Sense-Making and Decision-Making in a Joint Military Context : The Role of Translating, Verifying and Prioritizing Information

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Military units are specialized organizations whose marked hierarchy generates great advantages in terms of effectiveness. It makes it possible to simplify tasks and get familiar jobs done to best effect. On the other hand, military organizations are not necessarily functioning effectively in situations when the tasks at hand are less familiar and require integration of units that differ in their specialization. Such joint integration in networks is increasingly important, but it is hardly practised in military exercises and not often discussed in academic research.

One of the great challenges facing modern military forces is coordination between services and branches.[1] It is thus critical to understand how these challenges can be overcome if operations are to succeed. Such challenges concern coordination among units with different practices (Danielsen, 2008), and in such arenas there is a necessity to invent or improvise strategies for communicating.[2]

This article explores how new technology is used by military personnel in joint operations, and how it relates to sense-making, decision-making and collaboration in a military context.[3] To probe this question empirically, ethnographic fieldwork was conducted in Norway during a military exercise[4] whose scenario was prepared in advance. The aim was to test technical interconnections in joint operations involving Norwegian land, sea, air, special operations forces and the Home Guard.

Ths study's focus is on perspectives that have been influential in explaining how military units work together in everyday life and exercises (Weick & Roberts, 1993 ; Hutchins, 1995). In order to uncover the communication challenges and ways of overcoming them when new technology is introduced, the present article builds on and extends sense-making perspectives. Such perspectives suggest that military units function through the development of a collective mind which implies the initiation of newcomers to heedful interrelating. The central hypothesis, formulated based on our fieldwork, is the importance of sense-making as a lens to understand the changes brought by new technology in military contexts. Sense-making is defined here as a negotiation process "*prompted by violated expectations, that involves attending to and bracketing cues in the environment, creating intersubjective meaning through cycles of interpretation and action,*

[1] McChrystal, 2009 ; White & Orrick, 2009.

[2] Carlile, 2004 ; Majchrzak, Jarvenpaa & Hollingshead, 2007.

[3] The analysis in this article is founded on our fieldwork and experimentally-based doctoral dissertations : Danielsen, 2015 ; Valaker, 2017.

[4] The empirical findings were initially reported in Valaker & Danielsen, 2018.

and thereby enacting a more ordered environment from which further cues can be drawn".[5] Decision-making is seen as linked to sense-making: together, they make a frame from which people can choose how to act (Orton, 2000). Our aim is to discuss how communication processes worked in this specific military exercise.

Sense-making is grounded in professional socialization through institutional membership.[6] In the military, specific terminology, orders, and ranks are typical expressions of such socialization. But the use of technology, for example map software, is also part of institutional practice.

In our setting several military services were present, which provided an opportunity to investigate how different services make sense and decide together, using new technology. This gave us insights that extend traditional perspectives on sense- and decision-making in military organizations, hitherto primarily focused on homogeneous units.

Prior research had suggested that using institutionalized frameworks can limit understanding of novel cues and creativity (Weick, 2005*a*). Our ethnography suggests that knowledge of terminology and procedures provides a frame of reference that helps in analysing sense- and decision-making, and we see this as one of the study's contributions. Sharing geographical information and interpreting orders were made sense of through negotiation. Rather than limiting understanding, institutional knowledge provided a rich frame for making sense of novel information.

This article specifically focuses on the communication strategies (Te'eni, 2001) chosen to overcome coordination challenges. Based on our ethnography, the study delineates theoretical background, method, and then the three communication strategies for collaboration and communication : *translation* (sharing information with members of other military services using the "tribal language" of the receiving unit); *verification* (assuring the correctness of that technical information); and *prioritizing* (in a situation in which new technology generated information overload). Our theoretical contribution, the study's limitations, future research directions as well as practical implications are discussed in a concluding section.

Theory

New technologies are increasingly being introduced to connect different military services and units. However, the expectations generated by technology are not always met in the reality of the operations themselves. We see technology – things, tools and the way work is accomplished– as *social* in its essence. Practices, discourses, and meanings are attached to technology and the use of tools is always culturally contextualized.[7] Technologies are produced and reproduced in dialectical processes of choices, negotiations, modifications, testing, prioritization, and then changes of practices and discourses. This

[5] Maitlis & Christianson, 2014, p.67.
[6] Hutchins, 1995 ; Weick, 1995 ; Weick, Sutcliffe & Obstfeld, 2005.
[7] Pfaffenberger, 1988 ; Scott & Davis, 2007.

suggests that technologies are part of a wider set of procedures and terminology that organization members use in order to operate. When new technology is introduced, these relations are transformed.

Military personnel undergo an institutional apprenticeship – the systematic and situated learning of a profession. Members of the military profession share understandings concerning what they are doing and what that means for their communities, but they have different interests, make diverse contributions to activity, and hold varied viewpoints.[8] Practices, discourses, and meanings are phenomena nested in apprenticeships.[9]

Although all military personnel are trained as apprentices, the different military services and units have their own unique characters.[10] They have distinct roles or niches, and their personnel are trained to conduct different tasks. Service members gain skillsets and mindsets tailored for their tasks and aims. Institutional apprenticeship gives military personnel a common professional frame of reference, however, which is an essential context for analyzing communication in a joint exercise.

In the literature on sense-making and decision-making, it seems to be a primary assumption that communication strategies, such as contextualization, allow for rich information and are important to ensure clear communication in complex situations.[11] Communication that does not provide – or allow for – detail increases the risk of a decoupling from crucial aspects of the reality at hand (Weick, 1995). Disengaged information can lead to misrepresenting and misunderstanding a situation (Snook, 2000). Codified communication – in this context, procedural military terminology – is important to create clarity of communication, aid sense-making and develop shared cognition.[12]

Several researchers working on sense-making in complex situations have studied homogenous military (and other) organizations[13] ; less is known, however, about such communication among interservice units.[14] While some[15] have discussed the role of varied expertise as a prerequisite for operations in complex environments, few have investigated communication aimed at coordination among units from different military services. Fieldwork conducted in multidisciplinary hospital trauma ward teams implies that shared protocols, plug-and-play team arrangements, knowledge externalization and dialogical

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[8] Lave & Wenger, 1991 ; Hutchins, 1995 ; Sinclair, 1997.

[9] Weick, Sutcliffe & Obstfeld, 2005 ; Marchand, 2008.

[10] Builder, 1989 ; Hutchins, 1995.

[11] Weick & Roberts, 1993 ; Te'eni, 2001.

[12] Hutchins, 1995 ; Zohar & Luria, 2003.

[13] Weick & Roberts (1993) looked at institutionalized ways of contextualizing onboard aircraft carriers. Snook (2000) investigated Air Force coordination and Zohar & Luria (2003) emphasized institutionalized briefings within an Army battalion. A recent review also indicates that most research on sense-making has focused on sense-making within a bounded setting (Strike & Rerup, 2015).

[14] Davison *et al*., 2012.

[15] Weick (2005*b*) found that different American medical authorities did not manage to diagnose an unknown virus because they did not integrate various pieces of knowledge to form a more adequate diagnosis. Kendra & Wachtendorf (2006) found that in rescue efforts on 9/11 New York harbour boat personnel with different levels of expertise could communicate through maps and by focusing on one central goal.

coordination were important (Faraj & Xiao, 2006). Shared practices facilitate coordination among expert teams. However, the types of communication strategies we found have additional characteristics: they rely on pooling of different knowledge and skills to enable translation, and information sharing to enable verification and prioritization.

Our ethnography highlights that communication in the military rests not only on verbal communication or knowledge of service-specific terminology, but also on mastery of the other services' concepts, procedures and terminology, as well as on the use of new technologies. In line with the sense-making perspective, detail and contextualization emerged as important in the process of both translation and verification.

Military services have quite diverse specific professional concepts and service parlance. Some are well-known, for example that the Army uses *x* and *y* coordinates while the Navy uses longitude and latitude coordinates. Most military personnel are well aware of this difference. However, in some contexts they use the same term or concept, with different meanings or different concepts that actually mean the same.

"Translators" – in this exercise, liaison officers and officers with a diverse professional experience – had to pay attention to the specific detail of the local language of the units involved. Liaison duty is institutionalized as a function in most military organizations. However, we found that the individual skillset of the officers was essential to preserve detail and provide formality at the necessary level. Liaison officers were not interchangeable. Mastery was needed in Army, Air Force, and Navy terminology and concepts, and the differences between the professional Army battalion and the Home Guard had to be bridged.

Verification was itself a strategy aimed at ensuring that details were not lost in communication. Knowledge of the technical system and its shortcomings was vital. For prioritization, knowledge of the commander's intent, the main goals for the exercise, and the technological potential were important. The prioritization process was conducted to make available information with "enough" of the complexity of the mission.[16]

Our ethnographic findings indicate that contextualized communication in joint collaboration depended on different competencies from those emphasized in the previous research literature on homogeneous military units. Having multiple service languages and technological competencies proved to be more important.

Methodology

The exercise had a technical focus, and the main training audience was officers from *Communication and Signals*. The aim was to test and experiment with the technical interoperability between the various information systems and communication protocols used by the Army, Navy, Air Force, Home Guard and Special Operations forces. The operational ambition was to increase situational awareness by connecting sensors and effectors from different systems at the tactical level.

[16] Zohar & Luria, 2003.

In this exercise, military services and units that had not cooperated before were brought together to perform common tasks. The tasks consisted of protecting national military bases using air, naval, land, SOF, and Home Guard assets, as well as performing counter-terrorism tasks. Cooperation among services was the essential feature of the experiment.

Because the exercise was in essence exploratory rather than controlled, it did not permit a rigorous testing of hypotheses of causal relationships. Importantly, making detailed hypotheses might have diverted our attention from what would prove to be important. Working inductively allowed openness to what would emerge as important features, and necessitated a qualitative approach. It allowed us to follow traces that led to new and interesting insights. In essence, inductive, qualitative methodology permits taking into account challenges as they appear in the actual context of human interaction.[17]

This is a case study, whose research focus was initially thematically based. Our approach was to ground our theoretical considerations and evaluations on a qualitative, inductive, empirical field study, taking into account what was typical about the actual context rather than preconceived notions of what would be important. Through fieldwork ethnography, we gained insight on real events and challenges : participant observation yields a type and quality of knowledge that researchers cannot secure in any other way (Barth, 2008).

In most military exercises or experiments, there are several teams of observers and researchers. Our research was an independent part of the overall data collection. We participated in the planning and in the exercise itself as Norwegian Defence researchers. We also attended various coordination meetings prior to and after the exercise. On the first day, we briefed the exercise participants on our method and emphasized that anyone could refrain from being observed or interviewed. We did not receive any objections from the exercise participants – they are used to being observed and willingly shared their stories and views.

Observations, interviews, and emergent findings were discussed within our own group and with other observers during the event. The exercise was conducted at multiple locations. This posed challenges to our data collection. We split as an observer team and placed ourselves in different locations, to observe the exercise as broadly as possible. But we met regularly and updated ourselves on each other's observations. In addition, we continuously gathered information on the technical status of the experiment from the technical researchers. Our approach constituted a dialectical process of analysis, building our scientific understanding through a dialogue between our emergent ideas, those of other observers, and the officers' own understanding of the context. This involved discussing our preconceived notions and adjusting our notions of the field according to these insights.

Finding one's way into closely-knit and intricate networks, experimenting and experiencing new ways of engaging with people, is not merely a matter of methodological

[17] Glaser & Strauss, 1967.

interest: it also provides theoretical insights.[18] While we took a holistic approach to this experiment, it was not aimed at covering *all* aspects of interaction and communication. It sought rather to single out the typical and important features and patterns of the empirical context and discuss them within the frame of the full complexity of the field.

The kind of collaboration and communication we observed is increasingly seen in joint cooperation. We thus hold this case to have generalizability to such settings.

The Exercise: Description and Discussion

We observed that, in order to make sense and decisions, the officers negotiated at different levels and in all local settings throughout the processes of translation, verification, and prioritization of information. Their settled way of communicating and expectations of how communication should proceed were hampered due to differences among services and the introduction of new technology. In the following, the three aspects of interaction are empirically described and theoretically discussed. These aspects are not hierarchically ordered, but rather represent parallel processes that sometimes affect each other.

Translation. In our context translation meant making information linguistically clear and comprehensible across units and services. It had to take into account procedures and the way joint activities are performed in ordinary military exercises. The examples clarify the fact that translation processes were carried out in different ways and contexts.

Awareness of a Need for Communication and Translating. Awareness of a need for translation was present at Headquarters. On the first night, when the leaders of all units gathered to receive the in-brief, the commander (from the Army battalion) concluded by saying: "*The key is to share information and achieve handover. That is our goal. We have* [in this brief] *used Army language; is that* OK *by you* ?". All the other leaders answered yes to this question. The commander added:

> To be honest, I don't know how we will communicate tomorrow, but the key is sharing the same situational picture and handover. Sharing information on the enemy is important.

This remark illustrates the focus on communication. Although the personnel present were aware of the challenges of different "tribal languages", they did sometimes struggle to overcome them.

Simultaneous Translation. Translation was an important aspect of communication in the coordination between Air Force personnel (operating the Norwegian surface-to-air missile system [NASAMS], present at the exercise) and naval personnel (on duty on board a Frigate). In this joint operation, a liaison officer from the Navy was present at the Air Force-led operation.

Air Force and Navy procedures, technological systems, and terminology were quite different. The systems were configured differently and had different user interfaces. The

[18] Bateson, 1972 ; Eisenhardt, 1989 ; Garsten & Nyquist, 2013.

role of the liaison officer was filtering (verifying and prioritizing) and making the information understandable (translating). The translation and filtering happened more or less simultaneously, and were therefore dependent on the liaison officer's competence in both sets of terminology and procedures.

Translation worked well when done by a naval liaison officer who had undergone so-called cross-training and had taken a course in "Air Force language". While useful, this kind of education was not mandatory: one of the other liaison officers had not received the same cross-training and needed more time to perform the translation task.

The air and naval officers were primarily trained in their service-specific language, with different definitions of certain words and terminologies. For example, the Air Force operators usually said "report birds" to designate a distinct weapons system, whereas the navy operators said "report sugar" for the same weapons.

The officers told us that the challenge was not only the differences in concepts and procedures, but also how the computer systems worked. Translations meant not only relating information to language and terminology, but also to the physical appearance of the computer systems and different displays (user interface). The liaison officers thus needed to be able to translate between several layers of naval and air "tribal languages", different terminologies, and different technological interfaces. In other words, the liaison officers had to be "bilingual" at different levels.

Translation of Orders from a Professional Army Battalion to a Home Guard Unit. One process that exemplifies another type of translation was how a Home Guard unit translated the orders couched in the format of the professional Army Battalion leading the operation. The battalion was composed of professional soldiers, whereas the Home Guard was mainly made up of reservists with a few professional officers as leaders. The personnel in the two units thus had different statuses and competence.

The Home Guard leaders spent much time translating the Army orders for their unit. We discussed with the Home Guard command team how they translated orders from the battalion so that their own personnel could develop a comprehensive understanding of the operation. The leader of the Home Guard unit emphasized that they tried to present the orders so that they conveyed its role in the overall scenario. They translated the orders from English (normally used for all written orders according to the NATO standard, but not known by the reservists) into Norwegian and from military into civilian terminology. The Home Guard unit leader explained:

> The others [professional Army personnel] probably have a common language. Our challenge is that we have to start all over again in every exercise, with reservists with very different knowledge. The Army personnel have a focus on, and experience from, international operations. English is the common language in international operations, so it is understandable that they use English.
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> When we receive an order, we talk through the plan and tasks with the Home Guard platoon leaders – our personnel need detailed translations. In this respect, I must give praise to the *map* of the battalion.

The map he referred to had several circles and signs indicating what should happen in that area according to the plan : so-called areas of responsibility (AoR). The map was a regular map, with "modifications" according to the procedures of the battalion and its way of communicating orders. The abbreviation AoR was, however, unknown to the Home Guard personnel, whose leaders designated the important areas for their units by hand-drawn red circles. A Home Guard officer added :

> I have never seen anything being presented so well as this map. We have to present a comprehensive understanding for our Home Guard units, and then the map is useful : it clarifies the intention of the entire operation in a way everyone can understand.

A Home Guard major had previously served in the Army and was therefore familiar with its concepts and terminology. When he started giving orders to Home Guard soldiers as they did in the battalion, he quickly realized that that did not work. He then adapted and translated the orders and procedure into Norwegian and thereby made it easier to understand for the reservists. The major's bilingualism and the map were useful mechanisms in the translation process.

The Home Guard command team spent a lot of time dealing with what they called a "massive load of information" from the HQ commander, i.e. written comprehensive and detailed orders. They used up to four hours translating the daily commander's brief, to make it understandable to their reservists. The process of conveying the orders went through four stages. Prior to the order meeting, the leaders read the written orders carefully, and then they attended the commander's briefing. After the meeting, they clarified the essential takeaways for their units and finally they briefed the "translated" orders. They did not present all the information from the commander's brief, but only selected, relevant, prioritized information, and actively used the map to communicate. They explained the orders using Norwegian civilian terminology. When they briefed their units, they allowed for clarifications and discussion of the meaning of the orders. This rather complex translation from professional military terminology to more "civilianized" Norwegian, and the prioritization of information, seemed to be important sense-making and decision-making processes within the Home Guard. The combination of the command team's awareness of the terminology differences and their systematic translation resulted in a very good learning experience for their personnel, enabling them to contribute to the complex joint scenarios.

Translation Attempts. Not all kinds of translation and negotiation worked equally well. One example was the lasting problem of coordinating radio frequencies between the Army and Navy. The main obstacle was that the battalion and Navy unit had different terminologies for setting up and using radio frequencies. The personnel were not aware of these differences before the exercise. This led to confusion throughout the entire exercise, although there were some attempts at clarification. Due to the high task load and the unclear responsibility for who should communicate, translate, and make agreements on frequencies, they were not able to make sense of or decide about this matter. However, being exposed to this challenge revealed the need for translation.

Another challenge was sharing map coordinates between the battalion and the navy. This short conversation was heard on one of the first days in the headquarters:

> – "Do the Navy talk in lat/long ?", an Army officer asked.
> – "They do", the commander answered, and continued : "I presume we have to adapt to the Navy. But we have to communicate in the language that is comprehensible to our own [Army] forces. What frustrates me is that we do not find out how lat/long is converted".

This answer indicates a double set of issues concerning the sharing of map coordinates. Firstly, they had to convert the naval longitude and latitude coordinates to the standard Army *x* and *y* system. While there are calculators (apps) that take care of such translation, these were not utilized. Secondly, they realized that they had a translation issue; the map coordinates of the targets had to be presented in a way familiar to both Army and Navy personnel to avoid misunderstandings.

Verification of Information

While translation was important, so was the verification of information. Verification concerns developing trust in information through double- or cross-checking. Verification implied both ascertaining the information received from others, and making sure that personnel from other units or services had understood the information they were sharing.

New Technology and Old Practices. One example which illustrates this was the use of voice communication to ensure the correctness of map positions in the relatively new *Battle Management System* (BMS). The BMS provided the opportunity for a common operational picture to be displayed on all computer terminals. It was displayed on big screens in both the commander's HQ (composed mainly of personnel from the battalion) and the Home Guard operations room. Home Guard personnel did not feel confident in using the BMS, nor did they trust it. In order to ensure the correctness of the positions, they spent a lot of resources on updating the BMS data manually, instead of automatically, as was the core intention. They verified the data by calling their units via radio. The technical updates took more time and were perceived as slower than securing information in the old way by radio.

One Home Guard soldier said: "*The radio is essential to gain situation awareness*". Another said "*just by listening to the conversations on the radio you are able to gain real understanding of the situation. If it is important, you can hear it in his voice.*" Several times we heard : "*just looking at a screen does not give you enough information*". The radio was established as the transmitter of information of high importance. Radio is a tool they trust, because they are trained to use it.

The Home Guard reservists had received little training in using the BMS. At the beginning of the exercise, there were some technical problems in sending them the data from the battalion. These led to some scepticism – their expectation of immediate updating of information on the BMS had not been fulfilled. A third factor is that they were not

youngsters who had grown up with computers and iPads. When all these factors played together during the exercise, the personnel were not able to utilize the BMS technology in the way intended.

The need and eagerness for verification of information was evident at all levels. Personnel from the battalion often walked to the Home Guard quarters to make sure that the HQ information had been properly understood. This was easy, as all the different quarters were co-located. This underscored that face-to-face communication was valued even more than radio communication by most personnel from both the Army and the Home Guard.

The main point in these examples seems to be that information from other units transmitted through new technology was not always trusted. There was a need to communicate through familiar media in order to verify the information. As with translation, verification of information was about making others' information useful in one's own context, avoiding misunderstandings, making sense, and making the right decisions. The difference from translation was that verification was preferably sought in "the old way" due to a lack of trust in the new technology.

Prioritizing Information

A third aspect of communication and interaction was how personnel made sense of the information and made decisions on the strength of it to accomplish their mission. The commander pointed out the importance of prioritizing the information that was technically available: "*We need to define the higher commanders' critical information requirements. It becomes even more important to analyze and prioritize this beforehand*". The commander's intention was to prioritize information *before* operations, and it was a focus and concern throughout the exercise not to overload other players with information.

In the operations room, there were discussions on the physical design of the room and on what kind of information to show on the different screens. From experience, they knew that live F-16 video streams got a lot of attention, and they wanted to avoid getting caught up in watching "kill TV" – the local term for live stream in HQs. They therefore decided not to display a live stream from the tactical units in the operations room. This made them focus on what they considered important – leading the operation – but at the same time they were not utilizing the new technology's potential.

Inserting information from the Army tactical units into the F-16 pilots' digital maps was another case in which prioritizing became critical. What kind of information was important to the pilots became a point for discussion. Aircraft obviously have a larger range and lower resolution in their maps than in those used by Army units. Initially, information on blue force tracks from all tactical land units was conveyed to the aircraft, which resulted in cluttering the pilot's screen. "*It looks like a huge chewing gum*", the pilots stated. It was neither useful nor important for the pilots to get all the information available. In fact, using new technology with the old practices was counter-productive. Both senders and receivers of information had to prioritize. Otherwise, they would overload the other services.

The need to prioritize information in order "*to provide the right information, to the right people, at the right time*" was mentioned time and again. However, it seemed to be a challenge to know what information to prioritize when they cooperated with new actors performing new tasks. In this respect, prioritizing information has similarities with translation and verification : understanding the meaning and implications of the others' information in a new context. The resemblance is in the problem of how to relate answers to questions one has not asked. Prioritizing information seems to be a distinct aspect of interaction, however. It did not concern differences in terminology or language, or the usability of media, but rather whether information was useful in performing one's own tasks.

Discussion and Conclusion

In the old days, information from the area of operations was hard to get. In our digital age, military HQs and tactical teams alike suffer from information overload.[19] New technology has created a framework for information flow and communication that differs radically from earlier technologies.[20]

Technology is a total social phenomenon, meaning that it has implications throughout society. It informs and organizes seemingly quite distinct practices and institutions (Mauss, 1966). Techniques, methods, and skills are produced and reproduced in dialectical processes of choices, negotiations, modifications, testing, prioritization, and then changes of practices and maybe even discourses. Disruptive technology (Christensen, 1997) can be a game changer. It is apt to alter social interaction and ways of communication, though not in pre-determined ways : while it is not an autonomous power that can dictate social life, new technology will often have social, economic, moral, and legal consequences, some of them unanticipated.

In military institutions, we often find high technological optimism – the strongly-held notion that most problems can be solved by resort to adequate technology. But at the same time personnel are conservative in their approach to new devices or methods (Spulak, 2010). Introducing a new kind of technology does not necessarily imply either eradicating old technology or a change of practices.

The present case study sought to describe and analyze sense- and decision-making in a joint military exercise where the aim was experimenting with new technology. Ethnography "*from the wild*" (Hutchins, 1995) – as opposed to laboratory experiments where factors are isolated and tested – made it possible to contribute to new understandings and theory building on sense-making and decision-making in military teams. Three processes of collaboration and communication, namely translation, verification, and prioritizing information, were delineated to describe and discuss how culture is produced and reproduced in real practices (Bourdieu, 1997).

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[19] Flynn, Pottinger & Batchelor, 2010.
[20] Eriksen, 2014.

This article has focused on one of the armed forces' main tools: *the map*. The aim of military communication in operations is to translate or convert geolocations of the enemy, verify this information, and prioritizing which people to capture or target, or which building or asset to destroy in order to accomplish the mission. All military briefs and orders include a visualization of the action plan using a map. The different services use maps of different scales and shapes ; some prefer old-fashioned paper maps, while others use digitalized maps. Throughout their institutional apprenticeship, all military personnel learn that maps are needed in all operations.

Theoretical Implications

While our findings are in line with the sense-making perspective on communication, they also go beyond it in that they point to an important contingency affecting communication processes in inter-organizational settings – here in joint military collaboration. Being able to bring together multiple types of skills as a competency seems to be particularly significant. In this respect, this study has done what prior research (Sutcliffe, 2011) had called for : it specifies more precisely the range of know-how and skills required in organizing complex operations. Rather than focus on the task at hand, it draws attention to the challenges of expertise coordination. Where previous research focused on shared protocols, arrangements for information sharing, and dialogical coordination of different areas of expertise (Faraj & Xiao, 2006), our findings point to the role of knowledge from different fields embodied in individuals' own experiences. Both institutional and individual experiences enable and enrich communication strategies in joint collaboration.

In this experiment, disciplined knowledge of terminology and practices was essential to different ways of translating. The NASAMS liaison officer used his knowledge of two tribal languages and acted as a link between air and sea units. The Home Guard officer also used his bilingual knowledge to choose the information the reservists needed. The orders were translated into civilian parlance, discussed – not just briefed – and the map was used to visualize the information. The translation process followed no predetermined procedure, and did not easily conform to their previous knowledge. It required connecting the relevant language (terminology and the use of images such as the map). This sense-making was a process of interpretation, negotiation, prioritization, and decisions on responsibilities, which was not pre-planned.

Verification of geolocalization assumed a shared referent system, but this did not work out according to plan. There was often a time-lag in determining positions and, when the digital position did not confirm the information needed, they used face-to-face communication or radio to verify it. As with translation, the decision-making processes were dependent on verification of information. This involved using both new technology and familiar practices.

Transmitting information digitally from pilot to headquarters created ambiguous situations : it provided new opportunities, but also new possibilities for misunderstandings or failures. Headquarters staff were aware of the possibility of information overload, which they regarded as a tiresome downside of faster and more accurate information.

Communication in the armed forces depends on both institutionalized terminology/ procedures and individual skills. Leaders from the different services and units communicated differently within their own units than they did with others – they took pains to make themselves understood in the joint community. The Home Guard leaders spent considerable time with their reservists, and made the effort to translate, explain, and discuss the intent of the orders with them. From experience, they knew it would not work otherwise. And when the technology did not work, or the translation was too complicated, they used the old familiar tool: the map.

In summary, our findings suggest that sense- and decision-making rely a lot on institutionalized concepts and practices. The actors used their common, cultural frame of reference and negotiated within this frame, using the same rules. Strike and Rerup (2016) state that past research paid limited attention to context because its primary focus has been on sense-making *within* local social boundaries – not *across* social boundaries. The role of mediation in adaptive sense-making has thereby been largely overlooked.[21] We share their point of departure, but rather than examining (as they did) the importance of "outsiders", we focus on sense-making among military personnel from different services. Our analysis highlights how communication across boundaries is culturally contextualized.

Limitations and Future Research Directions

One of the limitations of our fieldwork was its short duration (one week). As both authors have worked for decades with the armed forces and undertaken several lengthy periods of fieldwork, they feel certain that a longitudinal follow-up study would be of interest. Comparing and contrasting different coordination practices could be a promising avenue for future studies. Another direction would be to compare communication in established military organizations where there is a low degree of joint collaboration, with those where joint collaboration is more commonplace. In addition, it could be important to examine sense- and decision-making in settings where bearers of other identities, such as foreign nationals or civilian actors, are present.

Practical Implications

One of the crucial practical implications from our findings and discussion is the need for contemporary military organizations to focus on joint communication and cooperation. In the global era, military missions often involve combined joint operations, even at tactical levels. Building competence to recognize challenges and enable the necessary coming together of different methods and skills at lower levels can thus be important for successful joint operations.

Fieldwork supplies "thick descriptions" (Geertz, 1973). Researchers need both to observe and to participate in order to give data a "taste": a rendition of feeling, mood, and atmosphere. Contextualized local stories are a source for analysis and the building of new theories. Thick descriptions give context to interpretations of people's behaviour or

[21] Strike & Rerup, 2016, p.881.

utterance, so that they become meaningful. Grasping procedures and technology in the making requires the simultaneous observing of institutionalized practice and their ongoing change. Documenting and analyzing such processes, using ethnography, produce grounded knowledge and understanding of contemporary joint and combined operations, and of how military professionals communicate and act together.

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