Terbit *online* pada laman web jurnal : https://jes-tm.org/index.php/jestm/index

Journal of Engineering Science and Technology Management

| ISSN (Online) 2828 -7886 |

Article

Importance-Performance Analysis of the Venus Vessel Network System for Crew Change Process Effectiveness at PT Pertamina International Shipping

Siti Aurum Eka Nursasi [1] , Rizqi Aini Rakhman [2] , Sri Mulyanto Herlambang [3] , Faris Nofandi [4]

[1,2,3,4]Applied Undergraduate Study Program in Marine Transportation, Surabaya Maritime Polytechnic

DOI: 10.31004/jestm.v6i2.413

E-mail: [a]erlinda120015@gmail.com, [b,*]dwipajunikaputra@usk.ac.id (Corresponding author), [b]imamandhika14@usk.ac.id

ARTICLE INFORMATION

Volume 6 Issue 2
Received: 27 January 2026
Accepted: 22 June 2026
Publish *Online*: 29 June 2026
Online: at https:JESTM.org

Keywords

Venus Application,
crew change management,
effectiveness,
Importance-Performance Analysis,
digital crewing system

A B S T R A C T

This study evaluates the Venus (Vessel Network System) application as an in-house digital crewing system that supports the crew change process at PT Pertamina International Shipping. The study used a quantitative descriptive approach supported by direct operational observation. Respondents consisted of 31 internal users who were directly involved in crew scheduling, document verification, approval, monitoring, and interdepartmental coordination through Venus. Data were collected using a Likert-scale questionnaire that measured the importance and performance of 12 system and service indicators, and the results were analyzed using validity testing, reliability testing, and Importance-Performance Analysis (IPA). The findings show that Venus was perceived positively by internal users, with an average importance score of 4.77 (95%) and an average performance score of 4.73 (94%). The application supports scheduling visualization, crew document monitoring, and approval coordination, thereby helping users reduce manual communication and improve operational visibility. However, IPA mapping indicates that four high-importance indicators still require priority improvement: fulfillment of crew change needs, timeliness, data security, and interdepartmental coordination. These gaps show that the effectiveness of Venus should be interpreted as perceived system effectiveness among internal users, while further improvement is needed in system quality, service quality, access control, deadline tracking, and workflow escalation. The study contributes to the evaluation of maritime human-resource information systems by combining user-perception measurement with field observation of digital crew change operations.

1. Introduction

Maritime crew change management is a critical operational activity because vessel continuity depends on the availability of qualified seafarers, valid certificates, medical readiness, and timely sign on/sign off arrangements. In shipping companies, crew change is not only an administrative activity but also a coordination process involving crewing units, fleet departments, manning agents, vessels, medical providers, and port-related requirements. The International Convention on Standards of Training, Certification and Watchkeeping for Seafarers requires seafarers to meet minimum training, certification, and watchkeeping standards, making accurate crew data and document readiness essential for safe vessel operations (International Maritime Organization, 1978).

The digital transformation of maritime transport has encouraged shipping companies to replace fragmented manual workflows with integrated information systems. Tijan et al. (2021) explain that digital transformation in maritime transport is driven by the need for data integration, process transparency, operational efficiency, and better decision support. In the context of crew change, these needs are reflected in digital scheduling, document validation, approval tracking, and real-time monitoring of crew rotation status.

Human-resource management in shipping companies must ensure that crew availability, competence, contract periods, and documentation are aligned with vessel operational schedules. In maritime crewing, the quality of HR management is reflected in the ability to maintain crew continuity, prevent expired documents, and coordinate replacements before operational disruptions occur.

At PT Pertamina International Shipping, the crew change process is carried out periodically through the MPCROWN planning mechanism. Internal crew change data for 2025 show 300 crew changes in Q1, 576 in Q2, and 442 in Q3. This volume indicates that crew rotation is a high-frequency operational process requiring accurate scheduling, timely document readiness, and fast coordination across departments. When these activities are handled through manual or semi-digital procedures, the process is more vulnerable to data input errors, delayed approval, repeated communication, and incomplete monitoring.

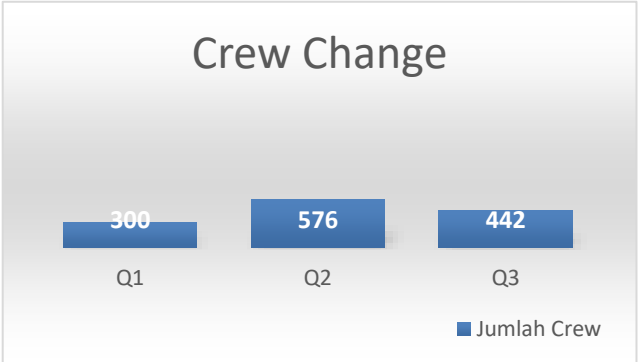

Figure 1. Number of Crew Change in 2025 (Q1-Q3)

.

To address these operational needs, PT Pertamina International Shipping developed Venus (Vessel Network System), an in-house application for managing crew data and crew change administration. Venus is used to support crew placement planning, crew scheduling, document monitoring, medical check-up follow-up, approval coordination, and visualization of rotation plans through features such as Crew Scheduling and Gantt Chart monitoring. The system connects internal users and related stakeholders so that the crew change workflow can be monitored more transparently and systematically.

Although Venus was developed to increase efficiency, its implementation still needs evaluation because digital systems may face technical, organizational, and service-quality limitations. In this study, the evaluation focuses on the gap between user expectations and system performance in relation to crew change needs, timeliness, data security, coordination, accuracy, stability, usability, and work efficiency.

Previous research by Rilisiana (2021) discussed the crew change process at PT Pertamina Shipping when several activities were still conducted manually and were affected by operational obstacles. However, limited empirical research has evaluated Venus as an in-house maritime human-resource information system using Importance-Performance Analysis and direct observation of crew change operations. Therefore, this study aims to evaluate the perceived effectiveness of Venus in supporting the crew change process and to identify priority improvements required for system optimization.

2. Literature Review

2.1 *Crew change* effectiveness concept

Effectiveness refers to the extent to which a system or process achieves its intended objectives with appropriate resources, procedures, and outputs. In this study, crew change effectiveness is understood as the ability of Venus to support timely crew replacement, accurate data processing, complete document control, secure information management, smooth coordination, user satisfaction, and operational efficiency. DeLone and McLean (2003) state that information system success can be assessed through system quality, information quality, service quality, use, user satisfaction, and net benefits, which are relevant to evaluating Venus as an operational information system.

In the shipping industry, crew change effectiveness is closely related to contract expiry monitoring, seafarer certification, medical check-up readiness, port document completion, vessel assignment, and sign on/sign off timing. A crew change process can be considered effective when replacement planning is completed before the operational deadline, required documents are validated, approvals are traceable, and stakeholders receive the same updated information through the system.

2.2 Venus Application (Vessel Network System)

Venus or Vessel Network System is an in-house digital application developed by PT Pertamina International Shipping to support integrated ship crew management. The system functions as a digital crewing platform that records crew data, visualizes crew rotation, supports MPCROWN planning outputs, monitors document readiness, facilitates approval by relevant units, and provides information for operational decision-making. The main users include Crewing Performance, fleet-related divisions, manning agents, and authorized personnel who need crew change information.

2.3 Implementation of the Venus Application in the Crew Change *Process*

This subsection describes the crew change workflow supported by Venus. The process begins with MPCROWN planning, continues with crew candidate preparation, medical check-up monitoring, document validation, approval by the manning agent and company units, and ends with sign on/sign off implementation. Each stage produces data that must be updated in the system so that stakeholders can monitor the same crew status and identify delays earlier.

Table 1. Venus Features and Relevance to Crew Change Management

Feature / module	Function and relevance to crew change
Crew Scheduling	Records crew placement and replacement schedules; helps users monitor planned sign on/sign off and avoid double planning.
Gantt Chart Monitoring	Visualizes crew rotation across time; supports monitoring of active crew, planned replacement, and vessel assignment.
Document Monitoring	Tracks crew documents, medical check-up status, and administrative completeness; reduces incomplete document risk.
Approval and Coordination	Supports verification, approval, and follow-up of crew change requirements; clarifies cross-unit coordination.
Reporting Output	Provides monitoring information for management and operational users; improves visibility of bottlenecks.

Table 2. Crew Change Workflow Supported by Venus

Stage	Main activity and output
MPCROWN planning	Determines crew rotation; produces crew placement plans and schedule visualization.
Crew preparation	Identifies crew candidates and assignment readiness; records profile, contract status, and planned movement.
MCU and document control	Checks medical and administrative completeness; monitors readiness and expired-document risk.
Approval process	Validates crew change requirements; records approval status and responsible parties.
Sign on / sign off monitoring	Monitors implementation and crew movement; updates actual rotation status.

.

2.4 Ship Crew

Based on Law of the Republic of Indonesia Number 17 of 2008 concerning Shipping, a ship's crew member is a person employed on board a vessel by the shipowner or operator to perform duties according to the position recorded in the certificate book. In this study, crew data become important system entities because Venus stores and processes information on identity, assignment, position, document status, medical readiness, and movement plans required for crew change decisions (Republic of Indonesia, 2008).

3 Research Methodology

This study used a quantitative descriptive approach supported by direct observation. The quantitative approach was used to measure internal user perceptions of the importance and performance of Venus, while observation was used to understand the operational workflow of crew change activities. The research was conducted at PT Pertamina International Shipping during the land-practice period from 15 July 2024 to 15 July 2025. During this period, the researcher observed crew scheduling, document monitoring, approval follow-up, and the use of Venus features in daily crewing activities. The questionnaire was distributed to internal users who were directly involved in the Venus-supported crew change process.

The sampling technique was purposive sampling because respondents had to meet specific criteria: active involvement in crew change activities, direct or coordination-based use of Venus, and participation in scheduling, document approval, crewing operations, fleet coordination, or manning-agent coordination. A total of 31 respondents were included. This number is appropriate for descriptive IPA because the purpose of the analysis is to map perceived importance and performance among active internal users, not to generalize statistically to all seafarers or external stakeholders. The questionnaire used a five-point Likert scale, where 1 indicated very low importance or performance and 5 indicated very high importance or performance. Observation notes were organized according to the same dimensions as the questionnaire so that field findings could be compared with the IPA results.

Importance-Performance Analysis was selected because it compares the level of importance expected by users with the level of performance perceived in actual system use. Martilla and James (1977) explain that IPA helps identify attributes that should be maintained, improved, or reallocated based on their position in a Cartesian quadrant. The suitability percentage was calculated by dividing the performance mean by the maximum Likert score and multiplying by 100%. The quadrant boundary was determined using the overall mean importance score of 4.77 and the overall mean performance score of 4.73. Items above the importance mean and below the performance mean were categorized as Quadrant I and became the priority for improvement.

Table 3. Operational Definition and Questionnaire Indicators

Item	Dimension	Indicator measured
1	Goal achievement	Fulfillment of crew change needs
2	Goal achievement	Timeliness of crew change process
3	Goal achievement	Updating and accuracy of crew data
4	Output quality	Information updating
5	Output quality	Information system stability
6	Output quality	Data security
7	Efficiency	Minimizing errors
8	Efficiency	Interdepartmental coordination
9	Efficiency	Comparison with previous system
10	Stakeholder satisfaction	Ease of use
11	Stakeholder satisfaction	More efficient work experience
12	Stakeholder satisfaction	Positive impact on the company

4 Results and Discussion

4.1 Research result

a. Descriptive Statistics of Respondents

Based on Table 4, the respondent profile shows that 6 respondents (19%) were male and 25 respondents (81%) were female. This information is presented as respondent background only and is not used to explain system effectiveness because the analysis focuses on

user role, system involvement, and perception of Venus performance

Table 4. Respondent Characteristics by Gender

No.	Gender	Number of Respondents	Percentage
1	Man	6	19%
2	Woman	25	81%
	Amount	31	100%

Based on Table 5, most respondents were in the 26-30 age range, representing 13 people (42%), followed by the 20-25 age group with 12 people (39%). The remaining respondents were aged 31-35 years (10%), 36-40 years (6%), and 46-50 years (3%). This age distribution indicates that the respondents were mostly active operational employees who interacted with digital work processes.

Table 5. Respondent Characteristics by Age

No.	Age	Number of Respondents	Percentage
1	20 - 25 Years	12	39%
2	26 - 30 Years	13	42%
3	31 - 35 Years	3	10%
4	36 - 40 Years	2	6%
5	46 - 50 Years	1	3%
	Amount	31	100%

Based on Table 6, most respondents came from the Crewing Performance division, with 19 respondents (61%). Other respondents came from Crewing Manning Agent (16%), Fleet Technical Performance (6%), Fleet Financial Performance (6%), FP 2 (6%), and Technical Superintendent / Marine Superintendent (3%). This distribution is relevant because the largest respondent group is directly involved in crew change administration and Venus-based monitoring.

Table 6. Respondent Characteristics by Division

No	Division	Number of Respondents	Percentage
1	*Crewing Performance*	19	61%
2	Fleet Technical *Performance*	2	6%
3	Fleet Financial *Performance*	2	6%
4	Technical Superintendent / Marine Superintendent	1	3%
5	FP 2	2	6%
6	*Crewing* Manning Agent	5	16%
	Amount	31	100%

b. Validity and Reliability Test

Table 7. Results of the Importance Validity Test

Dimension	Statement	r table	r count	Information
Goal Achievement	X01	0.355	0.457	Valid
	X02	0.355	0.641	Valid
	X03	0.355	0.6	Valid
Output Quality	X04	0.355	0.661	Valid
	X05	0.355	0.605	Valid
	X06	0.355	0.68	Valid
Efficiency	X07	0.355	0.563	Valid
	X08	0.355	0.585	Valid
	X09	0.355	0.501	Valid
Stakeholder Satisfaction	X10	0.355	0.795	Valid
	X11	0.355	0.641	Valid
	X12	0.355	0.707	Valid

Based on Table 7, the validity test for the importance variable shows that all 12 items were valid because each r-count value was greater than the r-table value of 0.355. The r-table value was based on n = 31 respondents with df = n - 2 = 29 at a significance level of 0.05. Therefore, the importance items were considered appropriate for measuring the expected level of Venus attributes.

Table 8. Results of the Performance Validity Test

Dimension	Statement	r table	r count	Information
Goal Achievement	Y01	0.355	0.8	Valid
	Y02	0.355	0.805	Valid
	Y03	0.355	0.766	Valid
Output Quality	Y04	0.355	0.859	Valid
	Y05	0.355	0.74	Valid
	Y06	0.355	0.793	Valid
Efficiency	Y07	0.355	0.754	Valid
	Y08	0.355	0.812	Valid
	Y09	0.355	0.802	Valid
Stakeholder Satisfaction	Y10	0.355	0.847	Valid
	Y11	0.355	0.873	Valid
	Y12	0.355	0.913	Valid

Based on Table 8, the validity test for the performance variable also shows that all 12 items were valid because each r-count value was greater than the r-table value of 0.355. Therefore, the performance items were considered appropriate for measuring the perceived performance of Venus in supporting crew change activities.

Table 9. Cronbach's Alpha Results for Importance

Reliability Statistics	
Cronbach's Alpha	N of Items
0.848	12

Based on Table 9, Cronbach's Alpha for the importance variable was 0.848. This value exceeds the minimum reliability threshold of 0.70, indicating that the 12 importance items had good internal consistency and could be used to measure user expectations of Venus attributes.

Table 10. Cronbach's Alpha Results for Performance

Reliability Statistics	
Cronbach's Alpha	N of Items
0.949	12

Based on Table 10, Cronbach's Alpha for the performance variable was 0.949. This value also exceeds the minimum reliability threshold of 0.70, indicating that the performance instrument had very strong internal consistency in measuring user perceptions of Venus performance.

c. Description of Research Results

1) Questionnaire Results

The questionnaire results show that respondents gave high ratings to both the importance and performance of Venus. The overall mean importance score was 4.77, equivalent to 95% of the maximum Likert score, while the overall mean performance score was 4.73, equivalent to 94%. These values indicate that Venus is perceived as important and generally performs well among internal users. However, the high overall score should not be interpreted as a complete absence of problems because the IPA results identify several high-importance items with lower performance that require priority improvement.

Table 11. Mean Scores of Importance and Performance Indicators

Item	Indicator	I / P mean	Quadrant
1	Fulfillment of crew change needs	4.84 / 4.71	I
2	Timeliness	4.81 / 4.65	I
3	Updating and accuracy	4.71 / 4.75	IV
4	Information updating	4.77 / 4.77	IV
5	Information system stability	4.61 / 4.55	III
6	Data security	4.84 / 4.73	I
7	Minimizing errors	4.71 / 4.74	IV
8	Interdepartmental coordination	4.87 / 4.71	I

9	Comparison with previous systems	4.68 / 4.74	IV
10	Ease of use	4.77 / 4.77	IV
11	More efficient work experience	4.81 / 4.81	II
12	Positive impact on company	4.87 / 4.87	II
Mean	Overall score	4.77 / 4.73	-

2) Observation Results

(a) *crew* rotation planning

The crew change planning process begins through the quarterly MPCROWN forum, which determines crew placement for the next three months. Venus functions as the digital medium for inputting, visualizing, and monitoring the results of this planning. Through this system, operational users can see the status of active crew, planned replacement crew, and upcoming movement schedules without relying only on manual communication.

During field observation, crew scheduling activities were found to be structured through the Crew Scheduling and Gantt Chart features. The Gantt Chart supports voyage schedules, crew contract expiry monitoring, vessel assignment, and sign on/sign off timing by presenting rotation plans visually. This feature helps reduce scheduling conflicts and double planning because stakeholders can compare planned crew movement with actual operational needs in one system view.

(b) Effectiveness of System-Based Operational Processes

Venus positively supports the crew change administration process, especially in document monitoring, status verification, approval follow-up, and interdepartmental information sharing. Before the use of an integrated system, the process depended more heavily on manual files, messages, and verbal confirmation, which increased the possibility of delayed information and repeated follow-up.

Field observation shows that Venus changes the information flow between stakeholders into a more structured process because crew documents, medical status, and approval progress can be accessed by authorized users through the system. Nevertheless, the observation did not measure objective before-after indicators such as processing time or error rate, so the results are interpreted together with user perception rather than as a full operational performance audit.

d. Data analysis

The effectiveness of Venus was analyzed using Importance-Performance Analysis to identify which system and service attributes should be maintained, improved, or reviewed for resource allocation. The IPA grid used the overall mean importance score of 4.77 as the horizontal boundary for importance and the overall mean performance score of 4.73 as the vertical boundary for performance. This makes the quadrant classification transparent and reproducible.

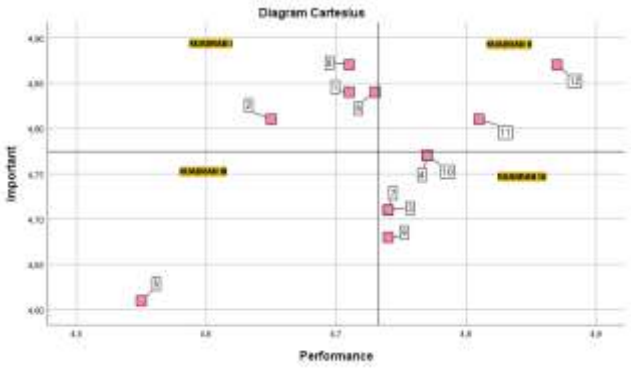

Figure 2. Cartesian Diagram of Importance-Performance Analysis

The Cartesian diagram in Figure 2 maps the 12 indicators based on their importance and performance means. Quadrant I contains high-importance and low-performance indicators that should become the main improvement priority. Quadrant II contains high-importance and high-performance indicators that should be maintained. Quadrant III contains relatively lower-importance and lower-performance indicators that still need monitoring. Quadrant IV contains indicators with relatively high performance but lower importance, so resource allocation should be reviewed without ignoring their technical value for system reliability.

a. Quadrant I – Top Priority (High Importance – Low Performance)

This quadrant contains indicators that users consider very important but whose performance

has not fully met expectations: statement 1, fulfillment of crew change needs; statement 2, timeliness; statement 6, data security; and statement 8, interdepartmental coordination. These indicators represent critical system-quality and service-quality issues because crew change operations depend on accurate fulfillment of vessel needs, timely approval, secure crew data, and coordinated workflow ownership.

b. Quadrant II – Maintain Achievement (*High Importance – High Performance)*

Indicators in Quadrant II are considered important and already show strong performance. Statement 11, more efficient work experience, and statement 12, positive impact on the company, indicate that Venus provides clear operational benefits by improving work visibility, reducing scattered communication, and supporting integrated decision-making. These achievements need to be maintained through consistent system support and user assistance.

c. Quadrant III – Low Priority (*Low Importance – Low Performance*)

Quadrant III contains statement 5, information system stability. Although respondents placed this item in a lower priority position compared with other attributes, system stability should not be ignored in a digital crew change system. Stability remains technically important because system disruption can delay approval, interrupt document monitoring, and reduce user trust. Therefore, this item should be monitored as a preventive maintenance concern even if it is not the first improvement priority in the IPA grid.

d. Quadrant IV – Low Importance – High Performance

Quadrant IV includes statement 3, updating and accuracy; statement 4, information updating; statement 7, minimizing errors; statement 9, comparison with previous systems; and statement 10, ease of use. These attributes show relatively high performance, but they should not be dismissed as unimportant. In maritime operations, accuracy and usability support adoption, reduce data input errors, and accelerate coordination. Therefore, these indicators should be maintained while improvement resources are focused first on Quadrant I.

4.2 Discussion

Based on data from 31 internal users of PT Pertamina International Shipping, the IPA results show that Venus is perceived as useful and generally effective in supporting crew change management. The strongest contribution of Venus is its ability to centralize scheduling information, document status, and approval monitoring. This finding is relevant to maritime crewing practice because crew change delays can affect vessel readiness, operational continuity, and compliance with document requirements.

1. The high importance score confirms that users need a digital system that can support crew change needs, timeliness, accuracy, coordination, and information visibility. Users rated the system as important because the crew change process involves many actors and deadlines, while incomplete information can delay sign on/sign off preparation.
2. The high performance score indicates that Venus has helped users conduct crew change activities more systematically. However, the performance score is a perception-based measure, so the conclusion is limited to internal user assessment. Objective indicators such as processing time, number of document errors, and approval duration should be measured in future studies to strengthen the operational effectiveness claim.
3. Interpretation of IPA Results
   a. Quadrant I shows the most important improvement area. Fulfillment of crew change needs may remain weak when crew availability, document readiness, and approval status are not synchronized at the same time. Timeliness may be affected by delayed MCU results, late document submission, or slow approval escalation. Data security needs deeper attention because crew data include personal identity, certification, medical, and employment information. Coordination between departments also requires improvement because crew change decisions involve crewing, fleet, manning agent, and operational users.
   b. Quadrant II shows attributes that should be maintained. More efficient work experience

and positive company impact indicate that Venus has provided net benefits for users by reducing fragmented communication and supporting more integrated monitoring. These benefits should be protected through regular system maintenance, user training, and continuous improvement of operational workflows.

c. Quadrant III should be interpreted carefully. Although information system stability has lower relative importance in the IPA grid, it remains a technical requirement for reliable digital operations. The item may have been rated lower because users focus more on direct deadline-related problems, but system stability must remain part of preventive monitoring.

d. Quadrant IV shows that some system attributes already perform well. Updating and accuracy, information updating, error minimization, comparison with previous systems, and ease of use should be maintained because they influence user adoption and the quality of crew change data. The main managerial implication is not to reduce these attributes, but to allocate additional improvement resources to Quadrant I priorities.

4. Field Findings

Field observations identified three operational issues that help explain the IPA findings: data input errors by some users, system disruptions that may delay approval, and external administrative barriers related to MCU, port documents, and regulatory requirements. Data input errors are related to accuracy and usability, system disruption is related to stability and timeliness, while external administrative barriers are related to fulfillment of crew change needs and interdepartmental coordination.

a. First, data input errors occur when users enter incomplete or inconsistent crew information, so validation rules and user guidance should be strengthened.

b. Second, system disruption can slow approval follow-up, making system availability monitoring and escalation procedures necessary.

c. Third, administrative barriers from external parties, such as MCU results, port documents, and regulatory requirements, need to be separated analytically from Venus-related limitations.

These findings show that crew change delays are not caused only by the application. Some delays originate from external administrative constraints beyond direct system control. Therefore, Venus-related performance should be distinguished from non-system factors, while system improvements should focus on automated reminders, document-expiry alerts, approval escalation, role-based access control, audit trails, and clearer workflow ownership between departments.

5 Conclusion

Based on the research results, Venus is perceived positively by internal users and is considered important for supporting the crew change process at PT Pertamina International Shipping. The average importance score was 4.77 or 95%, while the average performance score was 4.73 or 94%. These results indicate that Venus helps users manage scheduling, document monitoring, approval follow-up, and crew change information more systematically. However, the conclusion should be understood as perceived effectiveness among internal users because the study did not measure objective before-after operational indicators such as processing time, document error frequency, or approval duration.

The IPA results show that several strategic aspects still require priority improvement, especially fulfillment of crew change needs, timeliness, data security, and interdepartmental coordination. Recommended improvements include automated reminders for approaching crew change deadlines, document-expiry alerts, approval escalation mechanisms, clearer workflow ownership across departments, role-based access control, authorization review, audit-trail monitoring, and stronger coordination with external document providers. Maintaining the current strengths of Venus while improving these priority areas will help the system provide more reliable support for crew change management and maritime operational continuity

References

Afif, A. S. N. (2021). Strategi Pencegahan Keterlambatan Crew On Board Dalam

Pergantian Crew Kapal Pada Masa Pandemi Covid 19 Di PT Jasindo Duta Segara.

Aini, R., Sianturi, I., & Nofandi, F. (2021). Penerapan Inaportnet Dalam Proses Pelayanan Penyandaran Kapal: Studi Kasus. Dinamika Bahari, 2(1), 1–5. Https://Doi.Org/10.46484/Db.V2i1.264

Aryani, K. D. (2024). Pengaruh Kualitas Layanan Aplikasi Vessel Management System (Vms) Dan Marine Operating System (Mos) Terhadap Kinerja Jasa Kapal Di PT. Pelabuhan Indonesia (Persero) Regional 2 Tanjung Priok.

Aulia, H. (2023). Pengaruh Keterlambatan Crew Change Terhadap Kinerja Awak Kapal Pada PT Busan Jakarta Marine Global Indonesia. Jurnal Skripsi, 5–24.

Batary Citta, A. (2023). Pengembangan Sumberdayamanusia Dalam Mendukung Transformasi Transportasi Laut Dalam Era Revolusi Industri 4.0. Journal Of Social Science Research, 3(4), 6184–6197.

Beniah William Oktavianus Yosey, Indah Ayu Johanda Putri, Dyah Ratnaningsih, Dian Junita Arisusanty, Faris Nofandi, & Romanda Annas Amrullah. (2024). Pengaruh Teknologi Digital Dalam Pengelolaan Dokumen Crewchange Di PT. Equinox Bahari Utama. Journal Of Business, Finance, And Economics (Jbfe), 5(2), 282–292. Https://Doi.Org/10.32585/Jbfe.V5i2.5734

Bormasa, M. F. (2022). Kepemimpinan Dan Efektivitas Kerja.

Fauzan, Y., Frastika, Y., Saifudin, I., & Ansar, A. A. (2025). Proses Crew Change Terhadap Jumlah Ketersediaan Crew Di PT . Pertamina International Shipping. 1(March).

Hazlia, R. (2025). Kajian Efektifitas Penggunaan Aplikasi Seacrew Guna Memperlancar Pergantian Awak Kapal Di PT Multikreasi Senalaut Services.

Jamjami, M. R. (2025). Evaluasi Proses Pergantian Awak Kapal Dan Ketidaksesuaian Jadwal Keberangkatan Sebagai Upaya Mencegah Keterlambatan Pengiriman Awak Kapal Sign On Di PT. Karya Sarana Samudera.

Muhammad, K. (2018). Analisis Program Cadet Scholarship Terhadap Mutasi Perwira Kapal Di PT Jasindo Duta Segara. 167–186.

Pratama, R., Elvina, I., & Supiyan. (2024). Analisis Kepuasan Pengguna Feri Penyeberangan Mintin Kabupaten Pulang Pisau. 7(1), 181–191. Https://Doi.Org/10.33087/Talentasipil.V7i1.426

Rilisiana, D. (2021). Analisis Proses Crew Change Di PT. Pertamina (Persero) Shipping Jakarta.

Riyanto, S., & Hatmawan, A. A. (2020). Metode Riset Penelitian Kuantitatif.

Rubi Babullah. (2024). Mengenal Sumber Daya Manusia (Sdm): Pengertian Dan Fungsinya. Jurnal Arjuna : Publikasi Ilmu Pendidikan, Bahasa Dan Matematika, 2(4), 187–204. Https://Doi.Org/10.61132/Arjuna.V2i4.1104

Setiono, B. A. (2019). Peningkatan Daya Saing Sumber Daya Manusia Dalam Menghadapi Revolusi Industri 4.0. Jurnal Aplikasi Pelayaran Dan Kepelabuhanan, 9(2), 179–185. Https://Doi.Org/10.30649/Japk.V9i2.36

Sugiyono. (2013). Kualitatif, Metode Penelitian Kuantitaif Dan Kualitatif.