# The Quadruplicity of Future Military Command. Urbanization, Digitalization, Artificial Intelligence and Mission Command.

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**Abstract:** Future military command will be influenced by three core elements, namely urbanization, digitalization and artificial intelligence. To cope with the associated challenges mission command must be cultivated and remain the primary leadership principle in order to reduce complexity and enable successful mission accomplishment. This opinion paper outlines a proposal for the human-machine interaction agent **C**omprehensive **O**perational **M**emory **A**nd **N**eural **N**etwork **D**eliberation.

## 1. Introduction

Although the pure nature of a conflict will obviously not fundamentally change ("*Soldiers Will Die and They Will Cause Death.*") (Elliott 2017, p. 32) military command was and will be challenged by changing aspects, of which currently urbanization, digitalization and artificial intelligence develop a determining force. As *"Command consists of three intimately connected functions: mission definition, mission management and mission motivation."* (King 2019, p. 69) these aspects can be assigned to a function. With increasing probability of operations in an urban environment mission motivation must comprise the preparation for this demanding environment. Within mission management commanders must provide the necessary tools to enable their staffs to cope with the environment thoroughly and for a proper mission definition they will need additional information to assist them with their peer group (the core team) in better comprehending the environment. Urbanization, digitalization and artificial intelligence have an interdisciplinary relevance, witnessed an incredibly rapid development in the past years and show significant potential in the future. Meanwhile nearly every aspect of daily life is touched by these aspects and no human being nor organisation can escape this.

Military command to overcome these challenges is a difficult task as *"[…]western militaries have largely neglected training and equipping to fight a peer enemy in cities despite the likelihood of urban combat […]"* (Hofer and Knight 2024) and digitalization as well as artificial intelligence recently gained significant momentum and challenge organisations with the associated requirements – the preparation of commanders and their staffs remains a demanding task and has to adress these challenges.

## 2. Driving Factors of Future Military Command
### a. Urbanization

The Encyclopaedia Britannica defines "urbanization" as *"the process by which large numbers of people become permanently concentrated in relatively small areas, forming cities"* (Britannica, The Editors of Encyclopaedia 2022, urbanization). Therefore, it seems understandable that *"Human settlements are referred to as urban when of high population densities – as in cities – and as rural when related to low population densities – as in villages or hamlets."* (Pesaresi et al. 2016, p. 14) In 2015 85% of the world's population were reported to live in cities - 52% in urban centers and 33% in urban clusters (Pesaresi et al. 2016, p. 41). Urban centres are pivotal hubs for

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government, administration, finance, trade, education and research and offer a lot of amenities to their inhabitants. In a time, where the majority of the earth's surface can be detected by satellites, aircraft and drones, urban centres offer shelter and discreet hideouts in the interior of infrastructure. Although we want to avoid fighting in the cities, it will be a necessity in the future as it has been in the past. Numerous examples from besieging ancient cities to the contemporary examples underline the importance to prepare for this very demanding task which is – as leading experts tend to say – the hardest type of warfare (Spencer 2022). In that sense, urban operations especially manifest those four elements which Clausewitz defined as determining the nature of war: danger, physical exertion, uncertainty, and coincidence (Clausewitz 1999, p. 67). Complex urban operations have to be understood in the framework of size, the triple-S environment (Supersurface – Surface – Subsurface) and complexity (Hofer 2022a, p. 1) but the common understanding of "urban" does not match with urbanity described by those factors and is to often limited to close quarter battle drills only. Therefore, it is not enough to synchronise the efforts of preparing the troops for operations, but one has also to give them the idea in which environment and to which purpose they have to operate.

Complex urban scenarios are determined by the size of the urban system and the number of subsystems, the scale of forces and the fighting style of an opponent, the negative effects on the functionality of the urban system as well as the extent of the operational area (in all three dimensions!) and, due to multi-layered interdependencies, no longer allow a prediction regarding the development of events - the cooperation of all relevant actors is essential (Hofer 2022b). Urban operations depend upon the provision of a comprehensive situational picture integrating information on own and opposing forces as well as those heterogenous data sets representing the urban environment. Therefore, it is important to develop a comprehension of the urban environment to enable effective mission accomplishment with acceptable risk for own forces and reduction of collateral damage and harm to the population inhabiting the city.

### b. Digitalization

Digitalization is understood here as the combination of digitization and digitalization[1] as technical capabilities and human ability and willingness have to complement each other. Within the urban environment, the RADIV process of RApid Data Integration and Visualization (Hofer et al. 2022a) (Hofer et al. 2022b) is dealing with the digitization – digital enablement (Gartner 2023, term: digitization) of analog information – and integration of existing heterogeneous data required for a truly comprehensive Common Operational Picture, a process owned by the experts of the Urban Operations Support Cell (Hofer 2022b, p. 584) in support of the headquarters they assist. The staff members in turn have to be aware and familiar with the requirements and challenges associated with digitalization changing a business by the use of technologies (Gartner 2023, term: digitalization). Organisations must handle both aspects – again requiring management and leadership.

### c. Artificial Intelligence

Significant developments in artificial intelligence could be achieved in the past years. Two main approaches are relevant to its future use – an optimistic and a more reluctant one, the latter being the determining one for future military command: *"An AI capable of command would have to learn to distinguish between bad ideas that succeed with luck or enemy incompetence, or good ideas done badly or which suffer from external events that none could have foreseen."* (Hunter and Bowen 2023, p. 23). The wish to develop virtual assistants capable of interacting *"with an end-user in a natural way, to answer questions, follow a conversation or accomplish other tasks."* (Martínez-Plumed et al. 2021, p. 23) is perfectly understandable and although recent achievements are astounding, the technology readiness levels of a virtual assistant *"fully open-ended, with user modelling, routine learning and anticipation"* made comparatively little progress within 20 years (Martínez-Plumed et al. 2021, 24, 27). Furthermore the aspect

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[1] Once again, the English language is more precise as German by distinguishing between digitization and digitalization The same holds true for the German term "Sicherheit" describing safety and security likewise.

of taking responsibility for decisions – artificial intelligence cannot be made responsible and brought to justice – is of paramount importance as *"The emotional, chaotic, and political nature of war is why decisions must be justifiable rather than probabilistically derived."* (Hunter and Bowen 2023, p. 24) Consequently, artificial intelligence has to be integrated into decision-making to improve its quality without counteracting the role and responsibility of the commander.

To achieve this goal, we have to conceptualize an artificial intelligence agent.

## 3. Reflection on Mission Command

Mission Command  is a principle of command setting the subordinate commander a goal while providing necessary forces and resources, allowing freedom of action in carrying out the mission in the sense of the superior commander (Bundesministerium für Landesverteidigung currently updated, term: Auftragstaktik). Fox describes a continuum between command and control on the one hand and mission command on the other, the level of control determined by a series of factors with complex terrain / operational environment being one[2] (Fox 2017), and it is necessary to balance them to achieve mission command as being the prerequisite for success within complex urban scenarios. Mission command primarily requires thinking in broader contexts and dealing with uncertainty without losing sight of the mission – a good tasking sets the boundaries, clear aims and a purpose. A commander must transform the assigned tasks into an intent (a purpose), to that end it must be clear what something is being done for (effect) and not only why (cause) (Hofer 2018, p. 454)[3]. Growing complexity also increases the frictions of war and requires mission command in order to contribute to complexity reduction. Although the need to have an operational picture as complete as possible, the tendency to exercise tight control based on a bird-view perception of the situation on the ground is extremely counterproductive. Ernst Jünger described his encounter with the general staff officer in the division headquarters:

> *„Er war recht gallig, und ich merkte zu meinem Ärger, daß er versuchte, mich für den Ausgang des Unternehmens verantwortlich zu machen. Wenn er den Finger auf die Karte legte und Fragen stellte, wie etwa: »Warum sind Sie denn nicht rechts in diesen Laufgraben abgebogen?«, merkte ich, daß ein Durcheinander, in dem es Begriffe wie rechts und links gar nicht mehr gibt, außerhalb seiner Vorstellung lag. Für ihn war das Ganze ein Plan, für uns eine mit Leidenschaft gelebte Wirklichkeit." (Jünger 1983, p. 214)[4]*

Coping with the complexities of urban operations requires expert knowledge generally not available within a military staff. The Urban Operations Support Cell (Hofer 2022b, p. 584) has been designed to assist commander's and their staffs in performing their task of mission accomplishment in better understanding the

> *"[…] system of flows – commodities, people, power, energy, information, fuel, water […] Entering and occupying a city without having at least a basic understanding of how a city functions risks disrupting these natural flows and increasing these toxic byproducts and making the military operation significantly harder." (Collins and Spencer 2022)*

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[2] Fox describes the following factors: mutual trust, understanding, inherent protection, type of mission (level of complexity, level of synchronization required, terrain complexity, leader self-confidence, proficiency of unit(s), leader's proficiency, staff proficiency.

[3] *„Eine Führungskraft muss das vorgegebene Ziel in einen Zweck transformieren. Dazu muss vor der Entscheidungsfindung völlig klar sein, wozu (Wirkung) etwas getan wird und nicht nur warum (Ursache)."* (translated by author).

[4] *"He was quite bilious, and I realized to my annoyance that he was trying to hold me responsible for the outcome of the venture. When he put his finger on the map and asked questions such as, "Why didn't you turn right into that running trench?", I realized that a confusion in which terms such as right and left no longer even existed was beyond his imagination. For him, the whole thing was a plan; for us, it was a reality lived with passion." (translated by author)*

In the following chapter a concept for an artificial intelligence decision-making assistant shall be proposed.

## 4. Mission COMANND

The **C**omprehensive **O**perational **M**emory **A**nd **N**eural **N**etwork **D**eliberation shall assist with this task, but it cannot – and must not – take any command responsibility. This artificial intelligence agent must be capable of handling the Comprehensive Operational Memory (COM) database (figure 1) in correspondence with the theory of complementary modes of remembrance with an inhabited memory (*Funktionsgedächtnis*) and a memory of memories (*Speichergedächtnis*) (Assmann 2010, pp. 133–137). This can be compared to a Programmable Read-Only Memory (PROM) and the Random Access Memory (RAM), the former containing all information collected over time which are stored forever whereas the RAM is figured completely new after every restart according to the user's individual work (society in the respective era).
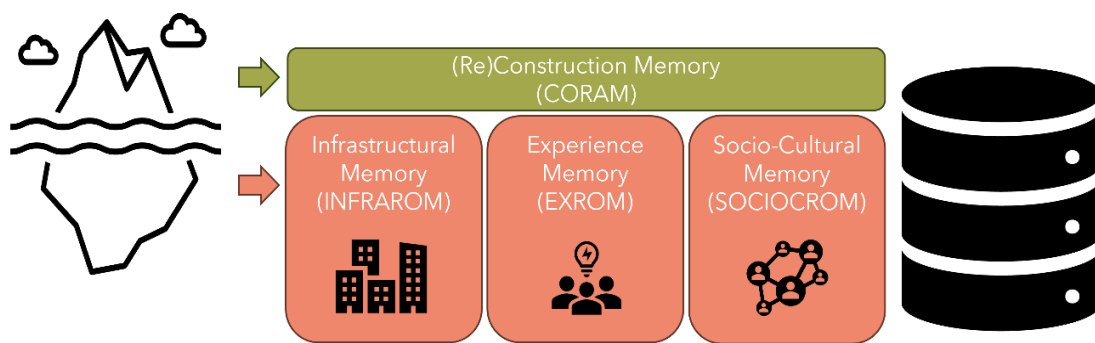


*Figure 1: The Comprehensive Operational Memory database contains all information about a city. CORAM is to be understood as the visible upper part whereas INFRAROM, EXROM and SOCIOROM are contained within the invisible part of the iceberg (illustration: author).*

Every individual and every society is striving for improvements thereby permanently shaping the infrastructural, historical and socio-cultural environment represented by the centre of historical development (Hofer 2014, 320-321, 359-363) and being the basis for the sound understanding of an urban operational environment. To understand recent representations, one must understand their developments over time. In order to make good use of COMANND it should be structured for three different purposes (figure 2) in accordance with the command-and-control elements.
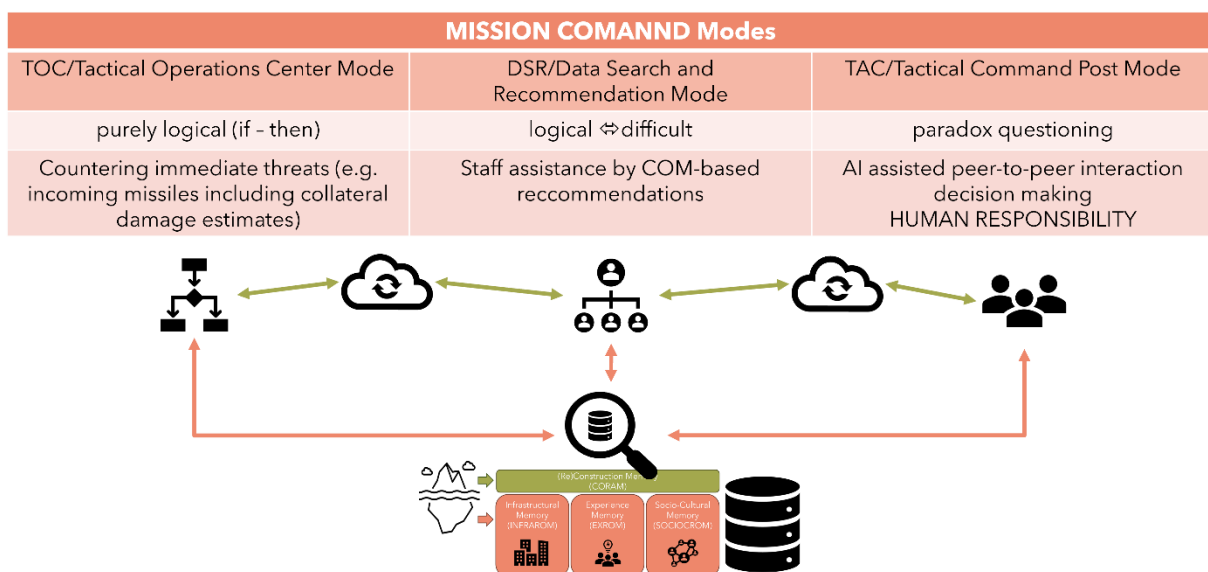
| MISSION COMANND Modes | | |
| --- | --- | --- |
| TOC/Tactical Operations Center Mode | DSR/Data Search and Recommendation Mode | TAC/Tactical Command Post Mode |
| purely logical (if – then) | logical ⇔ difficult | paradox questioning |
| Countering immediate threats (e.g. incoming missiles including collateral damage estimates) | Staff assistance by COM-based reccommendations | AI assisted peer-to-peer interaction decision making HUMAN RESPONSIBILITY |



*Figure 2: The Mission COMANND modes are intended to facilitate DECENT (decentralized - centralized) command networks (illustration: author).*

TOC (Tactical Operations Centre) Mode is designed for assisting current, fast-track decision making based on purely logical causality primarily countering immediate threats. DSR (Data Search and Recommendation) Mode ranges from logical to difficult interdependencies and assists the planning staff with recommendations based on the Comprehensive Operational Memory, and TAC (TActical Command Post) Mode assists peer-to-peer decision-making in answering questions on a paradox environment, in which clear and obvious causalities are missing (Hofer 2018, p. 452). DSR mode corresponds to inductive and TAC mode assists human abductive reasoning (Hunter and Bowen 2023, p. 4). The three modes are interconnected within a DECENT (DECentralized CENtralization) command network increasing survivability by dispersing elements and joining collaboration in a cloud.

## 5. Conclusion and Outlook

Urbanization, digitalization, and artificial intelligence will develop a driving force for military command in the future. Developments over time created cities with a high degree of urbanity thereby making operations highly complex. Digitalization provides tools and processes to better comprehend this environment. Whereas a lot of simple tasks already can be done by artificial intelligence, decision-making will remain human responsibility and mission command a proven way of leadership. In addition to that the concept of COMANND – a military artifical intelligence agent – provides assistance in complex operational environments. This will assist headquarters with current operations, planning tasks and decision-making based on in-depth analysis with the enormous amount of data and information which has to be processed to fully comprehend an urban operational environment.

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