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Topic 3: Battlefields of the Future and the Internet of Intelligent Things

Exploring Mission Command in a Concept for Future Command and Control

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Abstract

Future Command and Control (C2) need to be both agile and resilient to cope with unpredictable operational environments and to make use of the technological advances. The Swedish Armed Forces develops a concept for future C2 of military operations. The objective of this paper is to explore the utilization of mission command in a future C2 concept. Sweden has a solid tradition of mission command, promoted by the Swedish culture of participation and empowerment. However, the future operational environment demands a need for organizational agility, thus changing the prerequisites for mission command. The future C2 concept, which is under development, encompasses centralized and decentralized command in fixed and temporary organizations. Centralized approaches may be preferred when it comes to prioritization of technologically advanced exclusive resources. On the other hand, dynamic situations demand rapid decision making and seizing the opportunity given in the moment. The future operational environment includes hybrid warfare and gray zone issues, demanding thorough analysis in order to foresee the political consequences of decisions. Sensor and communication technologies enable enhanced situation awareness; however, the infrastructure is vulnerable. The current paper analyses the application of mission command in the future operational environment, and further mission command in relation to organizational agility. The conclusion is that mission command is still relevant in the complex future operational environment. However, the increasingly complex operational environment demands continuous development of the C2 function.

1. Introduction

To conduct military operations is complex and demanding (Brehmer, 2011). In order to sufficiently conduct military operations in future operational environment, command and control (C2) needs to be rapid, agile and resilient. Hence, extensive demands are put on future C2 systems. The Swedish Armed forces (SwAF) is currently developing a future C2 concept aimed to direct and guide the development of future C2 systems.

Technological development and new types of threats shape the future operational environment. Changes include several superpower nations instead of two, a more tangible gray zone, and hybrid warfare challenges (Pogoson, 2018; Wirtz, 2017). Further, the future operational environment is impacted by globalization, climate change, technological advancements, and ambitions and actions of different states (Ministry of Defence, 2014a). Possessing an adequate military capability is a key-enabler for states to defend their interests, and this has accelerated the procurement of military equipment (Stoltenberg, 2016). Hence, a sufficient military capability is costly to uphold. Sweden, as a small state, will not be able to match an aggressor in quantity. All aspects of quality within the Armed Forces such as advanced technology, willpower, training, and operational art will be utilized in order to win. Being a small state in terms of population, however larger in terms of area, demand for the most efficient use of available resources. Similar reflections are seen in other parts of the world. "The overall challenge is to generate more force, more rapidly, and more effectively when called to do so" (Brigadier General Mills of the Australian Army, Williams Foundation, 2016). A worldwide trend is an increased focus and call for improved joint operations, in terms of air-land integration (Ibid), multi-domain warfare (Woods & Greenwood, 2018; Reilly, 2016), and modern joint forces concepts (Ministry of Defence, 2014b).

The objective of this paper is to explore the utilization of mission command in a C2 concept for future armed forces.

1.1 Command and Control

C2 is a *function* of the military system (Van Creveld, 1985). It provides *direction* and *coordination* to the military efforts in order to produce military effects (Brehmer, 2007). In similar words, Alberts and Hayes (2006) express that C2 focuses the efforts of individuals, organizations, and resources; including information towards the achievement of some task, objective, or goal. The British Ministry of Defence (2017) defines that future C2 aims “[to] provide focus for individuals and organisations so that they may integrate and maximise their resources and activities to achieve desired outcomes.”

Brehmer (2013) states that military C2 is about managing uncertainty and describes three fundamental challenges to manage this uncertainty:

1. *Coordinate* and *communicate* in order to achieve a combined affect.
2. Manage inherent uncertainties to challenges such as gray zone issues, cyber threats, and irregular warfare.
3. Adapt to changing conditions in order to produce effect faster than the opponents do.

Several models describe how C2 should be carried out, in terms of functions or activities. Boyd’s OODA loop (Observe - Orient - Decide - Act) is one of the most well-known (Boyd, 1987). Variations or extensions to the OODA loop include the Cognitive OODA (Blasch, Breton, Valin, & Bosse, 2011) and Dynamic OODA (Brehmer, 2005). In other areas, such as in management, there are similar loops such as the Plan–Do–Check–Act (PDCA) (Sokovic, Pavletic, & Pipan, 2010).

More recent models, developed with a future C2 perspective, carry elements similar to OODA/PDCA. NATO Allied Command Transformation (2016) describes the C2 functions Connecting, Sensing, Processing, Sense-making, Deciding, and Effecting. Alberts and Hayes (2006) put a focus on internal processes and team cohesion, including activities such as determining roles, responsibilities, and relationships, establishing rules and constraints, and inspiring, motivating, and engendering trust (Alberts & Hayes, 2006). British Ministry of Defence (2017) include the function of recognizing the need to change our approach to C2 and/or the plan of action.

The C2 functions are carried out by *C2 systems*. At a general level, military C2 systems direct and coordinate resources so that they achieve the necessary effects to solve assigned assignments and tasks (SwAF, 2016b). C2 systems are socio-technical systems (Pilemalm, Lindell, Hallberg, & Eriksson, 2007; Walker, Stanton & Jenkins, 2017; Emery, 1978). The SwAF defines C2 system as consisting of Methods, Organization, People, Technology and Doctrine (SwAF, 2016a).

Throughout history, supporting *principles* for sound C2 have been developed. Sun Tzu’s Art of War (Giles, 1910), comprises mainly war fighting principles but some C2 principles are identified such as “if you know the enemy and yourself, you need not fear the result of a hundred battles,” and further “according as circumstances are favorable, one should modify one’s plans” (Ibid). *The Prince* by the Italian diplomat and political theorist Niccolò Machiavelli comprises some classical C2 principles. Machiavelli (1985) stressed the need for collaboration, stating that regardless of how a prince was elected to office, he would only be successful when he utilized the strengths of his ministers. Further, Machiavelli (1985) stated that collaboration creates camaraderie, leaving little room for disunity and rebellion. In the essay *Principles of War*, Carl Von Clausewitz expressed the need for timely and swift decisions: “[...] never to waste time. Unless important advantages are to be gained from hesitation, it is necessary to get to work at once” (von Clausewitz, 1812). Military experience have further resulted in principles relating to mission command (Zetterling, 2003, interpretation of textual material from the 1923 Heeresdienstvorschrift).

Based on the experiences of civilian enterprises, Fayol (1949) identified 14 principles for sound C2. The validity of Fayol's principles today have been questioned due to that the society within which

Fayol developed his C2 principles in 1916 was different from today (Rodrigues, 2001). Technological developments enable information to be distributed within and between organizations in a very different way than before. Further, there are national differences that affect organizational cultures and the applicability of different management principles, such as individualism (Rodrigues, 2001). In summary, the prerequisites for some principles have changed, while other principles still can be considered as valid. Fayol partly identified this, arguing that C2 is based on judgment and it seldom is possible or appropriate to apply the same principle twice under exactly the same conditions, but it must be assumed that the circumstances vary and change (Fayol, 1949). More recent work on C2 principles has been conducted by Johansson (2000) who studied C2 in rescue and police services.

1.2 Mission command

In Sweden, as in several other states, *mission command* is seen as essential to obtain the desired operational effect (SwAF, 2016b). Furthermore, mission command is referred to as a key factor enabling *manoeuvre warfare* (Lind, 1985). Sweden has a solid tradition of mission command, promoted by the Swedish culture of participation and empowerment. This concerns organizational culture within the private and public sector, politics and different societal functions. In multi-organizational crisis response, coordination is accomplished based on regulations and principles, regulating mandates and roles before, during and after a crisis. The *responsibility principle* states that the organization that is responsible for an activity in ordinary circumstances retains that responsibility during a crisis (Swedish Government, 2010; Swedish Civil Contingencies Agency, 2009). The *proximity principle* declares that a crisis should be managed where it occurs, if possible at local level. Not until the crisis extends beyond what the local organizations can manage, the regional or national level may provide support (Swedish Civil Contingencies Agency, 2012).

Although mission command is acknowledged in several countries and armed forces, it is not consistently described (Shamir, 2011; Storr, 2003; Flynn & Schrankel, 2013; MoD, 2017; Vogelaar & Kramer, 2004; SwAF, 2016b). Mission command is applied in different ways depending on how it was interpreted when adopted, the development in different armed forces, and adaptation to conditions and culture (Shamir, 2011). The different interpretations and applications of mission command makes it “a complex, elusive, multifaceted phenomenon, not easily quantified, measured, or institutionalized” (Shamir, 2011). Mission command is expressed as a philosophy, a concept, a method, a technique or a framework (Storr, 2003; SwAF, 2016b; Wittman, 2012; Vassilou & Alberts, 2017).

Generally, a *philosophy* describes a way of *thinking*, in other words, “a system of beliefs that influences someone’s decisions and behaviour,” while a *method* describes a way of *doing* something in a planned or established way (Macmillan Dictionary). Hohman (2014) argues that the same term definitely can be used to encompass a philosophy, an approach, or a methodology, as long as it is clear to which of these that is referred to. Shamir (2011) demonstrates the relationship between military success and the extent to which mission command is applied. Thus, the philosophy of mission command (the way of thinking) means nothing until it is accompanied by principles or methods (how to do), irrespectively of whether both the method and the philosophy are referred to as mission command, or whether different terms are used.

The *philosophical* perspective on mission command focuses on human relationships, and emphasizes that subordinates are qualified to make decisions and take initiatives. In the mission command environment, mutual understanding and trust will inspire subordinates to accomplish assigned missions in line with the intent stated by the commander (US Marine Corps, 2010). The commander is thus seen as an enabler or catalyst, rather than a view of a brilliant commander, where soldiers execute specified orders (Brehmer, 2005). The current Swedish Military Strategic Doctrine

acknowledges mission command as the command and control philosophy of the SwAF (SwAF, 2016b). In doctrines and handbooks, it is further stated how this philosophy should be implemented, either through denoting it as the mission command *methodology*, or by explaining in terms of forms/approaches of C2.

C2 should always be adapted to the requirements of the situation. Swedish Armed Forces' operationalization of mission command constitutes the foundation for situation oriented C2, which brings that mission guidance is the primary form. Swedish Armed Forces further adopts forms for direct guidance. In reality, these forms will be combined depending on the situation.
(SwAF, 2013 (translation))

From a *methodological perspective*, mission command implies that commanders provide objectives and guidelines, while subordinates are given extensive autonomy, allowing flexibility and adaption to the battlefields dynamics and frictions. Applying mission command enables faster decision-making relative the opponent and thereby making counteractions ineffective (Brehmer, 2005). Mission command in theory is easy to express, however the actual implementation has been reported to pose more of a struggle (Vassiliou & Alberts, 2017; Vogelaar & Kramer, 2004). Exploiting the full potential of mission command requires full commitment to all aspects enabling mission command (Shamir, 2011).

Barius (2012) identifies four fundamental principles that need to be in place to apply mission command: trust, intent focus, initiative, and common ground (Figure 1). Flynn and Schrankel (2013) similarly identifies the five principles: trust, intent, initiative, mission order, and risk acceptance.

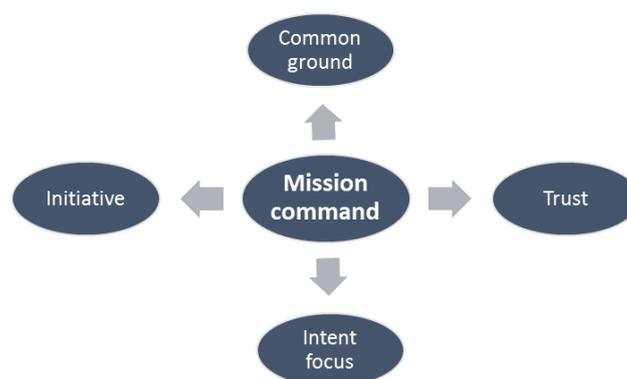


Figure 1. Four fundamental principles for mission command

The first principle, *trust*, is between the commander and the subordinates is essential as a large portion of the execution of the operation is handed over to subordinate commanders. Weick and Roberts (1993) express that “reliable performance may require a well-developed collective mind in the form of a complex, attentive system tied together by trust.” Decentralized decision making implies increased freedom of action of the subordinates, however actions on subordinate level restrict the solution space of the superior commanders (Uhr & Pettersson, 2018). Trust is supported by a willingness and capability among subordinates to assume responsibility, as well as mutual respect between the commanding levels. Looking into the future, where it is expected that human capacity will be enhanced by autonomous agents, it is sometimes debated how trust can be achieved in a human-agent systems. Experimentation on judgment of human and robot behaviour showed no general differences between people’s intentional stance toward the robot versus toward the human (Thellman, Silvervarg & Ziemke, 2017). The digitalization in society means that we increasingly

interact with technology rather than humans, learning how and when to rely on technology. The development within the area of explainable and transparent AI has expanded from a primary focus of transparency for developers to a larger focus on transparency for the end-users. This development facilitates an understanding of when and when not to trust a automatically generated solution (Miller, Howe & Sonenberg, 2017; Svenmarck, Luotsinen, Nilsson & Schubert, 2018). It seems, as the major issue for future military operations is to obtain trust between humans.

The second principle is *intent focus*, clarifying *what* has to be achieved and hand over the *how* part to the subordinates, allowing freedom of action and robustness to subordinate levels in a change of situation (Flynn & Schrankel, 2013; Uhr & Pettersson, 2018). The commander provides the necessary guidelines in the *mission order*, stating intent, tasks, resources and necessary constraints. The subordinates need to understand the objective in a larger context where the general rule is that the subordinate needs to understand the intent not only of the higher chief in command (HIC), but of the HIC's HIC. Conveying the mission order through dialogue as well as wargaming where subordinate commanders express how they intend to transform the intent into action. This creates a mutual understanding of how the intent can be achieved and a common understanding of the objectives.

The third principle is *initiative*. There needs to be a willingness to take initiatives throughout the organization, to exploit the opportunities that arise (Flynn & Schrankel, 2013). Willingness to take initiatives is heavily dependent of the organizational culture. The environment needs to encourage independent subordinate commanders and actionable individuals. A spirit of creativity is imperative (Barius, 2012). This can only be achieved if there is a forgiving culture rather than one that punishes every mistake due to initiative.

The fourth principle is *common ground*. Common values and common doctrines create a mutual cognitive understanding. The common ground creates an environment that enables commander's delegation of *how* the objective should be reached (Barius, 2012). It is supported by common education and training in a learning environment, so that commanders at all levels are skilled in independent decision-making and risk taking (Flynn & Schrankel).

Those factors should be facilitated by information sharing in all aspects (Barius, 2012).

Communication is essential for decision making, for building trust, for understanding, exchange of ideas and experiences. However, Vassilou and Alberts (2017) point out that "the same technologies that facilitate decentralization and the transmission of intent can sometimes also facilitate micromanagement." Further, mission command is a solution to manage lack of information or lack of information sharing possibilities (Brehmer, 2009). Mission command enables autonomous operations although communication is disrupted (Wither, 2018; Tucker, 2017). The ability to achieve effects in a communication-degraded environment is one of the main strengths of mission command, and is more relevant than ever, as information and communication systems are threatened by sophisticated cyber and electronic warfare.

Vassiliou and Alberts (2017) elaborate on how mission command relates to the NATO Network enabled Command (NE C2 Maturity model, describing C2 approaches in an approach space constituted of the dimensions *Patterns of interaction*, *Distribution of information of entities* and *Allocation of Decision Rights* (Figure 2). In the approach space, there is a preferred diagonal, where increased decentralisation implies a need for increased information distribution as well as increased interaction patterns. Vassiliou and Alberts (2017) claim that the traditional mission command doctrine omits the need for increased interaction patterns and information distribution, resulting in suboptimal C2, as compared to the preferred diagonal, which states that the more decentralized decision-making, the more information sharing is needed.

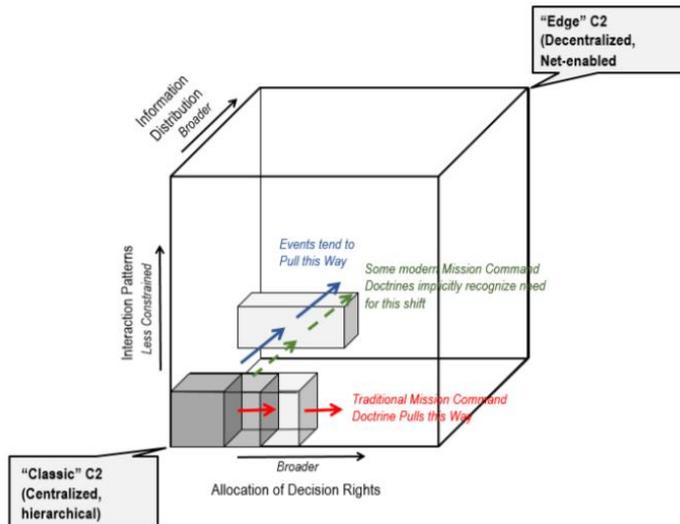


Figure 2. Vassiliou and Alberts' (2017) illustration of mission command in the C2 Approach space.

2. Development of a C2 concept for the SwAF

SwAF currently develops a C2 Concept in the perspective of 2035 (Granåsen, Hallberg, Josefsson & Ekenstierna, 2017; Granåsen & Hallberg, 2017). This section briefly presents the foundations and current state of the concept. The development process is further elaborated in Hallberg, Granåsen, Josefsson & Ekenstierna (2018). The basic concept idea is currently formulated as:

C2 capability encompasses achieving effect by commanding own resources and use others' resources through services. C2 will allow a dynamic and agile organization, which uses its resources in the most efficient way in every given situation. C2 is conducted with an effect perspective rather than a resource perspective (Granåsen & Hallberg, 2017).

The current section outlines the concept idea using a two-dimensional spectrum (Figure 3).

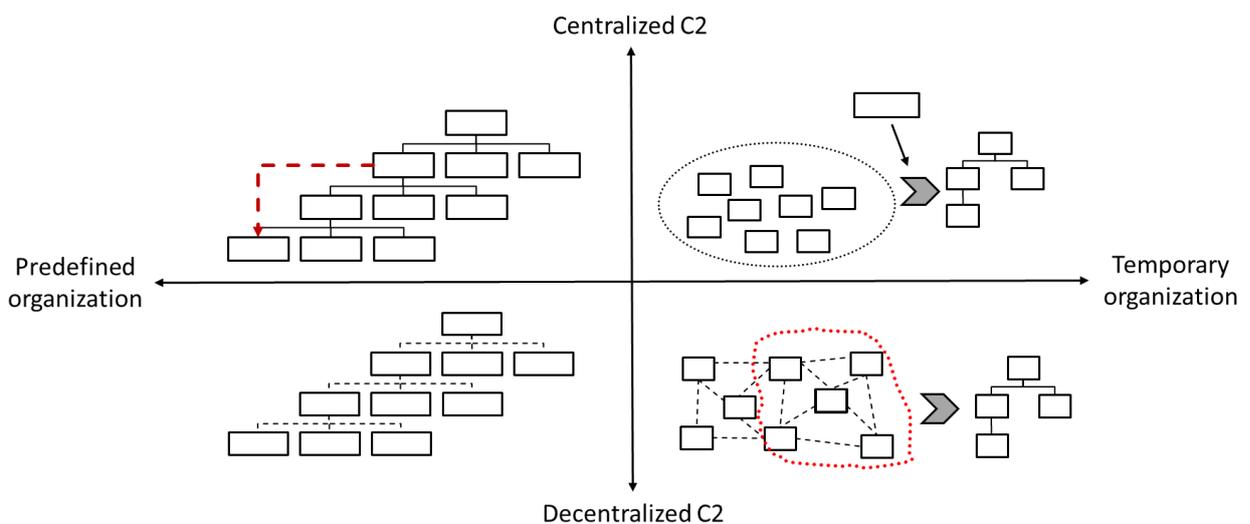


Figure 3. Concept spectrum used for the development of a future C2 concept

2.2 Degree of centralization

The vertical axis in Figure 3 depicts the extent to which decisions are centralized or decentralized. This corresponds to the allocation of decision rights in the NATO NEC C2 Maturity model (NATO

Systems Analysis and Studies Panel (SAS)-065, 2010; NATO SAS-085, 2014). Mission command is the primary commanding principle for the SwAF, stated in the doctrines as well as in strategic guidance regarding the future development of the armed forces (SwAF, 2018). In line with mission command, the C2 concept describes an effort to push decisions down in the decentralized area of the concept spectrum. Still, there are situations where centralized decision making may be needed. Temporarily centralizing decisions does not mean that mission command, as an overall C2 method or philosophy, is abandoned. Mission command means that there is an effort to make as decisions as decentralized as possible, not that every decision needs to be decentralized.

The C2 concept development includes the identification of C2 principles. The C2 principles are used for inspiration during concept development and to validate solutions within the future C2 Concept. Compiling the C2 principles is a way of embracing and incorporating experience of commanders and organizational theorists into the future concept. As Machiavelli (1985) stated, “the prince ought to read history, and reflect upon the deeds of outstanding men [...] examine the causes of their victories and defeats, and thereby learn to emulate the former and avoid the latter.” The C2 principles serve as supporting guidance for sound C2, although not every principle is valid in every situation (Rodrigues, 2001). A few of the principles identified during the C2 concept development are found in Table 1.

Table 1. Extract of the identified C2 principles, used during C2 concept development.

Principle	Description
Mission Command	<ul style="list-style-type: none"> - Mission Command denotes decentralized leadership; it is a philosophy that requires and facilitates initiative on all levels of command (Shamir, 2011). - Mission command takes advantage of each individual's decision-making capability. - The mission and the situation form the basis of C2 (Heeresdienstvorschrift 487, as interpreted by Zetterling, 2003). - A mission is a mutual agreement between the commanding officer and the recipient of the mission (SwAF, 2016b). - Within mission command, C2 is applied through two alternative forms of governance, namely <i>mission guidance</i> and <i>direct guidance</i>. In addition, initiatives are encouraged down to the individual level.
Situation-oriented command	<ul style="list-style-type: none"> - Through situation-oriented command, the one who has the best prerequisites is given the mandate to command. - The C2 system and its command concepts should be adapted to the requirements of the situation (Ashby, 1958). - In a complex situation, effective C2 requires that we continuously choose between different command methods (Johansson, 2000)
Unity of command and direction	<ul style="list-style-type: none"> - Each individual should only have one commanding officer and receive instructions from only one commanding officer (Fayol, 1949). - One and only one commanding officer shall lead units that have tasks with the same purpose (Fayol, 1949).
Command perspectives	<ul style="list-style-type: none"> - By taking into account all four management perspectives on all command levels (Normative/political, Strategic, Operational Tactical (Johansson, 2000)), an organization can function independently and reliably in a complex and changing environment. - Consideration of C2 from different perspectives helps to create a vital and viable organization (Beer, 1981; Johansson, 2000).
Correspondence	<ul style="list-style-type: none"> - Effective management requires a correlation between the situation and our C2 system (Ashby, 1958). - The more possible events, the greater variety our C2 system must have (Ashby, 1958).
Sufficient situation awareness	<ul style="list-style-type: none"> - The ability to manage a situation does not get better than the awareness the decision maker has of the situation (Giles, 1910 and Johansson, 2000).

Principle	Description
Decision-making	<ul style="list-style-type: none"> - A commander must make informed choices of decision-making methods so that decisions can be made on sufficient basis and on time to resolve the task (von Clausewitz, 1812). - In order to achieve a high pace in operations, decisions must be taken despite incomplete information. - When time allows, decision making should be preceded by analysis.

2.1 Predefined or temporary organization

The horizontal axis concerns the *organization of forces*. It is not in the mandate of C2 concept developers to decide upon the organization. However, it is essential that the C2 concept is valid for all organizational forms and that the C2 corresponds to the agility of the organization.

In the *predefined* organization (the left part of the concept spectrum in (Figure 3)), you find self-sufficient systems designed to perform a wide range of tasks. One example is an army brigade. It is a pre-configured system including capability to support itself in terms of intelligence, protection, maintenance, command and control, and moveability. Some flexibility is created in temporarily attaching or detaching units. As the system constitution is relatively stable, there are good opportunities for creating trust and cohesion, conduct collaborative training and develop tactics of the system. However, besides the risk of a limited flexibility, organizing forces according to a wide capability span can be expensive, as resources are permanently distributed and attached to pre-defined organizational clusters rather than being shared.

The temporary organizations are formed by clustering specialized units on demand to accomplish a specific purpose. An example can be found in the civilian crisis management domain, where emergency response resources are temporarily pooled in order to manage a specific incident. There is no pre-established “emergency brigade”, but a joint emergency response “force” emerges at the spot of the incident, where one of the responders is assigned on scene commander. A flexible organization allows for an effects-based approach, where plans are do not need to be limited to the resources you currently possess. This is in line with the ideas of service-based architectures (Pilemalm & Hallberg, 2008; Jungert, Hallberg & Hunstad, 2006). The advantage is a potential cost-efficiency both regarding optimizing the use of resources, and for maintenance and development. On the other hand, interoperability demands are high, and standardized interfaces enabling flexible composition of resources include agreements regarding both technology and methods. Besides descriptions of the services and their interfaces, there needs to be regulations and agreements regarding how and when services may be used. Transactions brings transaction costs, and the more rare the transaction is, the greater transaction cost (Williamson, 1979). Furthermore, in a flexibly composed system it may be a greater challenge to create cohesion. Thus, using resources in innovative ways is not uncomplicated. However, it is expected that the development of decision support systems, and technological progress, will aid in monitoring and facilitating these transactions.

In the concept spectrum the two decentralized quadrants are named Autonomy and Adhocracy (Figure 3). *Autonomy* corresponds to when self-sustainable organizations operate with a high degree of decentralization. A clear example is an army brigade that is given an extensive mandate, guided by a classical mission order. There will always be some constraints, though. For instance, the tasks that are given depict the level of ambition and which amount of effort that is needed, and the rules of engagement determine what is and is not allowed.

Adhocracy is based on specialized units with extensive decision mandates within their own area of expertise. Adhocracy includes self-organization with a focus on problem solving and taking advantage of emerging opportunities (Mintzberg & McHugh 1985). Adhocracy is designed for highly dynamic

situations with a high degree of uncertainty, situations demanding innovation and creativity. That is, situations in which it cannot be predicted which types of resources are needed beforehand. In order for adhococracy to be practically applicable, there is a need for clear rules and regulations about the use of resources. In civilian crisis management, at least partly adhococratic, there are well-known principles regulating responsibilities of participating actors. Adhococracy allows for an effect focus rather a resource focus. Furthermore, a prerequisite for adhococracy is information exchange between the units that are to connect and collaborate. Technical decision support managing keeping track of the availability of resources and the effects that they can provide would be strongly recommended in order to operationalize adhococracy. A classical mission order specifies the necessary guidelines by clarifying the *intent*, *task* and *resources*, and including necessary constraints. However, increased organizational agility imposes a challenge as the resources are *not* given. In order to accomplish decentralized command when resources are not given, the socio-technical C2 system needs to keep track of which resources are available and which resources that can produce a certain effect.

2.3 Movement in the concept spectrum

The current section explains the movement that occurs within the concept spectrum (Figure 3). No organizational form is optimal in every situation, but the C2 concept needs to be applicable for every organizational form. Adhococracy and autonomy are used to identify the boundaries of the decentralized part of the concept spectrum. However it may be more relevant to speak in terms of to which extent units are formed of basic and complementary capabilities.

The conclusion of the advantages and disadvantages of wide and narrow capability system is that the C2 concept needs to appreciate an *organizational agility*. The term organizational agility is found in the business sector. Using the definition found in the Business Dictionary (Business Dictionary), exchanging the terms: *company*, *market*, and *competitors* with *organization*, *situation*, and *threats*, would result in the following definition:

Organizational agility is the capability of an organization to rapidly change or adapt in response to changes in the situation. A high degree of organizational agility can help an organization to react successfully to the emergence of new threats, or sudden shifts in overall situation.

Thus, organizational agility is the ability of an organization to transform itself and create maximum use of its resources, either by organizational changes or by exchanging services. Figure 4 intends to illustrate organizational agility, as described during the concept development (Granåsen & Hallberg, 2017). An organizational entity has a set of *basic capabilities*, defining the organization under normal circumstances.

When needed, the basic capabilities of the unit are enhanced with *complementary capabilities*, either by attaching a unit on a more permanent basis, or by requesting a service. It is an assumption of the C2 development project, that the future technological development enable a greater organizational agility, a more dynamic use of available assets. As the British C2 concept states, “Delivering agile C2 is not only critical to enhancing joint action, but is seen as the preeminent future force joint function, a fundamental requirement to help deal with complex, uncertain and rapidly changing contemporary and future operating environments” (Ministry of Defence, 2017). Further, forces should have the capability to constitute a threat in every environment, while keeping several own options. This can be accomplished through joint combined weapons (US Army Training and Doctrine Command, 2014).



Figure 4. Organizational agility in terms of basic and complementary capabilities.

Resources that are dependent on each other over time form clusters of basic capabilities - systems and systems of systems. The artillery gun is of no use, if not provided with ammunition, and a communication system for target acquisition. Operational requirements regarding accessibility, self-sustainability, and collaborative training determines the capability span. Further, resources that have the ability to provide effect over large areas or even independently of distance have greater opportunities to act as service providers in terms of constituting complementary capabilities. Examples include long-range sensors and weapons, cyber assets, and air-borne units.

Technological development affect the horizontal movement in the concept spectrum in two ways. On one hand, technology steadily becomes more affordable, smaller and requiring less expert skills, enabling systems that former were considered as advanced and exclusive, to be distributed without additional cost. One example is the development of small and user friendly drones. On the other hand, other technological advances have very high demands regarding exclusive equipment, skilled personnel, and infrastructure. Thus, technological development pull in two directions, enabling a wide capability span at low cost, however not excluding that there are exclusive resources that are shared in specific settings. Military C2 systems (methods, organization, personnel, technology, doctrine) needs to allow for flexible use of available resources. The organizational challenge is to find the balance between what should be part of a basic capability of an organization and what can be requested as a service, when needed.

During concept development, some guidelines regarding when to apply a decentralized or centralized decision making were identified (Granåsen & Hallberg, 2017). The C2 principle of command perspectives emphasizes the need to understand the strategic context in terms of political implications of decisions. It is necessary to realize when an issue is a military problem, which may be particularly complicated in the *gray zone*. Centralized decision making may thus be necessary in the gray zone where the situation awareness of the strategic conditions can be found on the highest strategic level of command. *Defensive operations* generally is the main strategy of a small state, and as offensive operations requires more coordination in time and space in order to achieve desired effects, mission command may be easier to implement in defensive operations. *Time* is another factor determining when to apply different commanding techniques, as mentioned in the C2 principle of decision making. Decentralizing decisions may save time, as every decision do not have

to travel through the chain of command. However, there are situations in which centralized coordination will save time.

Apart from the two dimensions visualized in the concept spectrum (Figure 3), there are other aspects that are important in describing the environment in which C2 is conducted (horizontal axis) or how C2 is conducted (vertical axis). The NATO NEC C2 Maturity model dimensions *Patterns of interaction* and *Distribution of information of entities*, as seen in Figure 2, are not visible in the concept spectrum, but are nonetheless important to take into consideration in the design of a C2 concept. However, while the C2 maturity model (Figure 2) aims to visualize desirable C2 *approaches*, the C2 concept spectrum aims to visualize C2 *situations* in order to identify the requirements on future socio-technical C2 systems. In other words, the concept development needs to identify the dimensioning or most difficult requirements regarding patterns of interaction and distribution of information, why it is less relevant to visualize the range of these two aspects. If the situations demanding extensive information are identified, it is expected that by fulfilling this requirement, the organization will also have the ability to manage a situation requiring less information sharing. Thus, aspects such as interaction patterns and information distribution are managed during the concept development, in the operationalization of the concept ideas into C2 needs and requirements.

3. Discussion - Mission command in a future C2 Concept

Mission command enables local initiatives and faster decision making cycles, in line with the widely appreciated OODA Loop (Boyd, 1987). Mission command uses the collective intellectual capacity and may thereby create an increased holistic understanding within the whole organization. Barius (2012) states that trust, intent, initiative, and common ground as key enablers for mission command. Enabling freedom of action to subordinate level means that the commander needs to encourage *initiatives*, identify which *constraints* are needed, and state an *intent* that the subordinate level can act upon throughout the course of action. The expected increased unpredictability and complexity of the future operational environment, where distances are extended at the same time as timeframes are reduced (SwAF, 2018) may affect the possibility to formulate such intents. In an adhocratic organization, initiatives are allowed in an extreme sense, since they concern not only decisions about courses of action, but decisions about organization.

Concerning trust, we assume that people learn to adopt new technology, learn about the limitations and opportunities, and learn about when to use it in different situations. Decision support systems become increasingly sophisticated, and the development of explainable or transparent AI guides the user in understanding when and when not to trust technology. Thus, it is likely that the main challenge is inter-personal or inter-organizational trust. How can trust be achieved in agile organizations, where different organizational cultures meet in temporarily formed constellations? This trust issue further relates to the future needs for enhanced joint or multi-domain warfare. Mission command demands common efforts and common values; to accomplish joint operations requires a mutual trust between branches and services. Joint action requires joint training, and joint training is needed to achieve a *common ground*. Implementing mission command put high demands on training and education of commanders at all levels, as well as a sufficient *situation awareness*.

The extent to which decisions are decentralized will vary over time. Factors such as political implications, needs for coordination and time available affect to which extent mission command is applied. The C2 principle of situation-oriented command states that the mandate to command should be given to the one who has the best prerequisites (Ashby, 1963; Johansson, 2000). That may sound obvious, but it is not trivial to determine who has the best prerequisites, when (a) the situation is experienced in different ways in different places or at different levels in the chain of command, and (b) the operational environment is dynamic and complex, and this is expected to accelerate in the future. Delegation of mandate means increased freedom of action for the subordinates to the expense of the commander's freedom of action (Uhr & Pettersson, 2018). The commander needs to know the capability of the organization and understand when to take the freedom of action back, something particularly stressed in the Israeli mission command application "optional control" (van Creveld, 1985). A continuous assessment of the situation, including feedback from the subordinate commanders, is needed in order to ensure that the operation is in line with the intended effects. Mission command enables local adjustment of the organization, and thus forms a self-healing system. However, to change the course of the operation may take longer time.

The work on C2 principles resulted in an understanding of that the principles developed by Fayol and others were not developed with an agile organization in mind. One example is the C2 principle relating to unity of command and direction. Fayol (1949) stated that one and only one commanding officer shall lead units that have tasks with the same purpose, and further that every subordinate should have only one commander. Achieving the unity of command and direction is relatively straightforward when the system boundaries are set. When the organization is based on a greater proportion of complementary capabilities, using a more service-based approach, the service provider will most likely still be commanded by its ordinary organization, where the ordinary commander transforms the request to a mission order. A simple example is that a taxi driver (service provider) is

not commanded by the person who ordered the transport or the person that is transported. Thus, although the service provider and the consumer of the service have similar purposes (arriving to end point), they will have different commanders. Further, the dynamics of the situation may affect this chain of command. During the operation, the organization demanding the service may detect an opportunity that can be exploited, which is within the rules of engagement of the operation. However outside the scope of the service that was agreed upon. This illustrates the need to provide sufficient mandate to the service provider. In order for the service provider to accept changes in the service, the service provider needs to have knowledge about the implications that this will bring. The taxi driver may accept a detour, if he or she has knowledge of such as when and where the next pick-up will be. Thus, although unity of command and direction is not always achievable, at least *unity of effort*, or perhaps a *harmony of effort* should be achieved (Brehmer, 2011).

The trend towards cheaper technology may result in increased self-sustainability, where resources that now is considered exclusive may not be exclusive in the future, but can be distributed as basic capabilities. However, the future operational environment requires more advanced technology, which will need to be requested as services. Some of these resources will be prioritized and distributed carefully from a centralized command level; however, we believe that technological development will enable the demand of resources from a local level. Future technology such as decision support systems based on AI, ad-hoc communication networks enable decentralized decision making of organizational flexibility and using an effect focus rather than a resource focus. With the flexible organization comes transaction costs (Williamson, 1979). These can be stated in terms of increased demands for training in order to obtain trust and common ground. Further, forming a new organization may take considerable time, and for this to be done, the interoperability issues need to be solved.

Vassilou and Alberts (2017) claimed that the need for broader information distribution and less constrained interaction patterns is not sufficiently considered from a mission command perspective. We claim that, considering the decentralized approach, the need for information exchange depends on whether you are in the autonomous or adhocratic quadrant of the concept spectrum. Adhocratic organizations are more dependent on information sharing capability than an autonomous organization at the corresponding level of decentralization as continuous and updated information regarding resource availability needs to be distributed throughout the organization, in order to maximize flexible use of available resources. However, electronic warfare and cyber operations pose a major threat to information sharing capability. Although improved communication and decision support technology allows networking and self-organization, such organizational forms are particularly vulnerable in this sense. Furthermore, in an information degraded environment, we expect that the local level may be more vulnerable with respect to disinformation, as superior command levels may have a larger capacity to compile information from different sources. This means that there is a *trade-off* between being flexible but vulnerable, versus being inflexible but robust. Communicating intent is utterly important, when the risk of communication being shut off is overwhelming. The decision of who has the best prerequisites to make the decisions is dynamic, and the risk of communication degradation needs to be considered. Furthermore, training in how to detect and protect oneself from information operations is imperative.

The Swedish society is to a large extent built on decentralized, flat structures. We argue that implementing mission command in a society characterized by decentralization and participation works quite smoothly. In this sense, mission command is not a purely military strategy, it is a reflection of a society where people are fostered into a decentralized thinking. We claim that “fight like you train” is easier when the training extends further than the hours spent in uniform.

4. Conclusions

This objective of this paper is to explore the implementation of mission command in a future C2 concept. In this paper, we have argued for that mission command will contribute to the accomplishment of future SwAF military operations, however the agile organization may demand an extra effort in order to obtain the prerequisites for mission command (trust, common ground, intent focus and initiative). C2 systems must be designed to incorporate both centralized and decentralized decision making, and dynamically change between these.

The relationship between C2 and the characteristics of the organization, as well as organizational agility, needs to be further explored. Relating mission command to type of operation, aspects of the future operational environment, organizational agility and the challenges and opportunities of the small state is essential in order to understand the implications of different C2 approaches. The core of mission command - Enabling timely decisions and optimizing resources is more relevant than ever in the complex future operational environment.

The developed concept spectrum, combining organizational and C2 aspects is a generic visualization. To define and express organizational agility using the concept spectrum and describe an organization in terms of basic and complementary capabilities has proven to be useful during the process of developing a C2 concept that can manage the increased complexity of the future operational environment. Already Clausewitz (1812) spoke about swift and timely decisions. However, the swift and timely decision making needs to correspond to a swift and timely organization of available assets to produce the desired effect. Commanders need to be aware of the strengths and vulnerabilities of different organizational forms, and which demands different organizational forms put on C2. As a defensive, small state we need to adjust and respond to every unique situation. We cannot afford *not* being agile. Organizational agility is to continuously anticipate when to change into a more stable organization and when the stable organization need to be more dynamic.

The predefined organization provides a stability and simplicity from a C2 perspective. The capabilities are known, and tasks are tailored to this pre-defined system. The predefined organization can still be flexible, within its system boundaries. Further, there is a robustness to disturbances in the communication systems, thus well suited for traditional mission command.

Distributing resources into pre-defined organizational clusters is not always cost-efficient and it may be a challenge to focus efforts when they are distributed in predefined clusters. When the operational environment demands greater flexibility than can be achieved within predefined organizational clusters, the organization needs to be able to adapt. Exchange of services in which capabilities from different services are temporarily used jointly during a specific mission are traditionally commanded through centralized decision making due to the exclusiveness of resources as well as high coordination requirements.

The technological development is opening the door to the adhocracy quadrant of the concept spectrum, enabling more decentralized coordination, effect focus rather than resource focus, resulting in a more agile and efficient use of resources. This is *not* to say that brigades or other well-functioning pre-defined systems should be abandoned. However, the increased opportunities to obtain situation awareness and communicate throughout the organization gives the opportunity to consider a more agile use of the organization, without abandoning mission command. However, there are some challenges. First, the amount of effort currently put into joint and multi-domain warfare is a clear example of how difficult it is to obtain cohesion and interoperability between actors. Second, the vulnerability of communication and information systems needs to be taken into consideration. A hybrid warfare threat in which an opponent attempts to utilize the weaknesses in the society, characterized by surprise and disinformation is a threat to situation awareness, primarily

at the local level. Obtaining resilience and and agility is challenging. Trust, initiative, common ground and intent focus are prerequisites for mission command, but there is a two-way relationship, where applying mission command will also enhance these aspects, creating a culture of trust and initiative. Thus, the mission command philosophy brings value to decentralized as well as more centralized approaches.

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