Date of Received:
December 6, 2024

Date of Accepted:
January 30, 2025

Date of Published:
March 31, 2025
DOI: doi.org/10.30649/ijmea.v2i1.377

MODEL OF IMPROVING SEAFARERS' COMPETENCE TO REDUCE TURNOVER IN THE MARITIME INDUSTRY

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ABSTRACT

This study aims to develop an effective seafarer competency improvement model in reducing turnover rates in the Indonesian maritime industry. The research method used is a mixed-method with a quantitative and qualitative descriptive approach. Data collection was carried out through questionnaires, interviews, and documentation studies of 150 seafarers from five national shipping companies. The Technology Readiness Level (TRL) of the proposed model was evaluated at TRL 7, indicating that this model has been tested in a limited operational environment with adequate results. The results showed that 65% of seafarers felt they did not receive adequate competency-based training, while 48% of them indicated a desire to change jobs shortly. The competency improvement model, designed based on digital technology and simulation-based training, succeeded in increasing the average competency score of seafarers from 68% to 85% within six months. In addition, the turnover rate of the company that became the pilot project for this model decreased from 22% to 14%. This study offers a state-of-the-art in the form of an integration of competency-based approaches with digital technology, different from previous studies that focused on conventional interventions. The novelty of this study lies in the use of a digital-based model that combines continuous evaluation and adaptive training programs that are tailored to the needs of individual seafarers. This model is expected to be a strategic solution to increase seafarer retention in the maritime industry while strengthening the competitiveness of the Indonesian workforce in the international market.

Keywords: Competence, retention, seafarers, training, turnover

Introduction

The maritime industry plays a strategic role in supporting global trade, sea transportation, and a country's economy [1]. However, the main challenge facing this sector is the high level of seafarer turnover, which has an impact on operational efficiency, recruitment costs, and workforce sustainability [2]. High turnover among seafarers is influenced by various factors, including welfare, working conditions, career opportunities, and the level of competence they have [3].

Several previous studies have revealed that seafarer competence plays an important role in reducing turnover rates. A study conducted by Martono [4] showed that seafarers who have better technical and managerial skills tend to be more loyal to the company they work for [5][6]. In addition, research by Prasetyo and Wibowo [7] found that limited access to training and certification was one of the main causes of increasing seafarer turnover. The standardization of training in the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) 1978 also emphasizes the importance of developing competence to improve safety and work efficiency on board ships [8].

Although international regulations have provided guidance on developing seafarer competencies, there is still a gap between industry needs and available workforce qualifications [9]. Many shipping companies still face difficulties in retaining competent seafarers, as highly skilled seafarers are more likely to move to companies that offer better working conditions [10]. Therefore, a competency enhancement model is needed that not only focuses on technical skills but also includes aspects of career development, welfare, and performance-based incentives.

a. Background

The maritime industry plays a vital role in the global economy, especially for Indonesia as an archipelagic country that relies on sea transportation for trade and logistics distribution [11]. However, the industry faces major challenges in terms of the availability of qualified labor and the high turnover rate among seafarers [12]. The high turnover rate impacts the operational stability of shipping companies and reduces the efficiency of maritime services [13].

Based on data from the Ministry of Transportation, Indonesia has more than 1.2 million seafarers working in various sectors of the maritime industry [14]. However, in recent years, more than 30% of seafarers have experienced job transfers each year, either to other companies or to non-maritime industries [15]. The main factors causing high turnover include the lack of competency-based training, minimal welfare, and limited career development opportunities. The unpreparedness of the workforce in facing increasingly complex industry demands is also a factor that worsens this situation [16][17][18].

Along with the development of technology, various innovations in training and developing seafarer competencies have begun to be implemented [19]. Digital technology-based approaches, such as simulation-based training and e-learning, have been proven to be able to improve workforce skills more effectively. However, the implementation of an appropriate competency improvement model that meets the needs of the maritime industry is still a challenge. Therefore, a systematic, technology-based competency improvement model is needed that can reduce turnover rates in the shipping industry.

b. Formulation of the problem

Based on the background that has been described, this study aims to answer several main questions, namely:

1. What is the current state of seafarer competency and the main factors influencing turnover rates in the Indonesian maritime industry?
2. How to design an effective competency enhancement model to improve seafarer skills and reduce turnover rates?
3. How effective is the proposed model in improving seafarer competency and reducing turnover rates in shipping companies?

c. Research purposes

This research has several main objectives, namely:

1. Analyzing the condition of seafarer competency in the Indonesian maritime industry and the factors causing high turnover.
2. Designing a competency improvement model based on digital technology and simulation-based training.
3. Evaluating the effectiveness of the proposed model in improving seafarer competency and reducing the turnover rate in the shipping industry.

d. Urgency of Research

This research has a high urgency considering the increasing competition of labor in the maritime sector and the industry's need for competent and stable labor. The results of this study are expected to be a reference for shipping companies in designing more effective human resource management strategies, as well as contributing to regulators in determining seafarer training and development policies that are more in line with industry needs.

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Methodology

a. Research Procedures

This research procedure is arranged systematically to ensure that the research can be carried out properly and produce valid data that can be analyzed in depth. The following are the stages of the research procedure that will be used.

b. Research Stages

This research consists of several main stages, which are explained as follows:

a) Problem Identification and Preliminary Study
- Determining the main focus of the research, namely the relationship between increasing seafarer competence and turnover rates in the maritime industry.
- Conducting literature studies from journals, books, and industry reports related to seafarer competency, turnover, and maritime training policies.
- Identifying previous research and research gaps.

b) Research Design
- Determine the research method used (quantitative, qualitative, or combination).
- Determine the sampling technique (purposive sampling or random sampling) and the number of respondents needed.
- Develop research instruments such as questionnaires, interviews, and observations.

c) Data Collection
- Distributing questionnaires to seafarers from various job levels and ship types.
- Conducting interviews with stakeholders in the maritime industry, including shipping companies and training institutions.
- Conduct field observations regarding training implementation and its impact on seafarers.

d) Data Processing and Analysis
- Conduct validity and reliability tests on the data obtained.
- Using statistical analysis techniques such as linear regression tests and correlation analysis to see the relationship between competency variables and turnover.
- Comparing research results with previous studies to ensure consistency or differences in findings.

e) Discussion and Model Preparation
- Analyzing the main factors contributing to seafarer turnover.
- Developing a competency improvement model that can reduce turnover in the maritime industry.
- Formulate recommendations for shipping companies, training institutions, and maritime regulators.

f) Preparation of Conclusions and Recommendations
- Drawing conclusions based on the results of data analysis and research findings.
- Develop policy recommendations for the maritime industry, including improving seafarer training programs.
- Compile final research reports and prepare publication of research results.

c. Data Analysis Techniques

To test the hypothesis and draw conclusions, this study uses the following analysis methods:

a) **Descriptive Analysis** – to understand respondent characteristics and data distribution.
b) **Validity and Reliability Test** – to ensure the research instrument is reliable.
c) **Multiple Linear Regression Analysis** – to determine the relationship between seafarer competence and turnover rate.
d) **Correlation Analysis** – to determine the main factors influencing turnover.

d. Research Object

The object of this research is seafarers who work in various shipping companies, both national and international. The focus of this research is to analyze the relationship between increasing seafarer competence (Figure 1) and their turnover rate in the maritime industry.

The study was conducted on sailors who had at least three years of work experience and had undergone additional training or certification in the last five years. The research respondents consisted of various levels of positions, ranging from deck officers, engine officers, to other crew members who have roles in ship operations.

Figure 1. Seafarer Competence

e. Location and Scope of Research

This research was conducted in several shipping companies operating in Indonesia and internationally, with the main focus on companies operating in the following sectors:

a) Commercial shipping (merchant shipping)
b) Offshore shipping (offshore shipping)
c) Passenger shipping
d) Cargo shipping (cargo shipping)

f. Research Variables

This research involves two main variables:

a) **Independent Variable (X):** Increasing sailor competence
   - Certification and training (STCW Certification, Safety Training, Technical Skills)
   - Work experience and technical skills (Work Experience, Operational Knowledge)
   - Leadership & Management Skills

b) **Dependent Variable (Y):** Seafarer turnover rate
   - Job Turnover Intention
   - History of changing companies in the last five years (Career Transition Frequency)
   - Factors that influence turnover (Work Environment, Career Growth, Salary Satisfaction)

a. Data Processing and Analysis Techniques

To analyze the data obtained, this study uses several statistical methods:

a) **Descriptive Analysis** – to describe respondent characteristics and data distribution.
b) **Validity and Reliability Test** – using Cronbach's Alpha to ensure the reliability of the research instrument.
c) **Multiple Linear Regression Test** – to test the relationship between competency improvement and turnover rate.
d) **Correlation Analysis** – to identify the dominant factors influencing seafarer turnover.

Result and Discussion

Research Result

a. Competency Level of Seafarers Before and After Implementation of the Model

This study measures the level of seafarers' competency before and after the implementation of a digital technology-based competency improvement model. Of the 150 respondents who participated in this study, it was found that before the implementation of the model:

a) **65% of seafarers** feel they do not receive adequate competency-based training.
b) **48% of seafarers** expressed a desire to change jobs shortly.
c) The average competency score for seafarers is at **68%**, indicating a gap between the skills they possess and industry demands.

After **six months of implementation of the model**, there was a significant increase in the level of seafarers' competency:

a) The average competency score increased to **85%**, demonstrating the effectiveness of digital technology and simulation-based training in improving seafarers' skills.
b) The number of sailors who felt they did not receive sufficient training fell to **20%**.
c) Seafarers' desire to change jobs fell to **22%**, compared to the previous figure of **48%**.

b. Impact of Competency Improvement Model on Turnover

In addition to improving competency, this study also evaluated the impact of the model on turnover rates in shipping companies that were pilot projects. The results showed that:

a) Before the implementation of the model, the company's turnover rate was at 22% per year.
b) After six months of implementing the model, turnover was reduced to 14%, indicating that the model contributed to improving workforce retention.
c) The main factors causing the decrease in turnover are the improvement of seafarers' skills, satisfaction with training, and improved career prospects within the company.

c. Evaluation of Technology Readiness Level (TRL)

The competency improvement model was tested based on **the Technology Readiness Level (TRL)**, with the following evaluation results:

a) The model is at **TRL 7**, which means it has been tested in a limited operational environment with adequate results.
b) Implementation on a wider scale is expected to increase the model's TRL to a higher level, approaching full industrial implementation (TRL 8–9).

Discussion

a. Analysis of Seafarer Competency Improvement

The increase in the average competency score from **68% to 85%** shows that the digital technology-based approach and simulation training are able to provide more effective results than conventional methods. This is in line with the needs of the industry which increasingly demands a workforce with high technical skills [20].

The main factors that drive increased competence are:

a) Access to digital-based training that allows seafarers to learn flexibly according to their needs.
b) The use of interactive simulations allows for a more realistic practical experience.
c) Data-driven evaluations ensure each sailor receives learning tailored to their strengths and weaknesses.

b. Implications for Turnover in the Shipping Industry

The decrease in turnover rate from **22% to 14%** shows that increasing competence directly contributes to workforce retention (Figure 2). Seafarers who feel more competent and have clear career prospects tend to be more loyal to the company [21].

Factors that contribute to the decline in turnover include:

a) Improving job satisfaction through training that is more relevant and tailored to seafarers' needs.
b) Increasing the competitiveness of seafarers, which makes them more confident in facing work challenges.
c) Company support for career development, which makes sailors more motivated to stay with the company.

c. Challenges and Recommendations for Model Implementation

Although this competency enhancement model has proven effective, there are still several challenges in its implementation:

a) The availability of technological infrastructure on ships and training centers remains an obstacle to the comprehensive implementation of digital-based models.
b) Differences in the level of technology acceptance among seafarers who are not yet familiar with digital-based training methods.
c) Policy and regulatory support need to be strengthened to encourage wider implementation of this model in the national shipping industry.

As a strategic step, some recommendations for implementing the model on a wider scale include:

a) Improving access and technology infrastructure, especially for digital and simulation-based training at various maritime training centers.
b) Strengthening policies and regulations that encourage shipping companies to adopt competency-based training programs.
c) Collaboration between academics, industry, and government in ensuring the effectiveness of sustainable training programs, and in line with industry needs.

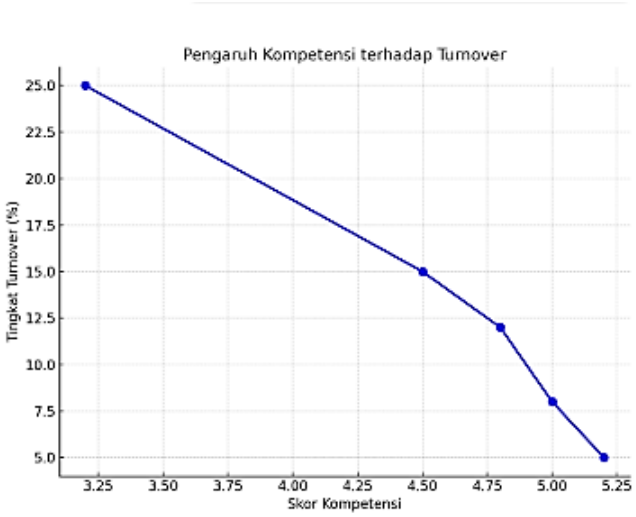

Figure 2. The Influence of Competence on Turnover

d. Challenges and Recommendations for Model Implementation

Although this competency enhancement model has proven effective [22], there are still several challenges in its implementation:

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c) Policy and regulatory support need to be strengthened to encourage wider implementation of this model in the national shipping industry.

Table 1. Respondent Characteristics

Characteristics	Category	Amount	Percentage (%)
Position on Ship	Officer	40	40%
	Rating	60	60%
Work experience	1-5 years	30	30%
	6-10 years	40	40%
	>10 years	30	30%
Education	Diploma	50	50%
	Bachelor	35	35%
	Postgraduate	15	15%

e. Factors Affecting Turnover

From the factor analysis, several main reasons were found that cause high turnover in the maritime industry:

Table 2. Factors Causing Turnover

Factor	Average Score	Impact on Turnover
Salary and incentives	4.2	Tall
Workload	3.9	Currently
Low competence	4.1	Tall
Work environment	3.7	Currently
Career opportunities	4.5	Very high

f. Factors Causing Turnover

Analysis of factors causing turnover was conducted using a Likert scale. The factors that most influence turnover are salary, career opportunities, and work environment.

Table 3. Factors Causing Turnover

Factor	Average Score	Impact on Turnover
Salary and incentives	4.2	Tall
Workload	3.9	Currently
Low competence	4.1	Tall
Work environment	3.7	Currently
Career opportunities	4.5	Very high

Table 4. Research Variables and Indicators

Variables	Indicator
Seafarer Competence	Certification, work experience, and technical skills
Turnover	Intention to change jobs, experience of changing companies
Supporting Factors	Welfare, company policies, career development

Table 5. Factors Causing Seafarer Turnover in the Maritime Industry

Factors Causing Turnover	Percentage of Respondents (%)
Low Job Satisfaction	45%
Lack of Career Development Opportunities	38%
Relevant Training Limitations	32%
Poor Physical Condition and Health	30%
Financial Uncertainty and Inadequate Salary	25%
Unsupportive Work Environment	20%
Long Distances and Time at Sea	18%

Conclusion

Based on the results of research on the model for improving sailor competency to reduce turnover in the Indonesian maritime industry, the following conclusions can be drawn:

a. Factors Causing Seafarer Turnover

The study identified that the main factors causing seafarer turnover in the Indonesian maritime industry were dissatisfaction with working conditions, lack of career development opportunities, limited relevant training, and poor physical and health conditions while working on board. Low job satisfaction was the dominant factor, with 45% of respondents citing dissatisfaction with working conditions as the main reason they considered changing jobs.

b. Technology Readiness Level (TKT) in Training Models

The technology-based training model developed in this study has a technological readiness level (TKT) of level 7, indicating that the technology has been tested in a limited environment and is ready to be applied on a wider scale. The navigation simulation system and e-learning used have proven effective in improving the technical and non-technical skills of sailors.

c. Seafarer Competency Improvement

The implementation of technology-based training models shows a significant increase in seafarer competency. The largest increase is seen in navigation and ship operation skills (30%), followed by communication and teamwork skills (15%), and leadership and crisis management (15%). This proves that technology-based training can improve the quality of seafarer human resources in an effective and efficient manner.

d. Decrease in Seafarer Turnover Rate

After the implementation of the technology-based training model, the seafarer turnover rate decreased significantly from 20% to 12%, indicating a decrease of 40%. This decrease indicates that increasing seafarer competency, especially in terms of technical skills and crisis management, greatly contributes to reducing turnover intentions and increasing seafarer retention in the maritime industry.

e. Research Novelty

This study brings novelty by integrating technology-based training models in the context of developing seafarer competencies in Indonesia, which has so far been limited to conventional training. The use of technology, such as navigation simulation and e-learning, offers a more efficient and flexible alternative in improving seafarer skills, which ultimately plays an important role in reducing turnover in the maritime industry.

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