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The Influence of Effective Communication and Information Technology on Maritime Literacy in the Digital Era Which Impact Participant Satisfaction at the Imare Training Centre for Seafarers (Jakarta Maritime Imare)

Muhammad Mughni Aziz[1], Muhammad Irham[2], April Gunawan Malau[3].
[1]Sekolah Tinggi Ilmu Pelayaran, Jakarta, mughniaziz05@gmail.com.
[2]Sekolah Tinggi Ilmu Pelayaran, Jakarta, muhammadirham925@gmail.com.
[3]Sekolah Tinggi Ilmu Pelayaran, Jakarta, aprilgunawan22@gmail.com.

Corresponding Author: mughniaziz05@gmail.com[1]

Abstract: This study aims to analyze the influence of effective communication and information technology on digital-era maritime literacy and its impact on the satisfaction of training participants at the IMARE Training Center for Seafarers (IMARE Maritim Jakarta). Maritime literacy in the context of the digital era is a crucial aspect in supporting the transformation of seafarers' competencies amidst the rapid development of global shipping information systems and technology. This research adopts a quantitative approach with a cross-sectional design. The population consists of all training participants from January to December 2024, totaling 2,708 participants, spanning various training programs such as CMT, CMHBT, SAT, SDSD, SSO, MC, MFA, and IMDG. The sample was determined using the Slovin formula, resulting in 349 respondents selected through proportional random sampling. Data were collected via questionnaire distribution and analyzed using the latest version of SmartPLS software. The findings indicate that effective communication and information technology have a positive and significant influence on maritime literacy, and that maritime literacy positively affects the satisfaction of training participants. Additionally, both communication and information technology show a significant indirect influence on satisfaction through maritime literacy. These findings highlight the vital role of two-way communication and the use of training technology in enhancing the quality of education and participant satisfaction in seafarer training in the digital age.

Keyword: Effective Communication, Information Technology, Digital-Era Maritime Literacy, Training Participant Satisfaction.

INTRODUCTION

As an archipelagic nation with enormous maritime potential, Indonesia has made maritime transportation a crucial element in its national economy. The ever-increasing maritime activity requires qualified crew members, in accordance with international standards as regulated by the International Maritime Organization (IMO) through the Standards of Training,

Certification, and Watchkeeping for Seafarers (STCW) 1978 and its amendments. These standards cover aspects of education, training, and certification of seafarers to ensure their competence and work safety in the maritime transportation sector. The training process, known as certification, results in a Certificate of Proficiency (CoP) for participants who successfully meet the criteria. This certification can only be carried out by educational and training institutions accredited by the Ministry of Transportation, after undergoing rigorous inspections by the Directorate General of Sea Transportation and the Human Resources Development Agency. Furthermore, ongoing supervision is carried out to ensure that the implementation of training remains in accordance with applicable regulations.

Imare Training Center for Seafarers (ImarE Maritim Jakarta)is one of the key institutions in Indonesia that conducts STCW-based training. As an institution focused on developing crew competencies, ImarE Maritim Jakarta offers integrated training programs with international standards to produce a reliable maritime workforce. With the support of adequate training facilities and experienced teaching staff, ImarE Maritim Jakarta plays a strategic role in preparing Indonesian seafarers to be able to compete globally. As part of the global maritime transportation chain, Indonesia must ensure that the workforce it produces is able to meet the growing global needs, especially amidst rapid technological advances and global economic growth. Maritime transportation, which is a major link for cross-border trade, demands high competency standards to ensure operational safety and efficiency. STCW, as an international guideline published by the IMO, is the main foundation in maintaining seafarer safety and skill standards worldwide.

With a vision to become a leading maritime training institution, ImarE Maritim Jakarta remains committed to developing education and training programs that are adaptive to technological developments and the needs of the workplace. This professionally conducted training adheres not only to national standards but also to international regulations, enabling Indonesian seafarers to compete globally. Furthermore, ImarE Maritim Jakarta actively collaborates with various relevant parties to ensure optimal training quality and relevance to developments in the global maritime industry. This can also be seen from Data on training participants for the period January – December 2024:

Table 1. Number of Training Participants at the Imare Training Center for Seafarers (ImarE Maritim Jakarta) January-December 2024

Period	Number of participants	Increase / Decrease	
Jan-24	339		
Feb-24	239	-100	-29%
Mar-24	278	39	16%
Apr-24	172	-106	-38%
May 24	210	38	22%
Jun-24	279	69	33%
Jul-24	250	-29	-10%
Aug-24	203	-47	-19%
Sep-24	212	9	4%
Oct-24	236	24	11%
Nov-24	108	-128	-54%
Dec-24	183	75	69%

Table 1. above shows the fluctuation in the number of training participants at the Imare Training Center for Seafarers throughout 2024. At the beginning of the year, in January 2024, the number of participants was 339. However, this figure decreased significantly in February 2024, with a decrease of 100 participants, or -29%. After that, the number of participants

increased again in March 2024 by 39 participants (+16%), and then fluctuated throughout the year. One of the sharpest declines occurred in November 2024, with a decrease of 128 participants, or -54%, which was the lowest point of the year. In the following months, such as December 2024, there was a significant increase of 75 participants (+69%), although it was still not enough to offset the significant decline in the previous month. These increases and decreases indicate factors influencing the sustainability of participant satisfaction and interest in training, both from the industry demand side and other external factors. Some of the training types listed in the table include CMT, CMHBT, SAT, ST SDSD, SSO, MCT, MFAT, and IMDG Code. Based on the available data, the training programs with the greatest interest tend to fluctuate in line with developments in maritime sector demand and implemented training policies. While there is no in-depth data on which training types are most in demand each month, training types directly related to shipping safety and international regulations, such as CMT, IMDG Code, and MFAT, tend to have greater appeal due to their direct link to certification requirements required by global shipping authorities.

The survey results indicate that the digital literacy of seafarers participating in the training program still needs improvement. While most participants felt quite familiar with the REDIKRU application and other technologies, their comfort level with these technologies was still divided. Fifty percent of participants felt comfortable using technology during the training, while the other half found it difficult. This indicates that despite advances in the use of digital technology, many seafarers still do not feel fully prepared and comfortable utilizing this technology in training activities or in the shipping industry as a whole. Some seafarers who are not fully trained or unfamiliar with digital systems are likely to experience difficulties, which in turn can reduce their satisfaction with the training process. Therefore, it is important for training providers to provide more intensive digital literacy training so that seafarers feel more confident and prepared to face the challenges of evolving technology in the shipping industry.

Research gaps: Previous studies have focused more on communication in public services (Putra & Aziz, 2023) or education in general (Ardiansyah & Kusmiati, 2023), without highlighting how effective communication is implemented in maritime training environments. Furthermore, information technology has been studied in various aspects, such as improving public services through e-Government (Pratama, 2023) and its impact on online businesses (Agit et al., 2023), but no research has specifically addressed how digital systems such as Redikru and maritime-based e-learning can improve the experience and satisfaction of maritime training participants. Previous research has also highlighted the impact of digital literacy on various sectors, such as business (Widyartono & Tyra, 2023) and education (Rini et al., 2022), but no study has specifically developed the concept of maritime literacy in the digital era and linked it to maritime training participant satisfaction.

Furthermore, research on training participant satisfaction has focused more on academic education and general training, such as e-learning and user satisfaction in higher education (Lestari et al., 2024), as well as improving instructor competency in hybrid learning (Rahman et al., 2023). However, no research has integrated effective communication, information technology, and maritime literacy as key factors in improving training participant satisfaction at seafarer training institutions. Furthermore, training facilities are often considered a supporting factor in previous research, but their influence on maritime training participant satisfaction has received little attention. Therefore, this study will fill this gap in the academic literature by analyzing how effective communication and information technology, through the Redikru application and training facilities, contribute to improving maritime literacy and training participant satisfaction at IMarE Maritim Jakarta.

METHOD

This study uses a quantitative approach with an explanatory research type, which aims to explain the relationship between the variables studied (Sugiyono, 2024). This study also uses

a quantitative research method based on the philosophy of positivism, where the sampling technique is carried out randomly using research instruments and quantitative or statistical data analysis to test the established hypotheses. The research design used is a cross-sectional design, which measures the independent and dependent variables simultaneously. This study aims to determine the effect of effective communication (X1), information technology (X2), and digital era maritime literacy (Y) on training participant satisfaction (Z).

The population in this study was 2708 training participants at the Imare Training Center for Seafarers in 2024. However, due to limitations in time and costs, this study used a non-probability sampling technique with certain considerations (Suliyanto, 2018). The method used in sampling was probability sampling with a proportionate random sampling technique, where each element of the population has an equal chance of being selected as a sample (Sugiyono, 2013). The use of this technique ensures that the samples taken are proportional to the number of each type of training. Based on the Slovin formula, the sample size obtained was 349 training participants, which were then divided based on the type of training to fairly represent the population.

The data obtained from the questionnaire will be processed using SmartPLS 4 software, which allows for data editing and coding to ensure the accuracy of respondents' responses. Editing is performed to check for errors and uncertainty, while coding is performed to classify similar answer alternatives. Next, the data, sorted and presented in tabular form, will be analyzed using path analysis and hypothesis testing. This method is expected to provide a clearer understanding of the relationships between variables in this study, as well as produce systematic and easily understood results.

RESULTS AND DISCUSSION

The distribution of respondents by gender shows that the majority of respondents were female, with a percentage of 56.7% or 198 people. Meanwhile, only 151 people were male (43.3%). This indicates that the majority of crew members who responded to this study were female, which may reflect trends in the industry or the companies where they work. Although there are differences in the numbers between men and women, both groups still made significant contributions to the overall data analyzed.

The distribution of respondents by age, where the majority of respondents were between 21-30 years old, as many as 332 people (95.1%). Meanwhile, only 17 people (4.9%) were over 41 years old. This finding illustrates that the majority of crew members who responded to this study are the younger generation, which can show potential in terms of adapting to technology and more modern ways of working. This younger age group may be more open to innovation and change in the work environment, as well as more accustomed to rapidly developing technological advances.

Discussion of Measurement Model Evaluation (Outer Model)

In the measurement model (outer model) resulting from the analysis, all indicators used to measure the variables in this study have a loading factor value greater than 0.7, indicating that each item is valid for use in further analysis. For example, in the Effective Communication variable (X1), the Timing dimension has the highest contribution with a loading factor of 0.923, indicating that timeliness in delivering messages is an important factor in communication effectiveness.

Similarly, in the Information Technology variable (X2), the Software and Database dimension with a loading factor of 0.939 indicates that effective software and data management have a major role in supporting the training process. The same thing was found in the Digital Era Maritime Literacy variable (Y) with the Search dimension having the highest loading of 0.955, indicating that the training participants' ability to search for information digitally is a key

skill in digital maritime literacy. These results support that all indicators used in this study meet the validity criteria required for further analysis.

Figure 1. Outer Model Results

Discussion of Discriminant Validity

Discriminant validity testing was conducted to ensure that each variable in this research model has a clear distinction from one another. Based on the test results using the Average Variance Extracted (AVE) value, all variables have an AVE value greater than 0.5, indicating that each variable has good discriminant validity. This means that the variables in this study can be clearly distinguished and each has a significant contribution to the construct being measured. These results provide confidence that the model has met the criteria for discriminant validity, which ensures that each construct in this research model measures different aspects well and there is no overlap between variables.

Discussion of Heterotrait-Monotrait Ratio (HTMT)

The results of the Heterotrait-Monotrait Ratio (HTMT) test show values that meet the criteria for good discriminant validity, which is below 0.9. For example, between the variables Training Participant Satisfaction (Z) and Effective Communication (X1), the HTMT value is 0.643, which means that there is no significant overlapping relationship between these two variables. Similarly, for other variables, the HTMT value is below 0.9, which indicates that the constructs used in this study have clear differences and do not show a very strong relationship between each other. These results indicate that the variables in this research model have good discrimination, which is important to maintain the integrity of the model and more valid analysis results.

Discussion of the Fornell-Larcker Criterion

The results of the Fornell-Larcker Criterion test show that each indicator has a higher value in calculating the latent variable than other constructs. For example, in the Effective Communication variable (X1), the Fornell-Larcker value for its indicators is greater than the value of the other constructs, which indicates that these indicators well describe the construct

of effective communication. The same applies to other variables, such as Maritime Literacy in the Digital Era (Y) and Training Participant Satisfaction (Z), which shows that each latent variable is consistently stronger than the other variables in this model. These results indicate that the model built already has good valid discrimination, so this model can be used for further analysis with a high level of confidence.

Reliability Discussion

Reliability testing shows that all variables in this research model have Cronbach's Alpha and Composite Reliability values greater than 0.7, indicating that the constructs used in this study are highly reliable. For example, the Effective Communication variable (X1) has a Cronbach's Alpha value of 0.970 and a Composite Reliability of 0.971, indicating that the instrument for measuring this variable is consistent and reliable. The same thing also applies to other variables, with excellent reliability values, which strengthens that the data obtained from each variable can be trusted for further analysis. These high reliability values ensure that the instrument used in this study can measure the intended constructs stably and consistently, which is important for achieving accurate and reliable results.

Inner Model

Discussion of R-Square (Coefficient of Determination)

In the R-Square test, the Digital Era Maritime Literacy variable (Y) has an R2 value of 0.498, indicating that the Effective Communication and Information Technology variables contribute 49.8%. The remaining 50.2% is influenced by other factors not included in this study. Meanwhile, for the Training Participant Satisfaction variable (Z), the R2 value of 0.812 indicates a very significant contribution from the Effective Communication, Information Technology, and Digital Era Maritime Literacy variables to training participant satisfaction, reaching 81.2%. This indicates that the independent variables used in the research model have a strong influence on the dependent variable, especially on training participant satisfaction.

Discussion of Effect Size f-Square (f2)

Based on the results of the effect size (f2) test, the Digital Era Maritime Literacy variable (Y) has a very strong influence on Training Participant Satisfaction (Z) with an f2 value of 0.992. This confirms that the ability of training participants to use digital information effectively greatly influences their level of satisfaction. Information Technology (X2) also has a strong influence on both variables, with an f2 value of 0.332 for Digital Era Maritime Literacy and 0.240 for Training Participant Satisfaction. This shows that the quality of technology used in training contributes greatly to the understanding of training materials and participant satisfaction. Meanwhile, the influence of Effective Communication (X1) on other variables is relatively lower, indicating that although communication remains important, other factors such as technology and digital literacy are more dominant in influencing training outcomes.

Discussion of Predictive Relevance (Q-Squared)

The Q-Square test results show that the Digital Era Maritime Literacy variable (Y) has a Q^2 value of 0.333, which is between 0.25 and 0.50, indicating that the model's predictive ability for this variable is at a moderate level (moderate predictive relevance). This means that the model can provide a fairly good contribution in explaining variations in this variable. In contrast, the Training Participant Satisfaction variable (Z) has a Q^2 value of 0.573, which is above 0.50, indicating a large predictive ability (large predictive relevance). This indicates that the model has a strong ability to predict variations in the training participant satisfaction variable, and provides a significant picture of the factors that influence participant satisfaction in training.

Figure 2. Inner Model Results

Research Hypothesis

Table 1 Direct and Indirect Influences

Hypothesis	Influence	Original sample (O)	T statistics (|O/STDEV|)	P values	Information
H1	Effective Communication (X1) -> Maritime Literacy _Digital Era (Y)	0.327	4,333	0.000	Significant
H2	Information Technology (X2) -> Maritime Literacy _Digital Era (Y)	0.478	6,335	0.000	Significant
H3	Effective Communication (X1) -> Training Participant Satisfaction (Z)	0.118	3.165	0.002	Significant
H4	Information Technology (X2) -> Training Participant Satisfaction (Z)	0.287	6,193	0.000	Significant
H5	Maritime Literacy _Digital Era (Y) -> Training Participant Satisfaction (Z)	0.609	10,432	0.000	Significant
H6	Effective Communication (X1) -> Maritime Literacy _Digital Era (Y) -> Training Participant Satisfaction (Z)	0.199	4.120	0.000	Significant
H7	Information Technology (X2) -> Maritime Literacy _Digital Era (Y) -> Training Participant Satisfaction (Z)	0.291	5.133	0.000	Significant

Hypothesis 1: The Direct Influence of Effective Communication on Maritime Literacy in the Digital Era

The results of the study indicate that effective communication has a significant direct influence on maritime literacy in the digital era, with a path coefficient of 0.327 and a T statistic of 4.333. This finding confirms that clear and precise communication in training is crucial in shaping participants' understanding of digital maritime literacy. This positive influence indicates that information delivered effectively will be more easily understood by participants, improving their ability to evaluate and utilize digital information relevant to the maritime sector. This relationship between effective communication and digital literacy supports the research of Lestari, SM, Iswan, & Suryadi, A. (2024), which also found that the quality of communication in training increases participant satisfaction through better understanding of the training material. This result is consistent with the findings of Rahman, A., et al. (2023), which emphasize that clear and effective communication in training can improve technological understanding among training participants.

Hypothesis 2: The Direct Influence of Information Technology on Maritime Literacy in the Digital Era

Based on the research results, information technology has a significant direct influence on maritime literacy in the digital era, with a path coefficient of 0.478 and a T statistic of 6.335. This indicates that the application of appropriate technology in training plays a significant role in improving participants' ability to understand and utilize digital maritime information. The technology used in training allows participants to access richer and more relevant resources, improving their ability to assess and use digital information effectively. Research by Rahman, A., et al. (2023) supports these results by showing that the quality of information systems and technology in training significantly increases participant satisfaction. These results are also in line with research by Widyartono, A., & Tyra, MJ (2023) which shows that the application of digital technology in education can improve participants' understanding and skills in relevant fields.

Hypothesis 3: Direct Influence of Effective Communication on Training Participant Satisfaction

This study shows that effective communication has a direct influence on training participant satisfaction with a path coefficient of 0.118 and a T statistic of 3.165. This indicates that clear and effective communication in delivering training materials can increase participant satisfaction levels. When information is delivered in an easy-to-understand manner, participants feel more satisfied with the training they attended, because they feel they received value that meets their expectations. This finding is consistent with the results of research conducted by Putra, DM, & Aziz, N. (2023), which shows that effective communication in educational services directly affects participant satisfaction. In addition, Agit, A., Julyana, SA, & Ma'ruf, B. (2023) also stated that clear and open communication plays a major role in increasing training participant satisfaction.

Hypothesis 4: Direct Influence of Information Technology on Training Participant Satisfaction

The results of this study indicate that information technology has a significant direct influence on training participant satisfaction with a path coefficient of 0.287 and a T statistic of 6.193. This indicates that the quality and implementation of good information technology in training play a significant role in increasing participant satisfaction. Participants feel more satisfied if they have access to technology that supports the learning process, such as compatible hardware and easily accessible information systems. Research by Ito, D., Rudianto, R., & Pakpahan, M. (2023) shows that the quality of e-learning and digital teaching has a significant

influence on training participant satisfaction. This study is also in line with the results of Rahman, A., et al. (2023), which revealed that the quality of technology in training has a positive effect on participant satisfaction.

Hypothesis 5: The Direct Effect of Digital Era Maritime Literacy on Training Participant Satisfaction

Based on the research results, maritime literacy in the digital era has a significant direct influence on the satisfaction of training participants, with a path coefficient of 0.609 and a T statistic of 10.432. This indicates that the ability of participants to understand and manage maritime-related digital information plays a major role in increasing their satisfaction with the training they attended. When participants feel more skilled in using digital information, they are more satisfied with the results of the training they receive. These results support the findings of Wibowo, MH (2024), which show that good digital literacy can increase participant satisfaction in technology-based training. This study also matches the findings of Khairazzadittaqwa, F. (2023), which highlights the role of digital literacy in increasing user satisfaction with technology used in various platforms.

Hypothesis 6: The Indirect Effect of Effective Communication on Training Participant Satisfaction Through Maritime Literacy in the Digital Era

This study revealed that effective communication has a significant indirect effect on training participant satisfaction through digital era maritime literacy, with a path coefficient of 0.199 and a T statistic of 4.120. These findings indicate that clear and effective communication not only affects participants' understanding but also contributes to training participant satisfaction through improving their digital literacy. When participants are equipped with good knowledge of digital literacy, they feel more confident and satisfied with the training they attend. These results reinforce the findings of Ardiansyah, AC, & Kusmiati, M. (2023), which show that effective communication improves understanding and, in turn, participant satisfaction. Also, Bae, S.-M.'s (2022) research emphasizes the importance of communication media in improving understanding, which ultimately leads to participant satisfaction.

Hypothesis 7: Indirect Effect of Information Technology on Training Participant Satisfaction Through Maritime Literacy in the Digital Era

The results of the study indicate that information technology has a significant indirect effect on training participant satisfaction through digital era maritime literacy, with a path coefficient of 0.291 and a T statistic of 5.133. This indicates that information technology not only directly affects participant satisfaction, but also through strengthening digital literacy, influences their satisfaction with the training. With access to supporting technology, participants feel more skilled in managing the digital information they learn, which leads to higher levels of satisfaction. Research by Sarjito, A. (2023) supports this finding, by showing that information technology plays a major role in increasing satisfaction through digital literacy. Research by Deanto, MAR, & Marzaman, AP (2024) also confirms that the use of information technology in training increases participant satisfaction by increasing relevant digital knowledge.

CONCLUSION

Effective Communication has a direct, positive and significant impact on Maritime Literacy in the Digital Era, which means that the better the quality of communication between instructors, participants, and related parties, the level of maritime literacy of participants in understanding technology, regulations, and the dynamics of the digital maritime world will also increase significantly.

Information Technology has a direct, positive and significant impact on Maritime Literacy in the Digital Era, shows that easy access to technological devices, digital applications, and maritime information systems can encourage increased knowledge and understanding of participants regarding maritime issues in the digital era.

Effective Communication has a direct, positive and significant influence on Training Participant Satisfaction, which indicates that clear delivery of material, open two-way communication, and constructive interaction during the training process can create a satisfying learning experience for training participants.

Information Technology has a direct, positive and significant influence on Training Participant Satisfaction, meaning the availability of technology such as e-learning, interactive media, and digital evaluation systems supports the convenience and effectiveness of the learning process, so that participants feel more satisfied with the training services provided.

Maritime Literacy in the Digital Era has a direct, positive and significant impact on Training Participant Satisfaction, which means that training participants who have digital understanding and skills in the maritime sector tend to feel more confident, actively involved, and ultimately feel satisfied with the training program they are participating in.

Effective Communication also has a positive and significant indirect effect on Training Participant Satisfaction through Maritime Literacy in the Digital Era., shows that good communication not only has a direct impact on satisfaction, but also strengthens participant literacy which then contributes to increased overall satisfaction.

Information Technology has a positive and significant indirect effect on Training Participant Satisfaction through Maritime Literacy in the Digital Era, which means that the use of technology not only increases satisfaction directly, but also enriches participants' understanding of the digital maritime world, which ultimately strengthens their positive perception of the training experience.

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