

## Original Study

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# A dynamic and decentralised headquarters to thrive in uncertainty

DOI 10.2478/jms-2024-0008

Received: August 12, 2024; Accepted: October 24, 2024

**Abstract:** Military headquarters have been seen as grown up to the point that this reduces the agility of decision-making and decreases the survivability of the headquarters and command posts in war. At the same time, war is becoming ever more complex and intertwined through the fast pace of information flows and technological advancements. This design science research aims to solve these problems of headquarters. The research was done by framing the problem with several theories and then designing a solution. Systems thinking and complexity leadership theories were used to understand the problem. After this qualitative coding was used to form complexity leadership themes specific to military headquarters. These themes were combined with organisational theories and the military theories of tempo-based operations. A solution was then designed through theory-based analysis and abductive reasoning and tested in exercises. This article suggests that military headquarters should not seek for one optimal organisational structure, but instead the structures should be intentionally and dynamically tailored according to the situation and context at hand. A headquarters seen through the mental model of a Dynamic Headquarters Structure (DHS) can adjust its own networking, information-flows and delegation of decision-making to thrive in different environments.

**Keywords:** headquarters, operational art, military design thinking, systems thinking

## 1 Introduction

This article suggests a novel mental model for understanding the functioning and structuring of a military

headquarters. The operating environment of western countries and NATO as the leading western defence organisation has changed towards more uncertainty. Global interconnectedness and the speed of digital information have changed the world for good. At the same time, Russia has shown aggression that might have been unimaginable to a wide audience just several years ago. It is also noteworthy that the Russian actions in the short-term point towards complex threats under the threshold of a declared war. Many uncertainties are looming in the near future that demands adaptability.

The basic headquarters structure used by Western military is derived from the age of industrialisation and forged since the battlefield experience of Napoleonic and Prussian generals (Price 2013, p. 48). These traditions date back to the latter half of the 19th century, when the Prussian wars against Denmark in 1864, Austria in 1866 and France in 1870–1871 showed that skills-based staff work opened a completely new way of preparing for a war (Rekkedahl 2013, p. 33).

In our contemporary times, there is a broad and shared impression of the ever-growing complexity of warfare (e.g. Kesseli 2013, p. 3; Palokangas 2022, p. 146). The intertwined and uncertain nature of conflicts has been increased by, among other things, the acceleration of the information dimension and the new dimensions of conflict in the cyber and space domains. Similar phenomena have been identified in the dimension of economic competition (Uhl-Bien et al. 2007, p. 299).

The paradox of industrial-era headquarters working in information age warfare has come with a price. Headquarters have grown too big and too vulnerable while trying to process all the information. One of the experiences of the ongoing Russian-Ukrainian war has been the number of casualties taken by Russia at the level of army, army corps and division headquarters. The precision fires have been able to reach the centralised command posts on a level not expected. There has been seen a trade-off where a headquarters is either not effective enough if decentralised or not survivable enough if centralised. (Scherrenburg 2020, p. 2; Beagle et al. 2023, p. 11–12). The

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current NATO doctrine on headquarters structures and debate in more detail are presented in the next chapter.

To address the paradox, the aim of this research is to design a solution for organising a headquarters to thrive in uncertainty. As a result, the article suggests a construction: The mental model of Dynamic Headquarters Structure (DHS model) would not just answer the tension, but as argued in this article use the complexity in its own advance and thrive in uncertainty. This prototype deconstructs the mental model of one optimal, static organisational structure that needs to be found and chosen correctly. Instead, it suggests reframing the concept of organisational structure anew and seeing it in a dynamic way, as a mental model and as a tool for leading an organisation. A headquarters should be a dynamic and proactively changing entity, instead of a static, optimised one-size-fits-all -solution. To do this, the implicit current metaphors are critically addressed.

The DHS model is a method to gain an advantage in tempo-based conflict, a method to increase adaptability and a method to also use the best practices of expertise with context-dependent rationalisation. The model is a tool for the chief of staff (COS) to lead the headquarters and to take proactive part in the sculpturing of the operating context. It is also a model to speed up one's own decision-making to gain an advantage in tempo-based conflict, in other words, a method to facilitate the ability of an organisation to grab the initiative and cause surprises to the enemy.

The model suggests that the COS of a headquarters should restructure the headquarters' organisational structure proactively, so that the headquarters is not just adapting to changes that have already occurred, but to be intentionally dynamic to gain advantage. The DHS model has built-in implicit characteristics that support leading in complexity. According to qualitative coding and narrative literary review, the main characteristics for a headquarters to thrive in uncertainty are information sharing, networking and delegation of decision-making authority, which address the main characteristics of complexity.

The next chapter of this article sets the background and methodology. The current NATO structure and logic of a deployed joint task force headquarters is presented first. Then the methodology and methods are explained. The third chapter frames the problem with different theoretical frames. The main theories used are those of systems thinking and complexity leadership, the contingency theory of organising and the tempo-based operational art. The result, the DHS model with its functions, is introduced in fourth chapter. The last chapter takes critical reflection and further discusses the validity of the model.

## 2 Methods

This chapter explains the background for the research. The first subchapter introduces the NATO model of headquarters structures. The second subchapter introduces the problem statement, the use of design science research and the use of methods. This article is qualitative and based on the philosophy of pragmatism. A holistic approach to information is used (Saunders and Tosey 2012, p. 58–59). The research builds on abductive reasoning to open new frames and to design a novel prototype. The validation of the results is expected through the test of time and real-world impact.

The problem statement in this research is to address and use for own benefit the ever more complex conflicts through designing the organisational structure of a headquarters anew. The main research question is *'What kind of headquarter structure supports the ability to survive and thrive in tempo-based operations and uncertainty?'.* The research question was based on the doctoral dissertation of Hanén (2017, p. 193) as he saw that the main focus for future research with complexity should aim towards empirical and practical study to test the implementation of complexity theories.

The first prototype of the DHS model was developed as part of a General Staff Officers Course thesis project in co-operation with the Finnish Border Guard. In the project, a structure was studied for a future operating environment, but the environment seemed unpredictable and optimisation seemed unreliable. A solution was designed for the user and this article represents a general and evolved construct for wider use. The writers of this research paper authored the project and it was presented in a thesis of the first writer, but as the details on this project are undisclosed the details are unavailable.

### 2.1 Current model of NATO headquarters structures

The operational command structures in NATO are defined in the Allied Joint Doctrine for the Conduct of Operations AJP-3 (NATO 2019). This doctrine also has an annex for joint staff functions. The NATO Center of Excellence for Command and Control (C2 COE) is responsible for the research on future ways of organising (Allied Command Transformation 2023). The basic organisational structure for a deployed joint task force headquarters is a staff directorate with cross-functional staff structure (NATO 2019, p. 3–15). The staff directorates are coded according

to their processes, activities and capabilities as presented in Figure 1 below (NATO 2019; Annex 2, 3–15).

Figure 1 below presents the different J-coded (J for Joint) directorates as red boxes and the different cross-functional entities in orange boxes. The same system is widely used in western armed forces. Both NATO and also the US Joint Staff argue that cross-functional entities – centres, groups, cells, bureaus, offices, elements, boards, working groups and planning teams – should be used to support the directorate structure through the headquarters processes. The US Joint Staff has argued on clear benefits in this structure of directorates for effectiveness, efficiency, administration, accountability and functionality (Joint Staff J7 2019, p. 5; NATO 2019, p. 3–15).

C2 COE has been working towards solutions to facilitate innovations on command structures for the future of Multi-Domain Operations (Allied Command Transformation 2023). Two different C2 COE working papers have seen the future operating environments as more volatile, uncertain, ambiguous and complex (Scherrenburg 2020, p. 1; Hornstra et al. 2024, p. 7). The current large footprint and static headquarters are seen as high-value targets and should be evolved to distributed and dispersed (Scherrenburg 2020, p. 2). The US Army has drawn the same conclusion (Beagle et al. 2023, p. 13).

Beagle et al. (2023, p. 11–12), Scherrenburg (2020, p. 2) and Hornstra et al. (2024, p. 7) have all called for more agility, flexibility or resilience. Scherrenburg (2020, p. 3) as also Beagle et al. (2023, p. 7) see that a future headquarters should be physically dispersed to several locations and this will be made possible by the increased use of technology and support of non-human intelligence collaborators or artificial intelligence tools for operations assessment, risk assessments and decision-making. Hornstra et al. (2024, p. 7) see the solution in more agile methods and more effective training programmes.

According to NATO doctrine, the headquarters can be modular and adapted to current operation, but the structure for a situation should be decided ‘as early as practicable’ (NATO 2019, p. 2–3). The US Joint Staff J7 (2019, p. 1) defines this the same: the solution is seen in determining mission-specific requirements through early commanders’ guidance of the roles and functions within the headquarters, with structured knowledge management processes and better coordination (Joint Staff J7 2019, p. 1).

The above-mentioned demands of contemporary conflicts are recognised in this research, but the solutions are seen as different. There have also been different approaches to organising military forces, for example by US Colonel John Boyd and Admiral Stanley McChrystal. Their ideas are

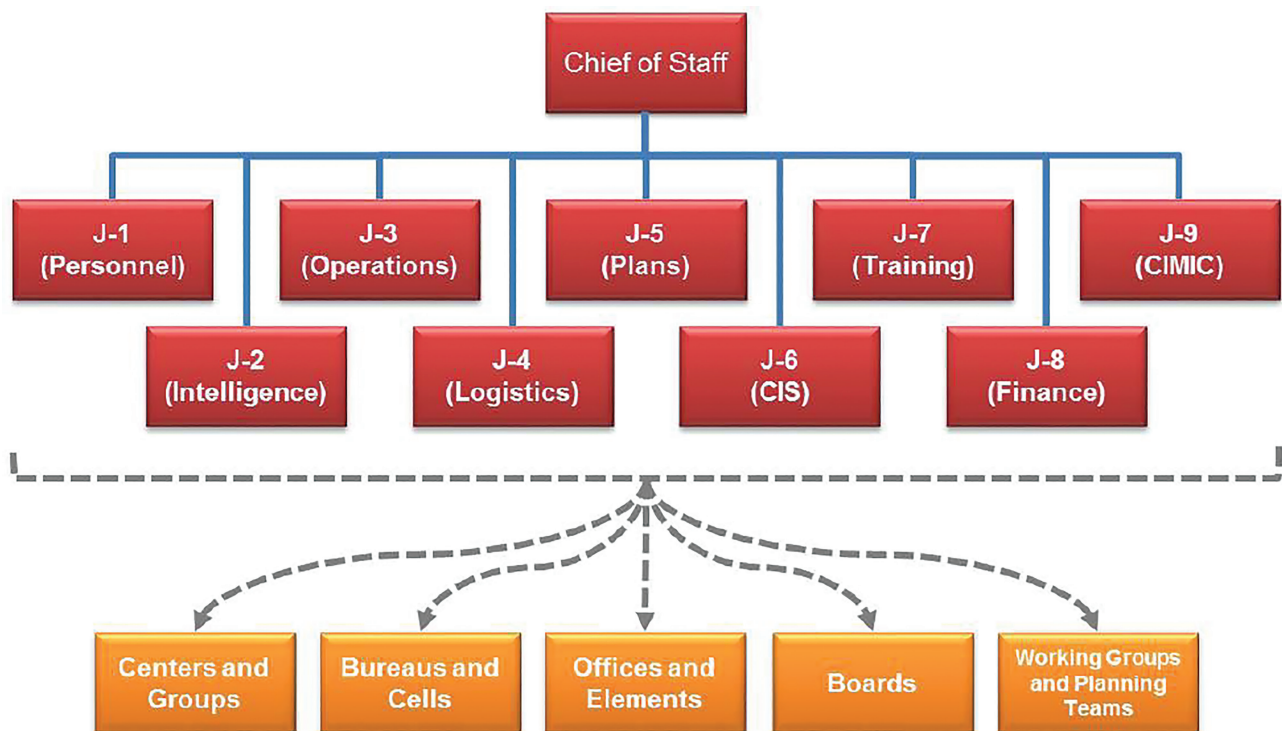


Figure 3.2 – Cross functional staff

Fig. 1: NATO Joint Force Headquarters cross-functional staff structure (NATO 2019, p. 3–15).

presented in the next chapter. The current NATO doctrine is not seen in this research as a constraint and even it can be seen as enabling quite many different solutions.

## 2.2 Research layout

This research was based on design science research, which is a methodology to advance from a problem framing to theory forming to prototyping a solution. The background for this is in design philosophy, which has been seen as *‘the conception and planning of the artificial’* (Buchanan 1992, p. 14). Design thinking in general aims to find novel solutions for a problem, whereas the design science research aims also to contribute to the existing knowledge (Piirainen and Gonzalez 2013, p. 213).

Design science research as a methodology aims to *‘imagine new realities and build them to see whether they work’*, instead of just analysing what already exists (Koskinen et al. 2011, p. 42). This happens through two distinct phases: the problem framing and the designing of solution. The problem framing aims to clarify the situation and to produce theories that describe the context (Perna 2013, p. 13). The constructions or artefacts that are designed or constructed can take the form of a model, method, concept, product, system, mock-up or prototype (Koskinen et al. 2011, p. 5–6; Piirainen and Gonzalez 2013, p. 209, 213). These constructs are aimed to cover some part of the problem frame (Piirainen and Gonzalez 2013, p. 213). Designing a solution or a prototype is not unambiguous, as it *‘occurs in the context of the indeterminacy of wicked problems, before the final result is known’* (Buchanan 1992, p. 18). This layout of the research is visualised in Figure 2 next.

As mentioned and as seen in Figure 2 the research layout has two distinct phases. The phase of problem framing is based on a real-world problem of fast paced contemporary conflict and the dilemma of headquarters balancing between effectiveness and survivability. The frame is built in a multi-paradigmatic way by looking at the problem with several theories and frames. These theories are represented in Figure 2 in the boxes, which frame the problem in the middle. The methods used are qualitative methods of narrative literary review and qualitative coding. Theory-based analysis was used for prototyping the solution.

For the literary review, every theory was approached with a hermeneutical approach. The hermeneutical approach was first used to find relevant scholars and then insights were included until a saturation was met. The narrative literary review aims to give a wide frame and to arrange the subject theories (Salminen 2011, p. 7). The complexity frame in this article emphasised Scandinavian and particularly Finnish researchers, as the functional and pragmatic solution suggested in this article were designed in this culture. Heltberg et al. (2024, p. 7) have suggested that the characteristics of Scandinavian culture are low hierarchy and high-trust societies, with the public-school system providing values of empathy, problem-framing, creativity, collaboration and reflective thinking. They suggest this makes an efficient ground for design thinking. Martela (2023) has suggested that Finland is spearheading a trend of Nordic minimalist leadership which supports initiative and innovation with a focus on supporting the ability of all employees to do their best. As part of all this, the Scandinavian military cultures have been seen as *“less hierarchical, and their*

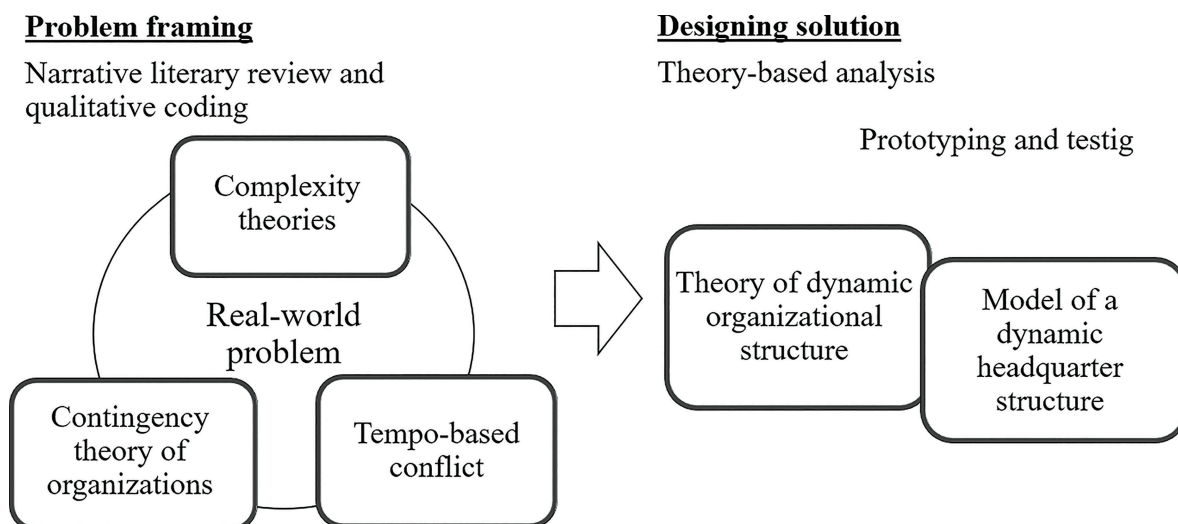


Fig. 2: Theoretical framework and research layout.

*operational planning ‘staff-driven’ rather than ‘commander-driven’*” (Heltberg et al. 2024, p. 7).

Qualitative coding was used to study the features of complexity to form themes and characteristics relevant to the aim of his study (Puusa 2020, p. 152). The qualitative coding was done by taking quotations from researchers on the characteristics needed in complexity leadership. These were taken to an electronic platform. On the platform, the quotations were first arranged to recognise the interconnectedness and relationships between them. As the final step, the themes were formed by arranging the suggested characteristics to groups according to similarities.

As the focus of the research was on the military organisation the article also represents operational arts and tactics, which are concerned with the principles of war, including the processes of military headquarters (Kesseli 2008, p. 11). The operational art is here understood in a broad definition of it being concerned with situation-dependent, contextual solutions, not just as arranging battles in time and space (Kesseli 2013, p. 3).

### 3 New frames for headquarters

This chapter with its sub-chapters frames the problem with the theories of the research layout. Systems and complexity thinking have been previously used by several military scholars, for example, Boyd (2018a, 2018b) and Naveh (1997), both of who can be seen as influential to contemporary western military doctrines. Paparone (2013, p. 35) has suggested that the metaphors derived from complexity theories can be seen as one of three main sources of metaphors in military art. McChrystal et al. (2015) and Boyd (2018b) have also used the complexity theories in addressing the ways of organising military decision-making and information flows.

To form a background first general systems theory and different decision-making environments are defined. The first sub-chapter will introduce the headquarter-specific characteristics of leading in complexity. The second sub-chapter will build further with theories of context-dependent organising. The third sub-chapter brings these theories together with the military theory of tempo-based operations and then summarises the theoretical frame. Even though these theories could be addressed as intertwined, in this article the theories are addressed separately to facilitate an innovative construct that has not existed before.

Wars as a whole are often described as complex. These definitions can be found from different perspectives and different cultural contexts. US scholar and professor

Vego (2006, p. 53–54) has argued that the ‘[r]eal world is highly complex and dynamic’. US general and secretary of defence Mattis (2008, p. 24) wrote that he wants he’s troops ‘to reinforce the reality that conflict is inherently complex and unpredictable. It is a nondeterministic human endeavor whose ramifications are never fully guaranteed because our adversaries have free will, which will inevitably impact the operating environment in unpredictable ways’. This same view has been shared in other countries too and for example, Finnish colonel (ret.) and professor Kesseli (2013, p. 3) has written that ‘[w]ars have changed to become highly complex’ (translation by writer).

When describing a war as a whole, war definitely can be described as unpredictable, dynamic and even complex, but any conflict involves different areas and domains that are facing different levels of action. This article sees a conflict as a combination of several decision-making environments, changing situations and contexts at once. These different contexts are encountered on the operational and tactical levels of warfare in different areas, domains and moments. For this purpose, the general systems theory and complexity theories are used to form the cognitive tools to describe these different environments.

Systems thinking differs from analytical thinking, as it does not take the environment as a static and structural, but instead focuses on the functioning and behaviours of the whole (Skyttner 2001, p. 31). This holistic approach to environments is combined in this article to conflicts. Conflicts have a unique characteristic in the form of actively hostile activities which aim to subdue one’s enemy (Mälkki 2013, p. 3). Systems can be also viewed as belonging to an environment, acting as a sub-system to it, and having constant mutual influence to each other’s processes and behaviours (Skyttner 2001, p. 59). In this article the word environment is used in an abstract form covering the operating environment as an open system, which includes all the interrelated parts: enemy and other actors, physical, psychological, digital, information and social domains.

The main characteristics of complexity can be described as connectedness, non-linearity and emergence (Mäki 2020, p. 87). This article represents the so-called metaphorical complexity science which instead of structuring models or simulations uses the vocabulary and concepts of complexity in describing reality (Hanén and Raisio 2017, p. 108; Puustinen and Jalonon 2020, p. 18–19). Complex environment lacks linear single causalities, definable order and predictability. Instead the environment can be dynamic and in constant unpredictable change. Still this should not be seen as randomness, but instead rather as plural causality (Gilpin and Murphy 2008, p. 42).

It has been argued that if an organisation is viewed through complexity thinking, it should be compared to a constantly evolving living organism, instead of a mechanical machine (Puustinen and Jalonen 2020, p. 33–34). On the other hand, for an organisation or any other entity to be viewed as a complex adaptive system, it needs to ‘*demonstrate goal directed adaptation*’ (Mittleton-Kelly 2003, p. 7). Complex adaptive systems have also been seen as self-organising and as systems where sufficient learning takes place (McMillan 2006, p. 11). These metaphors are discussed later in this article, as the chosen language (whether it is implicitly or explicitly chosen) is seen as a big part of the frames that are set (for frame awareness see Banach and Ryan 2009, p. 107).

The complexity leadership has been defined in several ways, for example as adaptability, learning and creativity as the main characteristics (Uhl-Bien et al. 2007, p. 298). Quick, local responses and organisational learning have also been suggested as important (Gilpin and Murphy 2008, p. 43). This article will address complexity leadership more at the next sub-chapter as part of the headquarters specific characteristics.

Instead of seeing every environment as complex, this article suggests a wider framework to view conflicts. The cynefin framework presented by Snowden and Boone (2007) divides the situations and environments according to the systemic qualities of five different contexts of decision-making, according to the ‘*nature of the relationship between cause and effect*’. They see that

systemically different contexts ‘*require leaders to diagnose situations and to act in contextually appropriate ways*’. The sense-making framework makes it possible to move beyond linear-rational logic, if the situation does not follow those traits (Franke 2011, p. 15–16). The cynefin framework is presented in Figure 3 and explained next.

The upper part of Figure 3 shows structured and ordered contexts, where causes and effects can be defined. These ordered environments are the contexts where pre-established solutions can be used and the aim can be in efficiency of the problem solving (Franke 2011, p. 13). These ordered contexts are divided into simple and complicated contexts. Simple environments are the ones where the situation can be first assessed and categorised and then an established solution can be chosen to respond. As such, this is the domain of best practises. (Snowden and Boone 2007, p. 68). From a military perspective this means using standard operating procedures and from the headquarters perspective, these tasks can be tasked to an individual expert responsible of the said subject.

Complicated contexts have multiple cause and effect chains at once and can contain multiple right answers, compromises and several domains of expertise. Still, the causes and effects exist to be found, as complicated as they can be. Complicated contexts can be seen as the domain of experts and require the decision-makers to first sense the situation, then analyse it instead of just categorising and then choose the answer through the analyse. (Snowden and Boone 2007, p. 68). In the military

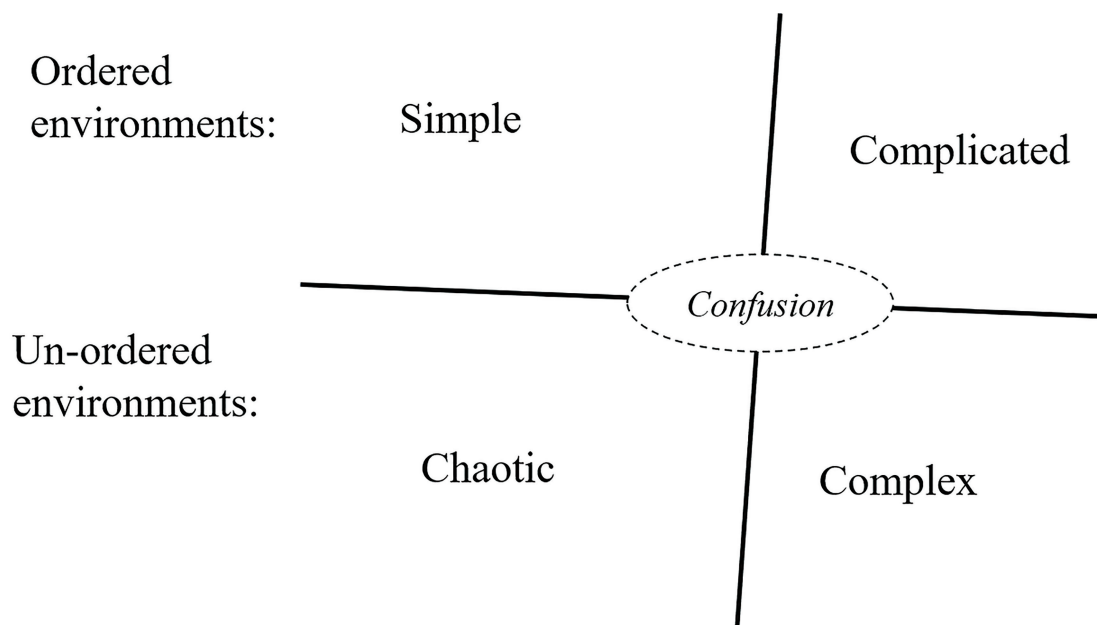


Fig. 3: Environments of the cynefin framework as presented by Snowden and Boone (2007).

headquarters' perspective this is the domain of planning groups and the domain of linear planning processes.

In the un-ordered environments at the lower part of Figure 3, the causalities cannot be recognised as the situation is ongoing or does not even exist. As mentioned earlier, complex environments do have causal relationships, but these are plural and loose and through this unrecognizable beforehand. This is the domain where there is no actual right answer and different unknown unknowns exist. This domain requires own actions to learn more about the environment and then adjusting own actions after new information emerges (Snowden and Boone 2007, p. 68). All this means that adaptability and resilience is needed instead of control to respond to rapidly changing uncertainty where *'the system does not work as expected'* (Gilpin and Murphy 2008, p. 41). Complex decision-making environments can still further be separated from the chaotic domains, where the causal relationships actually do not exist. In this domain survival is paramount and this can be accomplished also through strict top-down communication to survive until more sense can be made (Snowden and Boone 2007, p. 68).

It has been suggested that the complex and chaotic domains are the ones that Clausewitz wrote about for example with his concept of friction of war (Franke 2011, p. 13). At that point the reigning scientific paradigms were based on physics and reductionism, so the theoretical foundations did not exist to describe his observations of war (Hanén and Huhtinen 2012, p. 19). In military context complexity science really got support in 21st century through unpredictable counter-insurgency operations in Middle-East and further around the globe.

As a conclusion, for most organisations the majority of events and problems encountered are predictable, either simple or complicated. The simple environments require best practices, standard operational procedures and differentiation. Complicated environments require expertise and planning processes. Still not all environments can be controlled, predicted and planned and in these environments different approaches are needed.

### 3.1 Headquarters-specific complexity leadership themes

Through qualitative coding three headquarters-specific complexity leadership themes are suggested: information-sharing, networking and delegation of decision-making authority. These themes were named with pragmatic headlines, so that they could be used for real-life purposes. The themes are formed to implicitly produce

other characteristics needed for leading in complex environments.

As the first theme, leading in a complex environment emphasises information exchange (Hanén 2017, p. 177; Puustinen and Jalonen 2020, p. 30). There is also a broad consensus, that in an interdependent context the information has to be holistic (Hanén and Raisio 2017, p. 112–113, Puustinen and Jalonen 2020, p. 17). In this article this theme is called information sharing, as for the headquarters to function, the information needs to reach the relevant users and this requires proactive functions. This can be enforced by emphasising the importance of open information-sharing platforms and interaction between different actors.

There is also another perspective to view information, which gives this theme its pragmatic form: The information is needed for decision-making. According to Luoma and Lindell (2020, p. 81) the characteristics of information are evaluated as part of meta-level decision-making, where it is decided which information is taken in consideration and how decisions are made. As part of this, the holistic information gives subordinates the capability to follow the so-called mission command, to make independent decisions and to adapt to changes (Hanén and Raisio 2017, p. 112–113). When thinking of whether to share a piece of information, it should be remembered that one can only make decisions on things one is aware of (Czarnecki 2018). According to Boyd (2018a, p. 239) one has to *'emphasize implicit over explicit in order to gain favorable mismatch in friction and time'*. Lundström and Mäenpää (2020, p. 40) argue that instead of *a single plan*, the focus in complexity should be in holistic and non-linear *planning*.

The theme of networking holds in it several concepts needed to thrive in uncertainty. The theme intertwines with self-organisation, cognitive diversity, loose coupling and group processes and with these makes multidisciplinary decision-making possible. The theme is called networking in order to give clear guidelines of the type of activity needed. Hanén and Raisio (2017, p. 112–113) emphasise diversity of views and enabling of self-organisation. Self-organisation is seen as important by several other researchers also (Hanén 2017, p. 190; Ahonen et al. 2020, p. 245; Mäki 2020, p. 87; Puustinen and Jalonen 2020, p. 30). Mitleton-Kelly (2003, p. 9) encourages networking and a multiperspective approach and Uhl-Bien et al. (2007, p. 303) suggest diversification by increasing the *'number and level of interdependent relationships'*. Networking also overlaps with information sharing and information has been seen as the energy that keeps an organisation in existence (Hanén 2017, p. 177).

To reach this, it is argued that loose coupling should be emphasised (Hanén 2017, p. 191). Loose

coupling enhances resilience and ability to recuperate from damage, whereas tight coupling enhances efficiency if efficiency is seen as the ability to do a maximum number of functions in a certain time (Czarnecki 2018). In the complex domain the aim shouldn't be on efficiency, but rather adaptability. The idea of timely decisions in relation to the activities of the enemy, not in relation to a unit of time, will be addressed later in this article in more detail.

The loose coupling should be taken to practise through interaction of the personnel. Theory suggests that interaction should be local (Hanén 2017, p. 138). When multitude and various relations are established and maintained, an organisation will become more resilient to surprises. According to Boyd (2018a, p. 240) the leader has to set conditions for the subordinates to be able to interact continuously with each other and with the external world, as this creates ability for implicit shared orientations and images of impression in moments of stress.

The theme of delegating decision-making authority is something often argued distinct for military organisations trying to exercise mission command, but it still is something a lot easier said than done. The theoretical background for this comes from the constantly dynamic environment, which dodges the linear plans made beforehand. Hanén (2017, p. 161) emphasises the value of naming and giving a meaning to a situation. Puustinen and Jalonen (2020, p. 30) emphasise adaptation towards the ongoing action. Ahonen et al. (2020, p. 245) suggest experimenting, as there are multitude of courses of actions, of which none alone solves the tangle of the complex situation. Uhl-Bien et al. (2007, p. 309) suggest that one should '*enable conditions that catalyse adaptive leadership*'.

The flexibility of actions is seen as a way forward towards better results (Mäki 2020, p. 87; Czarnecki 2018). In the military context, this is often understood through the concept of mission-type orders and mission command (Hanén 2017, p. 190). According to Czarnecki (2018) this also demands recruited, trained, and empowered so-called strategic corporals.

### 3.2 Context-dependent organisational structures

This chapter continues the multiparadigmatic framing with the contingency theory of organizational management and behaviour. This theory will be addressed with the systems perspective and cynefin framework. It is suggested that organisations should follow the systemic qualities of the environment instead of trying to find a

one-size-fits-all solution for an organisational structure. This chapter discusses organisations in general, but also the headquarters as a specific form of an organisation.

From systems perspective an organisation can be described as a collection of personnel and material, which are interconnected through communication and aim for a specific purpose (Skyttner 2001, p. 53). The developers of the contingency theory, Harvard Business School professors Lawrence and Lorsch (1967, p. 6), also set a premise of viewing organisations as open systems with interrelated behaviours of its members. The systems thinking sees an open system as something that is in constant interaction with its environment and constantly exchanging matter, energy and information (Skyttner 2001, p. 58).

The contingency theory sees that the organisations as systems need to adapt to its environment. As the organisations grow, they differentiate into parts that specialise to certain functions but still are integrated to aim for a shared purpose (Lawrence and Lorsch 1967, p. 7). With the premise of organisations constant interaction and adaptation to its environment and the different environments presented by the cynefin framework we have a broad understanding to proceed to different structures applicable to different environments. This has been visualised by US admiral Stanley McChrystal (2017) as presented in Figure 4 next.

In Figure 4 above the different organisational structures are presented tied to the cynefin framework (McChrystal 2017). The vertical axis depicts the adaptability and degree of freedom for the parts and at the same time the amount of headquarter-specific complexity leadership themes needed. The parallel axis depicts the pace of change and the amount of unpredictability encountered in the environment. The bottom left part of Figure 4 suggests that simple environments require efficient segmentation of tasks. This 'mechanistic' structure is suitable for an organisation operating in '*relatively stable conditions*' (Lawrence and Lorsch 1967, p. 187–188). The mechanistic organisation structure can be optimised through best-practises, processes and technology that suits the operations. At the same time this linear, hierarchical, vertical and formal model has faced critique for offering limited flexibility and communication flows (McMillan 2006, p. 167).

The middle part of Figure 4 presents a networked structure suitable for constantly changing conditions which already Lawrence and Lorsch (1967, p. 187–188) called 'organic'. Complex environments have been seen as demanding for de-centralised, cross-functional teams, cells or '*multifunctional miniature think tanks, designed to tackle issues for senior commanders*' (Price 2013, p. 50).

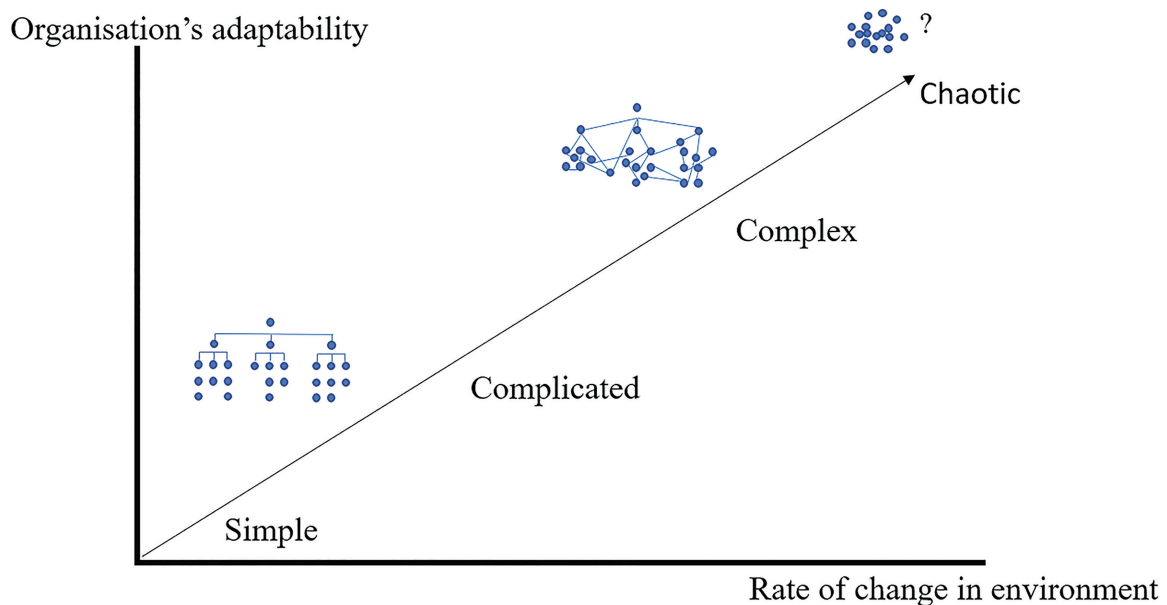


Fig. 4: McChrystal's (2017) visualisation of organising in the cynefin framework.

This concept of team-of-teams suggested not just by technological start-ups, but also by McChrystal et al. (2015, p. 128–130) is familiar to many soldiers. With all this, it has been suggested that a balance should be found between mechanistic and organic approaches (Hanén 2017, p. 183).

Further on, Boyd (2018a) has suggested that complex environments demand also leadership and organisational culture qualities that support the functions. This should be accomplished through:

*'A command and control system, whose secret lies in what's unstated or not communicated to one another (in an explicit sense) – in order to exploit lower-level initiative yet realize higher-level intent, thereby diminish friction and compress time, hence gain both quickness and security' (Boyd 2018a, p. 235).*

Lawrence and Lorsch (1967, p. 238–239) already saw the future of their time going to be more unpredictable. To address the unpredictability, they saw one of the most important function of the top managers to be in designing *'new forms of complex organizations to better achieve the multiple purposes of our evolving civilization'* (1967, p. 245). This is the background on which a dynamic, proactive mental model of context-dependently changing organising is suggested.

### 3.3 Adjusting speed through loose coupling

The third part of the theoretical framework of the research was the operational art. Here the focus is on the concept labelled as tempo-based operations (Kajanmaa 2021,

p. 53). The idea of tempo-based conflict is to win by keeping up one's own pace to first out-think and then out-maneuvre the opponent. This was explained first by Boyd (2018b, 155) in his presentation *Patterns of Conflict* through the relativity of one's own and the enemy's observation-orientation-decision-action (OODA) loops.

This concept of operations was first introduced to the domain of fighter aircrafts on the tactical or even technical level of warfare, where the analogy was transferred up to operational level. The idea was for the best fighter pilot to *'react to the enemy's maneuvers at a much faster tempo than their opponents could react to theirs, causing enemy fighters to become confused, under- or over-react as the fight progressed, and eventually lose the ability to control the situation'* (Stalk and Stewart 2019).

Boyd (2018a) also tied organising to his theory in his lecture *Organic Design*. This can be seen as a tool to tempo-based operational art. He has suggested that when designing an organisation:

*'Arrange setting and circumstances so that leaders and subordinates alike are given opportunity to continuously interact with external world, and with each other, in order to more quickly make many-sided implicit cross-referencing projections, empathies, correlations, and rejections as well as create the similar images or impressions, hence a similar implicit orientations, needed to form an organic whole' (Boyd 2018a, p. 240).*

Now the theories have been introduced in the forms that they were used in this research. At this point the most relevant theoretical contribution has been the introduction of the headquarters-specific complexity leadership

themes. Before the solution phase of the research is started, a critical reflection as suggested by design theories was applied (see e.g. Piirainen and Gonzalez 2013, p. 211). Banach and Ryan (2009, p. 107) have argued that the language used will implicitly categorise and structure our thinking and perspectives.

Using the word *adaptation*, a metaphor from complexity in biology, could – lead to reacting to changes that have already occurred as the desired state. Goodwin (1994, 178), a researcher who spearheaded complexity theory in 1990's, describes adaptation in biology as '*a modification that makes species better able to survive in a particular habitat*'. Earlier Puustinen and Jalonen (2020, p. 33–34) compared organisations to constantly evolving living organisms, making a distinction from the metaphor of a mechanical machine. Paparone (2013, p. 31–32) has suggested that all language comprises metaphors – '*Extension of meaning is the only way to communicate about novel experiences*' – but when the extension does not meet the needed meaning, they become 'dead'.

Taleb (2013, p. 4) has used the term antifragile to describe an entity that thrives in an unordered environment. He describes this with an example of a forest fire that gains from wind that would put out another fire. From military perspective some guerrilla and insurgency movements have been able to accomplish the same and gained more momentum even though constantly losing firefights and battles. Antifragile entities should tolerate uncertainty and even love the possibility of mistakes to not paralyse when facing unpredictability. The term antifragile as itself might not be the needed term, but as a metaphor it does represent the qualities needed.

With this critical discourse on the metaphors, this article suggests that a headquarter should be led to be adaptive. It should be intentionally and dynamically operating to be one step ahead and owning the uncertainty. Instead of a biological metaphor of adaptation, another metaphor is suggested: dynamic. One should take an active part in shaping the environment proactively in the tempo-based conflict, not just adapt to the changes.

The theories so far would suggest that for an organisation to survive in constantly changing situations, the organisation should be able to be resilient and adaptable and the structure should be context dependent. The COS is the one who could facilitate this by ordering changes to the structure and to the physical location of personnel. This adaptable and context-dependent organisational structure would build a new, fluid way of looking into organisations. This article suggests still one more step: That the biological metaphor of adaptability, used in most of complexity science, is not enough to describe

organisation in a reciprocal, intentionally hostile competitive conflict environment.

To conclude, the frames built in this article suggest that different ways of arranging an organisation are needed in different operating environments. The theoretical framework of this article started with complexity theories, contingency theory of organisations and tempo-based operational art which are presented in their forms essential to this research in Figure 5.

Figure 5 arranges the theories presented in this article to form a theoretical framework for the dynamic organisational structure. Instead of trying to fix one suitable solution from somewhere in the continuum between mechanistic and organic, a different concept is suggested. The theories suggest that in order to survive an environment which is changing more rapidly than your organisation permits you to adapt, you must be able to push the structure to the equivalent systemic level or beyond. This also suggests that there is a possibility to increase your speed of decision-making up to grabbing an initiative, by pushing beyond the level demanded by the systemic qualities of the environment.

Even as this design builds on tempo-based conflicts, subtle hints can be found also from the business management research. Uhl-Bien et al. (2007, p. 303) have suggested that a business entity can increase its internal complexity until '*exceeding, that of competitors or the environment*' to achieve '*responses to environmental problems include counter-moves, altered or new strategies, learning and new knowledge, work-around changes, new allies, and new technologies*'.

In the end the suggestion of this theoretical framework is quite straightforward: If higher speed or tempo is needed, the organisation needs to loosen control, delegate the decision-making authority for local decisions and boost the network with liaison officers and multiparadigmatic collaboration. The organisational structure should be changed proactively to accomplish this. With tempo, one will compromise some of the efficiency of simple tasks and the mental model can also be cognitively demanding. This theoretical frame was used for building the solution presented in the next chapter.

## 4 Conclusion: The dynamic headquarter structure model

This chapter suggests that headquarters should be seen through the Dynamic Headquarter Structure (DHS) model. The theories presented suggest that when facing

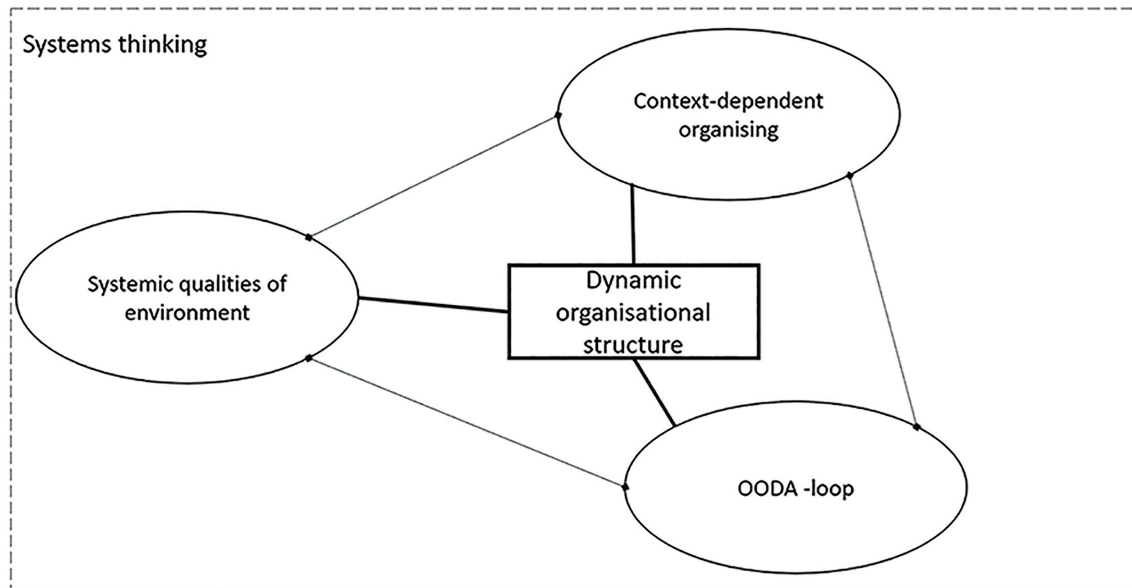


Fig. 5: Theory-frame for dynamic organisational structures.

uncertainty, the model needs to be dynamic and to adapt proactively. The prototype was constructed through theory-based analysis building on the framed problem statement. After this it was tested with the original co-operation entity in a military exercise.

The DHS model has the headquarters-specific complexity leadership themes as built-in. With this concept of built-in characteristics, complexity-leadership-by-design, this study's problem statement is met specifically with a model related to the organisational structure and operating principles, and does not require extensive changes in other functions (such as changing organisational culture or training). Dynamic headquarter structure proactively follows the conditions of systemically different operating environments while also increasing resilience. It is scalable to different troop strengths. In answering the question in this way, adequate simplicity was also considered important, so that the concept does not require heavy training packages or other special changes.

The main sub-part of this system is a *multifunctional cell*. A multifunctional cell is a situationally formed, geographically co-located group, which is built from experts of different headquarter branches or centres. As their main task, the experts are still in a management relationship with the chief of their own centre, even though they work remotely to their chief. These multifunctional cells need to include representatives of all the centres of the headquarters. Through this the cells are ready to act as planning groups and take responsibility of planning an operation with needed collaboration with counterparts. For example, an operations officer can hold his daily task

under the direction of the chief of planning, but when situated with experts of other centres, he is immediately ready to act as a planner for a specific operation. Operating in a multifunctional cell ensures continuous dialogue between the personnel of the different centres and the flow of information within the headquarters. The model is visually presented in Figure 6.

The model starts from the upper left corner of Figure 6 with basic hierarchical structure and with tasks differentiated according to standard operating principles. This offers optimisation for systemically simple conditions. The blue dots, orange squares and green triangles depict persons with their main speciality. When the headquarters encounters an unexpected situation, a necessary multifunctional planning group is established to assess the situation and plan own activities. When moving from planning to implementation, the members of this planning group can be tasked to lead a separate task organisation or tasked on Tactical control (TACON) or operational control (OPCON) to join a counterpart organisation. A cell can also be dismantled anytime back to the own offices of each participant.

As presented in the upper right corner of Figure 5 if the situation continues to be unclear and fragmented, a structure of several multifunctional cells can be formed. The personnel tasked to each cell are able to continue their previous task at some level through remote-work principles, but the main thing attained is the enhanced networking and information flow through the cell. This creates ability to consider the geographical location of each cell and shorten distance to situationally relevant

collaboration counterparts. Meetings are easier to arrange when the distances are short. Choosing a relevant location also enhances areal situational awareness of not just one cell but the whole headquarters. This all gives the cell an ability to act as a functional planning group. As the information flows and networking is implicitly enhanced, decision-making authorities can be delegated.

As seen on the bottom part of Figure 5, the model can be used with focus on dispersing the multifunctional cells geographically in locations relevant to the situation. Decentralisation builds resilience and survivability in case of interruptions in either communications connections or with military or other physical threats. It is noteworthy that the functions of the main fighting force should not be dispersed and reduced so that the headquarters cell would function as an operations centre or miniature headquarters in a certain geographical direction.

The delegation of decision-making authority is not something that can be decided solely by the headquarters. The commanding officer can support the model by meeting his subordinates to push the information and form shared awareness. At the same time, the headquarters should always act as the commander's support entity.

By avoiding reduction, each cell maintains the ability to take at least in a limited scale the responsibility of all of the headquarters functions in case of interruptions. Through geographical dispersion, the cells give an option to move the operations of the headquarters to a new geographical focus by strengthening one of the posts and 'creeping' the functions towards that new main area.

The most important staff processes should be explicitly followed in the staff even in the face of surprises, so that there are shared processes for collective action. Administrative tasks of normal conditions should be always maintained by at least part of the staff. This all sets demands for the COS, who needs to step out from traditional COS role controlling all the possible details.

Through the DHS model, the headquarters should have operating procedures with implicit, built-in qualities to enhance the information-pushing, networking and ability to delegate decision-making authority. To support the information flow and localised decision-making, the headquarters should focus on supporting the subordinate units and to strengthening a shared situational awareness and a common understanding of the goals (the so-called commander's intention). In rapidly changing situations,

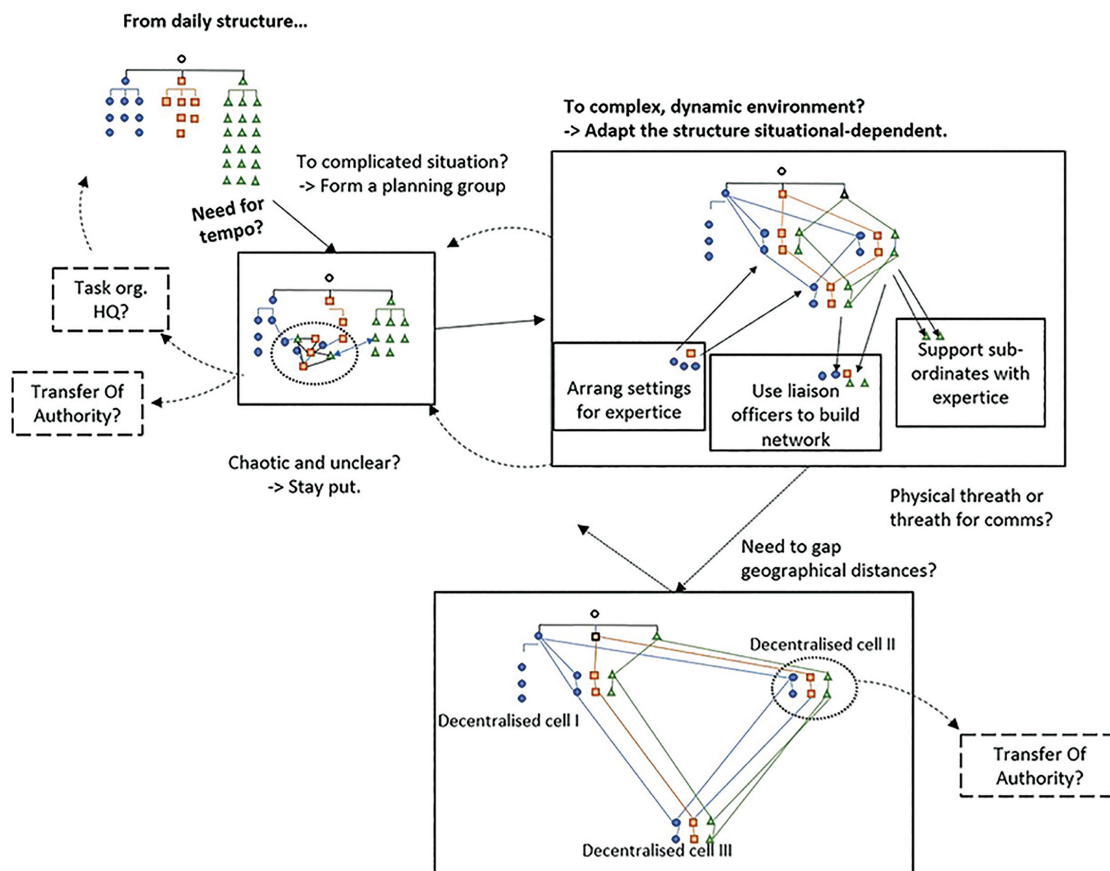


Fig. 6: The dynamic organisational structure model.

it is not necessarily certain who needs or can use a certain piece of information. This can be enhanced for example with situation update briefs as well as information sharing platforms available to all. Together with extensive authority to make decisions, this enables quick localised reactions to unexpected changes.

Expertise should be linked from outside the headquarters through cooperation with counterparts with the aim to create a common network of multiparadigmatic approaches. This can include external expert, reservists chosen for their rare expertise and active use of liaison officers. Own liaison officers should be also used proactively to build connections. A liaison officer primarily acts as a representative of the commander but at the same time supports information flows of all headquarter centres. This does not necessarily require tasking a liaison officer permanently to a certain place, as the most important thing is to establish the connection.

To implement the DHS model to use multifunctional cells and planning groups should be used routinely. In a normal daily operating environment, preplanned namelists of planning groups should be avoided so that flexibility can be maintained. The personnel of the headquarters can also be rotated between the centres in different tasks to increase cross-functional understanding under normal circumstances. From the complexity perspective the mental flexibility to work in different group compositions and to consider different roles is more important than optimising certain function in itself.

To conclude the DHS model can be used to enhance the headquarters' resilience, adaptation and decision-making to match the speed of change, grab the initiative and aim to win by breaking the adversary OODA-loop. This model is not suggested as an easy thing to do, but if the focus is on winning the day and not on finding the easiest way through the next moment, it can give an edge.

## 5 Critical reflection

The aim of this research was to design a solution for organising a headquarters to thrive in uncertainty. The problem statement emphasised the ever more complex contemporary conflicts and the need to see the organisational structure of a headquarters anew. The main research question was: *'What kind of headquarter structure supports the ability to survive and thrive in tempo-based operations and uncertainty?'* The aim of design research was presented to be to imagine new realities and test whether those work (Koskinen et al. 2011, p. 42). To evaluate design science research, it should not just create solutions but to also

contribute to the existing knowledge (Pirainen and Gonzalez 2013, p. 213). This can be seen as achieved with the Dynamic Headquarter Structure model, which was prototyped, tested, enhanced and is now suggested, with also addressing several theories.

The design science research can be seen inherently abductive. As always with creative solutions, it will take time to learn more of the applicability. Still the preliminary experiences seem encouraging. At this point the model has now been separated from the theoretical framework and it now needs to be self-sufficient. From a critical perspective, the model is a construct and as something that has not existed before it does not have the scientifically undisputed amount of data to support it. Still, this uncertainty can also be embraced, as the past experience does not always show what new inventions and novel advantages our adversaries can imagine (Zweibelson 2024).

The DHS model represents operational art and philosophy in an applied sense. It is an example of reframing something that has been taken for granted. The model was built with several different theories but instead of discrepancies, the theories had surprisingly many common elements. The ideas of networks, interaction and adaptation as a response to uncertainty were shared by all the theories. As such, the results of this research can be seen also as building a new way of looking at the conflicts, which does not categorise the conflicts as neither counterinsurgency, large-scale combat operations nor any other label, but focuses on the phenomena and effects instead.

This differs from the NATO conceptualisation on headquarters. The results in this research are conceptualised differently compared to earlier suggestions of improving headquarters' agility and survivability by dispersion through technological means (Beagle et al. 2023, p. 23, Scherrenburg 2020, p. 7). Complexity rather requires flexibility, adaptability and initiative. In the DHS model there is also an inherent risk, as the model differs from the earlier suggested best practises. A novel solution always has to be based on logic, instead of earlier experience on whether it functions.

Three theoretical contributions of different levels can be argued. First, describing operating environments and organisations through the environments systemic qualities has been done before, but the proactive approach towards organising has not been described before. This can help future research to understand the use of task organisations and other temporary structures arranged to face surprising events. Second, the three headquarters-specific complexity leadership themes should be further tested or questioned in scientific debate. Third,

the multiparadigmatic way of seeing organisational structure as more than just a geometric structure and tasks can also be seen as a new theoretical contribution. This research did not represent solely operational art, leadership, organisational culture or structures, but not just phenomena either. It can be seen as a new representation for something that we have been used to.

In the end, uncertainty will prevail and the model is not a prescription, but instead a mental model that needs to be applied depending on the situation at hand. The model emphasises the responsibility of the COS and leaves cognitive strain to make timely decisions. On the other hand, as a mental and social solution it does give new ways to address the problem statement, instead of looking for technological solutions or looking through existing manuals to find an existing solution.

## References

- Ahonen, H., Virolainen, L., & Gardemeister, S. (2020). Havahdu oppimaan alati kehkeytyvät – Oppimisesta kompleksisessa työelämässä. In: Vartiainen, P., & Raisio, H. (eds.), *Johtaminen kompleksisessa maailmassa*. Gaudeamus, Helsinki, pp. 229-245.
- Allied Command Transformation. (2023). NATO centres of excellence – command and control (C2 COE). *Web Article*. Available at <https://www.act.nato.int/article/nato-centres-of-excellence-command-and-control-c2-coe/> [accessed 23 October, 2024].
- Banach, S., & Ryan, A. (2009). The Art of Design: A Design Methodology. *Military review*, 89, 105.
- Beagle, M., Slider, J., & Arrol, M. (2023). The graveyard of command posts – What Chornobaivka should teach us about command and control in large-scale combat operations. *Mil Rev.*, 103(3), pp. 10-24.
- Boyd, J. (2018a). Organic design for command and control. In: Hammond, G. (ed.), *A Discourse on Winning and Losing*. Air University Press, Alabama, pp. 217-254.
- Boyd, J. (2018b). Patterns of conflict. In: Hammond, G. (ed.), *A Discourse on Winning and Losing*. Air University Press, Alabama, pp. 17-216.
- Buchanan, R. (1992). Wicked problems in design thinking. *Design Issues*, 8(2), pp. 5-21. doi: 10.2307/1511637
- Czarnecki, J. (2018). The failed thermostat: The illusion of control in an information-rich age. *The Strategy Bridge*. Available at <https://thestrategybridge.org/the-bridge/2018/10/24/the-failed-thermostat-the-illusion-of-control-in-an-information-rich-age> [accessed 6 January, 2022].
- Franke, V. (2011). Decision-making under uncertainty: Using case studies for teaching strategy in complex environment. *J Mil Strateg Stud*, 13(2), pp. 1-24.
- Gilpin, D., & Murphy, P. (2008). *Crisis Management in a Complex Environment*. Oxford University Press, New York.
- Goodwin, B. (1994). *How the Leopard Changed Its Spots: The Evolution of Complexity*. Scribners, New York.
- Hanén, T., & Huhtinen, A. M. (2012). Yhteenkietoutumisen teoria – Yllätysten ja sattuman tieteellinen selitys. *Tiede ja Ase*, 69, pp. 9-33.
- Hanén, T., & Raisio, H. (2017). Kompleksisuustieteet sotatieteellisessä tutkimuksessa – järkevä suunta vai harhapolku? *Tiede ja Ase*, 75, pp. 100-123.
- Hanén, T. (2017). Yllätysten edessä: kompleksisuusteoreettinen tulkinta yllättävien ja dynaamisten tilanteiden johtamisesta. Doctoral Dissertation. Tampere: Juvenes Print.
- Heltberg, T., Krogh, A. H., & Kyne, K. (2024). Military design in European defence forces: An evolving Niche. In: McD Sookermy, A. (ed.), *Handbook of Military Sciences*. Available at 10.1007/978-3-030-02866-4 [accessed 23 July, 2024].
- Hornstra, S., Durning, S., Hoogenboezem, J., & van Mook, W. (2024). An agile C2 method – adapting design thinking for military contexts. *NATO Centres of Excellence for Command and Control (C2COE)*. Available at [https://c2coe.org/wp-content/uploads/Library%20Documents/Annals/Seperate%20Articles/2024-01%20C2%20Annals%20-%20An%20Agile%20C2%20Method%20\(Hornstra%20et%20al\).pdf](https://c2coe.org/wp-content/uploads/Library%20Documents/Annals/Seperate%20Articles/2024-01%20C2%20Annals%20-%20An%20Agile%20C2%20Method%20(Hornstra%20et%20al).pdf) [accessed 23 October, 2024].
- Joint Staff J7. (2019). Joint headquarters organization, staff integration, and battle rhythm. *Insights and Best Practises Focus Paper*, 3rd edn. Suffolk. Available at: [https://www.jcs.mil/Portals/36/Documents/Doctrine/fp/jtf\\_hq\\_org\\_fp.pdf?ssp=1&setlang=fi&cc=FI&safesearch=moderate](https://www.jcs.mil/Portals/36/Documents/Doctrine/fp/jtf_hq_org_fp.pdf?ssp=1&setlang=fi&cc=FI&safesearch=moderate) [accessed 23 October, 2024].
- Kajamäe, P. (2021). Sotilasstrategia – Yksinkertainen, vaikea sota. Punamusta Oy, Joensuu.
- Kesseli, P. (2008). Operaatiotaito ja taktiikka tieteenalana. In: Huttunen, M., & Metteri, J. (eds.), *Ajatuksia operaatiotaidon ja taktiikan laadullisesta tutkimuksesta*. Taktiikan laitoksen Julkaisusarja 2, n:o 1/2008. Edita Prima Oy, Helsinki, pp. 11-16.
- Kesseli, P. (2013). Lukijalle. In: Rekkedahl, N. M., Grönberg, S. G., & Kesseli, P. (eds.), *Operaatiotaito – Operaatiotaidon kehittyminen neljässä suurvallassa*. National Defense University Tactics Department Publication Series 1/2013. Edita Prima Oy, Helsinki, pp. 3-4.
- Koskinen, I., Zimmerman, J., Binder, T., Redström, J., & Wensvee, S. (2011). *Design Research Through Practise: From the Lab, Field, and Showroom*. Morgan Kaufman, Burlington.
- Lawrence, P., & Lorsch, J. (1967). *Organization and Environment – Manging Differentiation and Integration*. Harvard University, Boston.
- Lundström, N., & Mäenpää, A. (2020). Pirullisia ongelmia ja pirullisia pelejä – Kuka pelaa ja millaista peliä? In: Vartiainen, P., & Raisio, H. (eds.), *Johtaminen kompleksisessa maailmassa*. Gaudeamus, Helsinki, pp. 37-59.
- Luoma, M., & Lindell, J. (2020). Johtaminen ja kompleksisuus – kolmijaosta kokonaisvaikutukseen. In: Vartiainen, P., & Raisio, H. (eds.), *Johtaminen kompleksisessa maailmassa*. Gaudeamus, Helsinki, pp. 60-84.
- Mäki, A. (2020). Jännitteitä ja yhteiskehittelyä – Kompleksisuus asiantuntijayhteisöjen johtamisen arjessa. In: Vartiainen, P., & Raisio, H. (eds.), *Johtaminen kompleksisessa maailmassa*. Gaudeamus, Helsinki, pp. 87-107.
- Mälkki, J. (2013). *Operational Art & Design – Western Traditions and the New Challenges*. Juvenes Print, Tampere.

- Martela, F. (2023). The outsized benefits of “minimalist” leadership. *Harvard Business Review*. Available at <https://hbr.org/2023/12/the-outsized-benefits-of-minimalist-leadership> [accessed 23 July, 2024].
- Mattis, J. (2008). USJFCOM commander’s guidance for effects-based operations. *Joint Force Q*, 51. (4th Quarter 2008), pp. 18-25. doi: 10.55540/0031-1723.2437
- McChrystal, S. (2017). Organizing to fight and win in a complex world. *West Point, Modern Warfare Institute Symposia*. Available at <https://youtu.be/eXKJLBkRBFM> [accessed 4 October, 2021].
- McChrystal, S., Collins, T., Silverman, D., & Fussel, C. (2015). *Team of Teams – New Rules of Engagement for a Complex World*. Penguin Publishing Group, New York.
- McMillan, E. (2006). Complexity, Organization and Change – An Essentiel Introduction. Routledge, New York.
- Mitleton-Kelly, E. (2003). Complex Systems and Evolutionary Perspectives on Organisations – The Application of Complexity Theory to Organisations. Elsevier Science Ltd, Oxford.
- NATO. (2019). *AJP-3 Allied Joint Doctrine for the Conduct of Operations*, Edition C, Version 1 edn. NATO Standardization Office, Brussels.
- Naveh, S. (1997). In Pursuit of Military Excellence – The Evolution of Operational Theory. Frank Cass Publisher, London.
- Palokangas, M. (2022). Yhteenveto sodan usvan hälventämiseksi. In: Palokangas, M. (ed.), *Sodan usvaa – Sodankäynti muutoksessa*. National Defence University Department of Warfare Series 2: Research Reports No. 18. Punamusta Oy, Joensuu, pp. 141-146.
- Paparone, C. (2013). The Sociology of Military Science – Prospects for Postinstitutional Military Design. Bloomsbury, Academic.
- Pernaa, J. (2013). Kehittämistutkimus tutkimusmenetelmänä. In: Pernaa, J. (ed.), *Kehittämistutkimus opetusallalla*. PS-kustannus, Jyväskylä, pp. 9-26.
- Piirainen, K., & Gonzalez, R. (2013). Constructive synergy in design science research: A comparative analysis of design science research and the constructive research approach *LTA*, 3–4/13. Available at [http://lta.lib.aalto.fi/2013/3-4/lta\\_2013\\_03-4\\_a3.pdf?ssp=1&setlang=fi-FI&safeSearch=moderate](http://lta.lib.aalto.fi/2013/3-4/lta_2013_03-4_a3.pdf?ssp=1&setlang=fi-FI&safeSearch=moderate) [accessed 23 July, 2024].
- Price, Jr., J. F. (2013). Napoleon’s shadow: Facing organizational design challenges in the U.S. military. *Joint Force Q*, 68. (1st Quarter, 2013), pp. 48-52.
- Puusa, A. (2020). Näkökulmia laadullisen aineiston analysointiin. In: Anu, P., & Juuti, P. (eds.), *Laadullisen tutkimuksen näkökulmat ja menetelmät*. Gaudeamus Oy, Helsinki, pp. 145-156.
- Puustinen, A., & Jalonen, H. (2020). Kompleksisuusajattelu – Ymmärtämistä edistävä uusi lähestymistapa vai vanhaa viiniä uudessa pullossa. In: Vartiainen, P., & Raisio, H. (eds.), *Johtaminen kompleksisessä maailmassa*. Gaudeamus, Helsinki, pp. 15-36.
- Rekkedahl, N. M. (2013). Johdatus operaatiotaitoon. In: Rekkedahl, N. M., Grönberg, S. G., & Kesseli, P. (eds.), *Operaatiotaito – Operaatiotaidon kehittyminen neljässä suurvallassa*. National Defense University Tactics Department Publication Series 1/2013. Edita Prima Oy, Helsinki, pp. 20-86.
- Salminen, A. (2011). Mikä kirjallisuuskatsaus? Johdatus kirjallisuuskatsauksen tyyppisiin ja hallintotieteellisiin sovelluksiin. *Vaasan yliopiston julkaisusarja, opetus-julkaisuja* 62, *julkisjohtaminen* 4. Available at [https://www.uwasa.fi/materiaali/pdf/isbn\\_978-952-476-349-3.pdf](https://www.uwasa.fi/materiaali/pdf/isbn_978-952-476-349-3.pdf) [accessed 23 July, 2024].
- Saunders, M., & Tosey, P. (2012). The layers of research design. *Rapport*, Winter 2012/2013, pp. 58-59.
- Scherrenburg, M. (2020). The NATO C2COE C2 demonstrator platform. A whitepaper by NATO C2COE, MDOC2D. *Demonstrating the Future of the Decision-Making Process*. Utrecht, Netherlands. Available at <https://c2coe.org/wp-content/uploads/Library%20Documents/Whitepapers/20200611%20Whitepaper%20NATO%20C2COE%20C2%20Demonstrator%201.0.pdf> [accessed 23 October, 2024].
- Skyttner, L. (2001). *General Systems Theory – Ideas and applications*. World Scientific Publishing Co, Singapore.
- Snowden, D., & Boone, M. (2007). A leader’s framework for decision making. *Harvard Bus Rev*, 85, p. 11.
- Stalk, G., & Stewart, S. (2019). Avoiding disruption requires rapid decision making. *Harvard Bus Rev*. Available at <https://hbr.org/2019/04/avoiding-disruption-requires-rapid-decision-making> [accessed 4 October, 2023].
- Taleb, N. (2013). *Anti-Fragile – Things that Gain from Disorder*. Penguin Books, London.
- Uhl-Bien, M., Russ, M., & McKelvey, B. (2007). ‘Complexity leadership theory: Shifting leadership from the industrial age to the knowledge era’. *Leadersh Q*, 18, p. 4. doi: 10.1016/j.leaqua.2007.04.002
- Vego, M. (2006). Effects-based operations: A critique. *Joint Force Q*, (41). (2d quarter), pp. 51-57.
- Zweibelson, B. (2024). Why do militaries stifle new ideas? *Contemp Issues Air Space Power*, 2(1), pp. 1-6. doi: 10.58930/bp38138320