

DOI: <https://doi.org/10.38035/sjtl.v4i2.1006><https://creativecommons.org/licenses/by/4.0/>

The Effect of Crew Manning Services and Crew Placement on Human Resource Quality: The Mediating Role of Crew Competence at PT Augustea Intcrews Indonesia

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Abstract: The main problem in this study is the suboptimal quality of human resources at PT Augustea Intcrews Indonesia, which is indicated by variations in the quality of crew manning services, the accuracy of crew placement, and differences in crew competency levels in meeting shipping operational needs. These conditions potentially affect the professionalism and performance of human resources amid increasing demands in the maritime industry and dynamic regulatory changes. This study aims to analyze the influence of crew manning services and crew placement on crew competency and their impact on qualified human resources. The study employed a quantitative approach using a survey method. The research population consisted of service users and related parties at PT Augustea Intcrews Indonesia, with a sample of 115 respondents selected through purposive sampling. Data were collected through structured questionnaires and analyzed using Structural Equation Modeling (SEM). The results showed that crew manning services and crew placement have a positive and significant effect on crew competency and qualified human resources. Crew competency was also proven to have a significant effect on the quality of human resources and to mediate the relationship between crew manning services and crew placement on qualified human resources. The study concludes that improving the quality of crew manning services, ensuring appropriate crew placement, and continuously developing crew competencies are the main factors in creating professional and qualified maritime human resources. Therefore, the company is recommended to strengthen its training systems, certification management, and competency-based crew placement to support the sustainable improvement of human resource quality.

Keywords: Crew Manning Services, Crew Placement, Crew Competence, Quality Human Resources

INTRODUCTION

The global shipping industry serves as the backbone of international trade, connecting countries through maritime transportation with increasingly complex operational demands. In this context, the availability of professional and highly qualified ship crews has become a critical factor in ensuring safety, operational efficiency, and the sustainability of shipping activities. International shipping companies today require not only technical competence but also effective communication skills, cross-cultural adaptability, and compliance with international regulations. Poor crew quality may lead to operational risks, workplace accidents, and declining customer confidence. Therefore, the management of maritime human resources has become a strategic issue within the global maritime industry. This situation positions crew manning services as an essential component of the international shipping value chain.

The development of international regulations, such as the Standards of Training, Certification and Watchkeeping for Seafarers (STCW), the Maritime Labour Convention (MLC) 2006, and other maritime safety standards, has significantly increased the competency requirements for ship crews. Every seafarer is expected to possess the certifications, technical skills, and professional attitudes required to meet the operational needs of vessels engaged in international shipping. These regulations have also strengthened the recruitment, selection, and evaluation processes implemented by shipping companies and crew management agencies. Consequently, crew manning companies must be capable of supplying seafarers who meet not only administrative requirements but also operational competency standards. Failure to satisfy these standards can directly affect the reputation of crew management companies. Therefore, the quality of crew manning services has become a key determinant of maritime human resource quality.

Globally, the role of crew manning companies has evolved from merely supplying labor to becoming strategic partners of shipping companies. Crew manning service providers are now expected to manage recruitment, selection, training, and crew placement in a professional and sustainable manner. Ineffective management of these processes may result in a mismatch between crew qualifications and vessel requirements. Such conditions often lead to high crew turnover and increased operational costs. Furthermore, inadequate crew competence may reduce overall vessel performance. Accordingly, the quality of crew manning services has become a major concern in the international shipping industry.

As one of the world's largest maritime nations, Indonesia has considerable potential to supply qualified seafarers to the global labor market. The number of Indonesian seafarers employed on foreign vessels has continued to increase alongside the expansion of international shipping activities. Nevertheless, the quality of Indonesian seafarers remains an issue frequently highlighted by international clients. These challenges include differences in competency standards, limited foreign language proficiency, and insufficient readiness to work in multicultural environments. This indicates that the growing number of Indonesian seafarers has not yet been fully supported by competencies that meet global standards. Therefore, the role of Indonesian crew manning agencies has become increasingly important.

PT Augustea Intcrews Indonesia is a company specializing in crew manning and maritime human resource management and is affiliated with the international shipping group Augustea. The company was established to meet the demand for professional seafarers serving both domestic and international merchant vessels. Augustea, headquartered in Italy, is widely recognized for its extensive experience in ship management, maritime transportation, and crew management. In response to the rapid development of the global maritime industry and the increasing demand for competent Indonesian seafarers, PT Augustea Intcrews Indonesia was established as the group's representative office and recruitment as well as crew development center in Indonesia.

Within PT Augustea Intcrews Indonesia, improving the quality of human resources has become a highly relevant strategic issue. The company is responsible for supplying ship crews to both national and international clients with diverse competency requirements. Variations in crew competencies, limited English language proficiency, and the accuracy of crew placement remain major challenges that require systematic management. Enhancing the quality of crew manning services and crew placement has therefore become a key priority for maintaining the company's competitiveness. These conditions demonstrate the importance of continuously developing crew competencies. Consequently, the quality of human resources is strongly influenced by the company's policies and operational practices. The following data present the total number of crew onboard managed by the company during 2025.

Table 1 Total Crew Onboard in 2025

Category	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Officers	5	7	8	14	23	30	31	32	35	40	38	36
Ratings	19	22	34	41	56	74	81	82	103	103	108	102
Cadets	4	5	7	6	6	11	13	17	20	23	23	24
Total	28	34	49	61	85	115	125	131	158	166	169	162

Based on Table 1., the total number of crew onboard throughout 2025 demonstrates a significant upward trend, particularly among Officers, Ratings, and Cadets, reflecting the increasing volume of crew placement activities carried out by PT Augustea Intcrews Indonesia. The increase in the total number of crew from 28 personnel in January to a peak of 169 personnel in November indicates strong demand from clients, especially international shipping companies, for qualified seafarers. However, this trend also highlights a critical challenge regarding human resource quality, as the growth in the number of deployed crew has not always been accompanied by consistent competency readiness, particularly in terms of English language proficiency and the professional standards expected by global clients. The substantial increase in the number of Ratings and Cadets further suggests a growing demand for operational-level and entry-level personnel, which may increase the risk of competency mismatches if recruitment, selection, training, and placement processes are not supported by rigorous quality assurance and competency development programs.

Based on previous studies conducted by Widodo and Prasetyo (2022), Anindya (2021), Mahalia (2020), Yuliana and Hartono (2021), Naufal (2021), Adewale (2017), Cruz (2018), Leggate (2011), Rahman (2019), and the Taraka Maritime Study Group (2020), it can be observed that most existing research has primarily focused on crew competence, recruitment, selection, crew manning services, and crew placement in relation to crew performance and the operational effectiveness of shipping activities. Previous studies generally positioned crew competence as an independent variable that directly influences crew performance. Consequently, limited research has examined crew competence as a mediating variable between crew manning services and crew placement in improving the quality of human resources.

Furthermore, studies concerning crew placement have largely been procedural and conceptual in nature, as discussed by Leggate (2011), while others have emphasized maritime safety aspects, such as the research conducted by the Taraka Maritime Study Group (2020). Although Cruz (2018) and Rahman (2019) examined crew manning services, their studies did not directly investigate the relationship between crew manning services and high-quality human resources as the dependent variable. Likewise, the studies by Adewale (2017) and Yuliana and Hartono (2021) focused primarily on the influence of crew competence on crew performance without integrating the roles of crew manning services and crew placement. Therefore, a significant research gap remains regarding the influence of crew manning

services and crew placement on the quality of human resources through the mediating role of crew competence, particularly within shipping service companies in Indonesia. This study is considered important because it is conducted at PT Augustea Intcrews Indonesia, an international crew management company with unique characteristics in managing seafarers for global shipping operations, which has received limited attention in previous studies.

Based on the foregoing discussion, this study is entitled "The Effect of Crew Manning Services and Crew Placement on Human Resource Quality: The Mediating Role of Crew Competence at PT Augustea Intcrews Indonesia." The study is based on the premise that the quality of human resources in the shipping industry is strongly influenced by the effectiveness of crew manning services and the accuracy of crew placement. These two factors play essential roles in developing crew competence, which subsequently affects professionalism, job performance, work readiness, and the ability of seafarers to comply with international maritime operational standards. This research specifically focuses on the Total Crew Onboard in 2025 at PT Augustea Intcrews Indonesia, as onboard crew members constitute the core workforce directly involved in vessel operations and represent a key indicator of the company's success in providing high-quality maritime human resources. The selection of crew competence as the mediating variable is based on its strategic role in linking the quality of crew manning services and crew placement with the development of professional, competent, and ship owner-oriented human resources.

METHOD

This study employed a quantitative research design using a survey method. A quantitative approach was selected because it enables researchers to objectively collect numerical data and analyze it using statistical techniques to examine relationships among variables in a systematic, empirical, and rational manner. This approach allows the research findings to be verified and generalized to the target population. Data were collected through a structured questionnaire distributed to respondents to obtain information relevant to the research objectives. The population of this study consisted of all 162 onboard crew members of PT Augustea Intcrews Indonesia who were actively working on board vessels in December 2025. This population was selected because onboard crew members are directly involved in shipping operations, making them the most appropriate respondents for assessing the influence of crew manning services and crew placement on human resource quality through crew competence.

According to Sugiyono (2019), a population is a generalization area consisting of objects or subjects that possess specific characteristics determined by the researcher for investigation and conclusion. Meanwhile, Lasse (2018) defines a sample as the selected elements that participate in a research study. In this research, the sampling technique combined purposive sampling and simple random sampling. Purposive sampling was first applied to ensure that only respondents meeting predetermined criteria—namely active onboard crew members—were included in the sampling frame. Subsequently, simple random sampling was employed to provide every eligible crew member with an equal opportunity to be selected as a respondent, regardless of their rank or position. The required sample size was calculated using the Taro Yamane formula (Ridwan & Kuncoro, 2018) with a 5% margin of error, resulting in a final sample of 115 respondents.

The collected data were processed and analyzed using SmartPLS 3, which facilitates efficient and accurate analysis of structural equation models based on Partial Least Squares (PLS-SEM). Prior to statistical analysis, the data underwent editing and coding procedures. Editing involved examining the completed questionnaires to identify incomplete responses, inconsistencies, or potential response errors. Coding involved assigning numerical codes to respondents' answers so that the data could be systematically classified and tabulated for

subsequent statistical analysis. These procedures ensured the quality, consistency, and reliability of the dataset before conducting hypothesis testing and model evaluation.

RESULTS AND DISCUSSION

Results

The statistical analysis in this study was conducted using the Partial Least Squares Structural Equation Modeling (PLS-SEM) approach to examine the relationships among the research variables. The analysis consisted of two main stages: the evaluation of the measurement model (outer model) and the structural model (inner model). The measurement model was assessed to evaluate the validity and reliability of the measurement indicators, while the structural model was used to examine the relationships among the latent constructs.

Measurement Model (Outer Model)

The outer model evaluation was performed to assess the validity and reliability of the indicators used to measure the latent constructs in this study.

Convergent Validity

Convergent validity was evaluated using the outer loading values generated by SmartPLS. The results of the analysis indicate that all indicators demonstrated loading factors greater than 0.70, thereby satisfying the recommended threshold for convergent validity.



Figure 4.1 (PLS Algorithm – Outer Model)

As illustrated in Figure 4.1 (PLS Algorithm – Outer Model), all 48 measurement indicators exhibited strong correlations with their respective latent constructs. Consequently, all indicators were considered valid and retained for subsequent analyses.

Discriminant Validity and Reliability

After establishing convergent validity, discriminant validity was assessed using the Average Variance Extracted (AVE) criterion. The AVE values for all constructs exceeded the recommended threshold of 0.50, indicating that each construct explained more than half of the variance of its indicators and possessed satisfactory discriminant validity. Subsequently, construct reliability was evaluated using Cronbach's Alpha and Composite Reliability. As presented in Table 2, all constructs achieved Cronbach's Alpha and Composite Reliability values greater than 0.70, confirming a high level of internal consistency and measurement reliability. Therefore, all constructs used in this study met the recommended criteria for validity and reliability and were considered appropriate for structural model evaluation.

Table 2 Results of Validity and Reliability Testing

Variable	Average Variance Extracted (AVE)	Cronbach's Alpha	Composite Reliability	Result
Crew Manning Services (X1)	0.760	0.977	0.979	Valid and Reliable
Crew Placement (X2)	0.724	0.965	0.969	Valid and Reliable
Crew Competence (Y)	0.643	0.960	0.964	Valid and Reliable
High-Quality Human Resources (Z)	0.699	0.969	0.972	Valid and Reliable

The results presented in Table 2 demonstrate that all constructs satisfy the recommended measurement criteria. Specifically, the AVE values are above 0.50, confirming adequate discriminant validity, while the Cronbach's Alpha and Composite Reliability values exceed 0.70, indicating strong internal consistency and reliability. These findings confirm that the measurement model possesses satisfactory psychometric properties and is suitable for further structural model analysis.

Structural Model (Inner Model)

The structural model (inner model) was evaluated to examine the causal relationships among the latent variables proposed in the research framework. According to Ghazali and Latan (2015), the inner model describes the structural relationships among latent constructs based on theoretical assumptions. In this study, the structural model was assessed using the coefficient of determination (R^2), predictive relevance (Q^2), and bootstrapping procedures to evaluate the significance of the hypothesized relationships. The structural relationships were estimated using the PLS Bootstrapping algorithm in SmartPLS.

Coefficient of Determination (R^2)

According to Hair et al. (2019), the coefficient of determination (R^2) measures the proportion of variance in an endogenous construct that can be explained by its exogenous constructs. R^2 values range from 0 to 1, where values of 0.75, 0.50, and 0.25 indicate substantial, moderate, and weak explanatory power, respectively.

Table 3. Coefficient of Determination (R^2)

Endogenous Variable	R^2
Crew Competence (Y)	0.664
High-Quality Human Resources (Z)	0.747

As presented in Table 3, the Crew Competence construct obtained an R^2 value of 0.664, indicating that 66.4% of the variance in crew competence is explained jointly by Crew Manning Services and Crew Placement, while the remaining 33.6% is attributable to other variables not included in this study. Meanwhile, the High-Quality Human Resources construct achieved an R^2 value of 0.747, demonstrating that 74.7% of its variance is explained by Crew Manning Services, Crew Placement, and Crew Competence, whereas the remaining 25.3% is influenced by other factors outside the research model. These findings indicate that the proposed structural model has substantial explanatory power.

Predictive Relevance (Q^2)

The Q^2 (Predictive Relevance) statistic was used to evaluate the predictive capability of the structural model through the blindfolding procedure. A positive Q^2 value indicates that the model has predictive relevance and performs better than a model without latent variables. According to Hair et al. (2019), Q^2 values between 0 and 0.25 indicate weak predictive relevance, values between 0.25 and 0.50 indicate moderate predictive relevance, and values above 0.50 indicate strong predictive relevance.

Table 4 Predictive Relevance (Q^2)

Variable	SSO	SSE	$Q^2 (=1 - SSE/SSO)$
Crew Competence (Y)	1,950.000	1,126.363	0.422
Crew Manning Services (X1)	1,950.000	1,950.000	0.000
Crew Placement (X2)	1,560.000	1,560.000	0.000
High-Quality Human Resources (Z)	1,950.000	955.144	0.510

As shown in Table 4., the Crew Competence construct produced a Q^2 value of 0.422, indicating moderate predictive relevance, as the value falls within the range of 0.25 to 0.50. Meanwhile, the High-Quality Human Resources construct achieved a Q^2 value of 0.510, which exceeds the threshold of 0.50 and therefore demonstrates strong predictive relevance. These results confirm that the proposed model has satisfactory predictive capability for the endogenous constructs.

Hypothesis Testing

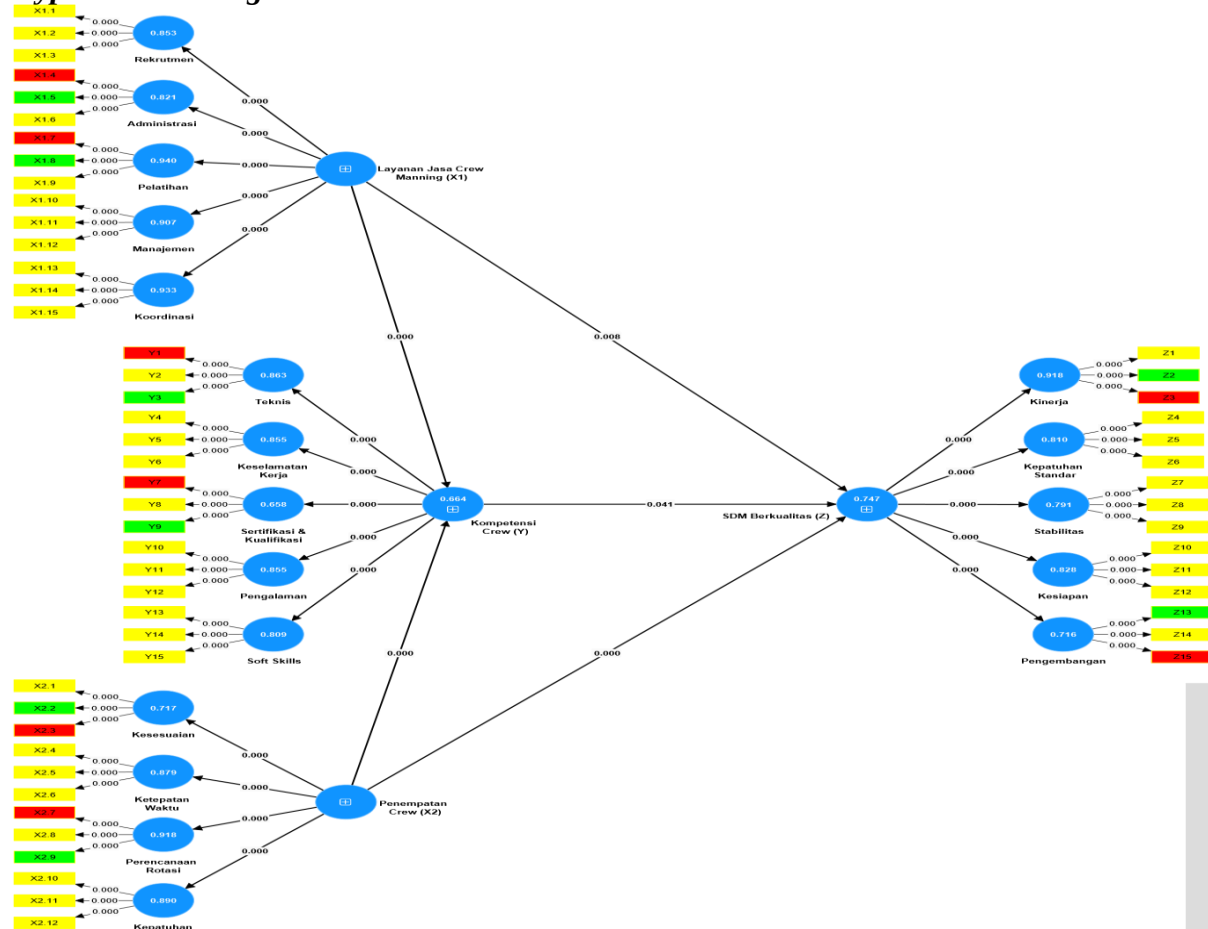


Figure 2. Inner Model Result

The significance of the estimated path coefficients provides important information regarding the relationships among the research variables. Hypothesis testing was conducted by examining the path coefficient estimates obtained through the bootstrapping procedure in SmartPLS. According to Ghozali (2016), the significance of the structural relationships is evaluated using the t-statistic and p-value. In this study, a hypothesis was accepted when the t-statistic exceeded 1.64 and the p-value was less than 0.10

The results of the structural model are illustrated in Figure 4.2, while the direct and indirect effects are summarized in Table 5.

Table 5. Direct and Indirect Effects

Hypothesis	Structural Relationship	Original Sample (O)	t-Statistic	p-Value	Result
H1	Crew Manning Services (X1) → Crew Competence (Y)	0.330	3.410	0.000	Supported
H2	Crew Placement (X2) → Crew Competence (Y)	0.588	7.193	0.000	Supported
H3	Crew Manning Services (X1) → High-Quality Human Resources (Z)	0.342	2.397	0.008	Supported
H4	Crew Placement (X2) → High-Quality Human Resources (Z)	0.338	3.432	0.000	Supported
H5	Crew Competence (Y) → High-Quality Human Resources (Z)	0.307	1.746	0.041	Supported
H6	Crew Manning Services (X1) → Crew Competence (Y) → High-Quality Human	0.301	3.456	0.000	Supported

Hypothesis	Structural Relationship	Original Sample (O)	t-Statistic	P-Value	Result
	Resources (Z)				
H7	Crew Placement (X2) → Crew Competence (Y) → High-Quality Human Resources (Z)	0.181	1.699	0.045	Supported

The hypothesis testing results indicate that all seven proposed hypotheses are statistically supported. Crew Manning Services significantly influence Crew Competence ($\beta = 0.330$, $t = 3.410$, $p < 0.001$), while Crew Placement has an even stronger positive effect on Crew Competence ($\beta = 0.588$, $t = 7.193$, $p < 0.001$). Furthermore, both Crew Manning Services ($\beta = 0.342$, $t = 2.397$, $p = 0.008$) and Crew Placement ($\beta = 0.338$, $t = 3.432$, $p < 0.001$) exert significant direct effects on High-Quality Human Resources. In addition, Crew Competence significantly contributes to improving High-Quality Human Resources ($\beta = 0.307$, $t = 1.746$, $p = 0.041$).

The mediation analysis further reveals that Crew Competence significantly mediates the relationship between Crew Manning Services and High-Quality Human Resources ($\beta = 0.301$, $t = 3.456$, $p < 0.001$), as well as the relationship between Crew Placement and High-Quality Human Resources ($\beta = 0.181$, $t = 1.699$, $p = 0.045$). These findings confirm that improving the quality of crew manning services and ensuring appropriate crew placement contribute not only directly but also indirectly, through enhanced crew competence, to the development of high-quality maritime human resources.

Discussion

Effect of Crew Manning Services on Crew Competence

The findings indicate that Crew Manning Services have a positive and statistically significant effect on Crew Competence, as evidenced by the path coefficient of 0.330 and the t-statistic of 3.410, which exceeds the critical value of 1.64. These results suggest that improvements in crew manning services contribute directly to enhancing the competence of seafarers. Professional crew manning services—including recruitment, selection, documentation management, training, certification support, employment protection, and communication with ship owners—provide an effective framework for developing both the technical and non-technical capabilities of crew members. Well-managed crew administration and continuous professional development enable seafarers to perform their duties more effectively while complying with international maritime regulations and operational standards. Consequently, the quality of crew manning services represents an essential organizational mechanism for strengthening crew competence and improving workforce readiness in the maritime industry.

The present findings are consistent with previous studies emphasizing the strategic role of crew management in developing competent maritime personnel. Widodo and Prasetyo (2022) reported that an integrated crew management system significantly improves seafarers' readiness and professional competence, while Mahalia (2020) demonstrated that objective recruitment and selection procedures enhance crew quality and performance. Similarly, Cruz (2018) found that high-quality crewing services positively influence seafarers' operational preparedness, and Rahman (2019) concluded that crew manning services significantly affect both competence and job performance. Naufal (2021) further argued that effective human resource management practices produce highly professional and competent seafarers. Therefore, this study reinforces existing empirical evidence by confirming that high-quality crew manning services constitute a critical determinant of crew competence within international shipping operations.

Effect of Crew Placement on Crew Competence

The empirical results reveal that Crew Placement has a positive and significant effect on Crew Competence, as indicated by the path coefficient of 0.588 and the t-statistic of 7.193, both of which strongly support the proposed hypothesis. This finding suggests that assigning crew members to positions that match their qualifications, professional certifications, technical expertise, and operational experience substantially enhances their competence. Appropriate placement enables seafarers to perform duties aligned with their capabilities, thereby improving operational efficiency, professional performance, and opportunities for continuous learning through practical experience. Conversely, inappropriate placement may reduce productivity, increase operational errors, and compromise maritime safety. Accordingly, competency-based crew placement serves as a fundamental strategy for optimizing the professional development of seafarers and ensuring effective shipboard operations.

These findings are supported by previous maritime human resource studies. Anindya (2021) concluded that appropriate crew placement contributes significantly to shipping operational effectiveness, while Leggate (2011) emphasized that competency and certification should serve as the primary criteria for assigning seafarers to shipboard positions. The Taraka Maritime Study Group (2020) also highlighted that competency-based crew placement and crew rotation are essential for maintaining maritime safety and the quality of human resources. Furthermore, Adewale (2017) demonstrated that technical competence and work experience significantly influence crew performance, whereas Cruz (2018) reported that effective placement services improve seafarers' operational readiness. Collectively, these studies and the present findings confirm that proper crew placement is a crucial organizational practice for developing competent maritime personnel capable of meeting the operational requirements of the global shipping industry.

Effect of Crew Manning Services on High-Quality Human Resources

The results demonstrate that Crew Manning Services have a positive and statistically significant effect on High-Quality Human Resources, as indicated by the path coefficient of 0.342 and the t-statistic of 2.397, which exceeds the critical value of 1.64. These findings suggest that the effectiveness of crew manning services plays a vital role in improving the quality of maritime human resources. Professional crew manning services, encompassing recruitment, selection, training, certification management, documentation, employment protection, and career development, contribute to the development of disciplined, competent, productive, and highly motivated seafarers. By implementing systematic human resource management practices, crew manning agencies ensure that seafarers possess the knowledge, skills, and professional attitudes required to meet the operational standards of both national and international shipping companies. Consequently, high-quality crew manning services represent a strategic organizational capability for developing competitive maritime human resources.

The findings of this study are consistent with previous empirical research emphasizing the importance of human resource management within the maritime sector. Naufal (2021) argued that effective crew management practices contribute significantly to the development of professional maritime personnel, while Widodo and Prasetyo (2022) found that integrated crew management systems improve crew readiness and workforce quality. Likewise, Cruz (2018) reported that high-quality crewing services positively influence seafarers' operational preparedness and overall professional quality. Yuliana and Hartono (2021) further demonstrated that competence and work motivation significantly enhance crew performance, whereas Adewale (2017) concluded that both technical and non-technical competencies are essential determinants of crew quality. Therefore, this study strengthens the existing body of

knowledge by confirming that professional crew manning services are fundamental to developing high-quality human resources within the international shipping industry.

Effect of Crew Placement on High-Quality Human Resources

The empirical findings indicate that Crew Placement has a positive and significant effect on High-Quality Human Resources, as reflected by the path coefficient of 0.338 and the t-statistic of 3.432, both of which support the proposed hypothesis. This result suggests that assigning seafarers to positions aligned with their competencies, professional certifications, operational experience, and vessel requirements significantly improves the quality of maritime human resources. Appropriate crew placement enables seafarers to perform their responsibilities more efficiently, enhances work discipline and motivation, and promotes professional development through relevant operational experience. Moreover, competency-based placement minimizes operational errors and contributes to safer and more efficient ship operations. Accordingly, an effective crew placement system serves as an essential component of strategic human resource management in the maritime industry.

These findings are supported by previous studies in maritime human resource management. Anindya (2021) reported that appropriate crew placement improves shipping operational effectiveness, while Leggate (2011) emphasized that competency and certification should form the basis of effective crew assignment. Similarly, the Taraka Maritime Study Group (2020) highlighted that competency-based crew placement contributes to maintaining both maritime safety and workforce quality. Cruz (2018) also found that effective crewing services improve seafarers' readiness and professional quality, whereas Adewale (2017) demonstrated that technical competence and work experience significantly influence crew performance. Collectively, these studies support the present findings by confirming that appropriate crew placement is a key organizational practice for developing highly qualified maritime human resources capable of meeting the operational demands of the global shipping industry.

Effect of Crew Competence on High-Quality Human Resources

The findings indicate that Crew Competence has a positive and statistically significant effect on High-Quality Human Resources, as evidenced by the path coefficient of 0.307 and the t-statistic of 1.746, which exceeds the critical value of 1.64. This result demonstrates that higher levels of crew competence contribute directly to improving the quality of maritime human resources. Crew competence encompasses technical expertise, compliance with safety procedures, professional certification, seafaring experience, problem-solving abilities, communication skills, and teamwork. Competent seafarers are better equipped to perform their operational responsibilities professionally, adapt to technological and regulatory changes, and maintain safe and efficient vessel operations. Consequently, crew competence serves as a fundamental determinant of developing high-quality maritime human resources capable of meeting international shipping standards.

These findings are consistent with previous empirical studies highlighting the strategic importance of competence in maritime human resource development. Yuliana and Hartono (2021) reported that crew competence significantly improves operational performance, while Adewale (2017) found that both technical and non-technical competencies are major determinants of crew productivity and work quality. Rahman (2019) also emphasized that crew competence is essential for improving seafarers' professional performance, whereas Widodo and Prasetyo (2022) demonstrated that effective crew management systems enhance crew competence. Furthermore, Naufal (2021) concluded that sound human resource management practices within crew management systems produce highly professional and

competent seafarers. Therefore, the present study strengthens existing evidence that crew competence is a key driver in developing high-quality maritime human resources.

Indirect Effect of Crew Manning Services on High-Quality Human Resources through Crew Competence

The results reveal that Crew Manning Services have a positive and significant indirect effect on High-Quality Human Resources through Crew Competence, as indicated by the indirect path coefficient of 0.301 and the t-statistic of 3.456. These findings confirm the mediating role of crew competence in the relationship between crew manning services and human resource quality. Professional crew manning services—including recruitment, training, certification management, documentation support, career development, and continuous competency enhancement—contribute to improving crew competence, which subsequently leads to higher levels of professionalism, productivity, operational effectiveness, and workforce quality. Accordingly, the influence of crew manning services on maritime human resources is not only direct but also operates indirectly through the development of competent seafarers.

The mediating role identified in this study is supported by previous research. Rahman (2019) reported that crew competence mediates the relationship between crew management practices and seafarers' performance, while Cruz (2018) found that high-quality crewing services improve operational readiness through enhanced professional competence. Widodo and Prasetyo (2022) similarly concluded that integrated crew management systems strengthen both competence and workforce quality. Naufal (2021) emphasized that effective human resource management practices in crew management produce professional and competent seafarers, whereas Adewale (2017) highlighted the importance of technical and non-technical competencies in improving crew performance. Therefore, this study extends previous findings by confirming that crew competence functions as an effective mediating mechanism through which crew manning services enhance the quality of maritime human resources.

Indirect Effect of Crew Placement on High-Quality Human Resources through Crew Competence

The empirical findings demonstrate that Crew Placement has a positive and statistically significant indirect effect on High-Quality Human Resources through Crew Competence, as evidenced by the indirect path coefficient of 0.181 and the t-statistic of 1.699, which exceeds the recommended threshold. These results indicate that assigning crew members to positions that match their qualifications, certifications, operational experience, and technical expertise contributes to improving their competence, which subsequently enhances the quality of maritime human resources. Appropriate placement enables seafarers to gain relevant operational experience, strengthen technical and professional skills, improve work motivation, and increase confidence in performing shipboard responsibilities. Consequently, competency-based crew placement indirectly promotes the development of highly qualified maritime personnel by strengthening crew competence.

These findings are in line with previous maritime human resource studies. Leggate (2011) emphasized that competency and certification constitute the primary foundations for effective crew placement, while the Taraka Maritime Study Group (2020) concluded that competency-based crew assignment contributes to maintaining both maritime safety and workforce quality. Rahman (2019) also identified crew competence as an important mediating factor between crew management systems and seafarer performance. Likewise, Anindya (2021) reported that appropriate crew placement improves operational effectiveness, whereas Adewale (2017) demonstrated that work experience and technical competence significantly influence crew performance. Collectively, these findings support the conclusion

that competency-based crew placement enhances the quality of maritime human resources indirectly by improving crew competence, thereby reinforcing the strategic importance of competency-oriented placement policies within international crew management organizations.

CONCLUSION

The results demonstrate that Crew Manning Services have a positive and significant effect on both Crew Competence and High-Quality Human Resources. The Crew Training and Development dimension (loading = 0.969) emerged as the most influential component, with the indicator stating that training improves crew work capabilities (loading = 0.907) showing the highest contribution. The structural model indicates that Crew Manning Services significantly influence Crew Competence ($\beta = 0.330$, $t = 3.410$) and High-Quality Human Resources ($\beta = 0.342$, $t = 2.397$). These findings suggest that professional crew manning services, particularly those emphasizing continuous training, competency development, and effective crew management, play a critical role in enhancing both the competence of seafarers and the overall quality of maritime human resources.

Similarly, Crew Placement has a positive and significant effect on Crew Competence and High-Quality Human Resources. The dominant dimension is Rotation and Employment Planning (loading = 0.958), with the indicator concerning appropriate management of working and rest hours (loading = 0.905) making the greatest contribution. The statistical results reveal significant relationships between Crew Placement and Crew Competence ($\beta = 0.588$, $t = 7.193$) as well as High-Quality Human Resources ($\beta = 0.338$, $t = 3.432$). Furthermore, Crew Competence itself has a positive and significant effect on High-Quality Human Resources ($\beta = 0.307$, $t = 1.746$), with Technical Competence (loading = 0.929) identified as the strongest dimension. These findings indicate that competency-based placement and the development of technical capabilities are essential for improving workforce quality within the maritime industry.

The mediation analysis further confirms that Crew Competence serves as a significant mediating variable in the proposed research model. Crew Manning Services indirectly improve High-Quality Human Resources through Crew Competence ($\beta = 0.301$, $t = 3.456$), while Crew Placement also exerts a significant indirect effect through Crew Competence ($\beta = 0.181$, $t = 1.699$). These results indicate that effective crew management practices and appropriate crew placement enhance maritime human resource quality not only through their direct effects but also by strengthening the competence of seafarers. Therefore, investing in comprehensive crew training, competency development, and competency-based placement systems is essential for producing professional, highly qualified, and internationally competitive maritime human resources.

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