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Sensemaking in the Fog of War: An Experimental Study of How Command Teams Arrive at a Basis for Action

DECISION MAKING AND COGNITIVE ANALYSIS

Eva Jensen
Department of War Studies
Swedish National Defence College
P.O. Box 27805
SE-115 93 Stockholm Sweden
Telephone: + 46 8 5534 2610
Fax: + 46 8 7889454
E-mail: eva.jensen@fhs.mil.se

and

Berndt Brehmer
Department of War Studies
Swedish National Defence College
P.O. Box 27805
SE-115 93 Stockholm Sweden
Telephone: + 46 8 788 8495
Fax: + 46 8 7889454
E-mail: berndt.brehmer@fhs.mil.se

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Abstract

A commander and his staff have to use whatever information is available to arrive at an understanding of the situation that can serve as a basis for action, hence sensemaking has a central role in the C2 process. This paper reports the results of a first experimental study of the sensemaking process in a command team. The participants were 99 Army captains studying at the Swedish National Defence College. They worked in 16 teams of 5-7 individuals, and one team member acted as brigade commander. The task was to produce a part of a brigade order within six hours. All teams were video taped for the entire session. Eight teams, assigned to the low uncertainty condition, received information about the location of all enemy units. The remaining eight teams, in the control, "normal" condition received what might normally be expected. It proved possible to distinguish two sensemaking processes, one concerned with understanding the mission and what it required, and one that involved producing the basis for the plan. The quality of the plan, as judged by experts, was related to the characteristics of the sensemaking process, as assessed from the video recordings.

Introduction

> "Sensemaking is the essential link to information and decision superiority, but remains a weak link in the C2 value chain" (CCRP & AIAA TC IC^{2}S, 2001, p. 19).

We consider sensemaking in command and control the process of achieving an understanding of a situation in terms of what to do. It is a central task in military decision making, and in the collective work of a military staff.

Despite the obvious importance of sensemaking, it has received little study in the context of military decision making. Most important, there seem to be no experimental studies of sensemaking in C2, so we know virtually nothing about what factors affect the quality of the sense achieved by a commander and his/her staff. The present paper is a first report from a project aimed at filling this gap in our understanding. The experiment reported here was designed to measure the quality of the sensemaking process in command teams involved in military planning. The independent variable was degree of uncertainty. In one of the experimental conditions, the teams planned in the normal fog of war, i.e., with a "normal" level of uncertainty. In the other condition, the fog had been lifted (presumably by electronic means) and the planning took place under conditions with near perfect information, as envisioned for the new network based defence. Our focus is on the sensemaking process. However, we also assess the correspondence between ratings of the sensemaking process and the quality of the plans produced by the command teams.

Sensemaking – Theories and Models

Weick (1995) may be considered the father of the concept of sensemaking, although the concept clearly has a grandfather in James's (1890) theory.

Sensemaking is not situation assessment (e.g., Klein, Orasanu, Calderwood & Zsambok, 1993; Klein et al., 2003), and sense is not situation awareness (e.g., Endsley, 1994a, 1994b). Nor can situation assessment and situation awareness be seen as components of the sensemaking process. Sensemaking has different roots and represents a different view of human cognitive processes than situation awareness does. Thus, situation awareness refers to how detailed and accurate knowledge an individual (or a group of people) has of a given situation (Endsley, 1994a, 1994b; Strater, Endsley, Pleban & Matthews, 2001), and the extent to which the individual can predict what will happen next. Situation assessment assumes a known situation for which the result of the assessment can be compared to the true situation, while a sense arrived at might have little in common with any "true" situation, for there is simply no way of knowing what the true situation is, except by acting on the basis of the sense that has been achieved. Life rarely offers the opportunity for people to check if their present view of a situation is wholly correct. The only information they receive is whether the actions resulting from the sense gained produce the intended effects. The sense will be considered correct if the actions based on it are followed by the expected results (James, 1907). Therefore, measurements of sensemaking should focus on the quality of the sensemaking process and the outcome of the resulting actions more than on how people picture the situation.

An important aspect of Weick´s (1995) theory of sensemaking that he is perhaps not that explicit about in his definition, but which is still present, is that sensemaking generally take place in the service of some goal, and that this goal has precedence. People thus do not take in a situation "as such"; they study it for a purpose. The goal could be to find arguments to convince others of some position, to confirm prior expectations, to strengthen ones commitment to some decision taken, and so on. From these examples it is obvious that sensemaking is by no means always undertaken in search of the "truth".

In command and control, the goal is generally to solve some pressing problem. When a military staff studies a situation, it does so because it has a mission to accomplish, not because they are interested in how things are. Different missions would make the commander and his/her staff focus on different aspects of the situation, and make different sense of it. This is, of course, true also of the pilots who are the primary subjects in studies of situation awareness (Endsley, 1994a, 1994b; Strater, Endsley, Pleban & Matthews, 2001). They most likely arrive at a different sense of the situation and the other aircraft around them when they are in combat compared to when they are just practicing flying in formation.

Since we have not found any useful model of sensemaking, as we understand it, in military decision making, we have developed our own. The "data/frame model of sensemaking" proposed by Klein et al. (2003) is a model of individual, not collective, sensemaking, and it looks more like a fairly traditional model of individual learning in cognitive psychology. Moreover, it is not possible to make any predictions from the model as to how different factors would influence sensemaking.

We now turn to a brief description of our model.

A Model of Sensemaking in Military Decision Making

Our model is shown in Figure 1. It is based on Weick's (1995; Weick & Sutcliffe, 2001) theory. The model considers the individual staff members as well as the staff as a unit, and treats the commander as an individual serving a specific function.

In military staff work, each and every staff member arrives at his or her view of what is possible to achieve in the situation, an *individual sense*, depending on his or her function in the staff, and from the perspective implied by that function. 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 staff members. Together the staff creates a more or less clear and elaborate *shared sense*. The commander is a special kind of an individual, 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. We call this the *commander sense*.

The commander has been assigned a mission and equipped with resources that may be used to accomplish it, as well as certain restrictions in the form of rules of engagement. The staff supports him or her. For each individual staff member, it is the mission in combination with the individual's task-related knowledge, function in the staff, and his or her personal values that determine what information available will be attended to. The (preliminary) sense, arrived at individually and as a consequence of the collaboration among staff members, serves to direct further search for information.

It is assumed that, if the staff members generously share their views with each other, 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.

Three factors are assumed to have important effects on this process:

1. *The degree of shared knowledge*. The more each staff member 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 would have been enough if the staff members had a greater store of shared knowledge.

2. *The social climate and interaction in the staff*. Is everybody listened to? Does everybody do his or her best to contribute? Are all views considered seriously? Do the staff members feel safe to express their opinions freely? It is assumed that affirmative answers to these questions imply better sensemaking.

3. *The organization of work* as well as 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/her staff. If the commander does not encourage free exchange of ideas, and demands submission by the staff members to his or her own views, this is assumed to have a negative effect.

These considerations lead to the model illustrated in Figure 1. The commander sense will be expressed in a commander's intent, and orders/missions to subordinate units will be based on this intent. This will eventually bring about some effect in the "real world", and information

about the result will be fed back to the staff, and perhaps result in new incoming orders, or a new mission.

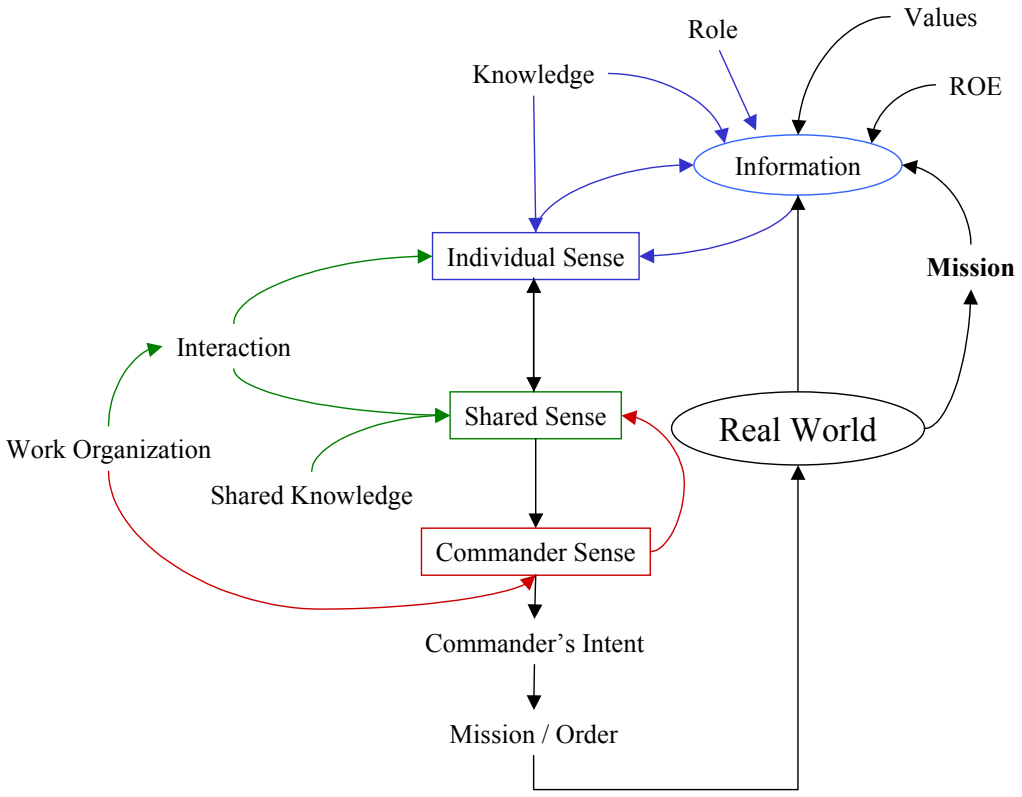

Figure 1. The Model of Sensemaking in Military Decision Making

The Present Study

Earlier studies of sensemaking have generally been case studies (e.g., Graeme & Brown, 2003; Miller, 2003; Murphy, 2001; Weick, 2001; Weick & Sutcliffe, 2001). Klein et al. 2002), however, compared expert and novice sensemaking performance. They designed scenarios that were presented piecemeal to the participants. The participants gradually acquired more and more information about the situation, and their thinking process was assessed repetitively during the session. The participants were asked to interpret the situation, to describe major themes and vital issues in the scenario.

In the present study, as noted above, we assessed the sensemaking process of the command teams, and compared the ratings of the quality of the sensemaking process with the expert ratings of the quality of the plans developed by the teams. Our question was if it would be possible to predict the quality of the plans from an evaluation of the sensemaking process, and whether the quality of the sensemaking was affected by the quality of the information provided. The effects of the information on the quality of the plans is discussed elsewhere (Thunholm, 2005).

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) 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. For the present analysis, eight of the 16 teams were selected for a detailed analysis, comprising the two teams that produced the best and the worst plans in each experimental condition.

Design

As explained above, the independent variable was level of uncertainty. There were two levels of uncertainty, with eight teams randomly assigned to each condition. In the low uncertainty condition, the command teams were given the kind of information that they would be expected to have in the new network based defence (network enabled defence, or network centric warfare, the terms used differ from country to country), i.e., full information about the location of enemy units. In the normal uncertainty condition, neither the exact location nor the number of the enemy units was known. 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 organised. 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, 2005). 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 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 their respective uncertainty condition.

Each team was videotaped for the whole six-hour session. The tapes were then analysed with respect to both the product and the nature of the sensemaking process.

Analysis

Coding of Videos. The first author analyzed the video recordings, and the actions of the team members were coded into a number of categories, using The Observer® (2003) software.

First, the stage of the planning process that the team was performing at the moment was noted. The stages considered here 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 phase were divided into subcategories:

In *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 had to be treated in the notes (described below).

In *understanding the present situation* phase, 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 (see below) 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*.

Deciding on a COA was treated as a broader category containing: *deciding on a COA*, *deciding on a concept of operation*, and *writing an order*.

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 the abovementioned category 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 her overall impression from observing the teams working, the first author graded each phase of the team's sensemaking process: 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 (common) sense arrived at by the team as a whole. 7) Finally the observer graded the leadership performance of the commander, in terms of hindering or facilitating the team's sensemaking process. The grades 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.

The process of **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 with 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. The major focus was on the staff's report of their work. When did it take place? Had the team members been 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 grades if they appeared thorough in their work, and if there was a high degree of exchange of information and ideas.

The phase of **identifying possible COAs** was graded accorded to criteria similar to those described for understanding the situation. It was noted how labour was divided in the process of generating own and enemy COAs, how those COAs were reported, how many COAs were generated, 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. The more of the team members who had important roles in this process, and the more each team member contributed to a discussion, the better the sensemaking process was considered to be.

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** was a process continuing more or less from start to the arrival at a concept of operation. This made it difficult to follow, and the score was only based on to what extent criteria of success were discussed in any organized fashion 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 (common) sense achieved by the teams. The observer also noted how well developed was the basis for the chosen COA, as well as how elaborate was this COA, and, above all, how well all members of the team knew all this.

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

In the low uncertainty teams, it was noted how they made use of the provided additional information.

Selection of High and Low Performing Teams According to Expert Judgments

As noted above, the two most successful and the two least successful in each condition (low uncertainty and normal uncertainty), were selected for analysis, in total eight teams, according to the mean ratings of the produced plans by two military expert. (For details concerning the criteria used by the raters we refer to Thunholm, 2005). The inter-rater agreement was moderate (r = 0.64). One of the high performing teams in the normal uncertainty condition had to be exchanged for the next best to it in the same condition. The video camera recording that team ceased to function in mid-session, so we were lacking information on the later stages of their sensemaking process.

The person rating the sensemaking process, the first author of this paper, was blind to the evaluation of the team's plans, and she was in no position to assess the cleverness of the ideas put forth, due to lack of military education. She was only able to assess the way the teams were working and interacting.

Results and Discussion

We identified a sensemaking process made out of two parts or processes: an initial process when the team strives to understand the mission and identify what aspects of the situation is relevant to it, finding out what is known and unknown, what is possible to find out and what is not, what could possibly be accomplished and what the enemy might be able to carry out. This phase is most clearly independent of planning; it occurs at least some time before the planning may begin. Some basic sense is needed on which to base the planning.

In the second process, the team works to figure out what would be best to do, what might possibly happen, and how to deal with every conceivable turn of events. This is based on what has been accomplished in the first-mentioned process. This process is also part of the planning process; considering possible courses of action is an initial step in the generation of a plan and it shows that there is some overlap between sensemaking and planning. The processes are not completely sequential; even though the first is the one first to be initiated, followed by the second, they overlap substantially. There are shifts back and forth between them, but they are, anyhow, processes dealing with different aspects of military decision making.

The second process is followed by a third, which belongs more or less exclusively to the planning process, namely the process of working out the finer details of the COA decided upon and transforming it into orders, or missions, to subordinate units. This process was excluded from the analysis in the present study, since it is not a part of the sensemaking process.

The ratings of the sensemaking process of the selected teams are summarized below in Table 1. In the Cond column, it is noted which condition the teams worked in: low uncertainty (Low) or normal uncertainty (Norm). In the Expert column, it is noted which teams were the high and the low performers according to the expert ratings of their plans. The N column gives the number of team members, UM stand for **understanding the mission**, UPS for **understanding the present situation**, IPCoA for **identifying possible COAs**, ECoA for **evaluating suggested COA(s)**, CrS for **generation of criteria for success**, TS for **team sense**, and Com for **commander performance**. Sum is the sum of the ratings.

Team	Cond	Expert	N	UM	UPS	IPCoA	ECoA	CrS	TS	Com	Sum
1	Norm	High	6	4	4	4	5	5	6	5	33
2	Low	High	7	4	6	5	6	5	6	6	38
3	Norm	Low	6	3	2	2	1	3	2	2	15
4	Low	Low	6	4	3	4	1	3	2	2	19
5	Norm	Low	7	3	4	3	6	4	5	4	29
6	Low	Low	6	3	2	2	4	3	4	3	21
7	Low	High	6	3	4	5	4	5	6	5	32
8	Norm	High	7	4	6	5	4	6	6	6	37

Table 1. Results From the Ratings of the Sensemaking Processes.

For each measure, t-tests were performed to assess the effects of uncertainty and planning performance. For uncertainty, there were no significant effects ($p > .05$). For planning performance, the teams ranked high performed significantly ($p < .05$) better for understanding present situation (5.00 vs. 2,75, $t_6 = 3,00$), identifying possible courses of action (4.75 vs. 2,75, $t_6 = 3.70$), generating criteria for success (5.25 vs. 3.25, $t_6 = 5.65$), team sense (6.00 vs. 3.25, $t_6 = 3.67$), commander performance (5.50 vs. 2.75, $t_6 = 4.92$) and the sum of all ratings (35.0 vs. 21.0, $t_6 = 4.25$), but not for understanding the mission and evaluation of COAs. The most important variables here are: understanding mission, understanding present situation, and identifying possible COAs, which belong to the first sub-process described above, and provide indices of sensemaking that are fairly independent of the planning process. For all these indices except understanding the mission, we have significant effects, and for understanding the mission, the difference between teams ranked high and low is the right direction (5.0 vs. 3.25). These findings suggest that sensemaking is an important factor that determines the quality of the work produced in a military staff unit. Moreover, the fact that the index of commander performance was significantly higher for the teams producing better plans suggests that the commander's behavior is an important factor in facilitating the sensemaking process. Most important, the results demonstrates that it is possible to measure sensemaking, even using the fairly rough measures reported on here, and to measure it independently of planning.

It was difficult to rate the quality of the **understanding the mission** phase. This is because we did not observe the sensemaking process with respect to understanding the mission directly. We could only infer their understanding of the mission indirectly. As explained above, the teams were allowed scheduled time (two hours) to study. In addition, they had 45 minutes to prepare before they received the division order. This period of time was not registered on videotape, and therefore we do not know what the teams were doing during that time. This means that information, relevant to the understanding of the mission, and how the teams organized their work during this phase, was lacking.

The most critical phase seems to be the **understanding the present situation** stage, or the period following the commander's return from the order briefing. Here the teams receive ratings ranging from 2 to 6, and they tend to receive similar ratings on the remaining criteria. It seems important that all team members are involved in the process of making sense of the situation, and that they frequently and thoroughly inform each other of their progress. The exchange of thought and information appears to be more important than to avoid disturbing

each other's thinking processes. Reports ought to be rather detailed and elaborate and be followed by questions and discussion.

The effects tend to accumulate over time. The differences between the team's sensemaking processes become increasingly pronounced. It seems to be difficult to make up later for an unsuccessful start.

In the phase of **identifying possible** (own and enemy) **COAs** too, the involvement of all team members is important. There might be a division of responsibility for the own and the enemy perspective, but all members should be involved in a discussion of possible alternatives. The number of alternatives considered seems less important than the thoroughness of their treatment. Some teams appeared to produce alternatives simply for the sake of it, which is probably not of much use.

When **evaluating suggested COA(s)**, which belongs to the second sub-process of sensemaking mentioned above, and is also part of the planning process, it is important to attack the alternative under consideration from every possible angle. To do this successfully, it is important that all team members take part in the discussion. War gaming might be helpful. It put the preliminary plan to a stage-wise test, highlighting the time dimension, making is easier to consider logistic issues, and identify important details that have to be dealt with. War gaming is probably more useful as a means to put the plan to test and working out the details, than as a confirmatory playing through of an already agreed-upon COA.

As already mentioned in the Method section, the **generation of criteria for success** was difficult to rate. They were generally listed on paper, not possible to read from the video recordings, and they were unfortunately not collected and saved after the exercise. This made it difficult to follow the process, and it was only the amount of time spent explicitly discussing them that could be assessed. This is clearly an important aspect of the sensemaking process since it concerns aspects of what can be done to achieve the mission. It is therefore important that a significant difference between teams whose plans were ranked high and teams whose plans were ranked low nevertheless emerged.

The **team sense**, an estimate of the degree of (common) sense arrived at by the teams, which could only be inferred rather than measured directly, is important for two reasons. First, for the collectively written order to be clear and coherent, it is essential that all its contributing writers have as similar a mission as possible in mind. If not, they will write parts of different orders, something that is certain to confuse the subordinates. Second, when the plan is to be implemented, it is vital that all are striving towards the same goal, by means agreed upon.

All commanders conveyed more or less the same information from the order briefing. It was probably less important *what* the commander said, because all information delivered was also part of the written order, than *how* he said it. That the commander approaches his task ambitiously and seriously, and thus inspires the team members to do the same, may possibly be of great importance. It may, of course, work in the opposite direction as well. A hard working team may encourage a commander to give his best effort to his task.

One major task for the commander (regardless of whether one or two individuals served that function; some teams used a chief of staff as well) is to make sure that all staff members work on important tasks. In addition, he (or she) must supervise the process as a whole,

summarizing the work to make sure all members agree upon the interpretations made, encouraging discussion, making sure everybody have his or her say in the matter discussed.

For one of the low performing teams, team 5, it was somewhat difficult to predict the quality of the resulting plan. The commander was in strong control of his staff members. He used the staff members to serve his own sensemaking process. From a team sensemaking perspective this is bad, but if the commander is a very competent individual and the task not too complex for one person to handle, then the resulting plan might still be quite good. This would require the commander to supervise every step in the procedure, which he, in fact, did. In this case, the resulting plan was of low quality, which lends support to the importance of a sensemaking process including all team members, or at least as many as possible. The team spent 40 minutes war gaming and during that phase they were discussing the COA under consideration. This led the rater to infer that the team sense might in fact be quite good. This seems, however, to have been an unwarranted assumption.

The level of uncertainty neither affected the sensemaking process nor the quality of the plans. The only thing observed was that the teams in the low uncertainty conditions warned each other of getting stuck in details. The reason for the lack of effect could be that the teams were unable to make good use of the detailed information on the enemy, that they had more pressing issues to attend to, or that the participating officers were so good at planning under normal conditions that a ceiling effect was achieved. The latter explanation is rather unlikely, however. There was substantial variance in performance in both conditions, and the overall impression by the expert raters was that there was ample room for improvements for most teams.

Conclusions

That sensemaking performance could be measured and explain the quality of plans resulting from the process, are encouraging results indeed. It suggests that it will be possible to perform experiments testing the effect of different technical solutions and work organizations, for example, on the sensemaking process.

Superior information failed to make the teams produce superior plans. The fog of war may not reside in the environment only, it may be found inside the heads of the decision makers as well. Having information alone is not sufficient; it has to make sense as well.

The study reported on here was a pilot study, and the measures used were based on the subjective ratings of one researcher. The results from these efforts were, however, promising. A natural next step will be to produce clear descriptions of the rating criteria, and have different raters code and grade the same material to test the inter-rater reliability. If it is sufficiently high, the rating procedure can be used for experimental purposes as a quality measure of the sensemaking procedure.

The students participating in the planning exercise studied all had the same military rank and fairly similar backgrounds. They served specialized roles in the teams, but they did not have a specialist's competence for their role. The impact of professional expertise and of having members with different professional backgrounds, on the sensemaking process, needs to be addressed by subsequent investigations.

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