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Transformation of organisational learning in the German Armed Forces: from the Imperial Army to the Bundeswehr (1914–2024)

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Abstract.

The article aims *to provide a historical and analytical overview of the development of organisational learning in the German Armed Forces from 1914 to 2024. The study covers four key periods: the First World War (1914–1918); the formation of the Reichswehr (1919–1935); the interwar and wartime evolution of the Wehrmacht (1935–1945); and the transformation of the Bundeswehr within NATO’s collective defence framework (1955–2024).* ***The research methodology*** *combines a heuristic approach with a historical reconstruction of the examined events. The source base includes scholarly and military publications, NATO doctrinal documents, and informational materials. The study applies a historical-systemic analysis of lessons learned capability based on a retrospective examination of its seven basic components: four “pillars” (organisational structure, process, tools, and personnel training); a key element (information sharing); and the foundational layer (mindset and leadership).* ***The scientific novelty*** *lies in the integrated comparative analysis of over a century of the German organisational learning model, including the identification and in-depth examination of its core components. The research highlights the main characteristics of institutional resilience and continuity within the German military organisational culture, which have ensured its capacity for systemic adaptation, innovation, and inheritance of best practices.* ***Conclusions.*** *The military-historical analysis of learning practices in German military organisations revealed key institutional and structural transformations, enabling an assessment of their effectiveness and alignment with contemporary approaches. The findings have practical and scholarly significance, providing a methodological foundation for enhancing the NATO-compatible Lessons Learned System of the Armed Forces of Ukraine. The recommendations developed in the study can be applied to improve doctrinal documents, knowledge-management processes, and learning culture.*

Keywords: *organisational learning, lessons learned process, organisational (institutional) culture, German Armed Forces, Ukrainian Armed Forces, NATO.*

Трансформація організаційного навчання в збройних силах Німеччини: від імперської армії до Бундесверу (1914–2024)

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Анотація.

Мета статті *– виконати історико-аналітичний огляд розвитку організаційного навчання у збройних силах Німеччини впродовж 1914–2024 років. Дослідження охоплює чотири ключові періоди: Першу світову війну (1914–1918); формування Рейхсверу (1919–1935); міжвоєнну та воєнну діяльність Вермахту (1935–1945); трансформацію Бундесверу в межах колективної оборони НАТО (1955–2024).* ***Методологія дослідження*** *ґрунтується на поєднанні евристичного підходу й історичної реконструкції вивчених подій. Джерельну базу становлять наукові та військові публікації, доктринальні документи й інформаційні матеріали НАТО. Застосовано історико-системний аналіз організаційного навчання на основі ретроспективного дослідження семи базових компонентів: чотирьох «стовпів» – організаційної структури, процесу, засобів і підготовки персоналу; ключового елемента – обміну інформацією; «фундаменту» – менталітету та культури навчання особового складу, лідерства командирів.* ***Наукова новизна*** *полягає в інтегрованому порівняльному аналізі понад столітньої еволюції німецької моделі організаційного навчання з ідентифікацією її базових складових, ґрунтовним їх вивченням. Дослідження висвітлює основні риси інституційної стійкості та наступності організаційної культури збройних сил Німеччини, що забезпечували їхню здатність до системної адаптації, новаторства та наслідування.* ***Висновки.*** *Військово-історичний аналіз розвитку практики вивчення та впровадження досвіду у німецьких військових організаціях дозволив виявити її інституційні та структурні зміни, оцінити чинники ефективності та відповідність сучасним підходам. Отримані результати мають практичне та наукове значення, формуючи методологічне підґрунтя для підвищення дієвості НАТО-сумісної Системи вивчення та впровадження досвіду Збройних Сил України. Розроблені рекомендації можуть бути застосовані для вдосконалення доктринальних документів, процесів управління знаннями та підвищення культури організаційного навчання.*

Ключові слова: *організаційне навчання, процес вивчення та впровадження досвіду, організаційна (інституційна) культура, збройні сили Німеччини, НАТО.*

The Problem Statement. In the military domain, organisational learning constitutes a core mechanism of armed forces development. It enables troops to adapt, emulate, and innovate. Its primary purpose is to improve doctrinal and guidance documents, as well as strategy, operational art, tactics, organisational structures, and military technologies (Farrell, 2010, p. 569; Dyson, 2020, p. 2). Historical experience demonstrates decisive importance of military learning. However, in practice, the frequent use of the term “lesson learned” (LL) often obscures the actual substance of this activity and weakens institutional motivation to develop effective learning procedures (Milton, 2010, p. 7). Undervaluing LL practices or ensuring their poor performance at any level (tactical, operational, or strategic), especially in wartime, results in defeat on the battlefield and severe consequences (Lynch, 2019). Armed forces operating in an uncertain and turbulent security environment require strengthened capacities for rapid and effective lessons learning, and continuous adaptation (Schulte et al., 2020, p. 153–154, 157).

Analysis of Sources and Recent Research. The outlined issue has held a prominent place in scholarly discourse for an extended period. Contemporary studies of LL systems over the past two decades highlight the decisive role of historical continuity and military culture in shaping effective organisational learning (Schulte et al., 2020, p. 157). M. Visser (2008; 2017) examined the Second World War (WW2) through an integrated four-dimensional “learning organisation” model, using the German and U.S. armed forces as case studies. N. Milton (2010) formulated conceptual approaches to modern LL processes based on an analysis of organisational learning in leading militaries. D. Davidson (2010) assessed how cultural and political factors affected the U.S. military learning after the events of 11 September 2001. Drawing on the British experience in Afghanistan, T. Farrell (2010) developed an organisational learning model aimed at enhancing military adaptability. N. Dixon (2011)

proposed a historical reproduction of the evolution of the U.S. LL system, emphasising the persistence of its core components.

Dr. R. Foley conducted a historical and comparative analysis of learning-from-experience practices in the German and British armed forces during the First World War (WW1) (Foley, 2014; Foley, 2015). His research demonstrated significant differences in how the two armies approached organisational learning. At the same time, scholars K. Harkness and M. Hunzeker (Harkness & Hunzeker, 2015) highlighted the limitations of learning mechanisms during the British campaign in Cameroon, emphasising the decisive influence of political constraints. Subsequent studies (Coticchia & Moro, 2016; Edmunds et al., 2016; Griffin, 2017) examined the main challenges of intergenerational knowledge transfer and the dependence of adaptation and innovation on the broader socio-cultural environment.

Prof. T. Dyson (Dyson, 2020) analysed LL models in the German and British armed forces and assessed their effectiveness. D. Barno and N. Bensahel (Barno & Bensahel, 2020) identified the roots of the weak adaptive performance of the U.S. military in twenty-first-century wars. F. Hoffman (Hoffman, 2021) synthesised the LL practices of U.S. forces across four major conflicts: Korea (1950–1953), Vietnam (1964–1975), Iraq (2003–2011), and Afghanistan (2001–2021).

Despite a substantial body of scholarly work, the historical evolution of LL processes in the armed forces of leading states remains insufficiently studied. The interaction between institutional continuity and innovation, as well as their impact on the effectiveness of learning mechanisms, remains unclear. Addressing these gaps is essential for a deeper understanding of how military organisations form, retain, and utilize knowledge accumulated across different historical periods.

In this context, a systematic examination of the development of learning within the German Armed Forces (GAF) from 1914 to 2024 is especially pertinent. Historically, the German Army demonstrated characteristics of a military structure capable of systematically assimilating combat experience. A notable case is the analysis of the defeat at Jena-Auerstedt (1806), which triggered a fundamental remodelling of the Prussian Army. The reforms of Scharnhorst, Gneisenau, and Boyen laid the foundations for decentralized command, a professional officer corps, and an institutional capacity for learning (Craig, 1955; Citino, 2005; Daniels, 2025, p. 5). Germany's LL capability remained consistent in later periods. It pioneered semi-formal mechanisms for collecting and analysing operational experience during WW1 (Foley, 2014, p. 6). Throughout WW2, it was among the first to develop and institutionalize formal LL procedures (Dyson, 2020). Today, the Bundeswehr has established a modern and effective learning system (Dyson, 2020; p. 1).

The Purpose of the Article. The article aims to conduct a comprehensive military-historical analysis of the evolution of organisational learning in the German Armed Forces from 1914 to 2024. It examines the factors that shaped its institutional continuity and innovation, and outlines mechanisms relevant for adaptation within the Armed Forces of Ukraine.

The Results of the Research.

Imperial Army. At the outset of WW1, the GAF established one of the most consistent semi-formal learning procedures (Foley, 2014; Foley, 2015). This approach was based on the institutionalized processing of combat experience, grounded in the Prussian tradition of military-historical analysis and the high training of officers (Corum, 1992, p. 7). The Imperial Army cultivated a supportive professional environment by strengthening military education, encouraging initiative, and advancing the careers of intellectually capable officers (Foley, 2014, pp. 10–11).

In 1916, the GAF introduced after-action reports (AARP; Erfahrungsberichte), a «reactive» learning tool based on «passive» information collection (Weber et al., 2001, pp. 20–21). Divisions and army corps were required to submit these reports after each operation (Foley, 2014, p. 13). For the first time, a dedicated LL body – War Experience Department (Kriegserfahrungsabteilung) – was established within the General Staff to collect and analyse combat experience. A network of training centres was created to disseminate lessons learned following the "teach the teachers" principle (Foley, 2014, p. 13). Within units, formations, and commands, formalized knowledge-transfer channels were implemented to ensure the flow of information both upward and downward through the command hierarchy (Lynch, 2019).

The effectiveness of the semiformal learning was demonstrated during the Somme campaign, where decisions based on collected AARPs led to the replacement of the outdated defensive doctrine with an innovative strategic and tactical approach (Foley, 2014, p. 13). At the initial stage, military organisations independently initiated requests for and exchanges of these reports. Corrective actions were implemented in a decentralised manner based on commanders' decisions. They included strengthening defensive measures, deepening positions, and modifying the battle command and control. On 1 December 1916, the consolidated lessons informed the publication of «Principles of Defensive Operations in Positional Warfare». The document was refined on the basis of additional AARPs, and a revised version was issued on 1 March 1917 (Foley, 2014, pp. 13–14).

In 1916, the General Staff established two training centres on the Western Front to prepare commanders, test innovations, and facilitate experience sharing among German and Allied forces (Foley, 2014, pp. 14–15). These measures ensured timely doctrinal updates aligned with the evolving combat environment. They strengthened the army's capacity for rapid adaptation through the creation of coherent collective knowledge circulating vertically between units and the General Staff (Foley, 2014).

The German military learning was marked by early and consistent institutionalization of the LL process, which enabled rapid modernization of tactics, technologies, and organisational structures across the forces (Foley, 2014; Foley, 2015; Lynch, 2019). Its effectiveness was indirectly illustrated by the GAF operational performance, which exceeded that of the British Army by a factor of 1.49, the French by 1.53, and the Russian by 5.4 (Corum, 1992, p. 24). Despite significant progress, the Imperial Army in WW1 lacked a centralized LL structure and formal LL training. Paper-based products were the main systematic channel for sharing lessons, and their circulation was slow. Although the officer corps showed leadership in implementing learning procedures, most personnel had limited awareness of these mechanisms and did not participate meaningfully in the LL process (Foley, 2014, p. 11).

Historical analysis of the WW1 indicates that Germany and its allies had no realistic prospects of victory (Corum, 1992, p. 4). Despite tactical and operational achievements, German commanders made a series of strategic miscalculations (Corum, 1992; Lynch, 2019). Moltke's abandonment of the Schlieffen Plan undermined the prospect of a rapid campaign (Corum, 1992, p. 5). Falkenhayn's attritional strategy at Verdun failed to achieve its objectives (Corum, 1992, p. 5–6). The opportunity for a decisive offensive on the Eastern Front in 1915 was disregarded, and Ludendorff's 1918 operations ended unsuccessfully (Corum, 1992, p. 6). Ultimately, the numerical and material superiority of the Entente determined Germany's strategic defeat (Corum, 1992; Lynch, 2019). In this context, scholars argue that the Imperial Army's tactical effectiveness stemmed primarily from a productive LL process, which enabled rapid adaptation to the conditions of trench warfare (Foley, 2014; Lynch, 2019). Yet the failure to internalize key strategic lessons in time became one of the factors leading to defeat (Foley, 2014; Lynch, 2019). This contrast highlighted the paradox of the situation and underscored the need for coherent learning at all levels (Lynch, 2019).

Reichswehr. The signing of the Treaty of Versailles in 1918 led to the dismantling of the previous military system and the establishment of the Reichswehr (1919–1935). It required a revision of organisational principles and training, which in turn catalysed the development of alternative LL mechanisms. To this end, the General Staff under von Seeckt devised a reform methodology in 1919 (Corum, 1992). Its approach to post-operational analysis remains relevant for contemporary LL practices (Dyson, 2020). A large remodelling programme involved several hundred officers for systematic and unbiased examination of wartime experience (Corum, 1992). The method of forming analytical groups was particularly noteworthy. Von Seeckt personally organized the selection of officers based primarily on analytical ability and initiative rather than solely on combat experience.

The research findings guided key decisions that shaped the development of the Mobile Doctrine in the 1920s, which later evolved into the Blitzkrieg Concept in the 1930s (Corum, 1992). A critical factor in achieving comprehensive learning from the war was the socio-cultural environment. The command promoted professional debates, enabling officers to present and defend alternative concepts without fear of disciplinary repercussions (Corum, 1992). The personnel exemplified meticulousness, responsibility, and integrity, traits characteristic of the German military tradition. Individual leadership played a key role. General von Seeckt became the central figure in transforming the army and initiating LL procedures. His achievements were especially significant given the political constraints and internal resistance he faced (Corum, 1992).

The Reichswehr implemented the semi-formal LL process trialled during WW1. Its application, however, was brief, limited to 1919–1920 (Corum, 1992). No dedicated LL structures or personnel training were established, and the force largely remained unaware of organisational learning, with minimal participation.

Wehrmacht. In the subsequent period (1935–1945), the GAF retained a leading position in organisational learning. They institutionalized the first formal LL procedures, which featured a structured process and a clear system for collecting and analysing regular standardized reports. These practices differed significantly from earlier semi-formal methods.

Despite its reputation as a rigid, hierarchical force characterized by strict obedience (Befehl ist Befehl; Kadavergehorsam), the Wehrmacht demonstrated a high capacity to learn, adapt, and emulate (Visser, 2008, p. 128). During the invasion of Poland in September 1939, the Army High Command (AHC; Oberkommando des Heeres) introduced an advanced philosophy that recognized the uncertainty and volatility of war and required a decentralized approach to respond to these conditions (Visser, 2008). This orientation encouraged commanders to overcome the «fog of war» through initiative, independent judgment, and responsibility. The systemic approach known as «Auftragstaktik»

emphasized the formulation of clear objectives while granting broad autonomy in execution (Visser, 2008, p. 130; Dungveckis, 2021, p. 2). It represented an early precursor to the modern NATO concept of Mission Command.

The campaign in Poland, despite its rapid success, exposed multiple shortcomings. Within 18 days, the army nearly exhausted its fuel, ammunition, and equipment stocks and suffered substantial materiel losses (Visser, 2008). In October 1939, Colonel-General von Brauchitsch ordered the submission of «maximally critical and objective» AARPs within one month, beginning at the regimental level (Visser, 2008, p. 131). This became one of the earliest documented applications of formal LL procedures (Visser, 2008, p. 131; Dyson, 2020, p. 4). The practice relied on trust and honesty, which created a favourable socio-psychological environment essential for adequate learning (Visser, 2008). Based on the analysis of submitted AARPs, the core principles of the Blitzkrieg doctrine were confirmed. Also, significant deficiencies were identified, including gaps in training, command initiative, and inter-service coordination.

Although Hitler opposed such critical assessments, the AHC adopted remedial measures. A key outcome was the transformation of lessons from the Polish campaign into a six-month retraining programme (Visser, 2008, p. 132). It covered both experienced and newly formed or reserve units. Training centres employed officers and NCOs with combat experience as instructors. A specialized training unit for commanders delivered three- and four-week courses attended by up to 300 officers per cycle (Visser, 2008, p. 132). The effectiveness of this formal learning approach became evident during the Western campaign in May 1940, when the Wehrmacht defeated the armed forces of France, Belgium, the Netherlands, and the British Expeditionary Force within six weeks.

This example showed that organisational learning could function efficiently even within rigid hierarchical structures (Visser, 2008). Trust, accountability, and leadership were decisive. Junior commanders required space for initiative within the assigned mission. Senior officers fostered an open learning climate, treated mistakes as opportunities for improvement, and focused on solutions rather than blame. Active engagement of senior leadership was therefore essential for fruitful learning practices (Visser, 2008; Dyson, 2020; Hunzeker, 2021).

During the WW2, the Wehrmacht created the first comprehensive LL System in military history, which is widely regarded as one of the most effective (Dyson, 2020; NATO 2024). Its principles shaped subsequent approaches to organisational learning not only in the Bundeswehr but also across NATO armed forces, particularly in the United States, which became a leading innovator in this field from the 1980s onward. The LL System consisted of three core components (NATO 2024, pp. 24–26):

1) Incipient centralized LL organisational structure. The Army General Staff (Generalstab des Heeres) oversaw the overall process. The AHC coordinated lesson analysis. The Troop Office (Truppenamt), later Army Inspectorate (Heeresinspektion), analyzed reports from divisions and corps and produced new doctrinal documents. The War Experience Department collected observations and generated lessons. “Trophy teams” (Beutekommandos) examined captured equipment and documents. Scientific institutions formed LL teams that systematically studied operational experience, focusing on tactics, weapons, and training. Field historians and war correspondents gathered information on the front line and submitted analytical reports to higher headquarters. Although this LL structure was not fully developed by modern standards, it represented a coherent institutional framework.

2) A standardized two-stage LL process was introduced. The first stage, «Analysis», involved the centralized collection of observations and their systematic examination. The Wehrmacht employed a rigorous methodology to study the tactics, organisation, and materiel of both friendly and opposing forces. The second stage, «Implementation», focused on remedial actions. It emphasized improving operational training and enhancing adaptability to dynamic battlefield conditions. Based on the acquired experience, the AHC produced and disseminated analytical and directive documents (Taktische Erfahrungen). Training centres processed these materials, instructors received refresher training, and curricula were adjusted accordingly. Tactical-level commanders then trained according to the updated lessons.

3) A developed set of «reactive» tools using «passive» data collection (Weber et al., 2001; NATO 2024). First, after-action reviews (AARV; Nachbesprechungen), which had been used in the Prussian Army since the late nineteenth century (Craig, 1955; Citino, 2005). By the interwar period, the Reichswehr made them mandatory for all exercises, and during the WW2 they became a key instrument for capturing combat experience (Dyson, 2020). Commanders, with the active involvement of their subordinates, analysed mistakes and shortcomings, formulated recommended actions, and submitted their findings through the chain of command. Second, «war diaries» (Kriegstagebücher) documented daily activities, enemy tactics, losses, and weapon performance. Divisional headquarters produced the most valuable of these records. Third, formal AARPs (Erfahrungsberichte) were prepared immediately after each operation and captured essential lessons. Fourth, periodic interim

reports were submitted from regimental level upward and assessed unit performance and weapon effectiveness over defined intervals.

Key features of the German LL System in WW2 can be identified (Foley 2014, pp. 287–290; NATO 2024, pp. 24–26):

1) Rapid response. Although dissemination relied on paper reports and bulletins, critical frontline experience was analysed, circulated, and implemented within weeks.

2) Scale and decentralisation. The modernised doctrine of «Auftragstaktik» ensured the involvement of all personnel in the LL process, primarily through mandatory AARVs. Commanders assumed strengthened leadership roles and were directly engaged in LL activities. They had the autonomy to adapt corrective measures to specific operational conditions.

3) Limitations. The absence of an extensive network of LL bodies and the lack of specialised training reduced the system's coherence.

Overall, the LL System enhanced the Wehrmacht's effectiveness and its capability for adaptation, emulation, and innovation (NATO 2024, p. 26). On the Eastern Front, the formal LL mechanism for submitting and analysing AARPs addressed critical shortcomings in training, tactics, and weapons employment. This substantially improved anti-tank performance (Dyson, 2020, p. 4). However, despite strong tactical and operational learning, the Wehrmacht assimilated strategic experience only to a limited degree, which contributed to its defeat in the WW2 (Craig, 1955; Citino, 2005; Hunzeker, 2021).

Bundeswehr. In the post-war period, most armed forces largely abandoned formal learning. Historically, semi-formal and formal LL procedures were applied mainly within the scope of specific campaigns (Foley, 2014, pp. 287–290; Dyson, 2020, p. 1). This was also the case in Germany, which joined NATO in 1949 and whose armed forces were reconstituted under Allied supervision as the Bundeswehr.

By the late 1980s and early 1990s, after the end of the Cold War, technological and conceptual progress in learning enabled the United States and, later, other leading NATO states, including Germany, to establish permanent formal LL processes (Dyson, 2020, p. 1). These practices evolved significantly during multinational operations, beginning with the 1991 Iraq mission. NATO's operation in Afghanistan (ISAF, International Security Assistance Force, 2001–2014) became the decisive catalyst for developing all major components of the contemporary Bundeswehr LL System (Dyson, 2020, p. 1; Daniels, 2025, p. 1). The turning point came in 2006, when German units faced a sharp rise in attacks. The need to enhance force protection and improve troop adaptation to the operational environment became the primary driver behind the institutionalisation of organisational learning processes (Dyson, 2020, p. 187).

After the WW2, from the first deployment during UNPROFOR in 1995 to the EUFOR mission in Congo in 2006, the GAF lacked formal LL structures (Dyson, 2020, p. 169). Temporary ad hoc officers were assigned to study peacekeeping experience in addition to their primary duties (Dyson, 2020, p. 169). The only LL instrument was the after-operation reports, which did not support in-depth analysis of training, equipment, education, or other aspects, and often overstated successes while understating problems (Dyson, 2020, p. 169). Knowledge accumulation and dissemination were limited. No LL database existed, reports were neither synthesised nor distributed (Dyson, 2020, p. 170). Most lessons identified were not converted into capability improvements across the DOTMLPF-I spectrum (NATO 2022, p. 30).

In 2006, the Army Command established the first permanent LL section, staffed by six officers responsible for organising the collection and analysis of observations and for disseminating lessons (Dyson, 2020, pp. 170, 190). In the ISAF contingent, LL staff officers (LLSOs) were appointed on a rotational basis, and LL teams were employed. This arrangement significantly improved tactics, techniques, and procedures, particularly in the area of force protection and especially in counter-improvised explosive device measures (Dyson, 2020, p. 190).

In June 2008, the LL section was transferred to the Operations Command, where a joined J357 section was established (Dyson, 2020, p. 170). It assumed a leading role in coordinating the LL process and in collecting and analysing observations from deployed contingents and exercise participants. Since 2010, the mandatory deployment of LLSOs and the involvement of LL points of contact (LLPOCs), sometimes at the company level, significantly improved organisational learning in the missions (Dyson, 2020, pp. 170–172). This enabled the production of systemic lessons with immediate operational relevance.

Between 2008 and 2016, the personnel of J357 increased to 17, and its mandate expanded to include oversight of remedial actions (Dyson, 2020, p. 171). Since 2016, the section has contributed to integrating long-term lessons into the development of land forces at the tactical level (Dyson, 2020, pp. 169–170). Subsequently, the Bundeswehr developed an extensive LL organisational structure that encompassed a broad network of LLSOs and LLPOCs (NATO 2024, pp. 26–27; Daniels, 2025, p. 1):

1) The Centre for Operational Communication (Zentrum für Operative Kommunikation, ZOpKomBw). It analysed operations, formulated proposals for improving DOTMLPF-I capabilities, and maintained close cooperation with NATO partners, including the US Center for Army Lessons Learned.

2) The Army Combat Training Centre (Gefechtsübungszentrum Heer, GÜZ). It provided operational training informed by collected experience. In particular, it employed the advanced virtual reality (VR) and augmented reality (AR) systems to prepare personnel for combat environments.

3) The Training and Exercises Command (Kommando Ausbildung und Übungen, KdoAusbUeb). It integrated validated lessons into educational and training programs and coordinated training across all branches.

4) Center for Leadership Development and Civic Education (Zentrum Innere Führung, ZIF). It studied tactical aspects and examined the impact of operations on personnel, producing recommendations on psychological and moral support.

In 2006, the Bundeswehr introduced both «reactive» and «active» LL tools and employed «passive» and «active» collection methods (Dyson, 2020, pp. 169–170; NATO 2024, pp. 26–28; Daniels, 2025, pp. 16–17). The core of «reactive» instruments comprised AARVs and AARPs submitted by contingent commanders. Their approval and subsequent sharing required prior review by the Chief of Staff of the Operations Command and J357 specialists during the debriefing phase (Dyson, 2020, p. 172). Reports were also screened for strategically, politically, or media-sensitive content, and dissemination was restricted when necessary (Dyson, 2020, p. 212). Additional data were collected through voluntary surveys conducted in home stations after operations, with participation rates reaching up to 23% of personnel. These surveys and interviews assessed the adequacy and quality of pre-deployment training (Dyson, 2020, pp. 169–170).

Key «active» tools included (Dyson, 2020, p. 173; NATO 2024, p. 28):

1) Incident reports (since 2009), which analysed critical incidents and combat engagements. These reports underwent additional legal review by contingent legal advisers.

2) «Quick Look» forms (since 2010), which have been completed by contingents, providing rapid identification of weaknesses across DOTMLPF-I areas and corresponding recommendations.

3) Reports from contingent commanders and LLSOs (since 2010) distinguishing potential best practices.

«Active» collection also involved targeted requests to contingents to gather data needed for practical problem-solving. LL bodies regularly issued mandatory questionnaires, including those assessing pre-deployment training four weeks before mission deployment (Dyson, 2020, p. 173). Since 2006, the «Interest in Insights» mechanism (Erkenntnissinteresse) has been used to distribute targeted surveys to contingents and personnel groups. It enables rapid assessment of unit performance and supports the refinement of tactics, techniques, and procedures (Dyson, 2020, p. 173; NATO 2024, p. 28).

The introduction of the information platform InfoSysEEBw by the Operations Command in 2004 marked a significant milestone in the development of the modern German LL System (NATO 2024, p. 28; Daniels, 2025, p. 15). InfoSysEEBw served as a centralized database that supported oversight of the entire learning cycle – from the registration and initial analysis of observations to decision-making, implementation, and the dissemination of validated lessons (NATO 2022). Since 2010, the German military has had access to the NATO LL Portal, which was actively used to study experiences from partners. The informational compatibility between the InfoSysEEBw system and the NATO Lessons Learned Portal ensured its deep integration with the NATO Joint LL System and enhanced the level of the Bundeswehr's interoperability within the Alliance (NATO 2018; NATO 2024).

In 2004, the GAF implemented a formal learning process aligned with the standardized NATO model and adapted to national conditions (Daniels, 2025, p. 15; Dyson, 2020, pp. 180–181; Fischer, 2008, pp. 51–52). The LL procedures defined by the «Standing Operating Procedure für die Durchführung bundeswehrgemeinsamer Auswertung von Einsätzen und einsatzgleichen Verpflichtungen» primarily applied to overseas military operations and to Bundeswehr activities conducted within NATO and the European Defence framework (Fischer, 2008, p. 52). During the «Analysis» phase, the observations were submitted through formal channels, primarily via InfoSysEEBw (Dyson, 2020, p. 173; Fischer, 2008, p. 54). After registration, LLSOs selected and analysed them. The Operations Command then verified each observation with the contingent commander or LLSO and consulted additional personnel. Anonymous submissions were not permitted, as each case had to include a verifiable point of contact. If the Operations Command and the Army LL Branch judged the observation to warrant further action, it became a lesson identified (NATO 2022, p. 10, 19). The Army LL Branch assigned responsibility for corrective measures to the relevant Army body and recorded the process within a dedicated InfoSysEEBw page.

At the onset of the «Implementation» phase, a dedicated «Massnahmen» (measures) page was established to specify the required remedial actions (Dyson, 2020, p. 180). The primary authority

responsible for transforming experience in remedial actions was the Training and Doctrine Command. Through this command, elements of DOTMLPF-I were adjusted, particularly combat training programmes, military education content, and training standards, which ensured systematic integration of lessons learned (Dyson, 2020, pp. 180–181; NATO 2024, pp. 28–29). The Army LL Branch later verified the effectiveness of these measures, normally within one year. A distinctive feature of the German LL model at the "knowledge utilisation" stage was a dedicated mechanism for assessing the quality of remedial actions (Fischer, 2008, p. 5). This mechanism was implemented through catalogues for the development of required skills and competences, as well as catalogues for goal achievement and the execution of combat training plans (Fischer, 2008, p. 5). Upon completion of validation, the acquired experience was reclassified as a "lesson learned" or a "best practice" (NATO 2022, p. 21) and subsequently disseminated within the Bundeswehr. The LL process for a specific case was then formally closed (Dyson, 2020, p. 180).

Lessons learned training was one of the Bundeswehr's development priorities and was considered essential for effective learning (NATO 2024). The training system for German LL personnel was built on a network of six NATO courses that ensured standardized preparation and unified LL procedures across the Alliance (NATO 2022). All staff serving in NATO headquarters had to complete LL training (NATO 2018).

Appropriate learning awareness among service members was maintained through regular training sessions, information briefings, and practical workshops. In the professional military education system, a basic course in organisational learning was integrated into officer-training programmes. Cadets acquired fundamental principles of the LL procedures and the use of relevant information systems (NATO 2024, p. 28).

A key indicator of the effectiveness of the German learning process was the short duration of its cycle. In most cases, the dissemination of critically important lessons took two to four weeks (NATO 2024, p. 29). This period covered the time from the submission of observations to the receipt by the troops of processed results, including the assignment of appropriate remedial actions. This responsiveness was enabled by several factors: the integrated use of the modernised InfoSysEEBw, the NATO LL Portal, and artificial-intelligence tools; a robust LL organisational structure; strong analytical capacity among LLSOs and LLPOcs; and clearly defined procedural timelines (NATO 2024, pp. 29–30).

The contemporary Bundeswehr's «learning foundation» – a deeply ingrained mindset, a mature military culture, and well-developed leadership – ensured both institutional continuity and capacity for innovation. The professional character of the GAF was reflected in the high level of personnel awareness of LL processes and their active involvement in them, particularly in after-action reviews. Most commanders actively contributed to organizing LL procedures (Daniels 2025, pp. 10–11). The officer corps combined traditional discipline with initiative and innovation rooted in the concept of «Auftragstaktik». German military climate was characterized by cohesion, individual and collective effectiveness, and constructive, adaptive, and transformational leadership (Dungveckis 2021, p. 7). Its foundation was formed by the synergy of high moral standards inherent in German discipline and pedantry, the principles of an effective learning military organisation, and a well-developed culture of innovation (Janke, 2021, pp. 4–6; Schulte et al., 2020, p. 175). This socio-professional environment created favourable conditions for effective organisational learning, whose continuity and sustainability was confirmed by more than a century of historical experience.

The Bundeswehr's LL model was not fully optimal (Janke, 2021, pp. 4–8; NATO 2024, pp. 28–30; Dyson, 2020). Some procedures required substantial harmonisation across services and branches. LL personnel were not always actively involved in organising and improving the learning process (Dyson, 2020, p. 26). Uneven LL training of personnel and inconsistent, low-quality documentation and analysis of good and bad practices reduced the effectiveness of its processing (NATO, 2002, p. 43). Deficiencies in the training and practical performance of LL officers weakened communication with personnel and led to intensive, uncontrolled informal exchange of experiences (Dyson, 2020, p. 215). At the unit level, LL procedures were often applied inconsistently, and their effectiveness frequently depended on the individual qualities and leadership of commanders. The influence of resistance to change and bureaucratic inertia was not fully eliminated (Schulte et al., 2020, p. 175). A culture of fear and the concealment of negative experience persisted, creating a vicious circle in which fear of punishment limited learning and encouraged the repetition of mistakes and problems (Janke, 2021, p. 4). Existing decision-making and feedback mechanisms did not always ensure the timely and effective implementation of lessons identified (Dyson, 2020).

The findings of this study can be applied to strengthen the LL capability of the Armed Forces of Ukraine (UAF). Bundeswehr practices can serve as a benchmark. First, doctrinal documents must be updated and aligned with NATO standards, while knowledge-management and knowledge-transformation procedures require improvement. Since 2004, the GAF has used the InfoSysEEBw

platform for digital learning information exchange and LL process monitoring. By contrast, the UAF LL Portal, planned for mid-2021, has not yet been launched.

A unified experiences-governance vertical is required. To integrate lessons into the DOTMLPF-I components, a coordinating body similar to the German Training and Exercises Command (KdoAusbUeb) should be designated. Standardised post-operation questionnaires and a mechanism, «Interest in Insights» (Erkenntnissinteresse), should also be introduced. Expanding training and simulation complexes based on real operational experience would be beneficial.

A deeper historical analysis of Bundeswehr organisational culture is essential for applying its results in Ukrainian practice. It should provide a basis for phased, trial implementation of key approaches in the long term. German experience has to be used critically: only effective LL elements should be adapted, with full consideration of Ukraine's security and resource conditions. Further improvements in organisational learning within the UAF require stable political and financial support, as well as regular audits of its effectiveness.

Conclusions. The study encompasses a retrospective analysis of organisational learning in the German Armed Forces over more than a century (1914–2024). It allows for tracing the historical dynamics of all seven core LL dimensions and the evolution of methodologies for acquiring, processing, and transforming knowledge.

The German Army was the first to apply semi-formal LL procedures during WW1, long before other armies. Subsequent stages – Reichswehr and Wehrmacht – demonstrate continuity and innovation in LL practices. Today, the Bundeswehr is among the leading forces implementing advanced formal processes for analysing and applying lessons in line with NATO standards. Its learning system relies heavily on modern information, communication, and simulation technologies, including artificial intelligence-based solutions. Its effectiveness is reinforced by a mature learning culture and systematic leadership. The LL model preserves continuity by integrating contemporary approaches with careful consideration of historical experience.

The research on the evolution of German learning practices has both theoretical and applied value. It allows the identification of effective mechanisms that can be adapted to enhance the LL capability of the Ukrainian Armed Forces under current challenges and conditions of ongoing war.

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