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Digital Transformation Maturity Analysis of Indonesian Navy Staff and Command College Using DTMM

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Abstract

The maturity of digital transformation refers to an organization's development level in adopting and integrating digital technology into its business processes. The level of maturity of digital transformation in the Indonesian Navy Staff and Command College as a military education institution is very essential. The problem is the information on digital transformation maturity has not been obtained. The qualitative method through in-depth interviews was conducted on the leadership elements, namely the director and departmental heads to answer the question of digital transformation maturity. Interviews were developed in the policy and strategy, technology and infrastructure dimensions, the use of IT in the business process of educational institutions, IT-based learning, lecturers and education, data, digital leadership, efficiency and IT-based performance, and IT culture. Determination of maturity level was carried out using DTMM at initial, developing, defined, managed, and optimized. The results of the study show that overall, the level of maturity of digital transformation at the Naval Staff and Command School has reached a defined (systematic) level. The strategy for increasing the maturity of digital transformation at the Naval Staff and Command School needs to be continuously developed and implemented in each dimension.

Keywords: Maturity, Digital transformation, Indonesian Navy Staff and Command College

1. INTRODUCTION

Digital transformation is defined as a process that aims to improve an entity by triggering significant changes in its property through the combination of information technology, computing, communication, and connectivity [1]. Another definition had previously been stated that digital transformation was a combined effect of several digital innovations that gave birth to new actors (and actor constellation), structures, practices, values, and beliefs that change, threaten, replace, or complete the rules of the game that exist in organizations, ecosystems, industries, or fields [2].

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Based on these notions, digital transformation in this study is defined as the process of integration of digital technology into all areas of business processes through a combination of information technology, computing, communication, and connectivity, which changes operational methods and provides added value to relevant stakeholders. This process is very important to ensure that the organization remains competitive, responsive to change, and can innovate quickly. Furthermore, there are nine dimensions in digital transformation, namely: strategy, technology and infrastructure, processes, learning, human resources, data, leadership, efficiency and performance, and culture [3]. Another dimension was put forward by covering the following aspects: Policies and Strategies, Transformation Management, Teaching and Services of Digital Education Management, Digitalization of Internal Processes and Operations, Student Interaction, Lecturers, and Digital Education Staff, and Use and IT development in the entire educational process [4].

Based on these two opinions, the digital transformation dimension in this study includes policies and strategies, technology and infrastructure, the use of IT in the business process of educational institutions, IT-based learning, educators and education, data, digital leadership, efficiency and IT-based performance, and IT culture. Graphically described in Figure 1.

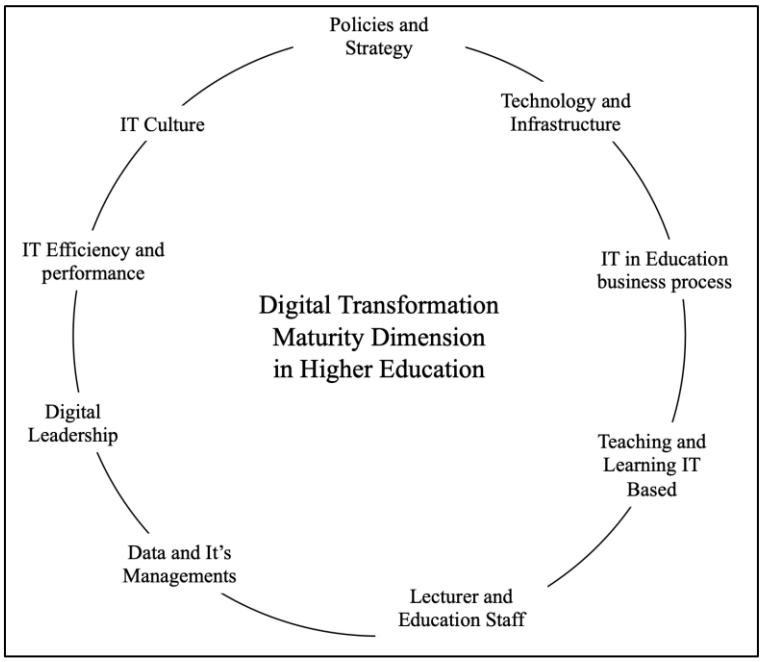

Figure 1. Digital Transformation dimension [3], [4]

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There are several reasons why digital transformation is crucial for the current organization including increasing operational efficiency, improving customer experience, increasing competitiveness and innovation, and increasing adaptability and flexibility [5], [6]. By referring to the interests of digital transformation, digital transformation maturity is needed for institutions for the transformation process carried out.

The maturity of digital transformation refers to an organization's development level in adopting and integrating digital technology into its business processes to improve performance, efficiency, and competitiveness. This level of maturity reflects the extent to which an organization has succeeded in implementing digital technology and cultural changes needed to support sustainable innovation and transformation [7]. The maturity of digital transformation can be understood as a spectrum, where the organization moves from the initial stage of the introduction and exploration of digital technology towards the stage in which this technology is fully integrated into all aspects of the organization's operational and strategic aspects. At the full maturity stage, the organization not only uses technology to improve efficiency but also to create new values and change its business models [6].

The digital transformation maturity model (DTMM) is a holistic concept that reflects the technology and managerial aspects of digital transformation. The level of maturity of digital transformation and this research) can be declared 5 levels [8], as follows.

Level 1 - Initial (Awareness):
Educational institutions are beginning to realize the importance of digital transformation but do not yet have a clear strategy or infrastructure.

Level 2 - Developing (Opportunistic):
Educational institutions are starting to try digital initiatives separately with several digital projects, but there is no coordinated strategy.

Level 3 - Defined (Systematic):
Several digital programs have been integrated into the education process and are starting to be used to support decisions.

Level 4 - Managed (Integrated):
Digitalization is an integral part of the operations of educational institutions. Digital technology is used consistently to improve the efficiency and effectiveness of education.

Level 5 - Optimized (Innovative):
Educational institutions are ready to adapt quickly to changes in technology and the learning process.

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Analysis of publication data from Google Scholar 2019 - 2024 has been carried out using the Publish or Perish (PoP) application and the Vos Viewer application is used to study previous research and find the research gap [9]. The analysis was carried out using maturity, digital transformation, and education keywords. Obtained 200 articles data. The analysis results have been presented using network visualization and density visualization as shown in Figure 2.

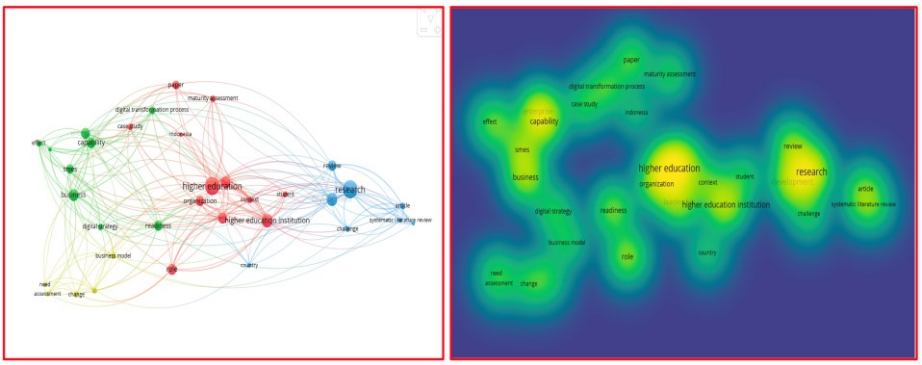

Figure 2. Density visualization previous research on the maturity of digital transformation in the field of education

Based on the results of research as presented above, many studies have been related to maturity, digital transformation, and education. In the first picture, it appears that when presented with interaction between words, 287 links are obtained. However, in more detail, the density visualization shows that research is grouped in clusters, and some are not connected. More clearly the cluster formed can be presented as shown in Table 1.

Table 1. Clustering from the relationship of important words

Cluster 1	Cluster 2	Cluster 3	Cluster 4
1. Case Study	1. Business	1. Article	1. Assessment
2. Context	2. Capability	2. Challenge	2. Business Model
3. Higher Education	3. Digital Strategy	3. Country	3. Change
4. Institution	4. Digital Transformation	4. Development	4. Need
5. Indonesia	5. Effect	5. Field	5. Systematic Review
6. Leadership	6. Enterprise	6. Research	
7. Maturity Assessment	7. Readiness	7. Review	
8. Maturity Level	8. Relationship	8. Systematic literature	
9. Organization			
10. Role			
11. Student			

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Based on Table 1, it appears that there is a grouping of research in following with keywords. So, research that examines the analysis of the maturity of digital transformation in educational institutions is found in cluster 1 and cluster 2. Moreover, there is no research on digital transformation maturity in military education institutions. This indicates that there is no similar research. Therefore, this research is expected to be a new thing that contributes to the analysis of the level of maturity of digital transformation in general military education institutions. In Indonesia, the problem of the maturity of digital transformation in educational institutions is faced with several significant challenges.

1. Digital gap. Digital inequality is one of the main problems in digital transformation in Indonesia. Many educational institutions in remote areas have difficulty accessing adequate technology. According to a study, there are significant differences in the use of digital libraries between students in Indonesia and Malaysia during the pandemic covid-19. This study shows that the gap in technology access is inhibiting the process of learning distance effectively [10].
2. Readiness and technology support. The readiness of educational institutions to adopt digital technology is still varied. A result of research indicated that digital technology that supports English learning in Indonesian universities still needs to be improved. Lack of infrastructure and technical support is the main obstacle to effective digital transformation in the higher education sector [11].
3. Digital skills and training. The lack of digital skills among teachers and students is also a challenge. The Research highlighted the importance of digital literacy in the learning process, especially in the context of independent learning. This study found that training and development of digital skills among students still need to be improved to support technology-based learning [12].

The application of digital transformation to military education institutions in Indonesia faces several significant challenges. This includes the limitations of infrastructure, cyber security issues, rejection of changes between staff and students, and the need for special training to be able to use new technology effectively. A multiphase approach that includes improving infrastructure, increasing cyber security steps, providing comprehensive training programs, and cultural development that embraces technological change was needed to overcome these challenges [13]. Furthermore, bibliometric analysis emphasized the need for an ongoing evaluation and adaptation of the digital transformation strategy to ensure that the strategy meets the needs of developing educational institutions [9].

Indonesian Navy Staff and Command College as a Navy education institution plays an important role in preparing the Navy human resources to carry out its duties and the main tasks of the TNI following Republic of Indonesia Law No. 34 of 2004 concerning the TNI. Challenges in Indonesian Navy Staff and Command College along with the challenges faced by the Navy and the TNI in carrying out

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their duties. Therefore, the Indonesian Navy Staff and Command College must always adjust to technological developments and use them to improve the quality of education. Based on the problems faced by the Naval Staff and Command College in implementing digital transformation, the purpose of this study is to obtain the level of maturity of the Naval Staff and Command College's digital transformation.

2. METHODS

To examine the maturity of digital transformation in educational institutions, various methods can be used. This study usually involves an in-depth analysis of various aspects of technology, organization, and culture in the institution. The survey and questionnaire methods from respondents regarding their perceptions, readiness, and experiences related to the adoption of digital technology [8], [14]. Another method is a case study that allows researchers to conduct an in-depth analysis of the digital transformation process in a specific context and explore the factors that influence their success or failure [15]. Content analysis can also be used which involves the collection and analysis of documents, reports, and other data available publicly or from internal sources of educational institutions to identify patterns, trends, and themes related to digital transformation [16].

In this study, qualitative research methods were used with in-depth interviews with decision-makers, teaching staff, and students to provide deeper insights into their experience and perception of digital transformation. The method used was in-depth interviews [17] with the Indonesian Navy Staff and Command College leaders, such as the Director of Education, Director of Development, Director of Educational Research and Development, and Director of Strategy Study and Operations to identify the level of digital transformation. The research focused on the maturity level of digital transformation of the Indonesian Navy Staff and Command College educational institution using DTMM at various levels, such as level 1 - initial (awareness), level 2 - developing (opportunistic), level 3 - defined (systematic), level 4 - managed (integrated), and level 5 - optimized (innovative).

Steps of Research Methods Qualitatively using in-depth interviews to analyze the maturity of digital transformation [15], [17]. The research steps were carried out as follows:

1) Preparation of an interview guide, containing nine questions about the level of maturity of digital transformation at the staff and command college.
2) Conducting interviews with expert sources, namely the Director of Education, Director of Development, Director of Educational Research and Development, and Director of Strategy Study and Operations.

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3) Triangulating the achievement of the level of maturity of digital transformation at the Indonesian Navy Staff and Command College.
4) Giving scores to the results of these achievements according to the maturity criteria. Scoring was done using the DTMM ranging from level 1 to 5.
5) Compiling a tabulation of the results of the search for the level of maturity and the score of the maturity of digital transformation at the Indonesian Navy Staff and Command College.

In detail, the research steps start from the existence of a phenomenon followed by a literature review and compiling research questions, then continue with the selection of subjects/experts, the preparation of interview guides, and the implementation of interviews. The next step is the data analysis process followed by interpretation and discussion. The entire series of research processes are closed with the preparation of conclusions and the preparation of reports. Graphically, the research steps are presented as shown in Figure 3.

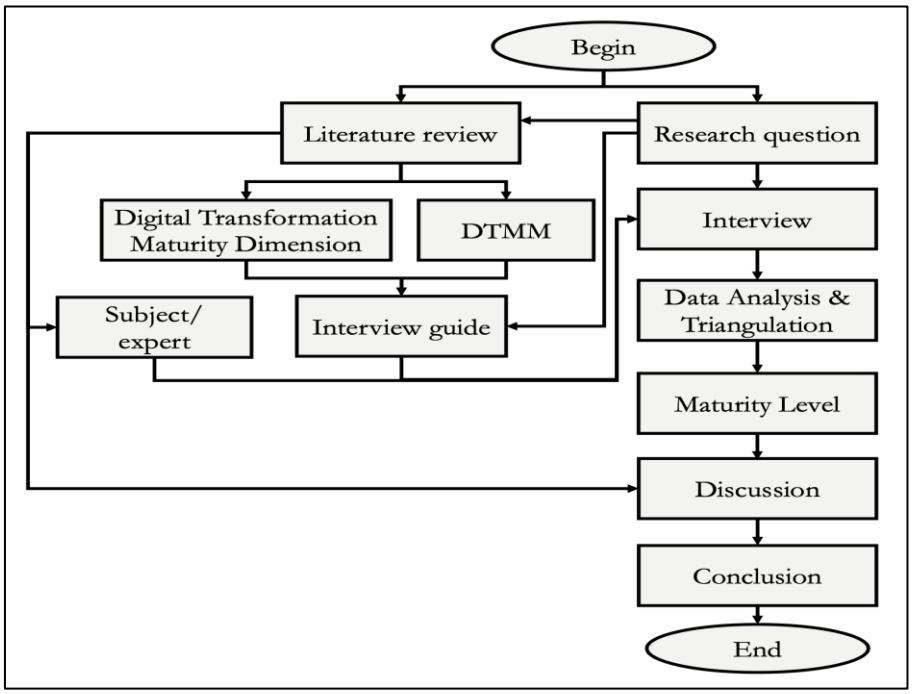

Figure 3. Research Flow Chart

Based on Figure 3, it can be explained that from the research problem, a literature review was conducted, especially on the digital transformation maturity dimension in higher education and DTMM. Furthermore, interview and expert selection guidelines were prepared. From these two things and the research problem that is

the focus of the research, interviews were conducted. Furthermore, the interview results were analyzed and triangulated to produce conclusions about the level of digital transformation maturity at the Indonesian Navy Staff and Command College in each dimension. The results obtained were then discussed with several previous studies. Finally, a conclusion can be drawn up which is the answer to the research question.

3. RESULTS AND DISCUSSION

3.1 Digital Transformation

Measurement of the maturity of digital transformation in educational institutions in Indonesia includes various dimensions that provide a comprehensive picture of the readiness and application of digital technology. the results of interviews with the Indonesian Navy Staff and Command College stakeholders related to the level of maturity of the digital transformation dimension in the nine main dimensions. The results of interviews from all sources were triangulated to be stated descriptively about the characteristics of achieving digital transformation maturity from each dimension. The results of this triangulation were then given a score or level of its maturity. The results achieved in detail are presented in Table 2.

Table 2. Measurement of the Indonesian Navy Staff and Command College Digital Transformation Maturity

Dimension	Explanation
IT policies and strategies	The Indonesian Navy Staff and Command College digitalization policy has been contained but not yet in detail describing the strategies and stages that need to be carried out in official documents. The IT policies and strategies assessment was at the level 3 defined (systematic).
IT technology and infrastructure	IT technology and infrastructure in the Indonesian Navy Staff and Command College were at a high level, but incomplete. In the Indonesian Navy Staff and Command College there is a smart campus that contains e-library (limited), e-office, e-Faculty, class and environmental monitoring with CCTV, Wargaming System laboratory based on IT. What did not yet exist is the information forum information system that was integrated with the wargaming system, as well as the completeness of the e-library that contains e-journals and e-books and learning videos. Artificial intelligence-based IT technology has not yet been used. The IT

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Dimension	Explanation
	technology and infrastructure assessment was at the level 4 – managed (integrated).
Use of IT in Education Business Processes	In the Indonesian Navy Staff and Command College business processes, it has been done. In the administration of the letter and disposition already using e-office. The student administration is still semi -manual. Whereas the personnel staff are still semi -manual. The use of IT in business processes was at the level 3-defined (systematic).
Teaching & Learning IT-based learning	The use of IT in learning material has been carried out. Weekly scheduling is still semi -manual. Learning and assignment and task submission are still semi -manual. The IT-based learning was at the level 3-defined (systematic).
Lecturers and education staff	Specifically for educators and education staff, the administration of semi -manual personnel. Search for material teachings from semi-manual e-ebrary sources. Some other search for teaching material using e-journal and e-books are not paid from the internet. Whereas paid e-books and e-Journals have no facilities. Provide assignments and receive assignments to students carried out semi -manual. Lecturers and education staff were at the level 3-defined (systematic).
Data and it's managements	Educational management data and organizational management are currently stored well, digitally and manually. However, digital management data management is still separate not integrated and has not been coherent so it cannot be optimized in the dashboard as a decision support system. Data and management assessments were at the level 3-defined (systematic).
Digital leadership	The Indonesian Navy Staff and Command College leadership in directing educators and education personnel as well as all personnel to utilize the IT facilities that were quite high. The spirit to use IT is quite high. Future vision for the development of IT infrastructure and its implementation were quite high. The digital leadership assessment was at the level 4-managed (integrated).
IT-Based Efficiency and Performance	IT-based efficiency and performance were quite good, faced with the limitations of the existing facilities. But not optimal. So, it needs to be optimized, considering

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Dimension	Explanation
	that there are still many that are carried out semi - manual, even though it can actually be full -based IT. Overall, the assessment of IT-based efficiency and performance in were at level 3-defined (systematic).
IT culture	IT culture was still growing continuously. At present all things are still widely backed up manually. So that efficiency and performance are not optimal. Many things can also be developed based on IT. The IT cultural assessment were at level 3-defined (systematic).

Overall, the level of maturity of digital transformation at the Indonesian Navy Command and Staff College has been quite good. The values generated in each dimension according to Table 2 can be presented in Figure 4.

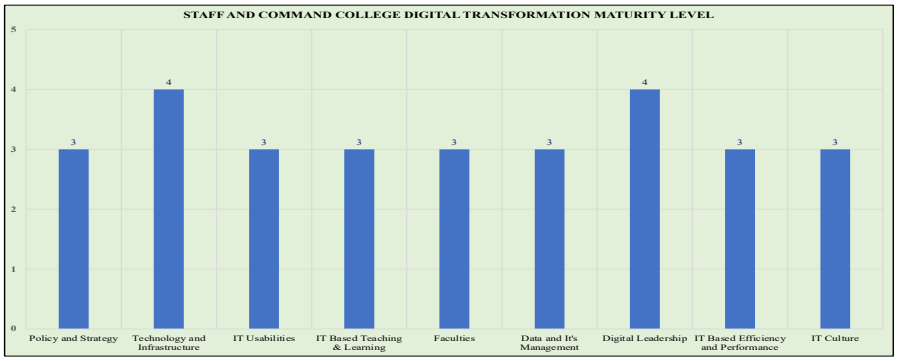

Figure 4. The results of the analysis of the achievement level of Seskoal digital transformation maturity

Based on Figure 4, it appears that all dimensions are at level 3-defined (systematic), except for the technology and infrastructure dimension and the digital leadership dimension, both of which are at level 4-managed (integrated). Quantitatively, the average of all dimensions is 3.2 out of 5. It is still categorized at the defined (systematic) level. So, there is still a lot of work to be done to achieve a comprehensive and sustainable digital transformation.

3.2 Discussion

The achievement of the maturity level of digital transformation in the Indonesian Navy Staff and Command College showed a good position. This statement was in line with the previous research which showed that the level of maturity of digital transformation in the military world, especially in technology and infrastructure, is getting better [8]. This also supported the results of research in the world of

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education in general which explains that the development of digital transformation maturity also continues to experience rapid development [14].

To increase the maturity of digital transformation in educational institutions, strategies are prepared in each dimension. In the policy and strategy dimensions, there needs to be a clear guide and regulatory support to direct digital transformation. On the technology and infrastructure side, investment in the latest technology and infrastructure that supports is very important. The use of IT in business processes must be optimized to improve operational efficiency. IT-based learning must be increased through an interactive and easily accessible e-learning platform. Educators and education staff need to be trained continuously to master new technology. Effective data management must be implemented to support data-based decision-making. Digital leadership must encourage technological innovation and adaptation. In addition, IT-based efficiency and performance must always be evaluated to ensure optimal results. Finally, IT culture must be strengthened throughout the organization to support the adoption of technology as a whole.

To implement a strategy to increase the maturity of digital transformation in detailed educational institutions, implementation steps are needed. Based on the triangulation of the results of the interview, the following steps can be taken: First, the Indonesian Navy Staff and Command College formed a digital transformation team consisting of the Director and Head of Department, the Head of the data management Section, and representatives of all departments. Furthermore, a digital roadmap is compiled with clear stages and timelines, including short-term and long-term goals, especially for policies that support technology adoption to the use of artificial intelligence and machine learning for learning, including rules for the use of devices, data security, and digital ethics in managing the Indonesian Navy Staff and Command College education.

Allocation of funds for purchasing hardware (computers, servers, network devices) and software (learning management systems, administrative software). Another very important hardware is the development of information systems for learning such as Machine Learning and Artificial Intelligence based integrated information systems for threat analysis, posture development, and risk analysis. Make sure network infrastructure (such as Wi-Fi) is strong and can support all users simultaneously. Routine maintenance and upgrade of the system to ensure that technology remains up-to-date.[18]

Gradually improve business processes based on IT use. Identification of automated business processes to improve efficiency, such as administration of registration and management of student learning activities. Furthermore,

integrating various IT systems to ensure data and information can be accessed seamlessly by all parties in need [16].

Implement an e-learning platform that is easy to use by students and lecturers, with features such as video conferencing, discussion forums, and online assessment systems. Together with the Indonesian Navy Education Office developed a curriculum that supports digital and hybrid learning, as well as interactive digital teaching materials [11], [19]. Conduct routine training and workshops for educators and education staff about the use of technology in the teaching and learning process in the Micro Teaching laboratory owned by the Indonesian Navy Staff and Command College. Developing a professional development program that focuses on improving digital competencies in officials, lecturers, and education staff and all staff.[14] Implementation of data management systems that can manage student data, finance, personnel, and operations efficiently and safely. Use data analysis tools to monitor and evaluate the performance of educational institutions and support data-based decision-making. Performance analysis tools such as Balance Scorecard, SWOT Analysis, and benchmarking quantitatively need to be developed.[20], [21].

Leaders continue to strive for their leadership to increasingly have a strong digital vision and be able to encourage innovation throughout the organization. Leaders follow the development of leadership models such as following the Digital Strategic Leadership workshop and improving communication and collaboration between directorates and departments to ensure all parties are in line with the purpose of digital transformation.[22]. The use of DTMM to measure the performance of various aspects, such as operational efficiency, quality of learning, and satisfaction of student officers and the Indonesian Navy Staff and Command College graduates. Periodically conduct reviews and optimization of automated processes to continue to improve efficiency [8]. The Indonesian Navy Staff and Command College need to continue to socialize and educate about the importance of IT adoption in daily life to all members of the organization. Besides that, it also encourages IT initiatives and projects at the degrees and departments or individuals to create a culture of technological innovation [14].

4. CONCLUSION

Overall, the level of maturity of digital transformation at the Indonesian Navy Staff and Command College was at defined (systematic) level. Several digital programs have been integrated into the education process and are starting to be used to support decisions. Assessment of the level of maturity of digital transformation showed at defined (systematic) level in the policy and strategy dimensions, the use of IT in the business process, lecturers and education staff, effective data management, efficiency and IT-based performance, and IT culture.

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Whereas the technological and infrastructure dimensions and digital leadership dimensions were already at Managed (Integrated) level. To increase the maturity of digital transformation in educational institutions, strategies are prepared in each dimension.

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