, it is his or her task to ascertain that all important aspects are covered, that vital information get brought together and digested, and that important actions are taken in due time. The commander is the individual best equipped to make these deliberations

The commander sense will be expressed in the selected course of action (COA). This will eventually bring about some effect in the "real world", and information about the result will be fed back to the command team, and perhaps result in new orders, or a new mission.

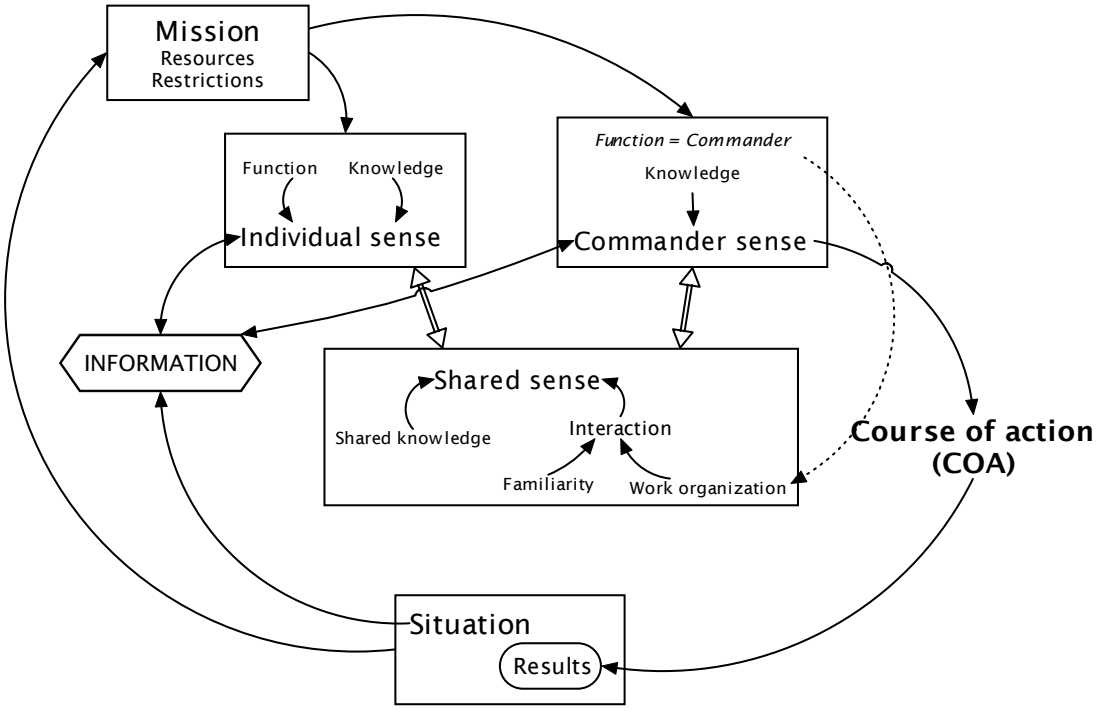

Fig. 3 Factors affecting military sensemaking

The Present Study

The study consists of an experiment that investigates if the quality of the plans produced is affected by the quality of the information provided. The relation between sensemaking *process* quality and plan (*product*) quality is also investigated.

In the DOODA-loop (Brehmer, 2006), the product from the planning is the orders[3]. Like the mission is the input to the sensemaking process, the selected course of action is the input to the planning process. In the present study, the quality of the sensemaking process is assessed. Specifically, it is investigated if the quality of the sensemaking process will predict the quality of the produced plans (or orders). If the quality of the sensemaking process proves to be related to plan quality this suggests a) that good sensemaking is important if good plans are desired, and b) that the measurement instrument works.

Video recordings of command teams performing a planning session are observed and analyzed. In order to be able to compare the performances of the teams, a coding scheme and criteria for rating sensemaking process quality is developed. Working from video recordings is a time consuming method, but alternative methods are too unreliable. We cannot ask people to reflect on how they perform a task while they are performing it without interfering with task performance. Asking them to report and reflect in retrospect is dangerous, even when it is done close in time and only covers a short period in time (Ericsson & Simon, 1993). This would offer no means to check the truth of the statements and only one observation. Several observers may watch participants performing in real-time, and if all observers make the same, or at least similar, observations, this adds to the reliability of these observations. We find video recordings very helpful, if the participants consent to being filmed. It allows you to watch an interesting sequence over and over, you have your raw data for the record, and you may have as many observers as you wish without the participants feeling crowded.

Method

Participants

Participants were 16 teams of 5-7 Army captains from the Staff program (the program required before a captain is promoted to major in the Swedish Armed Forces) in the spring of 2004 at the Swedish National Defence College, in total 99 individuals of whom two were women. Their mean age was 32 years. The exercise, designed as an experiment, was part of their course work at the college. The participants had been working together in their teams for the previous 7 months. The teams were free to organize the work and roles in their team, but one individual, elected by the team members, should serve as brigade commander, one should be responsible for the communication with the superior head quarters and with subordinate units, and one should document the process.

[3] It is the orders that bring about military action. Orders may, or may not, be preceded by the development of detailed plans, but a plan is, nevertheless, ultimately expressed in orders. What we refer to as plans in the present study is, in essence, fragmentary orders.

Design

The independent variable was the quality, or amount, of information on enemy units. There were two levels of enemy information, with eight teams randomly assigned to each condition. In the high quality condition, the command teams were given the kind of information that they would be expected to have in the new network based defense (network enabled defense, or network centric warfare, the terms used differ from country to country), i.e., full information about the location of enemy units. In the low quality condition, neither the exact location nor the number of the enemy units was known, which mimics what would normally be available today. The task was to produce a part of a brigade order.

Scenario

The scenario was a battle scenario at the tactical (brigade) level. In this scenario a mechanized division from the fictitious country Angripien ("Attackia") has been air dropped and landed in the Swedish cities of Stockholm (the capital of Sweden) and Nynäshamn (a sea port south of Stockholm) and they have established a bridgehead. The Swedish 1st Mechanized Division should now be ready to launch an attack with two brigades from the north to open up communications and subsequently attack and defeat the enemy.

Procedure

Six weeks prior to the experiment, the participants were informed about how the exercise would be organized. They also received a description of the evolution of the scenario up to the point in time when the exercise would begin.

The day before the experiment, the teams received information about the organization and equipment of their units, and maps of the area. The teams were allowed two scheduled hours to prepare for the exercise.

On the day of the experiment, the teams received a short description of their mission. They also received general instructions about what they were expected to do in addition to producing an order, such as documenting their planning activities and answering questionnaires at specified occasions (Thunholm, 2004). They were then allowed 45 minutes to make preparations and test communication channels (e-mail). After that, they were instructed to send a team member to collect the division order, and that marked the beginning of the exercise.

The teams had six hours to produce their order. Initially, they were given the mission for their brigade as well as information about the enemy and about own forces. After 20 minutes, the division commander assembled all team commanders for a briefing. The commanders of the teams planning with normal information returned to their teams after 40 minutes, while the commanders of the teams receiving detailed intelligence on enemy units remained an additional 15 minutes before returning to their teams. All teams could communicate by e-mail with their subordinate commanders to ask about the whereabouts of own units. These were, however, under transport and could be relied upon to be at their assigned destinations when so expected. The teams could request additional information from the superior commander, and they would receive whatever was consistent with what information

ought to be available in their respective condition (high vs. low quality of enemy information).

Each team was videotaped for the entire six-hour session, with the consent of the participants. The tapes were then analyzed with respect to the nature of the sensemaking process.

Analysis

Coding of videos

The actions of the team members were coded into a number of categories, using The Observer® (2003) software.

First, it was noted which part of the process the team was performing for the moment. The parts of the sensemaking process were: *understanding the mission*, *understanding the present situation*, *identifying possible courses of actions (COAs)*, *evaluating suggested COA(s)*, and *deciding on a COA*. There was also a category for *other activities* (such as having lunch). Each part was divided into subcategories.

For *understanding the mission*, the subcategories were: *identifying criteria for success*, i.e., the factors that would lead to success in accomplishing their mission, and *efforts to understand the mission*. There should also have been a subcategory for formulating a preliminary goal vision (end state). Now, this was registered in side notes.

For *understanding the present situation*, the subcategories were: *own resources*, *enemy resources*, *situation for civilians*, *terrain*, *weather*, *and visibility conditions*, and a category for *other considerations concerning the situation*. Some teams discussed third parties, for example.

For *identifying possible courses of action*, the subcategories were: *own COAs*, and *enemy COAs*. Notes were added to describe if the most likely and dangerous enemy COAs were identified, and if ways to handle them were considered in any detail.

For *evaluating suggested COA(s)* it was noted whether it was done by *reasoning*, or by *war gaming*[4].

Deciding on a COA was treated as a broader category containing: *deciding on a COA*, *more detailed planning activities*, and *order writing*. Only the part where the teams were deciding on a COA was analyzed, but it had to be noted when this part of the process had been fully dealt with, and other activities turned to.

For the entire session, it was noted who was doing what with whom. Each team member was assigned a code, but the group was also treated as a unit when the whole team was involved in the same task. For all team members, it was noted in which of

[4] War gaming may consist of anything from a stepwise discussion play on the map, letting own units and enemy units taking turns making moves, which is the method referred to here, to full-scale computer simulations (see e.g., Perla, 1990).

the abovementioned categories he or she was working, and for how long, as well as how.

The "how" part consisted of one of the following alternatives: *reporting* (giving a more formal report on his or her work), *saying* (one person says something), *discussing* (more than one person involved), *quiet* (says nothing), *leading* (performing leadership activities, such as organizing staff work, giving orders, etc.), in *concert* (all team or a subgroup), *alone*, *together with* (someone), *reading* (the order for information), and if they *leave* or *return*, and *as a group* (if they had done something on their own and now accompanied the rest of the group in what they were presently occupied with).

For each entry, it was possible to add a short note, if necessary. More extensive comments were recorded in side notes.

Observer judgments of sensemaking performance

From the output of the coding procedure, together with the overall impression from observing the teams working, each phase of the team's sensemaking process was scored. The phases were: 1) *understanding the mission*, 2) *understanding the present situation*, 3) *identifying possible COAs*, and 4) *evaluating suggested COAs*. 5) The *generation of criteria for success* was treated as a separate part, because it was an activity that was extended over the phases. 6) The observer estimated the degree of shared sense, or *team sense*, arrived at by the team as a whole. 7) Finally the observer scored the leadership performance of the commander, *commander performance*, in terms of hindering or facilitating the team's sensemaking process. The scores were given on a six-step Likert-scale, where 1 was very bad and 6 very good. This means that the teams could achieve 42 points at most, and 7 points at least.

Understanding the mission quite naturally starts with some time during which the team members read the order quietly. It was noted if they appeared to spend sufficient time reading, and if they, after reading, started working or if they spent some time leisurely chatting. Most of this period, the commander is away at the briefing from his superior commander. The extent to which the team commenced working in absence of the commander was noted (initiative considered good), if they worked in an organized manner, and if they discussed the mission and made efforts to collaboratively understand their task. Throughout the entire process, information sharing, involving all team members, was regarded as desirable.

For the process of *understanding the present situation*, how the different tasks were divided among the team members, was registered. For an individual to contribute substantially to the sensemaking process, and to arrive at a good sense for him or herself, it is, in all likelihood, important to have an area of responsibility that contributes to the solution of the task at hand. This would give the individual something to which he or she can relate the information acquired. It would probably also motivate a greater expenditure of effort by the team member than if his or her role were felt to be redundant. Thus, it would both equip the team member with a perspective for organizing his or her sensemaking, and with the incentive to put some effort into it. It was noted when the command teams reported on their work. Were the team members allowed sufficient time to penetrate their different areas of responsibility? Did they cover all relevant areas, did they give clear and detailed

reports, and what was the response of the other team members? Did they react with questions and discussion, or were they quiet receivers? The teams received high scores if they appeared thorough in their work, and if there was a high degree of exchange of information and ideas.

Identifying possible COAs was graded according to criteria similar to those described for understanding the situation. It was noted how labor was divided in the process of generating own and enemy COAs. It was commonplace to have different team members working on enemy COAs and own COAs. The idea was that the solutions should not be constrained by knowledge about what solutions the opposite side was considering. This was assumed to benefit sensemaking. It was noted how many COAs were generated. It was considered better if the team members collectively thought of a number of alternatives than if all team members contributed one alternative each. In the latter case, it seems likely that many of them would think of the same one. It was assumed to be best if all team members thought of a number of different alternatives. It was noted how those COAs were reported, and if all team members were listening and participating in subsequent discussions. It was noted if the most likely and the most dangerous enemy COAs were identified, and if ways of dealing with them were discussed in any detail. Some teams also considered possible COAs for the civilians, which increased their scores.

In *evaluating suggested COA(s)*, two factors were appraised. First, the process of comparing the different alternatives suggested, if more than one, and putting the one chosen for serious consideration under scrutiny, looking for weaknesses, and discussing how to deal with these. The more thorough this work the better, and the more team members engaged in the discussion the better. Second, there was the question whether they put the preliminary plan to test in war gaming or not. It was considered better if they did than if they did not. War gaming makes it explicit to all team members what it is that the team has agreed upon (or the commander has decided to put to test).

The *generation of criteria for success* continued more or less from start to the arrival at a final COA. This made it difficult to follow, and the score was only based on to what extent criteria of success were discussed in any organized manner in the teams, and the extent to which all team members were involved in these discussions.

Team sense was an estimate, based on the impression from the entire process, of how clear, and complete, was the shared sense achieved by the teams. It was judged how much everybody participated in formulating what was decided on as the command team's, or the commander's, chosen course of action, how knowledgeable each and everyone were regarding the details of this COA, and to what extent all team members agreed on the chosen COA.

The *commander performance* score was based on how well the commander (or commander together with his chief of staff[5]) organized the staff work. Did he (they were all male) divide the work among the team members in accordance with what has

[5] In a military staff, the commander is the (higher ranking) officer who decides on the course of action, and the chief of staff is the officer who organizes the work in the staff. In most of the teams participating in this study, the commander served both functions, but in some teams a designated team member served as chief of staff.

been hypothesized to facilitate sensemaking? Did all team members have tasks important to the sensemaking process, to understanding the situation and to generate a suitable course of action? Did he manage to keep everybody busy and involved in work? Did he keep track of all steps in the process, making sure that nothing important was forgotten? Did he encourage discussion, and did he summarize the discussions to make sure that everybody was on the same track before continuing to the next step in the process? And, did he strive to maintain a productive social atmosphere in the team?

Inter-rater agreement

To asses the reliability of the sensemaking process measurement, a second observer rated eight of the teams. (The author rated all the 16 teams.) Four teams were randomly selected from the teams in the condition with high quality of enemy information, and four teams were, also randomly, selected from the condition with low quality of enemy information. The entire process, from coding the videos to making the judgments of sensemaking performance, was once again carried out.

For training and calibration purposes, the second rater observed and graded two of the non-selected teams before grading the selected eight teams. These two pre-ratings were supervised by, and the results discussed with, the author. They were not included in the analysis. These teams were randomly selected, but selecting two extreme cases, one of the best and one of the worst, is probably more suitable for training raters.

Both persons rating the sensemaking process, the author and a colleague, were blind to the evaluation of the teams' plans, and they were in no position to assess the cleverness of the ideas put forth, due to lack of military education. They were only able to assess the way the teams were working and interacting.

Plan quality

The quality of the plans produced by the command teams was rated independently by two military experts. For details concerning the criteria used by the raters, the reader is referred to Thunholm (2004).

Results

Table 1 displays the means and standard deviations of the analyzed variables. The column *Δ conditions* shows the difference between the mean performances in the respective conditions. A negative value indicates a higher performance in the condition with low quality of information on enemy units.

Table 1 Descriptive statistics from Experiment 1 (Δ conditions = mean [high quality of information] – mean [low quality of information])

Variable	Mean	Standard deviation	Δ conditions
Plan quality – rater A	106.5	30.8	-28.5
Plan quality - rater B	96.0	20.2	3.2
Sum of plan quality ratings	**202.5**	**46.4**	**-25.2**
Understanding the mission	3.94	0.77	0.13
Understanding the present situation	3.50	1.37	0
Identifying possible COA(s)	3.44	1.09	0.38
Evaluating suggested COA(s)	3.81	1.42	0.38
Criteria of success	4.37	1.02	-0.25
Team sense	4.62	1.41	0
Commander performance	3.62	1.36	0
Sum of sensemaking criteria	**27.31**	**6.85**	**0.625**

The military experts who rated the plans reached a fairly good agreement, and so did the raters of the sensemaking process quality. The inter-rater reliabilities were calculated using the Spearman-Brown Prophecy formula (for prediction) based on the intra-class correlations of the raters' scores. For the plan ratings, the inter-rater reliability was $r_{SB} = 0.70$, and for the sensemaking process ratings, it was $r_{SB} = 0.74$.

The agreement between the military experts' mean rating of the plans and the sensemaking performance (the sum of the sensemaking criteria) was high, $r = 0.70$, $p < .05$; ($r_C = 0.97$ with correction for attenuation due to less than perfect reliability in both the independent and the dependent variable).

There was no difference in the quality of the plans between the teams who planned with low quality of enemy information and the teams who planned with high quality of enemy information (this result is further discussed in Thunholm, 2004). Nor was any difference found in sensemaking performance between the two experimental conditions.

Not all sensemaking criteria worked equally well. Neither *understanding the mission* nor *evaluating suggested COA(s)* correlated with plan quality, while all the remaining five criteria showed significant correlations with plan quality ($p < .05$, Bonferroni correction for seven tests), [correlations corrected for attenuation in brackets]: *understanding the present situation* ($r = 0.64$) [$r_C = 0.88$], *identifying possible COA(s)*($r = 0.65$) [$r_C = 0.89$], *identifying criteria for success* ($r = 0.60$) [$r_C = 0.82$], *team sense* ($r = 0.68$) [$r_C = 0.94$], and *commander performance* ($r = 0.72$) [$r_C = 1$].

The inter-correlations among the sensemaking criteria are presented in Table 2, with a Bonferroni correction for 21 tests of the significance criteria ($p < .05$).

Understanding the mission did not correlate with any of the other criteria, while *team sense* and *commander performance* correlated with all the others, and *understanding the present situation* correlated with *identifying possible COA(s).*

Table 2 Inter-correlations among the sensemaking criteria from Experiment 1

Criterion	1	2	3	4	5	6	7
1. Understanding the mission	--						
2. Understanding the present situation	.28	--					
3. Identifying possible COA(s)	.27	.87*	--				
4. Evaluating suggested COA(s)	.05	.50	.31	--			
5. Generation of criteria for success	.37	.62	.62	.46	--		
6. Team sense	.28	.76*	.68[a]	.76*	.80*	--	
7. Commander performance	.04	.86*	.79*	.65[a]	.78*	.86*	--

* $p < .05$. [a] $p < .10$.

A stepwise regression analysis with plan quality as the dependent variable, and the sensemaking criteria as independent variables, revealed commander performance as the criterion that best predicted plan quality ($\beta = 0.72$, $F_{(1,14)} = 15.2$, $p < .01$).

A principal components analysis of the sensemaking criteria resulted in two factors with eigen values > 1. The first factor had an eigen value of 4.56 and explained 65 % of the total variance. All the sensemaking criteria, except for *understanding the mission* loaded high in this factor: *understanding the present situation* (0.90), *identifying possible COA(s)* (0.84), *identifying criteria for success* (0.84), *team sense* (0.94) and *commander performance* (0.94) very high and *evaluating suggested COA(s)* (0.68) somewhat more moderately. The other factor had an eigen value of 1.07 and explained 15 % of the total variance. Only *understanding the mission* (0.88) loaded significantly in this factor.

Discussion

The results point to the centrality of sensemaking in military command, in that the quality of the sensemaking process proved more important than the amount of available information to the quality of the plans.

Of the two views on sensemaking, our results favor the goal directed, top-down view, fathered by Weick (1995), grandfathered by James (1890, 1907), and, within C2 research, endorsed by Brehmer (2006). More information is not better if you have what you think that you need already.

The method for measuring sensemaking performance proved successful. It proved possible to study process independent of product. Reliable scores were obtained, and the results demonstrate that the quality of the sensemaking process does indeed predict plan quality. Most important among the characteristics of the sensemaking

process is how well the commander leads and organizes the work in the command team, a factor which is closely related to performance in the entire sensemaking process.

The method for measuring sensemaking performance

There is little ground to assume that sensemaking was not judged independently of plan quality. First, the video recordings did not allow us to watch the maps or sketches produced, other than occasionally. Sometimes the participants were out of view. It was difficult, for the most part impossible, to hear what was discussed in dyads or triads. Sometimes two or three conversations were taking place in parallel. It was only when the team reported on their work more formally, or discussed in conference, that we could fully cover what was said, and occasionally, when a team member spoke in a low voice, not even then. Second, both persons rating the sensemaking performance were civilians. They knew too little about the both the details of the scenario and military tactics to be able to assess the cleverness of what was said and suggested.

Commander performance

In each team, one of the participating Army captains acted as brigade commander, a task Army captains are rarely trusted with. An important question is what the results would have been with more experienced and higher ranking commanders of the teams. Such commanders ought to have all been able to organize, lead, and keep track of the work in the command teams. Would perhaps all the teams then have performed equally well, or would others factors have come into play? This is an important topic for future studies.

The guidelines for military planning

All the participants were Army captains. Even if they differed in specializations within the Army, they can still be assumed to have a rather large amount of shared task-relevant knowledge. The team members had also been working together for the previous seven months, so they were quite familiar to each other and had prior experience of working together.

All teams analyzed in this study worked according to the Planning Under Time Pressure (PUT) guidelines (Thunholm, 2003, 2005), or some slightly modified version thereof. This could be inferred from the observations of the video recordings, but the participants were also questioned about what planning method they had been using (see Thunholm, 2004).

When performing military planning, there are certain things that need to be done. Guidelines for planning, such as the PUT guidelines, offer a procedure to follow that lists what to do and in what order. There are, however, no guidelines for *how* to work in the staff, or command team, to achieve this.

Hence, all teams used the same guidelines for *what* to do arrive at a course of action and produce a plan, but they differed in *how* they did it, their sensemaking process.

According to the Swedish Armed Forces staff regulations, staffs may choose to include all the staff members in the planning, or assign the planning to a group of

members of the staff, depending on how much time is available. When the time pressure is high, the recommendation is to involve all the staff members in the planning (Försvarsmakten, 1997). In the present study, some teams included all the team members in the planning process, while other teams selected two or three team members as responsible for the planning. Our sensemaking model predicts that the teams who choose the former procedure, to include all the team members, will be the better performers. This was also the result.

The present study demonstrates the importance of good sensemaking for achieving good plans. This agrees with Amos and Nathan's (2002) claim that the assumptions stemming from Weick's (1995; Weick & Sutcliffe, 2001) sensemaking framework ought to shape the norms for team work.

The model of sensemaking in military command

The model of military sensemaking proposed here (Fig. 2 and Fig. 3) differs from other models of military sensemaking in, at least, three ways:

First, the sensemaking process is directed by the mission. It is the mission that determines what information will be searched for and attended to. This is more than just assuming top-down schema driven processing which makes the result dependent on the schema rather than the mission. The bottom-up models do not explain how search for information is linked to the mission.

Second, sensemaking is described as a collaborate process, or more correctly, as a combined collective sensemaking (the command team) and individual (the commander) process. There are models with boxes for individual and collective, or shared, sensemaking, respectively, but these models have little to offer as to how the individual and the collective sensemaking are related.

Third, our model is a process model, or rather, a model that describes both the sensemaking process and the product, while most models of military sensemaking are just product models.

Concluding remarks

Brehmer (2006) maintains that sensemaking is the central function of military command. This study supports his claim. A good sensemaking process proved to be more important for producing good plans than high quality information (that proved to be of little value).

This study demonstrates that the quality of sensemaking in military command can be measured. This opens up the possibility to evaluate inventions intended to support military sensemaking.

Our model assumes that support for sensemaking would be more effective if it gave the users control over and access to the information they needed, rather than just pushing it only to be ignored.

Only the first part of the sensemaking process, finding out what to do initially, was investigated. It remains to study the second part, executing the plan (developed based

on the decided course of action) to see out how it works. This phase poses its own challenges, but it is probably here the effects of sensemaking quality will truly show.

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