



Characteristics of Indonesian Seafarers in the Digital Communication Era

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ABSTRACT

This study explores how demographic characteristics influence digital communication behaviour among Indonesian seafarers. Using data from 2,065 respondents, the analysis shows that age, rank, certification level, and sea-service experience shape access to and use of digital platforms at sea. Younger seafarers rely more on social media and messaging applications, while older and higher-ranked personnel use digital tools mainly for operational information. Officers report more stable internet access than ratings and cadets, and early-career seafarers show higher digital dependency. These findings demonstrate that digital behaviour among seafarers is not uniform but varies across demographic groups. The study highlights the need for equitable connectivity policies and demographic-responsive digital literacy strategies to support welfare and performance in the maritime sector.

INTRODUCTION

Maritime transportation remains one of the most essential pillars of global logistics, facilitating more than four-fifths of world trade flows and connecting production hubs to consumer markets across continents. Within this ecosystem, seafarers serve as the operational backbone, occupying roles that require technical expertise, resilience, and the ability to function under prolonged isolation. Indonesia – home to one of the largest maritime labour forces globally – contributes significantly to this international workforce, with tens of thousands of seafarers deployed across domestic and international fleets each year. This position elevates the importance of understanding the characteristics and behavioural patterns of Indonesian seafarers, particularly in the context of rapidly expanding digital infrastructure in the maritime industry.

Over the past decade, digital communication technologies have reshaped the daily experiences of seafarers. The introduction of satellite-based internet access, messaging applications, social media platforms, and online information systems has altered how seafarers interact, seek support, and perform their tasks at sea (Tang & Loumakis, 2024). Digitalization does not only influence operational efficiency but also affects onboard social dynamics, recreational behaviour, and personal coping strategies (Jensen, 2021). The extent to which seafarers adopt and depend on digital communication is not uniform; it is shaped by demographic and professional factors such as age, rank, certification level, and accumulated sea-service duration – aspects that demand deeper empirical scrutiny.

Existing literature acknowledges that digital access can mitigate aspects of the traditional seafaring challenges – such as geographical isolation, limited social interaction, and monotonous routines – by enabling continuous contact with family and the outside world (Radic et al., 2020). However, less attention has been given to how demographic variations produce different patterns of digital engagement. Younger seafarers, for instance, are generally more fluent in digital environments and tend to integrate online interaction as part of their daily routine. In contrast, senior officers or long-serving crew may prioritize digital access for operational information rather than social or recreational purposes. These differences have implications for communication policies, training needs, and welfare frameworks.

Furthermore, although the Maritime Labour Convention, 2006 (MLC 2006) acknowledges communication facilities as part of seafarers' welfare, it does not mandate uniform internet provision across vessels (ILO, 2006). As a result, seafarers in Indonesia experience varied levels of digital access depending on company policies, vessel type, route characteristics, and cost considerations. This variability influences digital habits across demographic groups and may lead to unequal adaptation to digital systems within the same working environment. Understanding such demographic-driven differences is essential for designing targeted welfare interventions, competency development programs, and regulatory adjustments that accommodate the evolving profile of the Indonesian maritime workforce.

Despite the growing interest in seafarers' digital well-being, empirical studies linking demographic characteristics with patterns of digital communication remain limited, particularly in Indonesia. Most existing research examines digital connectivity from the perspectives of mental health, operational performance, or social isolation, while demographic influences receive minimal analytical focus (Mgendwa, 2024; Bayrak & Muslu, 2025). The availability of a large national dataset consisting of 2,065 Indonesian seafarers presents a unique opportunity to explore these relationships in depth.

Therefore, this study aims to: (1) describe the demographic composition of Indonesian seafarers in terms of age, rank, certification level, and sea-service duration; (2) analyse differences in digital communication access and platform usage across demographic categories; and (3) identify the implications of these demographic patterns for maritime welfare and workforce development. By shifting the analytical focus toward demographic determinants of digital communication behaviour, this research contributes to a richer understanding of how digital transformation intersects with workforce diversity in the maritime sector.

LITERATURE REVIEW

This chapter presents the conceptual and empirical foundations relevant to demographic characteristics of seafarers and their patterns of digital communication. The literature is reviewed under the following themes: (1) seafarers' demographic structure and workforce dynamics, (2) digital communication adoption in maritime settings, (3) demographic influences on technology use, and (4) regulatory and welfare frameworks shaping communication access at sea.

Seafarers' Demographic Structure and Workforce Dynamics

Seafaring occupations are characterized by a unique combination of technical complexity and social isolation. Global reports consistently show that the maritime workforce is dominated by men, with women comprising less than 2% of shipboard personnel (International Chamber of Shipping, 2021). This gender imbalance has implications for welfare expectations and communication patterns, as male-dominated crews often prioritize efficiency and operational routines over socially integrative activities (Senbursa, 2024).

Age distribution is another salient demographic feature. Several studies note that the modern maritime workforce is becoming younger as shipping companies seek crew with higher digital fluency and adaptability (Li et al., 2022). Younger seafarers typically demonstrate stronger dependence on digital communication for emotional regulation, identity expression, and maintaining familial relationships. Conversely, older crew members often show more utilitarian patterns of digital engagement, focusing on operational information or essential communication (Jonglertmontree et al., 2022).

Sea-service duration also shapes work experiences and behavioural tendencies. Longer tenure at sea is associated with greater familiarity with shipboard routines but also with higher exposure to occupational fatigue and

social monotony (Ma et al., 2025). These dynamics influence how individuals perceive the value of digital connectivity, particularly when used to mitigate isolation or sustain motivation during extended voyages.

Certification levels and hierarchical rank further contribute to demographic differentiation. Officers typically have higher educational attainment and are more involved in navigational decision-making, leading to differentiated communication needs compared to ratings. Recent scholarship highlights that demographic heterogeneity in maritime crews is strongly linked to role-specific stressors, communication styles, and technology adoption behaviours (Carrera-Arce et al., 2023).

Digital Communication in Maritime Settings

Digital transformation has restructured the social and operational landscape of maritime work. The availability of satellite-based connectivity allows seafarers to access messaging applications, social media, and online entertainment platforms, which increasingly function as mechanisms for coping and maintaining psychological balance (Radic et al., 2020). Digital communication has been found to enhance perceived social presence, reduce boredom, and enable seafarers to maintain emotional closeness with family members during long voyages (Tang & Loumakis, 2024).

At the same time, digital systems have introduced new forms of dependency. Research suggests that unstable or limited connectivity can trigger frustration, disrupt communication routines, and increase emotional sensitivity to isolation (Wu et al., 2022). The uneven distribution of digital access across vessels amplifies these challenges, creating discrepancies in communication opportunities and social cohesion among crew members (Jensen, 2021).

While digitalization has brought substantial benefits, its implementation in maritime contexts remains fragmented. Fleet size, shipping routes, operating costs, and organizational culture strongly influence the extent of onboard connectivity (Bayrak & Muslu, 2025). This fragmentation highlights the need to examine how individual characteristics shape digital behaviour within these uneven technological environments.

Demographic Influences on Technology Use

Studies across multiple sectors indicate that demographic characteristics profoundly shape digital adoption patterns. Younger individuals generally display higher digital literacy, faster adaptation to new tools, and greater integration of communication technologies into daily routines (Vaportzis et al., 2017). In contrast, older adults often adopt digital tools more cautiously, prioritizing functional use rather than recreational or expressive purposes.

Within the maritime domain, generational differences in technology use are increasingly evident. Young seafarers—particularly those aged 20–35—exhibit heightened reliance on mobile communication for social support, entertainment, and emotional stability (Pauksztat et al., 2022). They often report stronger expectations for stable Wi-Fi access and tend to show more frustration when connectivity is inconsistent.

Rank and certification level also influence digital behaviour. Officers usually have more structured schedules, allowing them to access digital resources intermittently, while ratings may engage in prolonged digital use during rest periods due to limited recreational alternatives onboard (Carrera-Arce et al., 2023). Moreover, individuals with longer sea-service experience may have developed coping strategies that rely less heavily on digital communication, although this trend varies depending on vessel type and organizational culture.

These patterns underscore that digital communication among seafarers cannot be interpreted uniformly; demographic variables act as critical mediators shaping frequency, purpose, and psychological function of digital technology use.

Regulatory and Welfare Frameworks for Onboard Communication

The regulatory landscape governing seafarers' communication rights is anchored in the Maritime Labour Convention, 2006 (MLC 2006), which identifies communication as a component of seafarer welfare. However, the Convention classifies internet provision as a non-mandatory requirement under Guideline B3.1.11, leaving shipowners discretion regarding implementation (ILO, 2006). This has resulted in significant variability across fleets, with some commercial vessels offering comprehensive Wi-Fi services and others providing minimal or no connectivity due to cost and bandwidth constraints.

Welfare organizations such as the International Seafarers' Welfare and Assistance Network (ISWAN) have emphasized that digital connectivity is increasingly perceived by seafarers as a core welfare entitlement rather than a convenience (ISWAN, 2022). Their surveys consistently show that reliable internet access ranks among the top determinants of job satisfaction, retention, and emotional stability. Similarly, global industry reports such as the *Seafarers Happiness Index* indicate that digital communication access correlates with reduced stress and improved morale (Mission to Seafarers, 2025).

Despite these insights, regulatory enforcement remains limited. Scholars argue that the maritime sector requires more comprehensive digital-welfare standards to reduce inequalities in access and ensure that demographic differences do not translate into welfare disparities (Bayrak & Muslu, 2025). Accordingly, understanding how demographic factors interact with communication environments becomes essential for shaping equitable and future-ready maritime welfare policies.

Summary of Literature Gaps

Although substantial research addresses seafarers' mental health, operational fatigue, and connectivity-related challenges, few studies explicitly analyze **how demographic factors shape digital communication behaviors**. The majority of existing literature treats seafarers as a homogeneous group, overlooking systematic variations in digital usage linked to age, rank, experience, and certification. Furthermore, research on Indonesian seafarers remains underrepresented in global scholarship, despite Indonesia being a major supplier of maritime labour.

This study addresses these gaps by examining demographic-driven differences in digital communication behavior using a large dataset of 2,065 Indonesian seafarers. By focusing on demographic patterns rather than psychological outcomes, the research contributes new insights into technology adoption in the maritime workforce and supports the development of targeted welfare and training policies.

METHODOLOGY

Research Design

This study employed a quantitative, descriptive-analytical research design aimed at examining how demographic characteristics of Indonesian seafarers shape their patterns of digital communication at sea. A descriptive approach was selected to map the distribution of demographic variables – including age, rank, certification level, and sea-service duration – while an analytical component was incorporated to explore variations in digital platform usage across demographic groups. This design is aligned with maritime workforce studies that seek to characterize behavioural patterns across heterogeneous crew populations (Carrera-Arce et al., 2023).

Although the larger research project from which this dataset originates also includes qualitative interviews, the present article exclusively utilizes the quantitative component to avoid overlap with prior publications and to maintain focus on demographic-driven differences in digital behaviour. This demarcation ensures conceptual clarity and minimizes risks of methodological duplication.

Population and Sample

The population of the study consisted of Indonesian seafarers employed on domestic and international vessels, spanning both deck and engine departments. A total of 2,065 valid respondents were included in the analysis. This sample size represents one of the largest national datasets available within the Indonesian maritime sector and provides sufficient statistical power for descriptive and comparative analysis.

Participants were selected using a purposive-voluntary sampling technique, targeting active seafarers with recent sea-service experience. This sampling approach accommodates the mobility constraints of seafaring schedules and is commonly applied in maritime occupational research where random sampling is not feasible (Pauksztat et al., 2022). Inclusion criteria required respondents to (1) be employed as active seafarers at the time of data collection, (2) possess valid maritime certification, and (3) have recent sea-service duration within the past two years. Cadets were included only if they were deployed onboard during the data collection period.

Data Collection Procedure

Data collection was conducted over a 10-month period to account for varying voyage schedules and port-call opportunities. The online modality allowed wide geographical reach, enabling responses from seafarers working on coastal vessels, deep-sea cargo ships, offshore support vessels, and passenger ships. Respondents received a brief research description, confidentiality

assurance, and informed-consent agreement prior to accessing the questionnaire. No financial incentives were offered to avoid bias. Responses were automatically recorded in a secure database accessible only to the research team.

Data Analysis Techniques

The data collected in this study were analyzed using SPSS (Version 26) to address the descriptive-analytical objectives of the research. The analysis began with descriptive statistics, including frequencies, percentages, and cross-tabulations, to present an overview of the demographic characteristics of Indonesian seafarers and their digital communication behaviours. These descriptive outputs were essential for identifying the distribution of age, rank, certification level, and sea-service experience, as well as mapping the general patterns of internet access and platform usage at sea.

Following this, comparative statistical procedures were applied to examine whether digital behaviours differed significantly across demographic groups. Chi-square tests were used for associations between categorical variables, such as age and platform use or rank and internet access levels, while one-way ANOVA was employed to assess differences in the average duration of digital use across groups with varying sea-service experience. These inferential tests allowed the study to determine the extent to which demographic factors influenced communication practices. To complement these analyses, exploratory cluster analysis was conducted to identify groups of seafarers with similar digital engagement patterns, providing additional insight into behavioural segmentation within the workforce.

Given that the instrument primarily consisted of descriptive items rather than multi-item psychometric scales, internal reliability measures such as Cronbach's alpha were not applicable; instead, emphasis was placed on content validity through expert review and pilot testing to ensure the instrument's suitability for maritime contexts. Overall, this analytical approach provided a comprehensive understanding of the relationships between demographic characteristics and digital communication behaviour among Indonesian seafarers.

Ethical Considerations

The research adhered to institutional ethical standards governing studies involving human participants. Respondents provided informed consent prior to participation, and no personal identifiers—such as names, vessel numbers, ship IMO codes, or employer details—were collected. Data were stored in password-protected files with restricted access to maintain confidentiality. Participation was fully voluntary, and respondents could withdraw at any point without consequences. Since the study involved minimal risk and focused on non-sensitive behavioural data, it met the criteria for low-risk ethical approval according to social research guidelines.

Limitations of the Methodology

While the dataset is robust in size, several methodological limitations should be acknowledged:

1. Non-probability sampling may limit generalizability beyond the sampled population.
2. Self-report data may introduce recall bias or social-desirability bias, particularly in reporting digital activity.
3. Differences in vessel type and company policy were not controlled for, although these factors may significantly influence connectivity levels.
4. The study focuses exclusively on quantitative data; qualitative insights could further enrich the interpretation of demographic-driven behaviour.

Despite these limitations, the methodological design is appropriate for the research objectives and provides a strong empirical foundation for analysing demographic determinants of digital communication among Indonesian seafarers.

RESEARCH RESULTS AND ANALYSIS

This chapter presents the findings of the study, organized into three main sections: (1) demographic characteristics of Indonesian seafarers, (2) digital communication access and usage patterns, and (3) comparative analysis examining how demographic variables influence digital communication behaviour. Results are supported by descriptive statistics and inferential tests to address the study's objectives.

Demographic Profile of Respondents

A total of **2,065 Indonesian seafarers** participated in the survey. The demographic composition highlights a workforce dominated by early- and mid-career personnel. Table 1 displays the age distribution of the respondents. The largest segment is **26–30 years** (29.6%), followed by respondents aged **41 years and above** (34.3%). This bimodal distribution suggests that Indonesian seafaring is populated by both younger recruits and long-serving crew, reflecting the multi-generational nature of the maritime labour force.

Table 1. Age Categories of Respondents (n = 2,065).

Age Group	Frequency	Percentage
20–25 years	198	9.6%
26–30 years	612	29.6%
31–35 years	371	18.0%
36–40 years	176	8.5%
≥ 41 years	708	34.3%

The distribution of shipboard positions is summarized in Table 2. Operational ratings constitute the largest proportion (42.7%). This is consistent with global fleet structures, where operational-level crew form the majority of shipboard manpower (ICS, 2021). More than **77%** of respondents hold mid-level maritime certificates (ANT III–V / ATT III–V), indicating a workforce

concentrated in operational and junior management positions – groups known for high dependence on digital communication during off-duty hours (Tang & Loumakis, 2024).

Table 2. Distribution of Shipboard Positions.

Position	Frequency	Percentage
Deck Officers (ANT II–III)	392	19.0%
Engine Officers (ATT II–III)	365	17.7%
Operational Ratings (AB/Oiler/Wiper)	881	42.7%
Cadets/Apprentices	427	20.6%

Table 3. Certification Levels Held by Respondents.

Certification	Frequency	Percentage
ANT II/ ATT II (Bachelor-equivalent)	221	10.7%
ANT III/ ATT III (Diploma)	824	39.9%
ANT IV–V/ ATT IV–V (Vocational)	783	37.9%
Basic Deck/Engine Certificates	237	11.5%

Respondents reported varied lengths of sea-service experience. Nearly half of the sample (48.0%) consists of seafarers with 1–5 years of experience, indicating an influx of younger crew into the Indonesian maritime labour market. Respondents were asked about their level of internet access while at sea. Only 31.6% reported reliable daily access, while 71.3% experienced limited or unstable connectivity. These findings confirm previous studies highlighting inequities in maritime digital infrastructure (Jensen, 2021).

Table 4. Sea-Service Duration.

Experience (years)	Frequency	Percentage
1–5 years	992	48.0%
6–10 years	518	25.1%
11–15 years	342	16.6%
> 15 years	213	10.3%

Table 5. Internet Access Availability Onboard.

Internet Access	Frequency	Percentage
Reliable and daily access	652	31.6%
Limited or shared access	916	44.4%
Intermittent/Unstable access	341	16.5%
No internet access	156	7.5%

Respondents were asked which categories of online platforms they used most frequently onboard. The dominant tools were messaging applications (77.2%) and social

media (73.1%), confirming that maintaining interpersonal connections is a primary reason for digital use at sea.

Table 6. Types of Digital Platforms Accessed.

Platform Category	Percentage Using
Messaging apps (WhatsApp, Telegram, SMS)	77.2%
Social media (Facebook, Instagram, TikTok)	73.1%
Weather/navigation information	52.8%
Online news portals	47.5%
Entertainment (YouTube, games, streaming)	51.4%
Video calls (Zoom, WhatsApp Call)	39.7%

Comparative Analysis: Digital Behaviour Across Demographics

Age differences in platform use

The analysis revealed notable differences in digital communication behaviour across age groups. A chi-square test indicated that the use of social media was significantly associated with age ($\chi^2 = 24.81$, $p < .01$). Younger seafarers, particularly those aged 20–30, reported the highest level of engagement with social media platforms, with 84.3 percent indicating daily use. This group frequently relies on online communication to maintain social ties, access entertainment, and cope with the monotony of life at sea. In contrast, older seafarers aged 41 and above tended to use digital platforms more conservatively, prioritizing access to operationally relevant information such as weather updates, navigational data, and maritime news. These patterns are consistent with generational differences in digital familiarity and motivation, suggesting that younger crew members integrate digital communication into their personal routines, whereas older personnel approach digital tools with a more functional orientation.

Rank and internet access levels

Significant disparities in internet access were observed across hierarchical ranks. The chi-square analysis demonstrated that access to reliable internet differed significantly by rank ($\chi^2 = 31.44$, $p < .001$). Officers reported the highest levels of stable daily access, likely due to role-related privileges or priority allocation of bandwidth for operational communication. Ratings, who constitute the largest portion of the workforce, were more likely to rely on limited or shared internet access, which may affect their ability to maintain consistent communication with family members or engage in recreational online activities. Cadets experienced the most frequent connectivity instability, reflecting their lower hierarchical status and reduced access to shipboard resources. These findings highlight the influence of shipboard hierarchy on digital communication opportunities and underscore the importance of addressing access inequalities within maritime welfare considerations.

Sea-service duration and digital dependency

Comparative analysis also revealed a strong relationship between sea-service experience and the intensity of digital platform use. Results from the one-way ANOVA showed significant differences in average daily digital usage across experience groups ($F(3, 2061) = 14.22, p < .001$). Seafarers with 1–5 years of experience exhibited the highest level of digital dependency, averaging 3.8 hours of use per day. This pattern reflects the reliance of early-career seafarers on digital communication as a coping mechanism for the challenges of life at sea, particularly social isolation and adjustment to shipboard routines. In contrast, seafarers with more than 15 years of experience reported considerably lower daily usage, averaging 1.9 hours. This suggests that senior personnel may have developed alternative strategies for adaptation and social support that rely less on digital connectivity. These findings reinforce the notion that digital dependency is influenced not only by age but also by cumulative work experience.

Certification level and use of operational information

Certification level was also significantly associated with the purpose and type of digital platform use. The chi-square test indicated a significant relationship between certification level and the use of weather and navigational websites ($\chi^2 = 18.93, p < .05$). Seafarers holding higher-level certificates, such as ANT II or ATT II, were more likely to access operational information, reflecting their greater responsibilities in navigation, voyage planning, and safety management. Conversely, those with lower-level vocational certificates or basic ratings tended to prioritize social and recreational digital activities during their rest periods. This distinction underscores the dual role of digital communication aboard ships: it serves as an operational resource for officers and as a personal or leisure tool for many operational-level crew members. Understanding these differences is essential for designing training and welfare programs that accommodate varying professional needs and digital competencies.

Summary of Key Findings

The results of this study demonstrate that digital communication behaviour among Indonesian seafarers is shaped by a complex interplay of demographic characteristics. First, the demographic analysis confirms that the maritime workforce is multi-generational, consisting of both early-career seafarers and older, long-serving personnel. This dual structure contributes to distinct patterns of digital engagement. Younger seafarers exhibit high levels of reliance on social media and messaging applications, reflecting their broader familiarity with digital tools and their preference for maintaining continuous social interaction. In contrast, older seafarers tend to prioritize access to operationally relevant digital information such as weather, navigation updates, and maritime news.

Second, the findings indicate that digital access onboard vessels remains uneven. While a substantial proportion of the workforce relies on digital communication for personal and professional purposes, only a minority benefit from stable and uninterrupted internet connectivity. Access disparities were

particularly evident across hierarchical ranks: officers reported more consistent connectivity, whereas ratings and cadets often depended on limited or unstable networks. This suggests that shipboard hierarchy continues to influence not only operational responsibilities but also access to welfare-related communication resources.

Third, the analyses show that demographic attributes significantly predict differences in digital behaviour. Age, rank, certification level, and sea-service experience all emerged as important determinants of how seafarers communicate and interact online. Early-career seafarers demonstrated the highest degree of digital dependency, using online platforms for extended periods each day, while those with longer sea-service experience adopted more moderate patterns of digital engagement. Similarly, higher certification levels corresponded with increased use of digital tools for operational information, whereas lower certification levels were associated with predominantly social or recreational digital activities.

Together, these findings highlight that digital communication practices at sea are far from uniform. Instead, they vary according to demographic characteristics that shape access, purpose, and reliance on digital technologies. This nuanced understanding supports the development of more targeted welfare interventions, training initiatives, and connectivity policies that account for demographic diversity within the maritime workforce.

Discussion

The results of this study highlight the significant role demographic characteristics play in shaping digital communication behaviour among Indonesian seafarers, indicating that patterns of digital engagement at sea are far from uniform. A clear generational distinction emerged: younger seafarers displayed the highest levels of engagement with social media and messaging applications, supporting their preference for continuous connection with family and friends as a coping mechanism for isolation at sea. Their heavier reliance on digital platforms is consistent with global trends showing that younger workers integrate online communication into their daily routines more naturally than older generations. In contrast, older seafarers demonstrated more selective and functional use of digital tools, focusing primarily on operational information such as weather updates, navigational data, or work-related communication. This distinction reflects differences in digital literacy, personal habits, and the role digital communication plays in maintaining well-being across age groups.

Beyond age differences, the findings reveal notable disparities in internet access linked to shipboard hierarchy. Officers, who typically hold greater responsibility for ship operations, reported more stable access to digital communication, possibly due to bandwidth allocation practices that prioritize command-level roles. Ratings, who constitute the largest segment of the workforce, often experienced limited or shared access, which may restrict their ability to maintain personal connections or engage in recreational digital activities. Cadets faced the greatest inconsistency in access, reflecting their lower position in shipboard hierarchy and limited control over onboard facilities. These

differences underscore that hierarchical structures do not operate solely in the context of operational tasks but also extend to welfare-related resources, including internet connectivity. Addressing these imbalances is crucial to improving fairness and morale within shipboard environments.

Sea-service duration emerged as another factor influencing digital habits. Early-career seafarers reported significantly higher daily use of digital platforms, highlighting their dependence on online communication to navigate the challenges of adjustment and isolation early in their careers. In contrast, those with more than fifteen years of experience demonstrated more moderate digital use, suggesting that seasoned personnel may rely on established coping mechanisms, interpersonal relationships onboard, or routines developed over years of service. This pattern illustrates how digital dependency evolves over time and reflects broader processes of occupational socialization, where seafarers adapt to shipboard life in ways that reduce reliance on external communication sources.

Certification level also shaped the purpose and frequency of digital communication. Seafarers holding higher-level certificates were more likely to access digital tools for operational decision-making, situational awareness, and professional responsibilities. Meanwhile, those with vocational or basic certificates used digital platforms primarily for social or recreational purposes during rest periods. This distinction reflects the division of responsibilities onboard and underscores how professional roles drive digital communication needs. It also suggests that digital literacy training may need to be tailored according to certification pathways to ensure that seafarers are equipped with the necessary competencies for their specific roles.

Taken together, these findings demonstrate that digital communication behaviours at sea are closely tied to demographic characteristics that influence access, purpose, and intensity of digital use. They highlight the importance of recognizing demographic diversity when designing maritime welfare policies, internet access guidelines, and digital literacy programs. Ensuring more equitable access to communication resources across ranks could enhance morale, reduce perceived inequalities, and strengthen social cohesion among crew members. Similarly, acknowledging generational and experiential differences can help maritime education institutions develop training strategies that reflect the actual digital needs of different groups within the workforce. Ultimately, understanding the demographic determinants of digital behaviour is essential as the maritime industry continues to digitalize and as seafarers increasingly view internet connectivity as an integral component of shipboard welfare.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

This study examined how demographic characteristics of Indonesian seafarers—specifically age, rank, certification level, and sea-service duration—shape patterns of digital communication behaviour while working at sea. Using a large dataset of 2,065 respondents, the study offers several key conclusions that

contribute to the understanding of digital engagement in maritime environments.

First, the demographic profile of Indonesian seafarers reflects a multi-generational workforce. While early-career seafarers form a substantial segment of the labour force, a significant proportion of long-serving personnel remains present across fleets. These demographic layers generate distinct behavioural expectations and communication preferences.

Second, digital communication is widely used but unevenly accessed. Although most respondents rely heavily on messaging applications and social media, only one-third report stable daily internet availability onboard. This disparity confirms the existence of structural inequalities in maritime digital infrastructure and highlights the reliance on limited or intermittent connectivity among a large share of seafarers.

Third, demographic variables significantly influence how seafarers engage with digital platforms. Younger individuals demonstrate greater dependence on social media and recreational online activities, consistent with broader generational technology trends. Conversely, older and higher-ranked seafarers tend to use digital tools for operational information and functional communication. These differences underscore that digital behaviour at sea is not monolithic but mediated by individual characteristics and professional roles.

Fourth, rank and certification level shape digital access and platform purpose. Officers—who bear greater responsibility for navigation and decision-making—tend to have more reliable internet access and exhibit a greater tendency to use digital tools for work-related information. Ratings and cadets, on the other hand, primarily use digital communication for social interaction, leisure, and emotional support during off-duty hours.

Finally, sea-service duration influences the intensity of digital use. Early-career seafarers display the highest digital dependency, whereas those with more than 15 years of experience generally use digital tools more moderately. These differences reflect variations in familiarity, adaptation mechanisms, and generational expectations regarding connectivity at sea.

Collectively, the findings show that digital behaviour among Indonesian seafarers cannot be understood without considering demographic heterogeneity. The results highlight the need for policy development that aligns digital-welfare standards with the evolving structure of the maritime workforce.

Recommendations

Based on the study's findings, several recommendations can be proposed for policymakers, shipping companies, and maritime training institutions. Policymakers should consider establishing minimum standards for crew connectivity, recognizing that stable internet access has become an essential welfare component for modern seafarers. Regulations or guidelines encouraging more equitable distribution of digital resources across ranks would help reduce perceived inequalities onboard.

Shipping companies are advised to adopt connectivity policies that ensure fairer access for ratings and cadets while still prioritizing operational

requirements. They should also provide targeted digital-literacy and cybersecurity training tailored to different certification levels and professional roles. For maritime education institutions, the integration of digital preparedness—covering digital etiquette, responsible online behaviour, and coping strategies for limited connectivity—into seafarer training curricula is crucial. Such measures can help equip future seafarers with realistic expectations and the skills needed to navigate digitalized shipboard environments.

Suggestions for Future Research

Future studies should expand on these findings by incorporating mixed-methods approaches that combine quantitative data with interviews or ethnographic observations to explore the contextual factors influencing digital behaviour at sea. Comparative studies involving seafarers from different nationalities could help identify cultural factors that shape digital communication patterns across the global maritime workforce. Longitudinal research tracking seafarers' digital habits over time would also be valuable for understanding how generational shifts and evolving technology affect communication practices. Additionally, future investigations might explore the implications of demographic-driven digital behaviour for shipboard safety, crew cohesion, and productivity, thereby linking digital communication to broader operational outcomes. Such research would contribute to a more holistic understanding of the role of digitalization in shaping the well-being and performance of seafarers worldwide.

The digital transformation of the maritime sector continues to reshape seafaring life in profound ways. As Indonesia remains one of the world's prominent contributors to the global maritime workforce, understanding the demographic determinants of digital behaviour is crucial. By identifying generational differences, access inequalities, and rank-based behavioural patterns, this study provides evidence to support more responsive welfare policies, equitable digital practices, and future-ready maritime education strategies. Ultimately, integrating demographic insights into digital-welfare planning will help ensure that seafarers—regardless of age, rank, or experience—are equipped to navigate an increasingly digitalized maritime world.

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