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Assessment of Readiness for Accelerating Digital Transformation In The Navy Fleet Supply System

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ABSTRACT

This research assesses the readiness of the Navy fleet supply system for digital transformation using the 7S McKinsey framework. The Delphi method was employed to identify critical success factors (CSFs), validated using the Content Validity Index (CVI), while the Analytic Hierarchy Process (AHP) method determined the relative importance of the criteria, and the Technique for Order Preference by Similarity to Ideal Solutions (TOPSIS) method was used to rank the readiness for digital transformation. The research identified 10 critical success factors, with staff (0.232), skills (0.212), style (0.162), and systems (0.135) receiving the highest weights in the AHP analysis. The TOPSIS method ranked the criteria in terms of availability (0.849), infrastructure (0.845), responsiveness (0.827), and reliability (0.809), among others. The overall readiness score was 0.741, indicating a "ready" level of preparedness for digital transformation. This research provides valuable contributions by offering a policy framework for the Indonesian Navy (TNI AL) in fleet development, informing the TNI AL's 2025-2029 strategic plan, and demonstrating the application of the 7S McKinsey framework in the military sector.

1. Introduction.

The rapid development of digital technology has significantly influenced various sectors, including the military. Digital transformation has become imperative for addressing contemporary challenges, enhancing organizational efficiency and operational effectiveness (Kraus et al., 2022). In the military context, digital technologies bolster operational systems, particularly in logistics and supply chain management. Through advancements such as Big Data, IoT, and AI, digital transformation improves supply chain effectiveness, enabling faster and more accurate decision-making (Sharma & Soederberg, 2020).

In the Navy fleet's supply system, however, the current reliance on manual processes and poorly integrated systems has led to persistent challenges, including supply distribution delays, inaccurate inventory data, and a lack of transparency in logistics management. A key obstacle is the limited utilization of information technology in planning and monitoring processes (Maharani et al., 2023). This condition is increasingly untenable in an era of advanced digital technology, where efficiency and adaptability are critical, particularly in emergency situations (Yanuarico et al., 2024).

While the 7S McKinsey framework is widely applied in the business sector for organizational evaluation (Majid, 2022), its application in military operations remains limited. This research aims to analyze the readiness of the Navy fleet for digital transformation by applying the 7S McKinsey framework. Specifically, the research seeks to: (1) identify critical success factors (CSFs) that influence the successful implementation of digital transformation in the Navy fleet's supply system, and (2) assess the Navy fleet's readiness for accelerating digital transformation. The findings will provide actionable insights for TNI AL leadership in formulating policies to modernize the supply system, ensuring it aligns with digital transformation initiatives.

The research adopts a qualitative descriptive approach (Putra et al., 2024). The Delphi method is employed to identify and

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validate CSFs using the Content Validity Index (CVI). Subsequently, the Analytic Hierarchy Process (AHP) determines the weight of each 7S McKinsey component, while the Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) evaluates the readiness level of the Navy fleet's supply system. Expert Choice version 11 and Microsoft Excel 2021 are utilized for data analysis and visualization, following the recommendations of Putra et al. (2023).

This research offers both theoretical and practical contributions. Theoretically, it expands the application of the 7S McKinsey framework in the military sector and explores the integration of the Delphi, AHP, and TOPSIS methods. Practically, it provides a foundation for TNI AL leaders to develop strategic policies for modernizing the Navy fleet's supply system and contributes to the preparation of the TNI AL strategic plan for 2025–2029. By addressing critical gaps in logistics management, this research underscores the importance of digital transformation in enhancing the Navy fleet's operational readiness and adaptability.

2. Literature Review.

2.1. Logistic Theory.

Bowersox and Closs's logistics theory offers key insights into supply system dynamics, especially during digital transformation (Spillan et al., 2022). They define logistics as the process of planning, implementing, and controlling the flow of goods, information, and resources from origin to consumption to meet customer needs (Budiman & Purwaningsih, 2023). This theory is particularly relevant for the Navy fleet, where complex supply systems require efficiency and coordination among various stakeholders.

Digital transformation in the Navy fleet goes beyond adopting new technologies; it also involves changes in processes and culture (Oktaviani et al., 2023). Integrating technology into logistics is vital for creating a competitive edge (Akbar & Widowati, 2022). To achieve this, the Navy fleet must assess its readiness for digital adoption using the 7S McKinsey model, which evaluates strategy, structure, systems, shared values, skills, style, and staff (Firdaus & Arvianto, 2023).

The success of digital transformation depends on aligning technology with human capabilities. Therefore, the Navy fleet should promote collaboration, innovation, and digital skills training for its supply system personnel (Budiman & Purwaningsih, 2023).

2.2. Theory of Technology Adoption (Technology Acceptance Model - TAM).

Fred Davis's Technology Acceptance Model (TAM) (1989) is a key framework for understanding what influences users to adopt new technologies (Simaremare et al., 2024), including in the Navy fleet's digital transformation efforts. TAM focuses on two main factors: perceived usefulness and perceived ease of use (Zahara & Amalia, 2024). If Navy personnel believe that digital supply technologies improve performance and are easy to use, they are more likely to adopt them (Al-Qaysi et al., 2020).

A digital logistics management system in the Navy fleet can streamline processes and improve inventory management efficiency (Nur & Hura, 2024). The British Armed Forces' adoption of a similar system showed reductions in operational costs and increased efficiency (Payne, 2024). However, challenges such as resistance to change and lack of digital skills among personnel must be addressed through proper training. This aligns with the World Economic Forum's recommendation to prioritize digital skills development for navigating the digital era (Jackman et al., 2021). Using TAM, the Navy fleet can design strategies to prepare personnel and increase their acceptance of new digital technologies.

2.3. Technological Readiness.

Digital transformation requires a combination of technological readiness, organizational culture, skilled personnel, and efficient business processes. Technological readiness, as explained by Oliveira and Martins, measures how prepared an organization is to adopt new technologies (Blut & Wang, 2020). For the Navy fleet, this readiness is essential to support digital transformation in supply systems (Machado et al., 2021). Fast communication networks and integrated information systems are key components of the required infrastructure (Wijaya et al., 2023).

Organizational culture is equally important. A culture that encourages innovation and embraces change significantly impacts the success of technology adoption (Munir & Su'ada, 2024). For the Navy fleet, digital transformation can be promoted by changing mindsets through training and introducing digital technologies (Handayani et al., 2024).

Developing human resources is also critical. Training programs are needed to improve personnel's digital skills (Aifalesasunanda et al., 2024). Finally, existing business processes must align with new technologies to enhance efficiency. Assessing the Navy fleet's current supply processes will ensure digital technology simplifies and accelerates operations (Blut & Wang, 2020).

2.4. Digital Transformation.

Digital transformation is the process of integrating digital technologies into all areas of an organization, fundamentally altering how it operates and delivers value (Norliani et al., 2024). McKinsey highlights that successful digital transformation relies on clear strategic decisions, including setting priorities and allocating resources effectively (Demir & Kocaoglu, 2019). It goes beyond digitizing manual processes, focusing on innovating business models and strategies to improve efficiency and adaptability (Tulungen et al., 2022).

Through digital transformation, organizations can enhance productivity, add value, and improve customer satisfaction (Laily et al., 2024). Technologies like artificial intelligence (AI) and advanced analytics help increase efficiency and agility (Jamal et al., 2024). Additionally, this transformation encourages innovation by fostering adaptive cultures, new ways of thinking, and flexible structures (Metris, 2024), enabling organizations to respond swiftly to changing markets and demands.

2.5. 7S McKinsey's Model.

7S McKinsey's framework identifies seven key elements for organizational success: strategy, structure, systems, shared values, skills, style, and staff. This framework is highly relevant to the Navy fleet's digital transformation. A clear strategy provides direction, while a flexible structure allows the organization to adapt to technological changes (McKinsey, 2020). Studies show that collaborative organizational structures improve technology adoption (Gulati et al., 2019).

Integrated and efficient systems are crucial for better decision-making and faster information flow, which can reduce operational cycle times by up to 50% (Deloitte, 2020). Shared values, or the organization's culture, play a vital role; promoting innovation and collaboration can boost employee satisfaction and retention (Gebayew et al., 2018).

Finally, skills, leadership style, and staff readiness are essential. Regular training to improve digital skills ensures personnel can embrace change effectively (Sharma & Soederberg, 2020). By focusing on these elements, the Navy fleet can successfully advance its digital transformation.

3. Methodology.

This qualitative descriptive research used statistical approach to analyze digital transformation in the Navy fleet's supply system. The research focuses on identifying the critical success factors (CSFs) that drive successful digital transformation and assessing the Navy fleet's readiness for such changes using the 7S McKinsey framework.

The research applied the Delphi method to identify CSFs, collecting input from expert practitioners through a structured questionnaire. The criteria derived from the 7S McKinsey model were weighted using the Analytic Hierarchy Process (AHP) and the Saaty scale (1–9). Readiness levels were evaluated using the TOPSIS method with a five-point Likert scale (1–5).

Twelve middle-ranking officers responsible for the Navy fleet's supply system participated as experts in this research. Their feedback was crucial in shaping the initial data and refining the results.

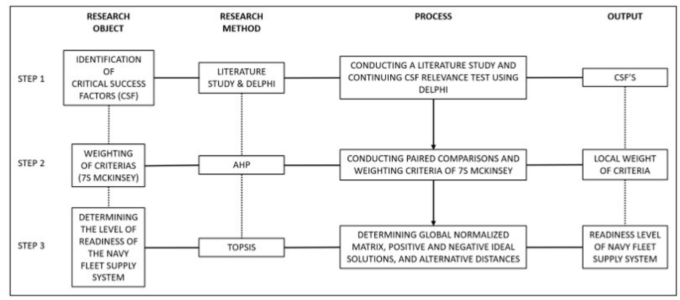
Table 1: Demographic information of the experts.

Expert	Field	Position
E1; E2; E3; E4	PhD in Defense Research	Professional
E5; E6; E7	PhD in Operation Research	Professional
E8; E9	PhD Student in Defense Management	Professional
E10; E11; E12	PhD in Defense Resource Management	Professional

Source: Authors.

As shown in Figure 1 this research follows three main steps. The first step identifies the critical success factors (CSFs) for digital transformation in the Navy fleet's supply system through literature review and relevance testing using the Delphi method. The second step assigns weights to the criteria, which are components of the 7S McKinsey framework, through pairwise comparisons using the Analytic Hierarchy Process (AHP). In the final step, the readiness of the supply system for digital transformation is evaluated using the TOPSIS method. The optimal solution is identified as the one closest to the positive ideal solution and farthest from the negative ideal solution (Jandi, 2020).

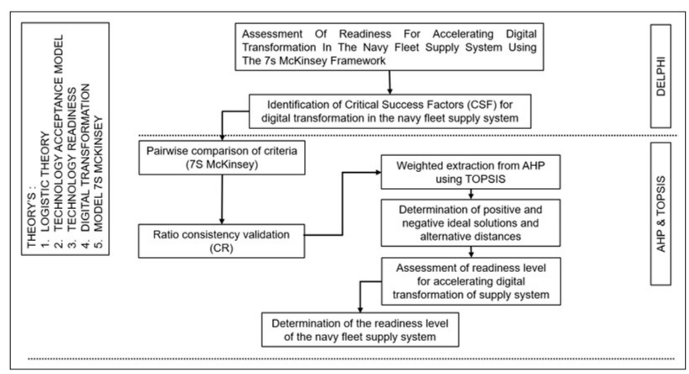
Figure 1: Research Design.



Source: Modified Model from Siagian et al.(2024).

3.1. Conceptual Framework.

Figure 2: Research Design.



Source: Modified Model from Siagian et al.(2024).

Figure 2 presents the structure of the conceptual framework used in this research. The objectives include:

- Identification of critical success factors (CSFs) influencing the digital transformation of the supply system in the Navy fleet.
- Determination of the readiness level for the digital transformation of the Navy fleet's supply system.

This research uses the Delphi, AHP, and TOPSIS methods, as illustrated in the conceptual framework in Figure 2. The process is divided into three phases (Putra, Octavian, Heikhmakhtiar, Tjahjadi, et al., 2023).

Phase 1 – Success factors influencing digital transformation are identified and refined through expert feedback. Open-ended questions allow experts to suggest additional factors, which are validated using the Content Validity Index (CVI).

Phase 2 – The seven criteria from the 7S McKinsey framework are validated through expert opinions collected via questionnaires. These responses are used to build a hierarchical structure, and the AHP method calculates the criteria weight values.

Phase 3 – The Navy fleet's readiness for digital transformation is assessed using TOPSIS, which evaluates the weighted criteria to determine readiness levels. Sensitivity analysis is conducted to ensure the model's reliability by testing how variations in expert preferences affect the results (Solangi et al., 2019).

3.2. Delphi.

In this research, the Delphi method was used to explore Critical Success Factors (CSFs) that affect the transformation of the Navy fleet's supply system (Fauziah et al., 2024). The Delphi method is a group process that allows researchers to gather expert opinions on a topic through questionnaires, which is useful when experts cannot meet in person. Most Delphi studies use questionnaires with a Likert scale (Nurfadilah et al., 2025), which measures individual traits like knowledge, attitudes, and behavior by combining multiple questions into a score (Ulfah et al., 2024). This method helps gather insights on challenges from experts and stakeholders. The Delphi process involves several steps: (1) forming an expert panel, (2) identifying barriers and creating the feedback system, and (3) conducting four rounds of data collection (Venkatesh et al., 2015). Since multiple rounds are involved, panel members need to commit to participating throughout to ensure consistent responses (Rathore et al., (2022); Ullah et al., (2021).

3.3. Content Validity Index (CVI).

The data in this research were analyzed using the Content Validity Index (CVI). Content validity refers to how well the elements of an assessment tool, like a questionnaire, represent the intended concept or target (Sugiharni, 2018). The assessment tool includes things like the questionnaire items, response formats, and instructions. The target concepts are called constructs. There are two types of CVI: Item-CVI (I-CVI) and Scale-level CVI (S-CVI). S-CVI can be calculated in two ways: S-CVI Average (S-CVI/Ave) and S-CVI Universal Agreement (S-CVI/UA) (Davis, 1992; Lynn, 1986; Polit & Beck, 2006). The steps to test content validity include: (a) preparing content validity items, (b) choosing experts to assess the validity, (c) conducting the validity test (in-person, online, or offline), (d) having experts review the items and give scores, and (e) determining the relevance of the content validity.

3.4. Analytical Hierarchy Process (AHP).

The Analytic Hierarchy Process (AHP) is a decision-making tool that breaks down complex problems into smaller, more manageable parts in a hierarchical way. Developed by Thomas L. Saaty, AHP helps in making decisions by comparing elements in pairs using a preference scale. This method turns subjective opinions into measurable data, which is then analyzed

Table 2: Types, Definitions, and Formulas of CVI (Davis, 1992; Lynn, 1986; Polit & Beck, 2006).

Types of CVI	Definition	Formula
I-CVI (*Item-level content validity index)*	The proportion of content experts who assigned a relevance rating of 3, 4, or 5 to a given item is used to evaluate its relevance.	**I-CVI** = (agreed item)/ (number of experts) $= \frac{agreed\ item}{Number\ of\ experts}$
S-CVI/Ave (*Scale-level content validity index based on the average method*)	The average Item-Level Content Validity Index (I-CVI) score across all items on the scale is calculated as the mean proportion of relevance ratings provided by all experts.	**S-CVI/Ave** = (Total I-CVI score)/ (number of items) $= \frac{\Sigma I\text{-}CVI}{Number\ of\ item}$
S-CVI/UA (*Scale-level content validity index based on the universal agreement method*)	The proportion of relevance is determined as the average of individual experts' ratings for each item based on whether an item achieves 100% agreement among experts; if all experts rate the item as relevant (i.e., 3, 4, or 5), the score is 1. Otherwise, the universal agreement score is 0.	**S-CVI/UA** = (UA total score)/ (number of items) $= \frac{\Sigma UA}{number\ of\ item}$

Source: Polit et al., 2007.

to make the best decision (Siekelova et al., 2021). AHP also checks the consistency of the comparisons to ensure reliable results. The scale ranges from 1/9 (for the least important comparison) to 9 (for the most important), covering the full range of comparisons. The following are the steps of AHP:

1. Define the Objectives, Criteria, and Alternatives.
2. Develop a Questionnaire.
3. Conduct Pairwise Comparisons by performing pairwise comparisons of the predetermined criteria. Experts assess the relative importance of each criterion, generating qualitative judgments that are then converted into numerical values (reciprocal scales).
4. Analyze Consistency: Evaluate the consistency of the pairwise comparisons using the Consistency Ratio (CR). The CR is calculated using the formula:

$$CR = \frac{CI}{RI} \quad (1)$$

Where CI (Consistency Index),

$$CI = \frac{\lambda maximum - n}{n - 1} \quad (2)$$

Meanwhile, RI (Random Index) is obtained from the table value.

Table 3: Random Index Value.

n	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
RI	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49	1.51	1.48	1.56	1.57	1.59

Source: Azhar et al., 2021.

The threshold value for the Consistency Index (CI) is set at 0.1, which implies a 90% confidence level in the decision-making process, allowing for a 10% margin of error or inconsistency. To ensure the reliability and validity of the results, the CI value must remain below 0.1. If the CI exceeds this threshold, it indicates unacceptable inconsistency in the pairwise comparisons, necessitating a revision of the judgment matrix to achieve the desired level of consistency.

3.5. Technique for Order Preference by Similarity to Ideal Solution (TOPSIS).

The TOPSIS (Technique for Order of Preference by Similarity to Ideal Solution) process uses CSF rankings and criterion weights to solve multi-objective problems. It helps decision-makers identify the best alternatives based on scores assigned to each option. The ranking of alternatives depends on the scores provided by the decision-makers (Marzouk & Sabbah, 2021). TOPSIS is a decision-making tool that measures the distance from the ideal solution. Developed by Hwang et al. (1981), it assumes that alternatives can be mapped into an m-dimensional space based on multiple criteria. According to Hwang and Yoon, the best solution is the one closest to the ideal solution and farthest from the worst solution (Jandi, 2020). The following section presents the steps of the TOPSIS process:

1. Calculating the normalized vector of the matrix. The normalized vector used to calculate, r_{ij} is as follows:

$$r_{ij} = \frac{x_{ij}}{\sqrt{\int_{i=1}^{m} x^{2}ij}},\ i = 1.\ \ldots,\ m;\ j = 1.\ \ldots,\ n \qquad (3)$$

2. Calculating normalized rating with weight. The weighted normalized rating can be calculated using the formula:

$$v_{ij} = wjrij, i = 1., m; j = 1., n \qquad (4)$$

Where v_{ij} is the weight of attribute number-j

1. Identifying positive ideal solutions and negative ideal solutions.

$$A^{+} = \left\{ \left(\max_{i} v_{ij} \mid j \in J_1 \right), \left(\min_{i} v_{ij} \mid j \in J_2 \right) \mid i = 1, \ldots, m \right\} \quad (5)$$

$$A^{+} = \left\{ \left(\min_{i} v_{ij} \mid j \in J_1 \right), \left(\max_{i} v_{ij} \mid j \in J_2 \right) \mid i = 1, \ldots, m \right\} \quad (6)$$

Where J_1 is a positive attribute (gain), while J_2 is a negative attribute (loss)

1. Calculating the distance. The concept of calculating the distance between the positive ideal solution and the negative ideal solution, using the Euclidean formula, is as follows,,

$$di^{+} = \sqrt{\int_{j=1}^{n} (v_{ij} - v_j)^{2}},\ i = 1.\ \ldots,\ m \qquad (7)$$

$$di^{-} = \sqrt{\int_{j=1}^{n} (v_{ij} - v_j)^{2}},\ i = 1.\ \ldots,\ m \qquad (8)$$

2. Calculating the proximity index. The proximity index to the positive ideal solution was measured using this formula;;

$$S\,i^{+} = \frac{di}{di^{+}di^{-}},\ i = 1.\ldots, m \qquad (9)$$

Sorting the results in the order of the largest $S\,i^{+}$ as the optimum solution.

Table 4: Paired comparison scale for AHP and Likert for CVI and TOPSIS.

Saaty's Scale	Definition	Description	Likert Scale	Note
1	Both criteria are equally important	Both criteria have an equally important contribution to the analysis of the readiness of the Navy fleet's digital transformation of the supply system	1	Very low
3	One criterion is slightly more important than the other	One criterion has a slightly more important contribution than the other criterion in the analysis of the readiness of the Navy fleet's digital transformation of the supply system	2	Low
5	One criterion is more important than the other	One criterion has a more important contribution than the other criterion in the analysis of the readiness of the Navy fleet's digital transformation of the supply system	3	Fair
7	One criterion is very much more important than the other	One criterion has a very more important contribution than the other criterion in the analysis of the readiness of the Navy fleet's digital transformation of the supply system	4	High
9	One criterion is absolutely very important than the other	One criterion has an absolutely very more important contribution than the other criterion in the analysis of the readiness of the Navy fleet's digital transformation of the supply system	5	Very high
2,4,6,8	A middle value between two adjacent considerations	Given if there is a doubt between two adjacent assessments	-	

Source: Modified from Siagian et al.(2024).

Table 5: Readiness Level.

Readiness	Score	Level	Description
4	0.87-1.00	Strongly ready	Organizations are fully equipped for digital transformation. Digital technologies have been seamlessly integrated into all operational aspects, with both leadership and employees demonstrating enthusiasm for adopting new innovations. Digital policies and strategies are effectively implemented, enabling the organization to thrive in a digital environment, address emerging challenges, and remain competitive in a technology-driven ecosystem.
3	0.62-0.86	Ready	Organizations at this level exhibit robust readiness for digital transformation. The necessary technological infrastructure is established and partially integrated, with leaders and employees actively participating in training programs. Digitalization efforts span multiple departments, though some areas still require refinement. Management demonstrates strong commitment, and most business processes are aligned with the use of digital technologies.
2	0.37-0.61	Fairly ready	Organizations display an early stage of readiness for digital transformation but require significant improvements in several areas. Basic infrastructure and resources are available, but technology adoption remains in its infancy. Policies supporting digital transformation exist but are not yet fully operationalized. While there is growing awareness of the importance of technology, internal challenges hinder its full implementation.
1	0.00-0.36	Not ready	Organizations at this stage lack readiness for digital transformation. Their systems, infrastructure, and resources are inadequate, and digital policies and strategies are either absent or poorly defined. Both leadership and employees are unprepared for technological change, and the use of digital technology remains minimal and underdeveloped.

Source: Nugroho, 2020.

4. Results & Discussion.

4.1. The Identification of Critical Success Factor (CSF).

In the first stage, the critical success factors (CSFs) for digital transformation readiness in the supply system were identified using the Delphi method. These factors were gathered from literature and previous studies, and validated through expert input using the Content Validity Index (CVI). The data were then processed using the AHP and TOPSIS methods, followed by a sensitivity analysis. A group of 12 mid-level Indonesian Navy (TNI AL) officers with expertise in the digital transformation of the fleet supply system was surveyed to assess the importance of different criteria. The criteria with the highest scores formed a hierarchy for weighting the criteria. These criteria were based on the 7S McKinsey framework and included: (a) Structure (C-1); (b) Strategy (C-2); (c) Systems (C-3); (d) Shared Values (C-4); (e) Skills (C-5); (f) Style (C-6); and (g) Staff (C-7).

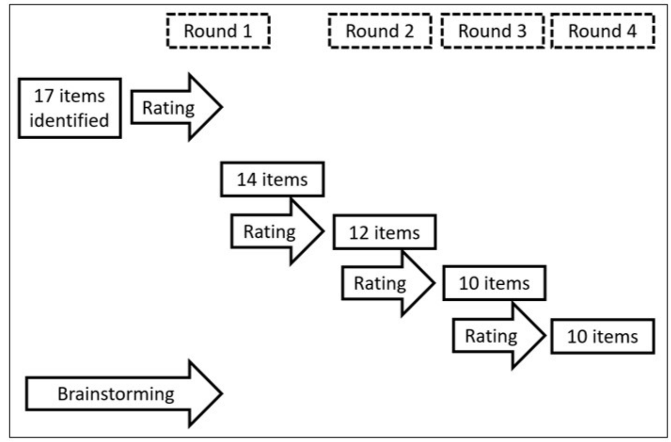
a. Structure: Structure pertains to the organizational setup, including hierarchy and communication flows. A flexible structure is essential for successful digital transformation, as it enables cross-departmental collaboration and facilitates adaptation to technological changes (Widnyani et al., 2021).
b. Strategy: Strategy refers to a long-term plan aimed at accelerating digital transformation. In the context of the supply system, the strategy should prioritize the integration of digital technologies to enhance logistics efficiency, accuracy, and responsiveness (Susilo, 2023).
c. Systems: Systems encompass the procedures, processes, and technologies utilized in daily operations. Digital transformation demands automated and integrated systems that support data analytics to enable informed and timely decision - making (Rochmawati et al., 2023).
d. Share value: Shared values represent the fundamental principles uniting the organization. In digital transformation, values such as collaboration, innovation, and sustainability are crucial to ensuring alignment with the organization's vision and mission (Lichtenthaler, 2017).
e. Skills: Skills include the technical and managerial competencies necessary for implementing digital transformation. Developing personnel skills through training or courses is critical, as inadequate skills can hinder the effective deployment of digital technologies (Sousa & Rocha, 2019).
f. Style: Leadership style plays a significant role in the success of digital transformation within the supply system. Leaders who actively support the adoption of new technologies and encourage their teams to embrace change are pivotal in accelerating digitalization (Octoyuda et al., 2023).
g. Staff: Staff refers to human resources skilled in information technology and digital logistics management. Ensuring that personnel responsible for supply management are equipped with the necessary digital expertise through targeted training or courses is imperative for effective digital transformation (Azarenko et al., 2018).

Once these criteria were identified, content validity index (CVI) analysis was conducted to evaluate the relevance of the criteria in achieving the expected objectives.

First Round.

As seen in Figure 3, in the first round, 12 experts received a questionnaire with a description of the research and its goals. The questionnaire included 13 items based on Delone and McLean's (2003) success factor model (Vogelsang et al., 2018), along with 4 items from expert suggestions, all rated on a 1-5 Likert scale. The questionnaire took about 10-15 minutes to complete. The Content Validity Index (CVI) for the items

Figure 3: Review of CVI Rounds.



Source: Authors.

ranged from 0.78 to 1. confirming that all items were valid. No changes were recommended for the themes or indicators. After the first round, 3 items were removed, reducing the total from 17 to 14 items.

Second Round.

In the second round, experts rated the Content Validity Index (CVI) for the 14 remaining items. The I-CVI values ranged from 0.78 to 1. validating all items. The items were rated on a 1-5 Likert scale, and the questionnaire took about 10-15 minutes to complete. There was a one-week gap between the first and second rounds. The overall Scale Content Validity Index (S-CVI) was 85.7% (acceptable if ≥ 0.8), and the I-CVI was 89.2% (acceptable if ≥ 0.78). After the second round, 2 items were removed, reducing the total from 14 to 12 items.

Third Round.

In the third round, experts rated the Content Validity Index (CVI) for the 12 remaining items. The I-CVI values ranged from 0.78 to 1. validating all items. The items were rated on a 1-5 Likert scale, and the questionnaire took about 10-15 minutes to complete. There was a one-week gap between the second and third rounds. The overall Scale Content Validity Index (S-CVI) was 83.3% (acceptable if ≥ 0.8), and the I-CVI was 94.4% (acceptable if ≥ 0.78). After the third round, 2 items were removed, reducing the total from 12 to 10 items.

Fourth Round.

After reformulating the instrument, it was sent for a fifth round of evaluation to assess its final validity, with an estimated completion time of 10-15 minutes. In this round, the I-CVI for all items was 1. indicating complete agreement among experts and an S-CVI of 100%. The I-CVI of 1 was considered very good, completing the overall validity process. The research identified 10 alternative critical success factors (CSFs) that affect the acceleration of the digital transformation of the Navy fleet supply system.

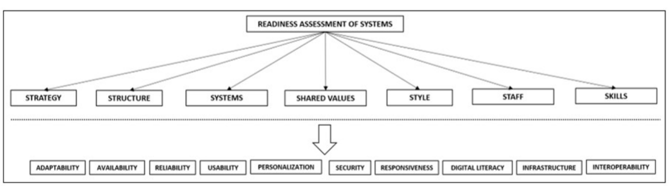
Table 6: Recapitulation of CVI questionnaire results.

No	CSF	Round 1		Round 2		Round 3		Round 4		Final results
		CVI	Result	CVI	Result	CVI	Result	CVI	Result	
1	Adaptability	0.833	Accepted	0.917	Accepted	1.000	Accepted	1.000	Accepted	Accepted
2	Availability	0.833	Accepted	0.917	Accepted	1.000	Accepted	1.000	Accepted	Accepted
3	Reliability	0.917	Accepted	0.917	Accepted	1.000	Accepted	1.000	Accepted	Accepted
4	Response Time	0.583	Not accepted							
5	Usability	0.917	Accepted	1.000	Accepted	1.000	Accepted	1.000	Accepted	Accepted
6	Completeness	0.833	Accepted	0.833	Accepted	0.750	Not accepted			
7	Ease of Understanding	0.750	Not accepted							
8	Personalization	1.000	Accepted	1.000	Accepted	1.000	Accepted	1.000	Accepted	Accepted
9	Relevance	1.000	Accepted	0.750	Not accepted					
10	Security	0.917	Accepted	0.833	Accepted	0.833	Accepted	1.000	Accepted	Accepted
11	Assurance	0.917	Accepted	0.833	Accepted	0.750	Not accepted			
12	Empathy	0.583	Not accepted							
13	Responsiveness	0.917	Accepted	0.917	Accepted	1.000	Accepted	1.000	Accepted	Accepted
14	Digital Literacy	1.000	Accepted	1.000	Accepted	1.000	Accepted	1.000	Accepted	Accepted
15	Infrastructure	1.000	Accepted	1.000	Accepted	1.000	Accepted	1.000	Accepted	Accepted
16	Interoperability	0.833	Accepted	0.917	Accepted	1.000	Accepted	1.000	Accepted	Accepted
17	Innovation Culture	0.917	Accepted	0.667	Not accepted					

*Accepted if mean >3.00; S-CVI/Ave =1; if number of expert > 9, I-CVI ≥ 0.78

Source: Authors.

Figure 4: Research Hierarchial Structure.

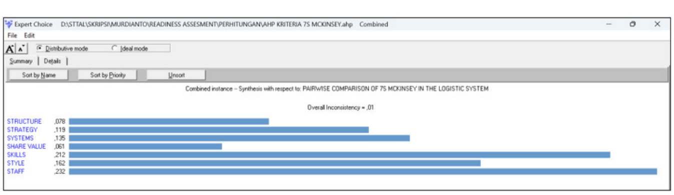


Source: Authors.

4.2. *Weighting of criteria and analysis of readiness levels for accelerating digital transformation of the supply system.*

As seen in Figure 4, the hierarchical structure of the problem was created using the criteria and alternatives. After collecting expert assessments to define the readiness criteria for accelerating the digital transformation of the Navy fleet's supply system, Expert Choice software (version 11) was used for the analysis. The pairwise comparison results of the criteria, using the AHP technique, can be viewed in Figures 5 and 6.

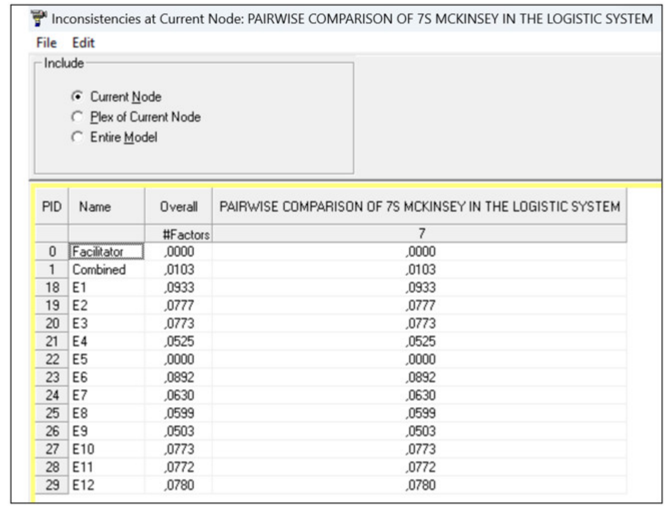
Figure 5: Weighting outcomes (7S McKinsey) using expert choice version 11.



Source: Authors.

Figure 5 shows the results of the criteria weight data processed from the pairwise comparisons made by 12 experts. The weight values for the criteria are: structure (C-1) at 0.078, strategy (C-2) at 0.119, systems (C-3) at 0.135, share value (C-4) at 0.061. skills (C-5) at 0.212, style (C-6) at 0.162, and staff (C-7) at 0.232. The overall inconsistency value of the 12 experts is

Figure 6: Inconsistency value of 12 experts using expert choice version 11.



Source: Authors.

0.01 (1%), which indicates the data is valid and consistent. Figure 6 shows the inconsistency values for each expert: expert 1 has 0.093, expert 2 has 0.077, and so on. All experts provided consistent pairwise comparison assessments.

The criteria for the digital transformation of the Navy fleet's supply system are based on a research by Demir & Kocaoglu (2019), which uses the 7S McKinsey framework as a tool for strategic planning and economic assessment in digital transformation. This research emphasizes the significance of the 7S McKinsey framework in defining the criteria for digital transformation in the Navy fleet supply system.

The data processing continues with a questionnaire for the experts, whose responses will be analyzed using the TOPSIS technique. In this stage, experts will rate the alternatives on a scale from 1 to 5.

Table 7: Normalized Matrix of Decision.

	CSF	DIVIDER						
		C-1	C-2	C-3	C-4	C-5	C-6	C-7
		14,252	14,448	14,409	14,362	14,502	14,280	14,445
1	Adaptability	0.339	0.340	0.283	0.331	0.322	0.338	0.335
2	Availability	0.339	0.329	0.341	0.337	0.333	0.338	0.335
3	Reliability	0.339	0.329	0.341	0.325	0.339	0.327	0.335
4	Usability	0.327	0.317	0.341	0.337	0.333	0.338	0.335
5	Personalization	0.327	0.340	0.335	0.331	0.328	0.338	0.335
6	Security	0.327	0.340	0.335	0.331	0.328	0.338	0.335
7	Responsiveness	0.327	0.329	0.335	0.337	0.339	0.333	0.335
8	Digital Literacy	0.339	0.335	0.341	0.337	0.339	0.321	0.323
9	Infrastructure	0.333	0.340	0.341	0.337	0.339	0.327	0.335
10	Interoperability	0.339	0.335	0.335	0.331	0.339	0.338	0.312

Source: Authors.

Table 8: Weighted normalized matrix.

	CSF	C-1	C-2	C-3	C-4	C-5	C-6	C-7
1	Adaptability	0.027	0.040	0.038	0.020	0.068	0.055	0.078
2	Availability	0.027	0.039	0.046	0.021	0.071	0.055	0.078
3	Reliability	0.027	0.039	0.046	0.020	0.072	0.053	0.078
4	Usability	0.026	0.038	0.046	0.021	0.071	0.055	0.078
5	Personalization	0.026	0.040	0.045	0.020	0.069	0.055	0.078
6	Security	0.026	0.040	0.045	0.020	0.069	0.055	0.078
7	Responsiveness	0.026	0.039	0.045	0.021	0.072	0.054	0.078
8	Digital Literacy	0.027	0.040	0.046	0.021	0.072	0.052	0.075
9	Infrastructure	0.026	0.040	0.046	0.021	0.072	0.053	0.078
10	Interoperability	0.027	0.040	0.045	0.020	0.072	0.055	0.072

Source: Authors.

Table 9: Positive ideal solution and negative ideal solution.

A+	0.027	0.040	0.046	0.021	0.072	0.055	0.078
A-	0.026	0.038	0.038	0.020	0.068	0.052	0.072

Source: Authors.

Table 10: Euclidean distance and proximity index calculation.

D+	D-	ALTERNATIVE	S
0.009	0.007	Adaptability	0.438
0.002	0.010	Availability	0.849
0.002	0.010	Reliability	0.809
0.003	0.010	Usability	0.765
0.003	0.010	Personalization	0.781
0.003	0.010	Security	0.781
0.002	0.010	Responsiveness	0.827
0.004	0.009	Digital Literacy	0.702
0.002	0.011	Infrastructure	0.845
0.005	0.009	Interoperability	0.615

Source: Authors.

The TOPSIS method was used to determine the operational readiness level of 10 critical success factors (CSFs) that affect the digital transformation of the Navy fleet's supply system (Putra et al,2023). Data was collected using a TOPSIS questionnaire and combined with the earlier AHP data. Table 7 shows the normalized decision matrix . Table 8 presents a weighted normalized matrix, where each criterion value is multiplied by the alternative. Table 9 identifies the positive and negative ideal solutions by selecting the highest and lowest values for each criterion. Table 10 shows the Euclidean distance and closeness index calculations.

Table 11: Readiness level for accelerating the digital transformation of the Navy fleet supply system.

ALTERNATIVE	S	LEVEL	RANK
Adaptability	0.438	Fairly Ready	10
Availability	0.849	Ready	1
Reliability	0.809	Ready	4
Usability	0.765	Ready	7
Personalization	0.781	Ready	5
Security	0.781	Ready	6
Responsiveness	0.827	Ready	3
Digital Literacy	0.702	Ready	8
Infrastructure	0.845	Ready	2
Interoperability	0.615	Ready	9
AVERAGE LEVEL	0.741	Ready	

Source: Authors.

From the results in Table 11, the "CSF availability" alternative has the highest value of 0.849, indicating a "ready" readiness level, followed by "infrastructure" (0.845) and "responsiveness" (0.827) at the same readiness level. Other alternatives, such as "reliability" (0.809), "personalization and security" (0.781), "usability" (0.765), "digital literacy" (0.702), and "interoperability" (0.615), are also at the "ready" level. The "adaptability" alternative, with a value of 0.438, is categorized as "quite ready." Overall, the readiness level of the Navy fleet's supply system in accelerating digital transformation is 0.741. which is considered "ready."

4.3. Sensitivity analysis.

Sensitivity analysis looks at how uncertainty in a system's output can be traced back to different sources of uncertainty in its inputs. Uncertainty analysis, which is more focused on measuring and spreading uncertainty, is a related approach. Ideally, both types of analysis should be done together. In sensitivity analysis, the goal is to recalculate results under different assumptions to see how changes in a variable affect the outcome. This helps evaluate how robust the model is when there is uncertainty (Saini & Singh, 2022). Different scenarios are tested by keeping the weight of one criterion fixed, while giving equal weights to the other criteria, as shown in Table 12. These adjusted weights are compared to the original results. In the first scenario, the weight of criterion C-1 remains unchanged, while the other six criteria are given equal weights.

Table 12: Several scenarios/tests given with varying weights.

	BASIC VALUE	SCEN 1	SCEN 2	SCEN 3	SCEN 4	SCEN 5	SCEN 6	SCEN 7
C-1	0.079	**0.079**	0.881	0.865	0.939	0.788	0.838	0.768
C-2	0.119	0.921	**0.119**	0.865	0.939	0.788	0.838	0.768
C-3	0.135	0.921	0.881	**0.135**	0.939	0.788	0.838	0.768
C-4	0.061	0.921	0.881	0.865	**0.061**	0.788	0.838	0.768
C-5	0.212	0.921	0.881	0.865	0.939	**0.212**	0.838	0.768
C-6	0.162	0.921	0.881	0.865	0.939	0.788	**0.162**	0.768
C-7	0.232	0.921	0.881	0.865	0.939	0.788	0.838	**0.232**

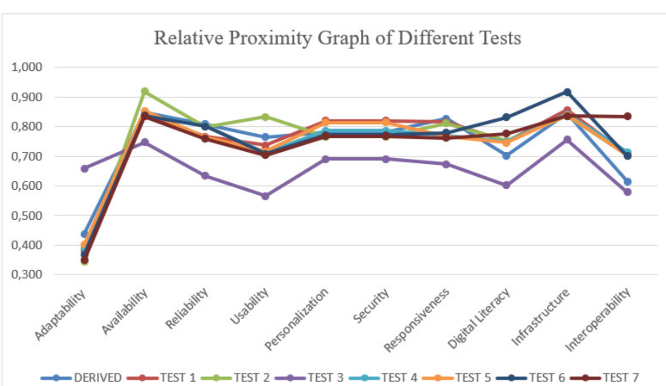
Source: Authors.

Table 13: Relative proximity values obtained from different test scenarios.

	DERIVED	TEST 1	TEST 2	TEST 3	TEST 4	TEST 5	TEST 6	TEST 7
Adaptability	0.438	0.382	0.345	0.659	0.392	0.402	0.368	0.349
Availability	0.849	0.840	0.919	0.748	0.840	0.854	0.838	0.835
Reliability	0.809	0.766	0.800	0.634	0.803	0.763	0.801	0.759
Usability	0.765	0.737	0.833	0.565	0.713	0.717	0.709	0.704
Personalization	0.781	0.820	0.767	0.690	0.787	0.815	0.772	0.768
Security	0.781	0.820	0.767	0.690	0.787	0.815	0.772	0.768
Responsiveness	0.827	0.816	0.811	0.674	0.771	0.767	0.780	0.762
Digital Literacy	0.702	0.749	0.752	0.602	0.749	0.746	0.832	0.776
Infrastructure	0.845	0.857	0.835	0.757	0.841	0.839	0.918	0.836
Interoperability	0.615	0.706	0.707	0.579	0.714	0.702	0.701	0.834

Source: Authors.

Figure 7: Sensitivity analysis.



Source: Authors.

The sensitivity analysis results, shown in Figure 7, indicate that "availability" (A-2) and "infrastructure" (A-8) are the most influential alternatives in determining the readiness level for accelerating the digital transformation of the Navy fleet's supply system, based on the seven scenario tests conducted (Table 12).

The ranking of the readiness analysis for accelerating the digital transformation of the Navy fleet supply system is based on several critical success factors (CSFs), such as adaptability, availability, reliability, usability, personalization, security, responsiveness, digital literacy, infrastructure, and interoperability. When the scenario is adjusted by keeping the weight of one criterion while giving equal weights to the others, as shown in Table 12, the relative proximity values from these scenarios are displayed in Table 13. Figure 7 presents the results of the sensitivity analysis graph. Table 14 shows the variations in the ranking of CSFs based on different scenarios. These variations reveal that, in some cases, "infrastructure" becomes the top critical success factor with a "ready" readiness level for accelerating digital transformation in the Navy fleet supply system.

Table 14: KRI ranking based on sensitivity analysis test.

ALTERNATIVES	DERIVED	TEST 1	TEST 2	TEST 3	TEST 4	TEST 5	TEST 6	TEST 7
Adaptability	10	10	10	6	10	10	10	10
Availability	1	2	1	2	2	1	2	2
Reliability	4	6	5	7	3	6	4	8
Usability	7	8	3	10	9	8	8	9
Personalization	5	3	6	3	4	3	6	5
Security	5	3	6	3	4	3	6	5
Responsiveness	3	5	4	5	6	5	5	7
Digital Literacy	8	7	8	8	7	7	3	4
Infrastructure	2	1	2	1	1	2	1	1
Interoperability	9	9	9	9	8	9	9	3

Source: Authors.

4.4. Discussion.

This research used the Delphi method to identify the Critical Success Factors (CSFs) influencing digital transformation in the Navy fleet supply system. It also applied the AHP method to compare the criteria of the 7S McKinsey components and used the TOPSIS method to find the best alternative.

The research found 10 critical success factors influencing digital transformation, expanding on the work of DeLone & McLean (2003), who identified 13 success factors. This is different from Morakanyane et al. (2020), who identified 7 success factors and 23 sub-factors.

TOPSIS analysis showed that 9 out of 10 alternatives were in the "ready" category, with "adaptability" in the "quite ready" category. The availability factor (Bilyalova et al., 2020) had the highest value of 0.849, followed by infrastructure (Nekrasov & Sinitsyna, 2020) at 0.845, responsiveness (Mangalaraj et al., 2023) at 0.827, reliability (Afsharnia, 2023) at 0.809, personalization *(Jain et al., 2021)* and security (Stewart, 2023) at 0.781. usability (AlGothami & Saeed, 2021) at 0.765, digital literacy (Cetindamar et al., 2021) at 0.702, interoperability (Kouroubali & Katehakis, 2019) at 0.615, and adaptability (Darius & Bogdana, 2020) at 0.438.

The results indicate that most of the 7S components are ready to support digital transformation, but adaptability needs more attention. This matches Schneider's (2019) findings, which emphasized the importance of technological availability for digital transformation in the Navy fleet. The research shows that the Navy fleet is ready in terms of technological availability for digital transformation.

While this research identified 10 critical success factors for digital transformation in the Navy fleet, it did not measure their exact influence. Future research is needed to explore the impact of these factors further.

4.5. Implications.

This section is divided into the managerial implications and the practical implications of evaluating the readiness to accelerate the digital transformation of the naval fleet supply system.

Theoretical Implications. This research offers significant theoretical implications by demonstrating how the 7S McKinsey framework can holistically assess and align the internal components of an organization to achieve its strategic objectives. The 7S model proves valuable in ensuring that the digital transformation strategy is integrated with a flexible organizational structure, innovative systems, adequate technological skills, adaptive leadership styles, and values that foster a culture of change. By emphasizing the interconnectedness of these elements, the 7S model provides a comprehensive approach to evaluating both individual components and their relationships within an organization.

Practical/Managerial Implications. This research offers important practical implications by demonstrating that McKinsey's 7S framework can serve as a foundational tool for enhancing organizational performance. Specifically, the Navy fleet, TNI AL, and other TNI organizations can effectively apply the seven elements—strategy, structure, systems, staff, style, skills, and shared values—to improve their performance. The insights gained from this research can guide policymakers in shaping the development of the Navy fleet and TNI organizations as a whole. By utilizing this framework, decision-makers can make informed choices to implement policies that enhance organizational effectiveness and efficiency.

Conclusions.

This research on assessing the readiness for accelerating the digital transformation of the Navy fleet supply system is of significant importance given the rapid technological advancements in digitalization, particularly within the defense sector. The research highlights the readiness of the Navy fleet supply system, using the 7S McKinsey framework, and identifies the critical success factors (CSFs) for the transformation process. The results from the TOPSIS method indicate that most factors, including availability, infrastructure, and responsiveness, are at a "ready" level, with adaptability identified as an area that still requires improvement. The average readiness score of 0.741 suggests that the Navy fleet's supply system is well-prepared for digital transformation.

However, the research has some limitations. While it provides valuable insights into the assessment of readiness, it does not delve into the implementation and real-world validation of the results in the Navy fleet context. Further research could explore practical testing and feedback to validate the effectiveness of the identified CSFs in accelerating digital transformation. Additionally, future studies could use Structural Equation Modeling (SEM) to analyze the influence of these CSFs on the readiness of the supply system and investigate the relationships between them. Another potential direction for future research is to compare different multi-criteria decision-making techniques, such as Analytic Network Process (ANP), Decision-Making Trial and Evaluation Laboratory (DEMATEL), and VIseKriterijumska Optimizacija I Kompromisno Resenje (VIKOR), in assessing digital transformation readiness across different sectors.

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