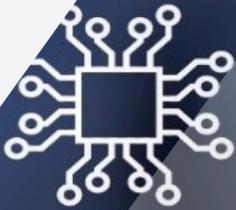


Strategic Aspects of Digital Transformation for Military Organisations

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DIGITAL TRANSFORMATION





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CREDITS

CONTRIBUTING AUTHOR

Prof. Dr. Christian Matt

Professor and Co-director of the Institute of Information Systems, University of Bern.

OPEN CAPABILITY LEADER

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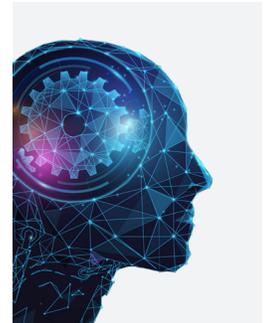
Mr Ian Birdwell

Ms Rachel Grimes

Mr Neil Schuehle

SGM Neculai Arghire

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EXECUTIVE SUMMARY

Many commercial businesses and public institutions are currently in the process of “Digital Transformation” (DT). Driven by increasingly powerful digital technologies, conventionally operated organizations are trying to find ways to adapt their way of working to the digital needs and realities of today. However, given the complexity and the scope of DT, not all of them are able to navigate through this complex endeavour successfully. Research has shown that successful DT is far from being a purely technological issue, as organizations often face major obstacles related to organizational structures and culture, which require a comprehensive strategic assessment.

Military organisations differ from commercial businesses in many aspects. Although they might have some similarities, DT of a “chain of command” structure, as well as IT landscapes that require the high-est security standards and reliability, are aspects that do not appear to be an ideal fit for the require-ments of DT. The organizational complexity of a multi-nation alliance potentially complicates this fur-ther. As DT is seen as inevitable for NATO, strategic decision-makers among allied forces will need to reconsider their approaches to organizational culture, organizational structures, as well as IT-landscapes, in order to adapt themselves for the future ahead.

The purpose of this research paper is to present central topics and findings of the recent literature on strategic aspects of DT and to adopt these to the context of current military organizations. The paper first outlines the overall relevance of DT for organizations and classifies the scope of different

DT initiatives based on 5 different levels. It further describes the particularities and challenges for organizations, showing why DT is different from IT-projects, why this gives great importance to other nontechnological factors, and why it requires a strategic approach to tackle these challenges. The article presents several organizational requirements as well as mechanisms that help organizations to gain more agility in respect to organizational culture, organizational structures, as well as the IT landscape. For each, key aspects and concepts are presented with reference to the latest literature, and explicit considerations for the military are provided. The article concludes with key results and recommenda-tions for NATO and its alliance partners, which are meant as a basis to spur discussions and initiate fur-ther actions.

Keywords: Digital Transformation, Strategic Aspects, Military Organizations, Agility, Requirements

RELEVANCE AND SCOPE OF DIGITAL TRANSFORMATION

Artificial Intelligence (AI), robot-process automation, ubiquitous sensors, new user interfaces, and other forms of digital technologies offer organizations substantial possibilities to not only improve corporate routines and processes, but also their outcomes in terms of value creation for their customers. However, novel digital technologies do not only mean bright opportunities and “low hanging fruits”; along with the benefits, there are various challenges for organizations of various kinds: Many fear digital disruptions of their business models, cyber security and data privacy incidents seem prevalent, and various industries and public sector organizations are often criticized for not keeping pace with digital transformation (DT). However more than 70% of DT initiatives fail, often due to unsuitable corporate cultures or organizational structures, which lack the ability to overcome the challenges of DT (Forbes, 2022; Salmela et al., 2022). Still, the high failure rate does not imply that organizations should sit back and stop their efforts. Organizations simply need to embrace the potentials of DT, mainly for two reasons: First, they should explore how digital technologies can create additional value for their stakeholders (“technology push”). Second, they should identify how digital technologies can be used to fulfil new external requirements, such as new regulations, economic changes, or changing customer preferences (“technology pull”). Here, organizations have a direct external requirement to act, and digital technologies might be a means to an end to fulfil these requirements (Wiesböck & Hess, 2020).

Organizational digital transformation takes place on different levels, while the effective operational

changes are usually conducted through individual DT projects. Such projects seek, for instance, to implement new software, optimize business processes, automatize production, or even alter an organizations’ business model. These examples show that the reach of DT projects may vary substantially. They also show that at least some of these activities do not seem very new, since organizations have been carrying for instance business process optimizations since years. (Lanzolla et al., 2020). Venkatraman (1994) already systematized the levels of technology-induced changes for organizations of various kinds based on 5 different levels (Fig. 1). Despite its age, Venkatraman’s model can still be used to categorize the different types of digital transformation, and it can also be applied to military organizations. The five levels differ in the range of the potential benefits and the reach the IT has, split into more “evolutionary” (Levels 1+2) and more “revolutionary” levels (Levels 3-5) (Fig. 2.3).

Level 1 (“localized exploitation”) describes changes in the local application area, e.g., new software for which only a specific department has access to, but which is not directly accessible by other parts of the organization. For example, a separate hiring system for new job applications may be valuable on its own, but the transfer of data to existing HR systems and payroll systems would also be desirable. Although localized exploitation is still present in organizations, it should be avoided for new applications as it often creates “isolated applications”, and their later integration into the IT-landscape may become difficult. The goal of Level 2 is therefore to reach an “organization wide integration” of IT systems, which enables joint

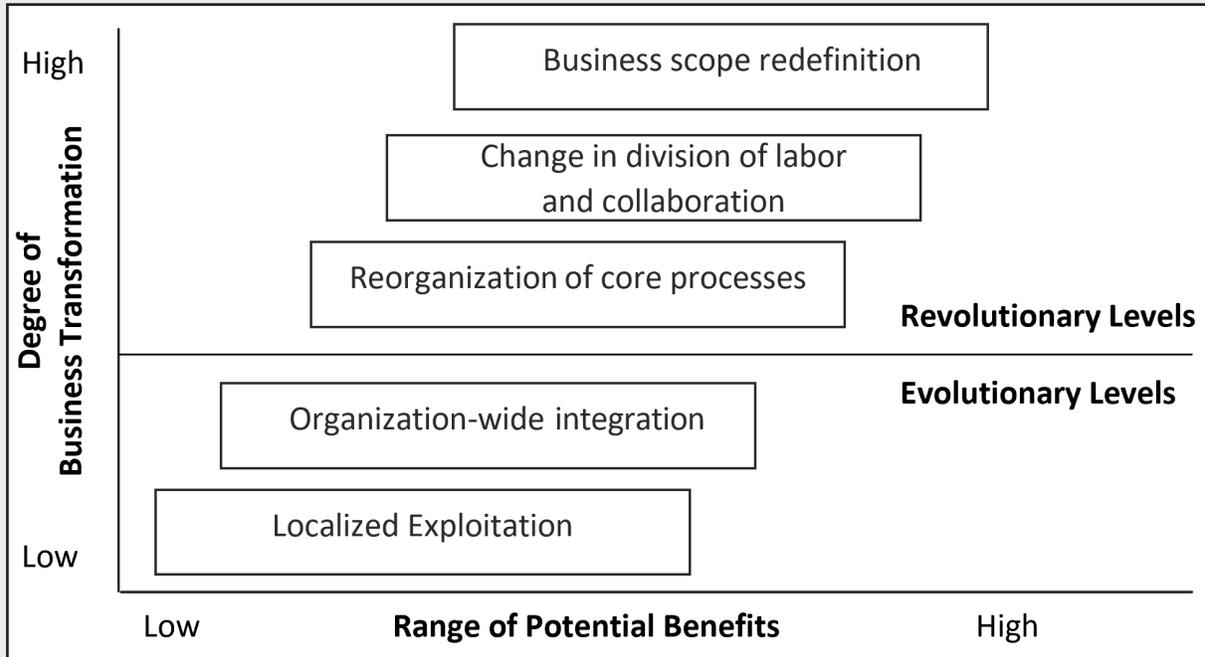


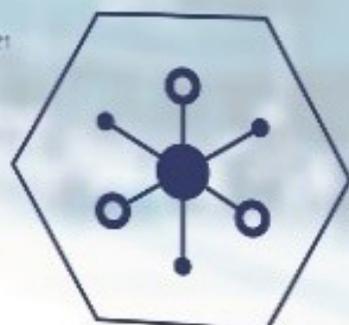
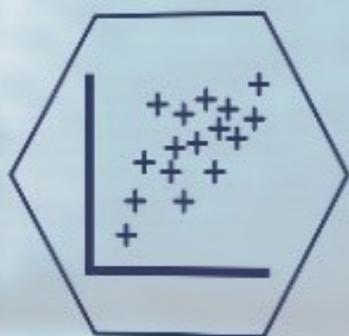
Fig. 1: Five Levels of Digital Transformation (based on Venkatraman, 1994)

access to programs and data across corporate units and between different applications. What sounds at first to be a minor change, often turns out to be a multi year effort, which requires substantial investment, often substantially affecting business processes, and is subject to high failure rates (Baiyere et al., 2020; Gurbaxani & Dunkle, 2019). It must be remembered that large organizations often have hundreds of different systems in place, which have often grown organically over decades, which creates an immersive complexity. This is especially common for large, decentralised organizations such as NATO, which rely on connections to various, independent stakeholders and their IT systems world-wide. This presents a challenge since agreements on common technological standards need to be found to ensure compatibility. Proceeding further, the revolutionary Levels 3-5 comprise the changes driven by digital technologies in the areas of core processes, the division of labour between companies, and an organization's product and service spectrum. Changes on these levels often affect organizations in their entirety as well as their competitive position. Level 3 considers the "reorganization of core processes" and builds on the fundamental idea that the full potential of IT-systems can often only be exploited if business processes are designed based on IT requirements.

Instead of adapting existing processes to better fit the IT, organizations might consider drafting new business processes from scratch ("business process reengineering", Hammer, 1990; O'Neill & Sohal, 1999), a procedure that has not always fulfilled its expectations in practice. Level 4 deals with how IT can enable changes in how organizations collaborate with others and share their responsibilities and workloads as part of a joint service. This could for instance relate to the degree of involvement and the type of tasks that NATO offers to its Alliance partners when coordinating a joint operation. For instance, NATO can profit from IT innovations for better communication and coordination between alliance partners, and as a result potentially offer certain services centrally that have been executed by alliance partners individually in the past. This could also help create a higher level of standardization across the alliance. Level 5 comprises the redefinition of an organizations' business scope, which means that IT enables products or services to be offered that differ significantly from any previous offers. This at the same time means that organizations enter "new territories", and therefore often not only have substantial technological challenges to solve, but also need to acquire different capabilities and skills in this new area.

Notably, all 5 levels of the Venkatraman framework are still relevant in practice. While most organizations nowadays seek to avoid Level 1 for new applications, many still struggle with achieving a suitable organization-wide integration owing to the heterogeneity and complexity of their IT-landscape. Nevertheless, in the course of digital transformation Levels 3-5 of the framework have become more relevant to many organizations in recent years. However, the higher levels are often associated with higher complexity, thus making such endeavours potentially riskier. To tackle the involved complexity, digital transformation should not be perceived or managed as a purely technological challenge, it should be approached strategically. For this, organizations first need to understand the particularities and scope of DT and why it goes beyond regular IT projects. Second, organizations should know about the requirements to conduct digital transformation as well as current mechanisms that have proven helpful to respond to the challenges posed by DT. The present article seeks to inform organizations about the strategic relevance of DT in general, and for military organizations in particular, to be able to form their own strategic vision and initiate their DT program.





PECULIARITIES OF AND CHALLENGES POSED BY DIGITAL TRANSFORMATION

2.1 Assessing the Value of Digital Transformation

Digital transformation should not be an end in itself; the primary reason for conducting DT should always be based on the potential to create value for the organization and/or their stakeholders. Value considerations are usually also the driver of regular IT-projects, which primarily focus on the introduction of technological solutions (Châlons & Dufft, 2016). In contrast, DT projects can have a broader impact, and trigger a plethora of new born-digital phenomena such as new work practices, new business models, or new search behaviours among individuals inside and outside an organization (Lanzolla et al., 2020). Such developments create new opportunities for firms, who might seek to obtain technology-leadership in their field, but they might also be required to use digital technologies in response to changing market conditions, customer preferences, or new financial regulations, result from these developments. Given the range of associated changes and involved stakeholders (i.e., not only employees but potentially also new customer groups or partners and suppliers), this often exceeds the IT-department's classical scope of operation. DT projects therefore typically also involve the relevant specialist department (e.g., marketing or production), as it is not only about technological integration of digital technologies, but also the associated development and integration of a suitable business solution (e.g. who is in charge of the product, how does a competitive solution on the market look like). This potentially requires also

the adoption of organizational structures (e.g., flatter hierarchies or a specific digital innovation unit) (Barthel et al., 2020).

Owing to the broad scope of DT and its substantial effects on organizations, individual digital transformation projects are often characterized by challenges related to long project durations, low controllability and transparency, high uncertainty regarding technological developments, and a difficult integration into existing IT-landscapes (Berghaus & Back, 2017). Given these challenges and the potential risk to fail, it is critical for organizations to assess the value of DT projects in advance. Larger organizations typically follow a portfolio approach, which means that several DT projects are conducted at the time, and these are selected in advance and managed during their execution, with respect to the overall portfolio of DT projects and their goals and required resources. Since resources are scarce, the number of potential DT projects and required resources typically exceeds the number of potential concurrent projects, therefore organizations need to prioritize and consider potential dependencies. For example, one project might only be started after another has been fully completed as it relies on the implemented IT applications of the previous project. In fact, many organizations realize that actions on higher Levels of the Venkatraman framework will only be possible after they have completed the organization-wide integration of the central enterprise systems on Level 2 in order to be able to exchange data across systems or across corporate-borders. In practice, this often means a multi-year project with substantial investments

and high risk of failure to be conducted before other (more advanced) actions can be taken.

Considering factors such as an organization's strategic vision, dependencies between projects, limitations of particular resources, as well as individual risk of failure, those DT projects that contribute a higher value should be prioritized. However, the value of individual DT projects is often difficult to be determined in advance, since traditional project controlling measures (e.g., the calculation of the project's "Net Present Value") are not directly applicable here. Project controlling usually has a strong focus on plan/actual comparisons and the fulfilment of schedule, cost, and quality targets. This is difficult for DT projects, which are often subject to unforeseen technological changes, as well as having goals which are often difficult to quantify in advance. These goals can be rather long-term oriented, or rather intangible (e.g., brand building or serving higher strategic purposes). Therefore, organizations need to apply different assessment criteria which consider a broad range of factors and may also include qualitative measures if no quantitative criteria are accessible or quantifiable. For instance, military organisations may find it difficult to precisely quantify the impact of strategic long-shot projects (e.g. a joint new digital unit for the alliance-wide integration of IT-systems) as their actual financial benefits might depend on numerous factors, such as the accession of further allies. However, they could still relate to the project's potential qualitative impact (e.g., low, medium, high) on future collaborations or the political power of the alliance.

The "Digital Value Canvas" (Anding, 2020; Barthel et al., 2021) seeks to capture all value-relevant contributions of DT projects and aligns these with corresponding key performance indicators (KPIs). Varying in their tangibility and reach, these value contributions are divided into three categories (Fig. 2): The inner ring outlines contributions to direct profitability, capturing cost reductions or income gains resulting from DT projects. Related KPIs are often well quantifiable and easy to understand for different stakeholders. Public organizations without explicit revenue or income in its original sense might use KPIs related to the core tasks of their public purpose, e.g., the number of requests processed or projects completed per year. The

middle ring entails contributions to the core business, which comprises indirect contributions. The considered factors are asset utilization, business process speed and quality, employee effectivity, marketing promotion, stakeholder satisfaction (e.g., customers but also regulatory bodies and others), as well as positive effects on the income of the core business. For the latter, as an example, a data analytics software that is introduced for a new service offering might also have positive spillover effects on the core business. While the factors on the middle ring are still rather easily quantifiable, the clear attribution of benefits to a single project might be challenging; for example, because there are several established and new marketing promotions running at the same time. The third and last category is about the "future success" (long-term benefits) and comprises threat and risk mitigation (e.g., better anticipation of a crisis using machine learning algorithms), branding (as an employer but also in general), leveraging strategic alliances, technology expertise, as well as strategic long-shots (e.g., establishing a technological standard or collaborations to better enter rising markets later). Arguably, contributions on the outer ring are much more difficult to measure. In addition to more qualitative measures, organization can be creative to identify or develop new suitable KPIs (e.g., the number of job applications or likes on LinkedIn for the category employer branding).

2.2 Approaching Digital Transformation Strategically

While the assessment of each DT project is already a challenge, organisations usually need to deal with a large number of concurrent DT projects, which can lead to additional complexity. Each project, in addition to new technological skills, may also impose fundamental changes to value creation and organizational structures. From a portfolio approach, all DT projects should therefore comply with the following four requirements: 1) fit with the financial framework, 2) avoid redundancies 3) exploit synergies among each other, and 4) follow the overall agenda. This requires a clear strategic vision that needs to be communicated to all involved internal and external stakeholders.

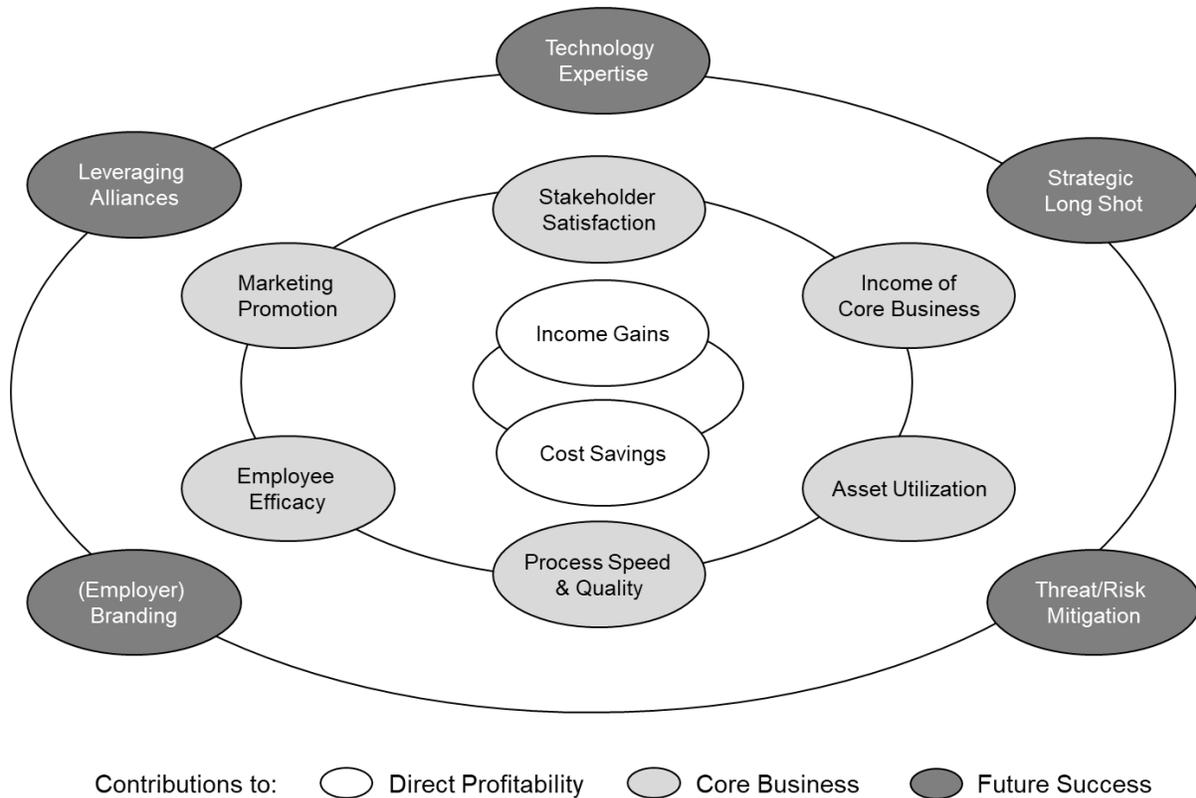


Fig. 2: Value Criteria for Digital Transformation Projects (based on Barthel et al., 2021)

Many organizations already struggle in defining the strategic vision and planning its execution. To provide guidance, the Digital Transformation Strategy Framework (Matt et al., 2015) describes the four essential cornerstones of a digital transformation strategy: the use of technologies, changes in value creation, changes in the organizational structure, as well as the financial framework (Fig. 3). These aspects should be jointly considered when defining goals of the digital transformation ahead, since they need to be aligned with each other, not only for the development, but also for the execution of the digital transformation strategy. Importantly, there is no universal digital transformation strategy that fits all organizations, hence the four dimensions of the framework need to be filled with content (for instance “What are the concrete changes to value creation for a certain unit?”) based on the specific situation of the organization (Correani et al., 2020; Ricken et al., 2021).

- **Use of technologies:** Here, organizations should first be clear about the importance of technologies for them, whether they are rather

a “means to an end” to achieve certain goals or whether they are of central significance for the functioning of the entire organization. Second, they should question their ambitions regarding their IT use, i.e., whether they want to become a technology leader or rather build on established solutions (Hess et al., 2020). Achieving technology leadership can impose competitive advantages but often entails higher risks and not all organizations have the resources and market power to establish technology leadership. Third, organizations need to clarify which concrete technological developments and trends they need to consider and observe.

- **Changes in value creation:** Novel digital technologies may not only affect existing business processes, products and services, they may also enable new product and services, entering other competitive arenas, or assuming a different position in a value chain (e.g., an external service provider may no longer be needed for on site money transfer or cheque payments, since mobile payment solutions can

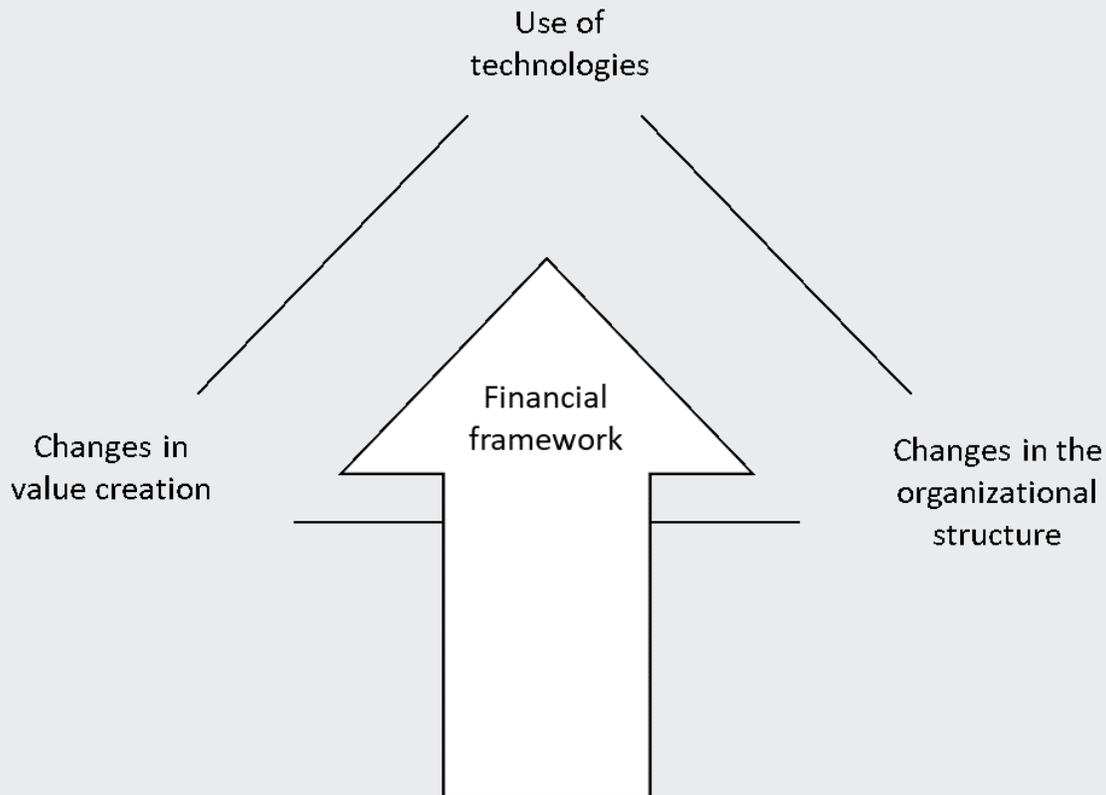


Fig. 3: The Digital Transformation Strategy Framework (Matt et al., 2015)

be directly integrated into services). The higher the deviation from existing business arenas, the higher usually the associated risk. This is because different product-related competencies and skills are needed, and the organization still lacks best-practices in this new area.

- **Changes in organizational structures:** The aforementioned technological and value creation changes may not perfectly fit the current organizational structure anymore, since they may require different skills, or a different flexibility and speed in decision making and collaboration. Organizations should first ask themselves, whether the new “digital activities” can be integrated into existing structures or whether they should be explicitly separated (organizationally, legally, or physically). A stronger deviation from the current activities usually speaks rather for creating separate, autonomous units, while smaller changes may speak for an integration into existing structures to profit from established processes and practices.

- **Financial framework:** DT projects often require substantial resources over a longer time period. While a well run organisation might still have such resources, it can be reluctant to change (either because they do not feel the need, but also because the hectic daily business leaves little room). In contrast, organizations already under financial pressure might no longer be able to conduct substantial DT projects. Therefore, organizations should discuss their options and reallocate resources to new digital activities as long as they still have the opportunity. Public services, on the other hand, are special in the way that financial resources are allocated, often being hampered by lengthy legislative procedures, difficulty in obtaining funding over a long period, as well as high risk aversity in order to protect taxpayer money.

Along these four dimensions, the Digital Transformation Strategy Framework sets the cornerstones, based on which organizations can answer the first fundamental questions of how to configure their individual digital agenda, which

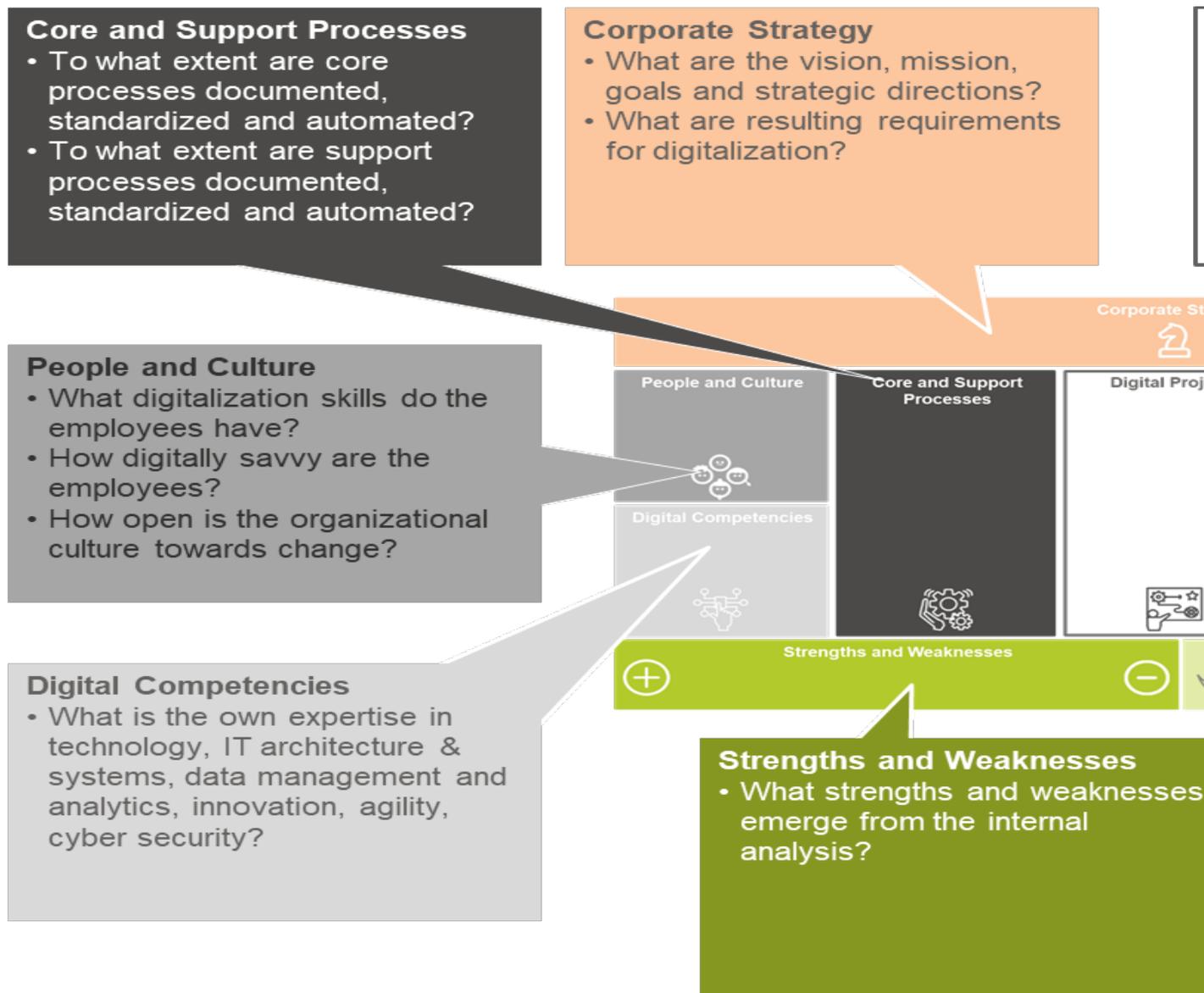
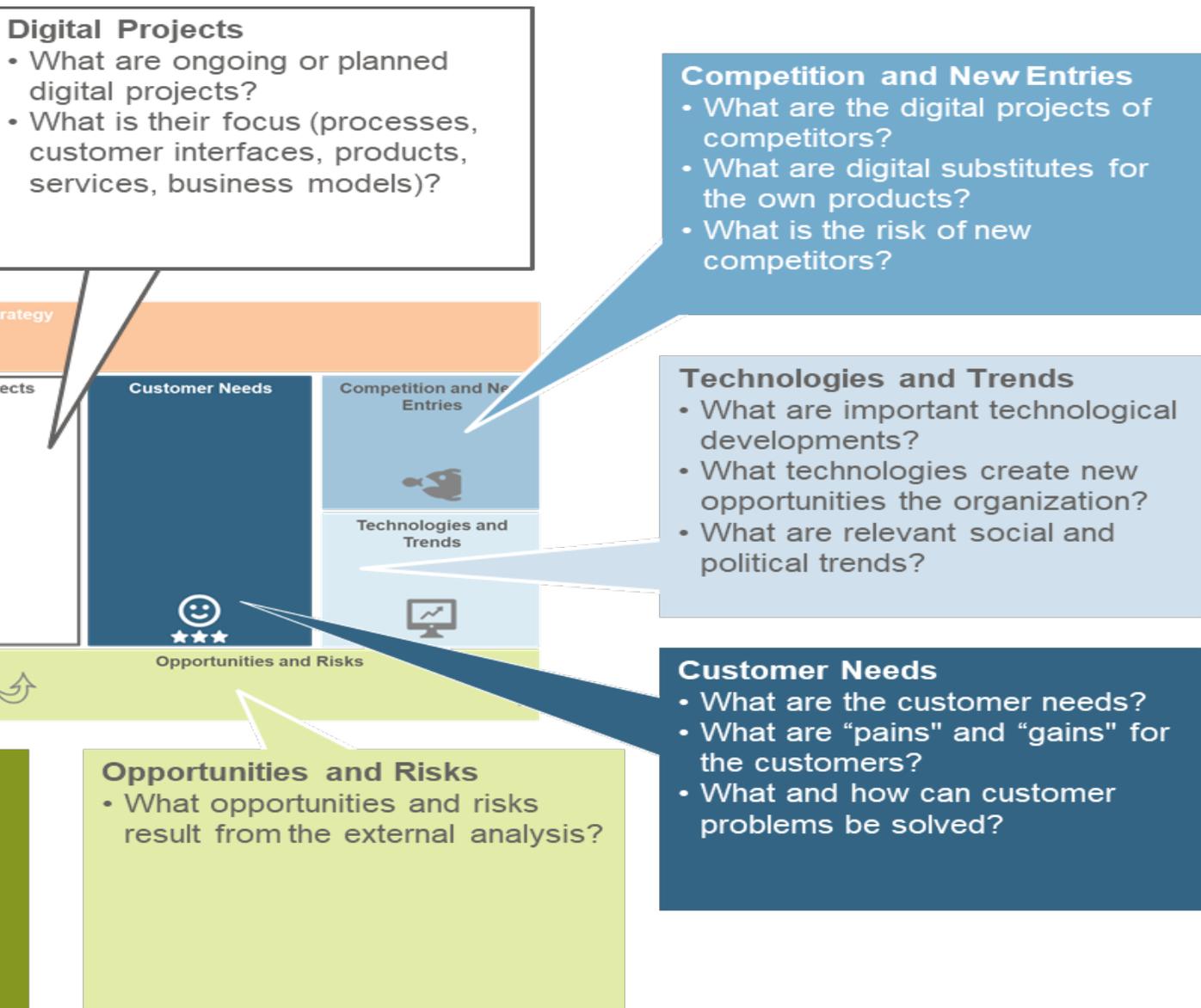


Fig. 4: Digital Analysis Canvas (based on Ricken et al., 2021)

should be based on an organization's current status. To proceed further, the "Digital Analysis Canvas" (Ricken et al., 2021) provides a tool for organizations' consolidated assessment and presentation of their current digital transformation status, which seeks to reduce complexity and create a well founded basis for the organization's DT journey. Similar to the Business Model Canvas (Osterwalder & Pigneur, 2010), the Digital Analysis Canvas consists of 10 building blocks, which can be grouped into the 5 different "parts": upper, middle, right-hand and left hand side, as well as lower part. These categories comprise the most important aspects of a more fine grained DT assessment, e.g., explicitly considering digital projects, digital competencies, and technologies and trends (Fig. 4).

The upper part of the Digital Analysis Canvas focuses on the overarching corporate strategy. Here, organizations need to summarize the core statements of their corporate strategy and resulting implications for DT. In the middle part, organizations need to identify the current and planned DT projects and their focus (customer interfaces, processes, new products, services, or business models). On the right-hand side, organizations need to consider external factors that will affect their DT, comprising competition and new entries, technologies and trends, as well as customer needs. The left hand side focuses on internal factors, consisting of core and support processes, people and culture, digital competencies (e.g., data analytics, innovation & agility, and cyber



security). Last, the lower part describes strengths and weaknesses, opportunities and threats, as already well known from the traditional SWOT-analysis (Strengths, Weaknesses, Opportunities, and Threats, Puyt et al., 2020).

The Digital Analysis Canvas helps organizations to obtain an in depth picture of their current DT status that serves as a basis for determining the further digitization steps. Nevertheless, it must be said that the collection of such an in depth picture is associated with considerable effort. As a rule, the analysis takes place in several workshops, which usually involves both management and staff from

different departments. It is here also important to select the appropriate level of abstraction, especially for larger decentralized military organizations, because capturing all DT projects alone can be very complex. Instead of getting lost in details, organizations should better take an overarching perspective first, and then gradually turn to specific aspects in more detail. Military organizations that regularly work in conjunction with other organizations should also consider possible conflicts of objectives with regard to their partners to avoid incoherent planning.

SETTING THE STAGE FOR DT - REQUIREMENTS AND MECHANISMS

While DT will remain a complex endeavour, military organizations can improve their chances of success by creating certain conditions and applying mechanisms, which have proven effective in other DT scenarios. These include creating suitable leadership and organizational culture, encouraging greater agility across the organization, as well as greater flexibility of their IT landscape. If these conditions are not yet established, they should receive a high priority when formulating an organization's DT strategy.

3.1 Leadership and Organizational Culture

Organizational culture has been identified as a major determinant for successful DT, and many companies even name it as the most significant obstacle towards this goal (Hanelt et al., 2021; Tabrizi et al., 2019). Organizations often find that their employees lack the right digital mindset (Deist et al., 2022), and that achieving a suitable digital culture is challenging and time consuming. Here, two aspects stand out: First, although all employees form an organisational culture, the responsibility for initiating cultural change lies with leadership. Organisational leaders can be particularly affected by DT, since automation allows more tasks to be run without human involvement, and data-driven management can increasingly supplement the previously key managerial competencies of intuition and experience with data and experimentation (Lanzolla et al., 2020). Therefore, DT might not always be in the best interest of leaders. However, managers' cooperation with an organization's DT mission is essential for

its success, and even more so when it comes to promoting more advanced levels (=drastic changes) of DT (Porfirio et al., 2021). Leaders are responsible for which values are put into practice in reality, by either encouraging or prohibiting corresponding behaviour. Therefore, leaders not only play a key role in shaping organizational culture, they must also actively support a cultural change (Alvesson & Svenings-son, 2015). They need to communicate the content and new values of a DT strategy to their employees, to actively set an example by demonstrating this new approach. If, for example, managers demand more flexibility from their employees, but themselves only rely on adhering to formal standard process guidelines in their daily work, the success of this measure is foreseeable from the outset.

Second, the question emerges of what a "digital culture" should look like. Although there is no universal digital culture that fits all organizations, research has identified values that are central to a digital culture and that are the basis to achieving higher organizational agility. These values are divided into external, market centric values and internal, employee centric values (Fig. 5, Hartl & Hess, 2017; Hess, 2022). While communication bridges both perspectives, central market-oriented values comprise a strong customer focus, cooperativeness (especially towards external partners and customers), entrepreneurship and initiative of the employees, courage to take risks, as well as innovation-friendliness. Central employee oriented values comprise participation, a climate of fault tolerance, willingness for change, and openness for new things. However, the external market oriented factors also relate

to factors of the internal employee oriented perspective. For instance, courage to take risks needs to be promoted within a corporate culture, which requires a climate of fault tolerance in which employees can dare to propose unconventional ideas.

the work-force (Nadkarni & Prügl, 2021). Notably, aside from classical measures such as workshops, training or collaboration with external partners, the introduction of new digital technologies can also contribute to cultural change (Volkoff et al., 2007).

Many of the aforementioned values of a digital culture are not typically associated with a classical chain of command structure in military organizations, which typically stems from a long standing culture, emphasising tradition and consistency, built over decades. Therefore, initiating credible cultural changes requires potentially even greater effort and preparation, as well as the unconfined support of leadership actively living the new culture. Dr. Raj Iyer, CIO of the U.S. Army also holds “Going digital is a mindset, it’s culture change...it’s about how we can fundamentally change how we operate as an Army through transformative digital technologies, empowering our workforce, and reengineering our rigid institutional processes to be more agile...” (Office of the Army Chief Information Officer, 2021). Here, it is important to take all employees on-board to avoid an overall skills gap and the division of

In modern organizations, many tasks are conducted by humans and IT forming an ensemble, and, as such, the introduction of digital technologies can have both positive and negative effects on employees individually and the manner in which they collaborate with others (Helkala & Rønnfeldt, 2022). A practical example is the introduction of video conferencing tools such as Microsoft Teams or Zoom that has taken place during the Covid pandemic. Compared to email, such tools enable faster, informal communication, and thus enable more efficient, flexible, and informal ways of working. However, there might be also new dangers in terms of higher distraction of employees through these tools, and a technology-induced cultural change must be accompanied by other internal value changes, e.g., the communication via such tools often follows different patterns than via email (Köster, 2016), which also need to be accepted in an organizational culture.

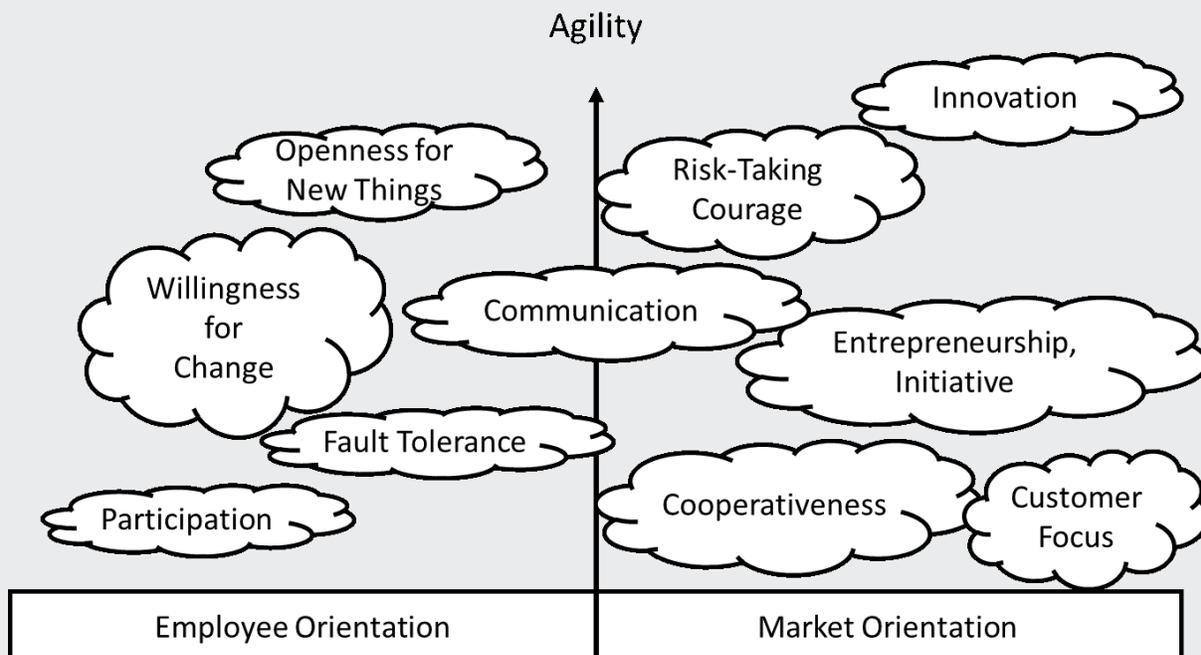


Fig. 5: Values of a Digital Culture (Hess, 2022)

3.2 Agility and Digital Units

In addition to cultural aspects, DT can often put pressure on existing organizational structures (Deist et al., 2022). This is especially true for larger, traditional organizations which are often characterized by hierarchal structures and complex decision making processes, and thus lack the required agility for DT (Sebastian et al., 2020). Furthermore, for organisations of all sizes, decision-making processes are often based on short term goals that rely on incremental improvements to existing processes, products, services, or business models. While incremental improvements can be fruitful, such structures might restrict “big bang” innovations, which are often associated with higher risk and returns only in the long-run. Usually, roles and responsibilities are also firmly anchored in a narrow organisational structure, making collaboration across departmental boundaries difficult.

One option to respond to these challenges is to change entire corporate structures. However, this is cumbersome, often involves strong resistance, and there is a high risk of failure. Therefore, many organizations try to achieve higher agility by creating separate “digital innovation units” within the organizations (Salmela et al., 2022). These are independent organizational units that are responsible for exploratory tasks, i.e., for developing and implementing innovations, and have additional leeway to do so. These digital innovation units are managed in a different way than the traditional business, i.e., they can work with different objectives, are often clearly separated in terms of resources and the time horizon to generate profits, and can adapt more flexibly to changing environmental circumstances (Barthel et al., 2020). Instead of striving for incremental improvements, this should enable them to better identify ground breaking innovations.

For the configuration of digital innovation units, Fuchs et al. (2019) present a taxonomy that divides the different characteristics of a digital innovation unit on the basis of the five dimensions: Goals and Scope, Staffing & Collaboration, Funding, Governance & Structure, and Origins (Table 1). For “Goals&Scope”, the main objectives of a digital innovation unit can be the development of digital in-

novations (as most often the cases), but also driving cultural change, or building digital competencies. Likewise, the focus of the innovations can be placed both on either existing, or on new business areas. For “Staffing & Collaboration”, the question arises, as to whether the digital innovation unit’s employees are specifically staffed for this, or are sourced from the existing core organization, or from external partners. In terms of “Funding”, there are numerous options ranging from a central budget to financing by individual business units or through internal cost allocation. For “Governance & Structure”, organizations need to select how strongly the digital innovation unit is integrated into the existing corporate network (structurally but also physically) and which degree of freedom it has. The category “Origins” describes whether the digital innovation unit’s establishment is directly linked to the digital transformation strategy and whether its implementation is conducted top-down or bottom-up.

When considering establishing a digital innovation unit, military organizations should consider two aspects: First, digital innovation units should be established with a clear objective in mind, otherwise they are often doomed to fail. A starting point for the configuration can be the weaknesses which are identified in relation to their current DT status and the organizational culture. It is possible that the objectives of the unit can change later when DT is progressing. Second, while from an agility perspective, different organizational rules for the digital innovation unit compared to the main business may be desirable, there still needs to be coordination with the rest of the organization. If organizational rules between the two differ substantially, this can lead to problems on both sides, such that the new unit is not accepted or even envied by the traditional organization for their degree of freedom, while the digital innovation unit will have difficulties accepting complex coordination processes during joint projects. As an example for digital innovation units in the military sector, the German Bundeswehr has launched its Cyber Innovation Hub (CIHBw), which collaborates with start-ups, that can still enjoy their own culture and processes, to develop innovations in a more agile way (www.cyberinnovationhub.de/en/). As part of the U.S. Department of Defence, the Defence Innovation Unit (DIU) seeks to more rapidly implement and scale commercial technologies across the six areas: artificial intelligence, autonomy, cyber, energy, human systems, and space (www.diu.mil).

Table 1: Taxonomy of Configuration Options for Digital Units (Fuchs et al., 2019)

Category	Dimension	Characteristic				
Objective & Scope	Main Objectives	Digital Innovation		Cultural Changes		Development of Digital Expertise
	Innovation Orientation	Purely Internal	Primarily Internal	Balanced	Primarily External	Purely External
	Market Focus of Innovation	Existing Business Areas			Novel Business Areas	
	Scope of Innovation Process	Idea Generation	Idea Selection	Innovation Development	Innovation Implementation	Innovation Commercialization
Staffing & Collaboration	Staffing (Project)	Digital Unit Employees		Core Organization Employees		External Partners
	Importance of Ext. Partners	None	Low	Medium	High	
Funding	Funding (Project)	Central Funding	Business Department	Sponsorship Model	Internal Cost Allocation	External Revenue
Governance & Structure	Embedding	Integrated	Separate Department	Separate Legal Entity	Virtual	
	Permanent	Yes			No	
	Location	Onsite			Offsite	
	Degrees of Freedom	Very Low	Relatively Low	Balanced	Relatively High	Very High
Origins	Origins from DTS	Yes			No	
	Formation	Top-Down			Bottom-Up	

DTS = Digital Transformation Strategy

3.3 Bimodal IT

In addition to organizational culture and structures, the IT-landscape can also be a major obstacle towards achieving greater agility (Werder et al., 2021). The reason is that existing IT-landscapes are often designed for continuity and resilience, therefore

involving lengthy planning and implementation cycles, which seek to define the entire development in advance. New innovative IT-solutions, however, typically emerge with different development paradigms. They are often developed in an agile, iterative manner, including early market releases, and continuous improvements thereafter (e.g., via

Table 2: Comparison of Traditional and Novel IT as a Basis of Bimodal IT (Horlach et al., 2016)

Traditional IT (mode 1, industrial / core IT)		Digital IT (mode 2, agile IT)
Stability	<i>Goal</i>	Agility & speed
IT-centric	<i>Culture</i>	Business-centric
Remote from customer	<i>Customer proximity</i>	Close to customer
Performance and security improvement	<i>Trigger</i>	Short term market trends
Performance of services	<i>Value</i>	Business moments, customer branding
Security & reliability	<i>Focus of services</i>	Innovation
Waterfall development	<i>Approach</i>	Iterative, agile development
Systems of records	<i>Applications</i>	Systems of engagement
Slow	<i>Speed of service delivery</i>	Fast

software updates). Here, two worlds collide, but the inflexible, long-term approach of the traditional IT makes both the realization of new IT-solutions and also their later integration into the overall IT-landscape difficult.

However, undoubtedly, the orientation towards continuity and resilience of traditional IT has its value, and continuity and resilience are generally positive and will remain essential attributes of certain IT-systems, especially system critical ones with clear objectives and requirements. Therefore, the traditional approach might still be appropriate to update or replace outdated enterprise-wide IT systems (e.g., ERP system), or to renew monolithic application software (e.g., a billing system). The agile approach, on the other hand, is more beneficial for pilot projects (e.g., Big Data projects), or where objectives and requirements cannot fully be anticipated in advance or are likely to change during development. Consequently, more flexibility is required, usually bundled with a closer customer orientation, in which feedback is directly considered for further iterations of an application.

As indicated, both development approaches differ in several characteristics, and have their own purposes. Bimodal IT acknowledges this and seeks to separate the development of traditional IT from the development of new IT by establishing two different operation modes (Haffke et al., 2017). Table 2 presents a comparison of both approaches.

However, the establishment of agile development and operational modes, in addition to classical development practices, can lead to internal ruptures in existing processes, working methods, and task distributions. For example, the new agile roles in a typically rather flat hierarchy might not be compatible with traditional development paradigms that are based on more formal processes and stricter hierarchies. This could also be particularly difficult for military organizations, whose traditional structures are more formal and hierarchical, and which therefore need, for instance, to discuss whether and how they can adopt to decisions based on democratic majority votes. In addition, dependencies of a financial and personnel nature and interactions between the agile and the traditional approach will persist. For instance, it is more than likely that the new digital IT will

also require data from the traditional systems (e.g., employee data) and vice versa (e.g., for integrating app based location data into an existing supply chain management system). Therefore, organizations need to find a suitable alignment between these two different operation modes within their IT organization. Research has presented several mechanisms to achieve this, which comprise the so called functional, organizational, or structural ambidexterity (Badr, 2018; Jansen et al., 2009; Kusanke & Winkler, 2022). However, such alignments often still prove difficult in practice and therefore some organizations are increasingly relying on full agile development for their DT projects (Cappgemini, 2018).

Owing to complex decision-making and financing frameworks, as well as high requirements on safety and security, IT-landscapes of governmental organizations are often lagging in terms of agility and flexibility (Gong et al., 2020). This applies to military organizations in particular, where the highest security standards are not only necessary within the organization itself, but often also for a complex network of partners, for whom IT-systems

and networks must provide secure and efficient communication across alliance boundaries (Gibson et al., 2017). Because of this, the usage of various applications that might be available for private firms, is more restricted for public organizations, or only possible after all security concerns have been resolved. This often substantially prolongs initial integration times because software updates must potentially undergo extensive tests. In such an environment, staff might also be overly cautious or even refrain from taking on new projects due to a lack of belief in the capabilities of their IT landscape. While a transition towards more agility is often difficult, one can imagine that running IT in different operation modes will potentially become an even greater challenge. Re-search has presented first attempts and frameworks that help establish more agile IT-frameworks particularly for the military sector (Ciancarini et al., 2020; Lauf & de Waal, 2018). As a practical example, with InnoX the German Bundeswehr has created a digital unit that seeks to develop innovative IT-solutions for their clients (mostly with the Bundeswehr) and that operates on agile principles and decision making processes.



CONCLUSION AND RECOMMENDATIONS

While the power and reach of digital technologies increases continuously, many organizations struggle to keep pace and transform in order to better fit this new digital reality. Instead of conducting a single project, ongoing technological developments will require organizations to further pursue this path. For military organizations, new technological developments, such as artificial intelligence or blockchain, promise substantial opportunities across various application scenarios; for example, related to procurement, crisis prediction, or operation planning and leadership (von Krause, 2021). On a broader level, the complexity and scope of changes associated with their introduction shows that this is not merely a technological challenge. Instead, the success of DT is mainly about the people that drive DT, since they are not just part of organizational structures, they also build an organizational culture that may or may not be suitable for the transformation (Kane, 2019; Kane et al., 2015). Organizations therefore require a strategic approach which jointly considers technological, value creation related, structural, as well as financial aspects, and which seeks to develop an individual digital transformation program based on the organization's current status. On the operational project level, organisations can use tools such as the Digital Value Canvas to identify the most promising DT projects by assessing their individual value in a comprehensive manner.

DT poses particularly difficult challenges for military organizations to reach the required agility, since their starting point seems unfavourable from several points of view: First, their IT-landscapes are firmly built upon longevity and the highest

security standards need to be ensured, often while also collaborating with their partners. Second, their organizational structures are often rather rigid, rely on complex decision-making processes, and involve various stakeholders outside the organization. Third, their organizational cultures are built upon a chain of command structure, which is known to not be overly oriented towards risk-taking or customer orientation. All these factors make DT an even greater effort than it already is for other types of organizations, even more so when considering that all of these 3 factors cannot be changed easily and certainly not at short notice. Furthermore, the 3 factors are not to be considered in isolation but are interwoven. Corporate cultures must harmonize with and reflect organizational structures. The use of technology often enables or requires changes in the organizational structure and at the same time contributes to cultural change. The increasing role of digital technologies as part of decision-making processes also presents major challenges for military organizational cultures, since it questions the role and identity of the commanders (Heltberg, 2021). Getting all staff onboard is therefore essential to successfully drive DT, but also to avoid negative effects of digital technologies on staff (such as technostress, Tarafdar et al., 2015), or staff becoming a vulnerable target of attacks enabled by digital technologies (e.g., Phishing emails, Helkala & Rønnfeldt, 2022).

While IT-longevity and high security standards may be nonnegotiable, military organizations should consider whether and to which extent they are willing to make their organizational structures and cultures more open and flexible to achieve



greater agility. If a complete opening across the entire organization does not seem realistic or is not desired, a partial separation can be made both for the IT-landscape (using bimodal IT) as well as in the area of innovation (using digital innovation units) to become more agile. But even this requires a clear agenda in mind, as well as alignments between the new, separated area and the existing one, which typically becomes more difficult the stronger the new area deviates from the existing one. Again, a holistic strategic approach is recommended to master such an endeavour.

Summing up, DT for military organizations is a highly complex issue that requires a strategic master plan, guided by the following recommendations:

1. Do not perceive DT as a single IT-project, assume DT strategically as a continuous effort that deeply affects the entire organization beyond their technological capabilities.
2. Develop a clear digital vision that can be formalized in a DT strategy and that should reflect on a comprehensive assessment of the organization's status quo.
3. Design the DT strategy with all key stakeholders in mind (also those outside the organization to avoid conflicting trajectories), and project a realistic time horizon.
4. Assess the relevancy for and the possibilities to initiate cultural change and create active engagement. Make this a top priority as it will be the basis for the successful transformation.
5. Make necessary adjustments to IT and organizational structures, keeping in mind potential dependencies and synergies.

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