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Lessons identified from planning doctrines development: quantitative approach to measure information completeness

It is wildly acknowledged that the Ukrainian Armed Forces have successfully implemented the Military Decision-Making Process (MDMP). A simple count of the pages allotted for the MDMP process itself shows that the Ukrainian doctrine contains equal number of sheets compare to US publication. However, the results of the survey indicate dissatisfaction of officers with the available national doctrine. This led to the development of an approach that allows a more accurate measurement of doctrine information completeness.

The proposed approach enabled us to compare the quantity of doctrinal information. The results confirmed the hypothesis of insufficient information of national doctrines. A comprehensive list of deficient processes and procedures within Ukraine's MDMP has been identified. It hinders an effectiveness of MDMP in Ukraine's Armed Forces, thereby proves the need for pertinent doctrines revision.

Keywords: planning, NATO standards, Shannon entropy, quantitative document analysis, theory of information, US Army doctrine, information quality.

The Armed Forces of Ukraine continue to build defence forces that are «interoperable with the relevant competent authorities of NATO member states and able to make a worthy contribution to the conduct of a NATO operation» [1]. Interoperability is the ability to act together coherently, effectively, and efficiently to achieve tactical, operational, and strategic goals [2]. Interoperability with Allied forces is achieved through the use of the English language, common terminology, procedures, and doctrine [3]. The central element in achieving these goals in Ukraine is the development of a new doctrine based on the standards of leading countries of the world [4]. The use of common planning standards is of paramount importance for interoperability in allied operations. Therefore, the proper implementation of these standards in the national doctrine should be one of the highest priorities for a country to join NATO.

An analysis of the new Armed Forces of Ukraine doctrines shows that these standards are usually implemented by translating and harmonizing the relevant NATO and US doctrines. Given the considerable number of documents to be implemented simultaneously and the limited funding for this work, nonprofessional linguists are often involved in the interpretation of these publications. Therefore, in the absence of necessary time, parts of the documents may not be translated at all. Consequently, valuable information may be lost, which affects the efficiency of the use and implementation of relevant NATO procedures. One such doctrine is the publication [5] which implements US Army Military Decision-Making Process.

The military decision-making process (MDMP) is the main procedure that ensures the interoperability of NATO tactical planning for land operations. The introduction of MDMP in selected AFU military schools and collective training centres began in 2017 [6]. The first official document on MDMP implementation was published in November 2020 [5]. While it is not obligatory to use it in war, since September 2022, military schools are required to teach this process as a national tactical planning method [7].

The official approval of a new MDMP doctrine began on March 9, 2021, after the approval of the Ukrainian Land Forces doctrine for mechanized infantry [8] and armour brigades [9], developed based on the respective US Army FM 3-96. One of the first stages of testing was a two-week brigade staff training course initiated at the National Defence University of Ukraine. A survey conducted during these courses showed that more than 90% of the students believed that the available doctrine was insufficient to implement MDMP. The results of the survey allowed us to formulate the hypothesis that the amount of information specified in the national doctrine could be less than that specified in the relevant doctrines of the US Army.

There is a clear need to assess the results of the development of new tactical planning doctrines for the Ukrainian Armed Forces. Currently, there are no practical methods for assessing information loss that occurs during

the harmonization of foreign military standards. In this study, we investigated an approach that uses information completeness as a quantitative criterion in doctrines analysis. Completeness is an intrinsic characteristic of information [10]. This characteristic can be identified using the mathematically rigorous objective methods available in the theory of information.

Analysis of publications

Key methods for measuring the amount of information have been presented by Hartley, Shannon, and Kolmogorov. A study on the quality and completeness of information was conducted by Helfert, Ge, Lillrank, Huang, Ballou, Pazer, Wand, Wang, Strong, Olson, Cappiello, Amicis and others.

Research on US Army MDMP was done by Kievennar, Marr, Charlton, Burwell, Cooney, Kopsch, Hughes, Shvalyuchynskyi, Filyunkin, Tkachuk, Lunkov, Bahinsky, Sirko, Melnyk, Stetsiv, Synytsia, Zadorozhniy, Filippenkov, Tikhonov, Samokvit, Piskunov, Polishchuk, Klymovych, Bogutsky, Pashchetnyk. An analysis of the US Army and NATO doctrines and planning methodologies is presented in our previous works [11–13].

However, the current provisions of the AFU doctrine have not been studied, and subjective non-quantitative methods have been used to analyze doctrines. Therefore, **this study aimed** to measure the completeness of the information contained in the national MDMP doctrine and compare it with relevant US Army publications on MDMP. To achieve this goal, we created a sample of relevant doctrines, prepared data for analysis, and calculated and compared the amount of textual information specified in relevant doctrinal publications.

Materials and methods

The initial data were generated, refined, and processed using a combination of scientific methods. At the initial stage of the study, a sample of AFU doctrines on MDMP was formed (*Table 1*). The analysis of doctrines (*Table 1*) showed that the national documents were based on the doctrinal publications of the US Army. To create a sample of US Army doctrines (*Table 2*), we used the approach discussed in [11]. Both samples were analyzed using a traditional document analysis method. The results of the study are discussed in the next section.

The quantity of information in the doctrines of the US Army and AFU was measured using Shannon's probabilistic measure of information entropy [14]. Data preparation and measurement was carried out using code written in the software environment R. The amount of information was compared using Microsoft Excel. The following paragraphs briefly discuss the procedure for obtaining the primary data, and the main stages and methods used during the study.

An initial sample of the US Army MDMP doctrine was compiled in accordance with the methodology described in [11]. We began by acquiring ADP 3-0 Operations [15], Doctrine Smart Book June 2022 [16], and FM 1-02.01 [17]. ADP 3-0 is US Army's capstone doctrine. It defines the content of the remaining US Army doctrines. The Doctrine Smart Book is a compilation of doctrinal publication lists and hierarchies. FM 1-02.01 includes terms, definitions, and doctrine references that introduce these terms. Using this data, we created an initial sample of ten doctrine publications (*Table 2*). The preliminary sample was refined by traditional document analysis.

Traditional document analysis uses logical structures to uncover the fundamental content of the material under investigation, and turns it into something of interest to researchers [18]. The main types of traditional approaches are the external and internal analyses of documents. External analysis is intended to establish the type of document, form, date, edition, organization that developed it, and the purpose and reliability of sources. Each doctrine underwent an external reliability evaluation. The main task of such an evaluation is to ensure the inclusion of the most recent version of doctrinal publications in their original language. Thus, based on [11] and using official repositories (https://Armypubs.Army.mil/), we obtained the latest version of the planning doctrines. Following an external examination, we applied internal document analysis to the chosen doctrines.

Internal analysis is a method aimed at examining document content. This method allowed us to refine the initial doctrine sample and identify the number and page ranges allocated to the description of the MDMP (*Table 3*). As a result, we excluded doctrines not directly related to the conduct of the MDMP (JP 5-0, JP 2-01.3, JP 3-60). Likewise, the internal analysis led us to append an initial sample. We added the doctrines on integrating processes (FM 3-55, ATP 2-01.1, ATP 6-01.1), publications detailing the conduct of the MDMP (ATP 5-0.2-1, ATP 5-0.2-2), its individual steps (CALL 20-06), and the Standard Operating Procedures development process (ATP 3-90.90). Consequently, 11 PDF documents were included in the updated sample. The decision column in *Table 2* contains a plus sign (+) to indicate documents that are part of the refined sample.

Another decision we made was the selection of the US Army MDMP doctrine as the basis for comparison with relevant AFU publications. The AFU's document on MDMP was developed in 2020, based on the US Army FM 6-0 2016 edition. However, from 2022, the US Army uses FM 5-0. Meanwhile, analysis of the content, number of pages, and comparison of VP 7(5)-00(11)03.01 2020 with FM 6-0 2016 showed that VP 7(5) cannot be considered a translation of FM 6-0 2016 (*Table 3*). In addition, FM 5-0 2022 contains more information on the MDMP steps and integrating processes than the previous version of FM 6-0 does. Therefore, considering that the future revision of the national MDMP is based on a recent version of the US Army MDMP publication and a questionable interpretation of FM 6-0 2016 in VP 7(5), we chose FM 5-0 2022 over FM 6-0 2016.

The refined sampling and page ranges obtained using traditional document analysis were processed using

information-theory techniques. This made it possible to measure and compare the volume of information allocated to the MDMP and its supporting processes in US Army and AFU doctrinal publications. Below, we substantiate the proposed approach for measuring and comparing the information in the respective documents.

The amount of information contained in the text documents can be estimated with varying degrees of precision. The textual information specified in the doctrine can be measured by the number of pages, words, and symbols with and without spaces. In addition, there are more accurate methods that consider the power of the alphabet and the probabilities of a single character in an information-message code.

The most practical and accessible way to measure information in a military setting is the page count. It can be accomplished manually, without the use of software. When comparing the number of doctrine pages, it is important to note that the US Army and AFU use different paper sizes (Letter and A4), font sizes (10 and 14 points), line spacing, and indentation. Therefore, one fully filled page of the AFU and the US Army doctrines contained different quantities of information.

The word count is another accessible method for quantifying textual information. Microsoft Word and its free equivalents provide this information via the «statistics» menu. Using this metric requires consideration of the fact that English and Ukrainian have distinct structures, grammar, and average word length. The English words are shorter in length. Similarly, Microsoft Word counts the English articles (a, the, in, and on) as separate words, while they have minimum meaningful information.

Another accessible method using Microsoft Word counts the number of characters in the text with and without spaces. Although comparing the amount of information in text messages encoded in two languages, it is necessary to consider the power of the corresponding alphabet. The foreign doctrines used in the development of national doctrines are the NATO and US Armed Forces publications written in the English. The number of letters in the Ukrainian and English alphabets are 33 and 26 respectively (without spaces). Thus, encoding a message in a language with lower alphabetic power requires fewer characters.

A combinatorial measure of Hartley's information entropy (1), which accounts for an information message's alphabetic power, can solve this problem [19]. This measurement can be performed using Equation (1).

$$I = K * \log_2 N, \quad (1)$$

where I is the amount of information in bits, K is the message length (number of characters in the message), and N is the number of characters in the alphabet (alphabetic power).

However, the Hartley measure requires identification of the alphabetic power used to encode a message. As demonstrated above, the alphabet of a doctrine publication comprises of numbers, special characters, spaces, and letters from other languages. Additionally, the capital and lowercase versions of the same letter must be counted as separate characters. Yet, a standard text editor cannot calculate the alphabetic power of a doctrinal publication needed by Hartley's approach.

Additionally, Hartley's formula does not consider the probability of an individual letter in a particular doctrinal text. It assumes that the likelihood of each alphabetic character appearing in an information message is equal. This issue can be resolved by employing Claude Shannon's information entropy probabilistic metric.

Shannon's entropy is a measure of the unpredictability of information content [20]. It is calculated using Equation (2).

$$H(X) = -\sum_{i=1}^{n} p(x_i) * \log_2 p(x_i), \quad i = 1...n, \quad (2)$$

where the $H(X)$ is entropy of set of probabilities of symbol x_i appearing in the string of code X with length of n symbols. The physical interpretation of Shannon's entropy is the minimal bound of the binary code (in bits if using $\log_2$) required to encode and store the corresponding message in an information system. It allows the use of common measures to compare similar information coded in different languages. Yet, it requires calculation of the probabilities for occurrence for each character encoding the text messages. Therefore, it is not possible to use text editors' built-in tools to calculate this measure.

A practical solution to this problem is the use of data analysis software R, Python, SSPS, and others. To achieve this, we propose the following algorithm.

1. Pre-processing the document for analysis: convert PDF documents into vectors of textual information, removing symbols with a little semantic load and/or information that is not lost during translation (numbers, spaces, page markings, punctuation, letters of other languages, and uppercase letters of the alphabet).

2. Calculate and store the probability of each character in the pre-processed document (count the total number of characters and the number of individual characters in the message, and then determine the ratio of each individual symbol to the total number of characters).

3. Calculate and store the Shannon entropy for each character in the pre-processed text (the probability of a single symbol of the alphabet in the text multiplied by logarithmic basis 2 of its probability).

4. Calculate the amount of information in the pre-processed text using the Shannon entropy of individual characters in kilobytes (the sum of entropies of each individual symbol in a text divided by 8000 to convert a value in bits to kilobytes).

We developed the code in the R language to execute this algorithm and calculate the required values. Comparison and visualization of the results is done using Microsoft Excel. The results of the comparison are presented in *Table 4*.

Results

The purpose of this section is to present the key findings and their relationship with the methods discussed in the previous section. In this study, we prove the hypothesis of information loss during the national harmonization of the US Army's MDMP doctrines. *Table 4* summarizes the results. It compares the information contained in US Army and AFU MDMP doctrinal publications. *Table 3* is a supplementary tool for the calculation in *Table 4* and it can be used to identify pages allocated to MDMP steps and integrating processes. Another result of this study is the list of MDMP doctrines from the US Army and AFU, which can be used to further improvement of the current Ukrainian doctrines (*Table 1–2*). The details of key findings are presented below.

The first result of this study was the identification of AFU doctrines on MDMP (*Table 1*). As the AFU currently lacks a convenient repository for doctrinal publications, the sample identified through interviews with officials directly involved in the development of these doctrines. Additionally, an internal analysis helped us to discover the peculiarities of development and application of mentioned doctrines.

Table 1

Sample of Armed Forces of Ukraine doctrines on MDMP

Title	Reference	Decision
VP 7(5)-00(11)03.01, Guidelines for planning and organizing battles according to NATO standards (brigade (battalion) headquarters and their equals), 14.11.20	US Army: FM 6-0, ADRP 5-0, FM 5-0, CALL 15-06	+
TKP 3-(00)152(03).01 Procedure «Work of the commander and headquarters of the tactical level of the command for planning battles (combat operations) according to standard NATO operating procedures» (headquarters of brigade (regiment), battalion and their equals), Main Directorate of Doctrines and Training of the General Staff of the Armed Forces of Ukraine, 2021	US Army: ADP 3-0, ADP 5-0, FM 3-55, ATP 5-19, ATP 2-01.3	–
BP 3-(01,04)11(55).01 Temporary combat charter of the mechanized troops of the Land Forces of the AFU part 1 (brigade), Order of the Commander of the Land Forces of the AFU dated 09.03.2021 No152	US Army: FM 3.96	–
BP 3-(02)11(55).01 Temporary combat charter of the tank forces of the Ground Forces of the AFU part 1 (brigade), Order of the Commander of the Land Forces of the AFU dated 09.03.2021 No153	US Army: FM 3.96	–
SP 2-22(01).01 Doctrine «Intelligence Procedures», Order of the Commander-in-Chief of the Armed Forces of Ukraine dated 12.10.2020 No166	NATO: AJP – 2, AJP – 2.1, AJP – 3.9, AintP – 8	–

According to [8, 9], Guidance [5] is the primary document of the AFU regarding MDMP. Temporary mechanized infantry and armour brigades manuals [8, 9] state that they are only used for training during the period of their approbation and do not replace the previous version of «Mechanized and Tank Forces manual of the Land Forces of the Armed Forces of Ukraine, Part I (brigade)» dated 25.12.2016 No. 8t.

As the preamble of [5] says, the Guidelines are designed to «facilitate the study of the fundamentals, principles, and approaches to the military decision-making process adopted in NATO member countries, which will help adapt these principles and approaches to the needs of the AFU in the context of improving the effectiveness of the planning process.» Therefore, the real purpose of [5] was to familiarize developers [8, 9] with the MDMP procedure to further adapt and implement it in the doctrine of Ukrainian Land Forces. However, it never occurred, and both publications point again to [5] by statement that «The detailed procedure for planning and organizing a battle according to NATO standards (level of brigade (battalion) headquarters and equals) is defined» in [5]. Accordingly, guidance [5] was not intended as a service-level doctrine.

Another national MDMP publication [21] came six months after approval of [5]. As found from the internal analysis, [21] was intended as «adapted to the military terminology of the AFU version of the Military Decision-making Process» to use in tactical level individual training, command post, and field training exercises to increase interoperability with NATO and gradual transition of the AFU to NATO standards. This publication is not mentioned in [8, 9] and is probably designed for use in land force sister services, such as marine or airborne. Concurrently, an adaptation of the already available Guidance [5] to «the military terminology of the AFU» led to inconsistent terminology between [21] and [5], as well as to loss of 30% of Guidelines [5] information (100 vs. 144 pages). Considering the aforementioned, we selected Guidelines [5] as the sole basis for comparison with the relevant US Army documents.

Similarly, we excluded from our sample doctrine on «Intelligence Procedures» SP 2-22 (01).01. Although it contained information like Intelligence Preparation of the Battlefield (IPB), but it had neither reference to relevant US doctrines (ATP 2-01.3, FM 3-55, ATP 2-01) nor to a NATO publication (AintP-17). Additionally, it adds to terminological inconsistency of national publications. Despite being published earlier than other related documents, its terminology is neither used by [21] nor [5].

An analysis of the references in *Table 1* made it possible to determine that the Ukrainian MDMP doctrines was based on US Army publications. Considering the abovementioned, the original current versions of the US Army MDMP doctrine was used as the basis for further analysis and developing recommendations on the implementation of the MDMP in the Armed Forces of Ukraine.

The search for the US Army doctrine was based on recommendations [11],

US Army capstone doctrine on operations (ADP 3-0), and major planning doctrines (ADP 5-0, FM 5-0). As a result, we obtained the following list of the US Army doctrines related to MDMP (*Table 2*).

Table 2

US Army MDMP doctrines sample

Code	Year	Title	Decision
Initial sampling according to the Doctrine Smart Book June 2022			
JP 5-0	2020	Joint Planning	–
ADP 5-0	2019	The Operations Process	–
FM 5-0	2022	Planning and Orders Production	+
JP 2-01.3	2014	Joint Intelligence Preparation of the Operational Environment	–
JP 3-60	2013	Joint Targeting	–
ATP 2-01.3	2019	Intelligence Preparation of the Battlefield	+
ATP 3-60	2015	Targeting	+
ATP 5-0.1	2015	Army Design Methodology	+
ATP 5-0.3	2020	Operation Assessment	+
ATP 5-19	2021	Risk Management	+
US Army documents that were considered during the refinement of the initial sample			
FM 6-0	2016	Commander and staff organization and operations (ch 1,2)	–
ATP 5-0.2-1	2020	Staff Reference Guide Vol I (Staff Manual Part 1)	–
ATP 5-0.2-2	2020	Staff Reference Guide Vol II (Staff Manual Part 2)	–
FM 3-55	2013	Information Collection	+
ATP 2-01	2021	Collection Management	+
ATP 6-01.1	2015	Techniques for Effective Knowledge Management	+
ATP 3-90.90	2011	Army Tactical Standard Operating Procedures	+
CALL 20-06	2020	How to Master Wargaming: Commander and Staff Guide to Improving Course of Action Analysis	+

Analysis of the US Army MDMP doctrines (*Table 2*) allowed us to identify recent changes made in planning the doctrine hierarchy. The first change occurred in 2019 with the removal of ADRP-type publications. This information is now part of ADP-type publications. The second shift was the return of the planning doctrine to publications in series 5-0 (from FM 6-0 to FM 5-0). In addition, there has been an increase in the number of doctrinal publications on the conduct of MDMP. The available research and current AFU doctrines on MDMP do not reflect these changes. Visual representation of these changes is shown in *Figure 1*.

Another result is that MDMP cannot be seen as a self-sufficient process but only as an element of an interconnected and complementary planning system. The major components of this system are the integrated planning and integrating processes (*Figure 2*). The interactions between these processes are discussed in detail in our previous study [13].

Information on most of these processes is absent in the AFU planning doctrines, nor did we find mentions of them in scientific publications. This creates problems for their implementation. Some of these processes must be performed directly during MDMP, hence they are essential to fulfilling MDMP potential. Information on these processes is contained in two categories of the US Army doctrine: general information in 2022 FM 5-0 and detailed information in their individual doctrines (*Table 2*).

Table 3 was developed to calculate and compare the amount of information allotted to individual steps and processes (integrated planning and integrating processes). It also provides information on the previous planning doctrine of FM 6-0, which was in place from 2014 to 2022. FM 6-0 is mentioned in the reference list for the current doctrine of AFU. Because the current doctrine of AFU on MDMP is to be revised, we decided to compare the volume of MDMP information in VP 7(5) with the current US Army FM 5-0 2022 instead of using the old FM 6-0 2016. At the same time, a comparison of FM 6-0 and FM 5-0 allowed us to observe a trend in the development of the US Army planning doctrines.

As shown in *Table 3*, the number of pages of the new US doctrine allotted to the steps of the MDMP increased by

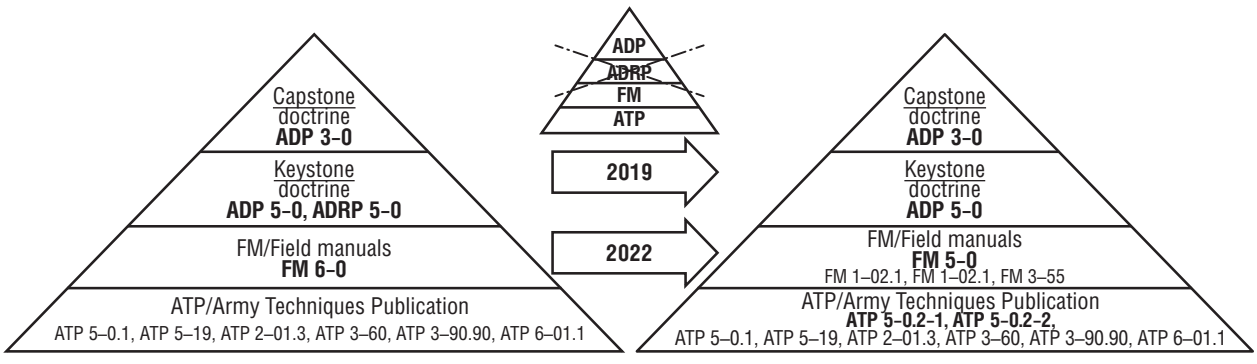

Figure 1. Changes in hierarchy of US Army planning doctrines

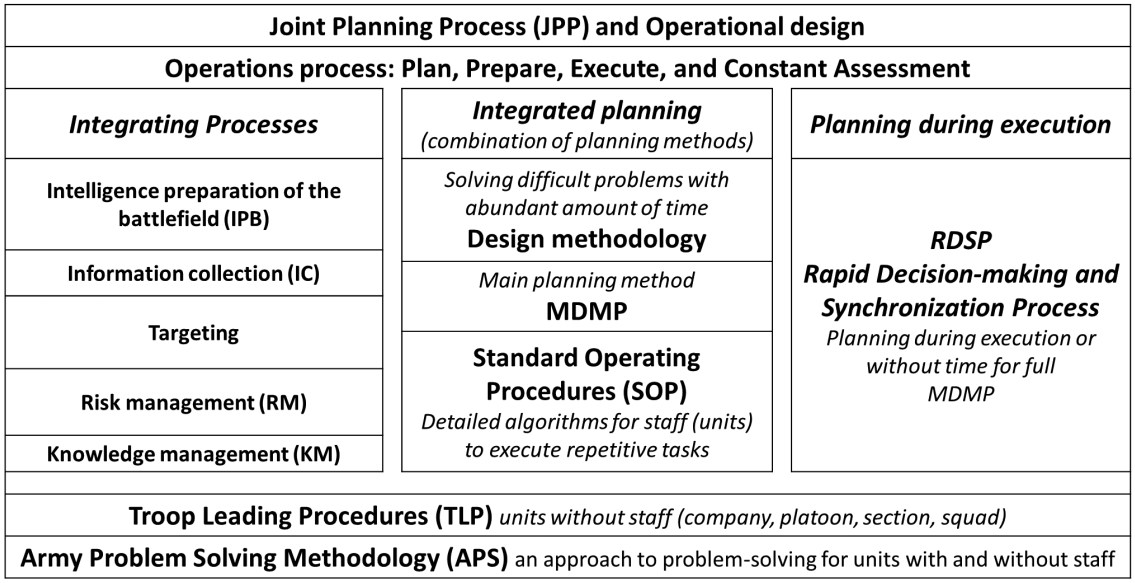

Figure 2. Diagram of the US Army Planning System

Table 3

Ranges and number of pages allocated to planning in the main doctrinal publications of the US ARMY and the AFU on MDMP

Name of step or process	Number of pages			Page range		
	VP 7(5) 2020	FM 6-0 2016	FM 5-0 2022	VP 7(5) 2020	FM 6-0 2016	FM 5-0 2022
Pages on MDMP steps allocated in main MDMP doctrinal publication						
Step 1 (Receipt of mission)	6	2	5	36–46	102–104	90–94
Step 2 (Mission analysis) without integrating processes	16	10	14	47–75	104–114	96–109
Step 3 (COA development)	15	10	12	76–90	114–124	110–121
Step 4 (COA analysis)	12	13	18	91–102	124–137	122–139
Step 5 (COA comparison)	2	2	2	103–104	137–139	140–141
Step 6 (COA approval)	2	1	2	105–107	139–140	142–143
Step 7 (Orders production, dissemination, and transition)	5	2	3	108–112	140–142	144–146
Total MDMP steps	58	40	57	36–112	102–142	90–146
Pages on Integrating processes allocated in main MDMP doctrinal publication						
IPB* (Intelligence preparation of the battlefield)	8	–	6	47–55	–	352–357
Risk* (Risk management)	2	–	1	59–60	–	368–369
IC* (Information collection)	3	–	4	61–63	–	358–361
KM (Knowledge management)	–	11	1	–	63–73	369–370
Targeting	–	–	6	–	–	362–367
Pages on Integrated planning allocated in main MDMP doctrinal publication for units with staff						
ADM (Army design methodology)	–	–	22	–	–	65–86
RDSP (Rapid decision–making and synchronization process)	–	8	11	–	189–196	147–157
APS (Army problem solving)	–	6	9	–	75–80	55–63
Pages on operation assessment allocated in main MDMP doctrinal publication						
Assessments	–	9	9	–	197–205	169–177

30%. The same trend can be observed in relation to the integrating processes, integrated planning, and assessment of operations. These are not new processes, but some were spread across numerous doctrines and were not properly communicated to consumers. Thus, it can be argued that the new US Army planning doctrines refocuses the attention of staff officers on the concept of integrated planning (the simultaneous use of several planning processes) [13], the role of integrating processes and their interactions during planning, and the importance of the assessment stage of the operation process. A direct comparison of the amount of information on MDMP in the US Army and AFU doctrinal publications is shown in *Table 4*.

Table 4 presents the main results of this study. The use of the methods of information theory and code developed in the programming language R made it possible to determine that the main document of the AFU on MDMP contained 26% of the corresponding information of the US doctrines. However, comparing the amount of information allotted to the MDMP and its steps, the doctrine of the AFU contains

Table 4

Comparison of the amount of information in the primary doctrinal publications of the US ARMY and the AFU on the MDMP

Name of step, process, or doctrine	Number of pages			Entropy per character in bit		Amount of letters without spaces			Amount of information in Kb		
	AFU	US	%	AFU	US	AFU	US	%	AFU	US	%
Main MDMP doctrine (AFU – VP 7(5)–00(11)03.01 2020, US Army – FM 5–0 2022)											
Planning doctrine	144	404	36	4.55	4.13	212552	887055	24	120.92	457.93	26
Main MDMP doctrine dedicated for MDMP steps (AFU – VP 7(5)–00(11)03.01 2020, US Army – FM 5–0 2022)											
Step 1	6	5	120	4.52	4.10	16517	11732	141	9.32	6.01	155
Step 2	16	14	114	4.54	4.12	22270	38419	58	12.65	19.78	64
Step 3	15	12	125	4.55	4.14	18267	29063	63	10.39	15.04	69
Step 4	12	18	67	4.56	4.13	17141	36242	47	9.78	18.71	52
Step 5	2	2	100	4.53	4.15	2815	5687	49	1.59	2.95	54
Step 6	2	2	100	4.49	4.09	2744	3515	78	1.54	1.80	86
Step 7	5	3	167	4.52	4.13	5598	9797	57	3.16	5.06	62
Total MDMP steps	58	57	102	4.53	4.13	85352	134511	63	48.43	69.43	70
Step 4 MDMP COA Analisys/Wargaming (AFU – dedicated pages in VP 7(5)–00(11)03.01, US Army – separate publication)											
Step 4 CALL 20–06	12	102	11.76	4.56	4.17	17141	121745	14.08	9.78	63.52	15.40
Integrating processes (AFU – dedicated pages in VP 7(5)–00(11)03.01, US Army – independed publications)											
ATP 2–01.3 (IPB)	8	228	3.51	4.52	4.12	7760	481742	1.61	4.39	248.09	1.77
ATP 5–19 (RM)	2	84	2.38	4.53	4.14	3710	147343	2.52	2.10	76.32	2.75
FM 3–55 (IC)	3	86	1.49	4.54	4.08	4167	186939	1.04	2.37	95.06	1.16
ATP 2–01 (PRAC/IC)		116			4.10		212650			109.08	
ATP 6–01.1 (KM)	–	146	–	–	4.15	–	309837				
ATP 3–60 (Targeting)	–	122	–	–	4.12	–	218141				
Total integ. process	13	782	1.66	4.53	4.12	15637	1556106	1.00	8.86	801.57	1.10
Integrated planning process for units with staff (US Army – separate publications of pages in FM 5–0)											
ATP 5–0.1 (ADM)	–	82	–	–	4.13	–	160063	–	–	82.72	–
FM 5–0* (RDSP)	–	11	–	–	4.14	–	24360	–	–	12.60	–
FM 5–0* (APS)	–	9	–	–	4.16	–	22577	–	–	11.74	–
Operation assessment (US Army – separate publication)											
ATP 5–0.3 (Assesm.)	–	132	–	–	4.13	–	179248	–	–	92.56	–
Standard operating procedures development (US Army – separate publication)											
ATP 3–90.90 (SOP)	–	32	–	–	4.15	–	45404	–	–	23.55	–
TOTAL	144	1534	9.39	4.55	4.13	100989	2949621	3.42	57.29	1521.85	3.76

70% of the doctrine information of the US Army. This provides a general understanding of the MDMP.

Meanwhile, considering a new US Army CALL supplementary publication dedicated solely to step 4 (COA analysis/Wargaming), the amount of information of the AFU allotted for the corresponding step is 15.4%. Wargaming is one of the most difficult and important stages of the MDMP. It allows staff to reduce the uncertainty of the potential outcome of actions by sequentially modelling of at least three courses of action for their troops against the two of the enemies (the most likely and the most dangerous). The available amount of information (15.4%) is not sufficient to implement Step 4 effectively.

Regarding the integrating processes, the doctrine of the AFU considers 1.1% of the relevant information of the respective US Army publications. For instance, Intelligence preparation of the battlefield (IPB) – is 1.77%, Information collection / Plan Requirements and Assess Collection – is 1.16%, and 2.75% of the US Army Risk Management. This is inadequate for conducting MDMP.

Meanwhile, information on Targeting and Knowledge Management is not present at all. The same is true for methods of integrated planning (Design, RDSP, APS), operations assessment, and Standard Operational Procedures development processes. Thus, considering that all these processes and procedures are necessary for effective planning at the tactical level, information on the doctrines of the AFU contains only 3.76% of that of the US. The implications and limitations of the results are discussed in the next section.

Discussion

The analysis of the results obtained from the development of planning doctrines has provided valuable lessons. Incorporating these lessons into the future doctrines could prove advantageous. Finally, at the end of this section we present the limitations of our study.

Lesson 1. The current national tactical planning doctrines need to be revised.

VP 7(5) was not originally intended as a comprehensive doctrine, but rather as a reference for MDMP doctrine developers. Moreover, it represents less than 4% of the current related US publications. While it may provide a general understanding of tactical planning, its incomplete information hinders its effectiveness within AFU. This has resulted in frustration among students who rely on these doctrines as well as led to this study. Based on these findings, we see a need to revise the existing doctrines.

Lesson 2. The implementation of a foreign standard requires the allocation of time, funding, professional linguists, and military experts for translation. Currently, officers are responsible for this task due to limited funds. However, their expertise as translators is questionable and they face constraints in terms of time availability. Properly translating doctrine can take months, which is not practical given an officer's responsibilities. Our partners have already invested billions of dollars in aligning our forces with NATO standards. The cost of translating operational standards may seem insignificant compared to other war expenses but the benefits far outweigh it. To address tactical planning doctrines effectively, there is a need to translate 2000 pages at an estimated cost ranging from $4000 to 6000$. Outsourcing proves to be a favourable approach for resolving this issue.

Lesson 3. To successfully implement a foreign standard, it is crucial to have a solid understanding of the hierarchical structure of foreign doctrines and how the required standard fits in. The US Army doctrinal system and planning doctrines are built on an advanced hierarchical framework. When working with lower-level doctrine, it is essential to comprehend its parent publications. For instance, while FM 5-0 describes the MDMP process, this process is based on concepts from ADP 5-0 and ADP 3-0. Unfortunately, our current doctrines lack many of their vital concepts, which creates obstacles for implementing corresponding parts of planning. By properly incorporating US Army tactical planning from FM 5-0 into our national doctrines, we can also integrate the operations process (ADP 5-0) as well as adopt a broader perspective on operations according to ADP 3-0.

Lesson 4. Modern planning doctrines encompass a variety of interconnected methods, processes, and procedures that are essential for effective MDMP applications. Yet, our current doctrines exhibit a lack of adequate understanding in this area. Presently, only a small fraction (1.1%) of the information on integrating processes is included within the existing framework. Furthermore, there is a scarcity of information regarding integrated planning methods, operations assessments, and standard operating procedures. Although some AFU headquarters possess SOPs, there is no clear guidance on their proper use and development process. This deficiency can be attributed to the shortcomings of the previous US doctrine (FM 6-0 2016), which failed to effectively communicate these matters. Considering that this outdated doctrine was active in time of our national doctrines development, revising our doctrines holds a potential for resolving such issues.

Lesson 5. The national tactical planning doctrine and the NATO APP-28 were developed based on the US Army MDMP. The NATO APP-28 was officially approved in 2019, followed by the enactment of Ukrainian Guidance VP7(5)-00(11)03.01 a year later. In parallel, the US Army FM 5-0 underwent a review and was finally released in 2022 along with modifications to the MDMP process itself. Therefore, we recommend utilizing FM 5-0 2022 as a main source for developing national doctrines. That and the rest of discussed US Army doctrines can be accessed through the official repositories of the Publishing directorate at https://Armypubs.Army.mil/. Ensuring their accurate translation and harmonization will enable us to establish

effective national tactical planning for land operations that align with multinational standards and incorporate best practices endorsed by NATO.

While the proposed approach allowed us to prove a hypothesis, **there are three limitations** that we need to address. Firstly, the Shannon information entropy captures text information at a syntactic level only, focusing on the probability of individual character appearance in the text. Thus, it disregards both the semantic level of doctrinal information and its value to users on a pragmatic level. It is important to note that additional research is required to explore these measures further.

Secondly, we did not consider the presence of tabular and graphical information, as well as numbers, letters in other languages, and special symbols found within the doctrines. The main challenge when developing new doctrine for AFU is to ensure quality translation of corresponding international standards. Therefore, based on our assessment, translating tables and graphical materials requires minimal effort and hence the absence of this information had a negligible impact on the outcome of this study.

Thirdly, in our analysis, we focused solely on relevant documents that did not contain restricted information. As a result, we excluded US Army ATP 5-0.2-2 from study due to its access restrictions. It should be noted that this particular document primarily consists of reference and supplementary materials. While we did not get access to this publication, it is deemed non-critical for further revision of our doctrines.

Conclusions

We developed an approach to assess the results of developing national tactical planning doctrines from the perspective of information completeness. There is a wildly accepted assumption that the AFU successfully implemented MDMP in education and training. A simple count of pages demonstrates that it contains the same information as the US. While using our measure, we determined that the AFU doctrine contained less than 4% of the US Army's MDMP information. This confirms the hypothesis and justifies the need to revise the relevant doctrines. The proposed approach and lessons identified in this study can be applied to the enhancement of national doctrines that implement multinational standards.

A specific list of processes and procedures supporting MDMP in the US doctrines was identified. The absence of this information limits the efficacy of MDMP in the Armed Forces of Ukraine. Proper translation and harmonization of these doctrinal publications can increase national planning effectiveness and accelerate the achievement of interoperability with the relevant military organizations of NATO member states.

Meanwhile, the proposed approach does not allow estimation of correspondence degree of national doctrines with the content of the original documents. Therefore, further research should focus on exploring the content of doctrines using measures of semantic similarity and developing a methodology for identifying the degree of compliance of national doctrinal publications with international military standards.

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