

The determinants of Operational Performance in Tanzania Cargo Containers Freight Stations: A case of KEFA Cargo Solution Container Freight Station

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Abstract

Container Freight Stations were established at the Port of Dar es Salaam to reduce congestion and improve cargo movement. However operational inefficiencies, including delays in cargo handling, inadequate utilization of cargo-handling equipment, and limited adoption of modern technologies, continue to affect their performance. This study examined the effects of cargo handling time, equipment utilization, and cargo-handling technology on the operational performance of KEFA Cargo Solution Container Freight Station at the Port of Dar es Salaam. The study adopted a positivist research philosophy, a deductive approach, and a cross-sectional explanatory survey design. A census was conducted involving all 80 employees of the organization. Primary data were collected using a structured questionnaire based on a five-point Likert scale and analyzed using descriptive statistics, Pearson correlation analysis, and multiple linear regression. The findings reveal that cargo handling time has a positive but statistically insignificant effect on operational performance, whereas equipment utilization has a statistically significant positive effect. Cargo-handling technology demonstrates the strongest positive influence on operational performance, and the regression model explains 39.9% of the variation in operational performance. The study concludes that effective utilization of cargo-handling equipment and investment in modern cargo-handling technologies are the key drivers of operational performance in Container Freight Stations and are essential for improving operational efficiency and service delivery within Tanzania's port logistics sector. The study recommends that Container Freight Stations prioritize investment in modern cargo-handling technologies, strengthen equipment utilization through regular maintenance and efficient scheduling, and enhance staff training to improve operational performance and service delivery.

Keywords: Container Freight Station; Operational Performance; Cargo Handling Time; Equipment Utilization; Cargo Handling Technology

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Introduction

Container Freight Stations (CFSs) play an essential role in supporting port operations by providing off-dock facilities for cargo consolidation, deconsolidation, temporary storage, customs processing, and cargo distribution. They help reduce congestion within seaport terminals, improve cargo flow, and enhance the overall efficiency of logistics operations. As global trade continues to expand, the demand for efficient cargo handling services has increased significantly, making operational performance a critical concern for logistics service providers and policymakers (Munim & Schramm, 2021; Merk & Dang, 2020).

The Port of Dar es salaam is Tanzania's principal maritime gateway and several land-linked countries, including Zambia, Rwanda, Burundi, Malawi, Uganda, and the Democratic Republic of Congo. The continuous growth in cargo throughput has increased pressure on port facilities, resulting in congestion, longer cargo dwell time, and operational bottlenecks (Chinedum, 2018; Chhetri et al., 2026; Nwokedi et al., 2021; Saini & Lerher, 2024). To address these challenges, Container Freight Stations were established to complement port operations by facilitating faster cargo clearance and improving cargo movement within the logistics chain (Tanzania Ports Authority, 2022).

Operational Performance within Container Freight Stations depends on several operational factors. Previous studies have identified cargo handling time, equipment utilization and cargo handling technology as important determinants of logistics efficiency. Efficient cargo handling reduces delays and improves cargo throughput, while effective utilization of cargo handling equipment increases productivity and minimizes equipment idle time. Likewise, the adoption of modern technologies such as warehouse management systems, electronic documentation, digital cargo tracking, and integrated information systems enhances operational visibility, improves decision-making, and increases service reliability (Saini & Lerher, 2024; Chadenyile & Kassembe, 2025; Cho et al., 2026).

Although numerous studies have investigated operational performance within ports and container terminals, most have concentrated on general port operations or examined individual operational factors in isolation, without assessing the combined influence of cargo handling time, equipment utilization, and cargo handling technology on performance within Container Freight Stations specifically. Empirical evidence from Tanzania remains particularly limited, despite the important role CFSs play in supporting cargo movement through the Port of Dar es Salaam (Okere, 2021; Pham & Nguyen, 2022; Ningrat et al., 2024).

This study addresses this gap by jointly examining the effects of cargo handling time, equipment utilization, and cargo handling technology on operational performance in Tanzania Container Freight Stations, using KEFA Cargo Solution Ltd Container Freight Station as a case study. Unlike prior studies that treat these factors separately or study them at the broader port level, this study evaluates their combined contribution within a single CFS, providing empirical evidence to assist managers, policymakers, and logistics practitioners in improving operational efficiency, service quality, and competitiveness within Tanzania's maritime logistics sector.

Literature Review

Resource-Based View (RBV) Theory

This study is grounded in the Resource-Based View (RBV) theory developed. The theory explains that organizational performance depends on an organization's ability to acquire, utilize, and manage valuable, rare, inimitable, and organized resources. According to RBV, firms achieve sustainable competitive advantage when they effectively deploy both tangible and intangible resources to improve operational efficiency and organizational performance.

Within Container Freight Stations (CFSs), important organizational resources include cargo handling equipment, information technology systems, operational procedures, and skilled human resources. Efficient utilization of these resources enhances cargo movement, minimizes operational delays, improves service reliability, and strengthens operational performance. Therefore, the Resource-Based View provides an appropriate theoretical foundation for explaining how cargo handling time, equipment utilization, and cargo handling technology influence operational performance in Tanzania Container Freight Stations.

Cargo Handling Time and Operational Performance

Cargo handling time refers to the period required to receive, inspect, store, process, and dispatch cargo within a Container Freight Station. Efficient cargo handling minimizes vessel and truck waiting time, improves cargo throughput, reduces congestion, and enhances customer satisfaction. Previous studies have consistently reported that shorter cargo handling time contributes to improved operational performance by increasing productivity and reducing logistics costs (Chadenyile & Kassembe, 2025; Saini & Lerher, 2024). However, studies conducted in developing countries indicate that customs procedures, inadequate infrastructure, and operational bottlenecks may weaken this relationship, suggesting the need for further investigation within the Tanzanian context.

Hypothesis 1: Cargo handling time has a significant positive effect on operational performance in Tanzania Container Freight Stations.

Equipment Utilization and Operational Performance

Equipment utilization refers to the effective use of operational resources such as forklifts, reach stackers, cranes, and transport vehicles during cargo handling activities. Efficient utilization of these resources minimizes equipment idle time, increases cargo throughput, reduces operational costs, and improves service delivery. Previous studies have shown that organizations with higher equipment utilization generally achieve superior operational performance, improved customer satisfaction, and greater operational efficiency (Pham & Nguyen, 2022; Okere, 2021). Despite these benefits, equipment breakdowns, inadequate maintenance, and poor operational planning remain major challenges affecting logistics performance in many developing countries.

Hypothesis 2: Equipment utilization has a significant positive effect on operational performance in Tanzania Container Freight Stations.

Cargo Handling Technology and Operational Performance

Cargo handling technology includes warehouse management systems, automated cargo tracking, electronic documentation, integrated information systems, and digital communication platforms that support cargo operations. Adoption of these technologies improves operational visibility, increases cargo tracking accuracy, reduces documentation errors, shortens processing time, and facilitates coordination among logistics stakeholders. Previous studies have reported a positive relationship between technology adoption and operational performance, indicating that organizations investing in modern technologies achieve greater efficiency and competitiveness (Cho et al., 2026; Mwaya & Mwisila, 2025; Tsagkaris & Moschovou, 2025). However, empirical evidence regarding the influence of cargo handling technology on Container Freight Stations in Tanzania remains limited.

Hypothesis 3: Cargo handling technology has a significant positive effect on operational performance in Tanzania Container Freight Stations

Conceptual Framework

The conceptual framework of this study proposes cargo handling time, equipment utilization, and cargo handling technology as the independent variables influencing operational performance as the dependent variable. The framework is developed from the Resource-Based View (RBV) theory and empirical literature, which suggest that effective utilization of

operational resources and technological capabilities enhances the performance of Container Freight Stations.

INDEPENDENT VARIABLE

DEPENDENT VARIABLE

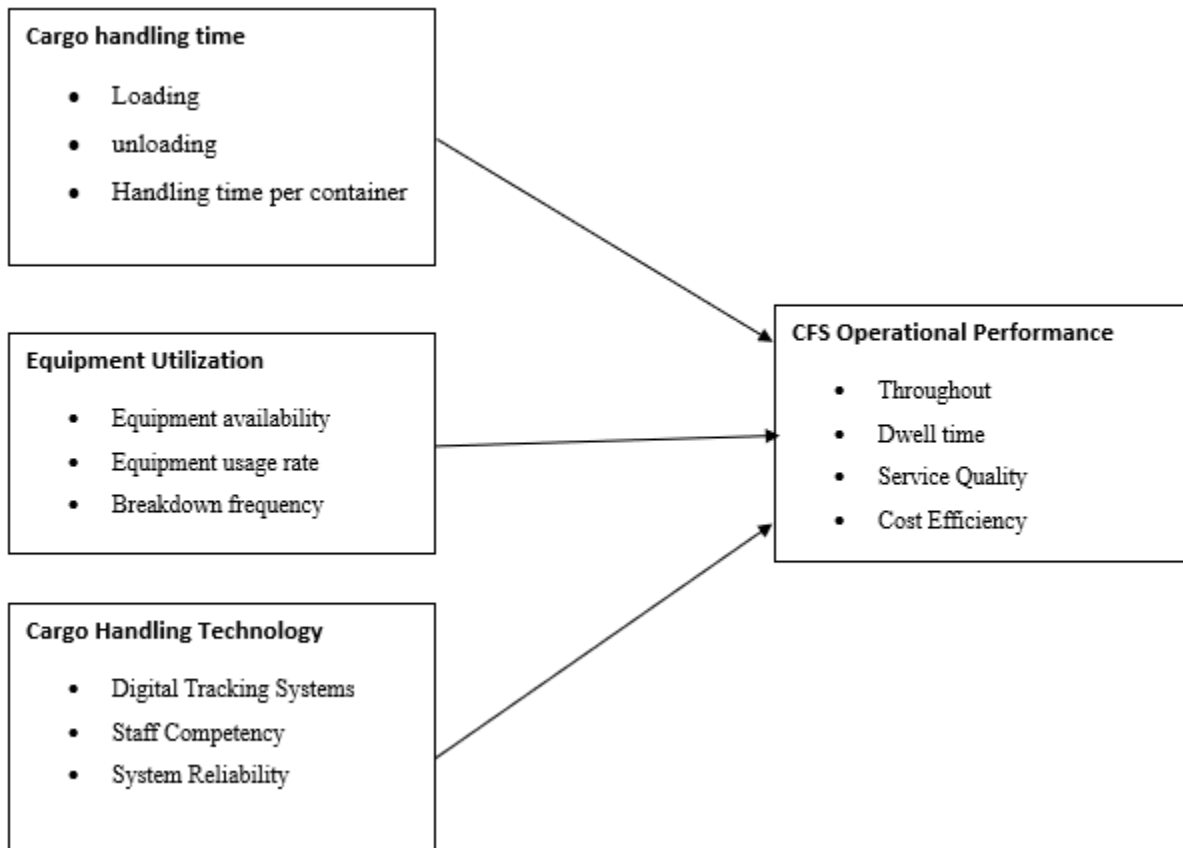


Figure 1. Conceptual framework on cargo handling efficiency and CFS operational performance

Source: Developed by the researcher (2026).

The Mathematical Model of the Study

The regression model used for this study is represented by the following equation:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$$

Where: represents the dependent variable, which is operational performance of Container Freight Stations. X_1 , X_2 , and X_3 represent the independent variables, namely cargo handling time, equipment utilization, and cargo handling technology, respectively. β_0 represents the constant term, while β_1 , β_2 , and β_3 represent the regression coefficients showing the contribution of each independent variable to operational performance. ε represents the error term.

Methods

A positivist research philosophy and deductive research approach guided this study, aiming to empirically examine the relationship between operational resources and performance outcomes in Container Freight Stations. The study adopted a quantitative research approach using a case study design, focusing on KEFA Cargo Solution CFS in Dar es Salaam, Tanzania. The target population consisted of 80 employees involved in cargo handling operations, warehouse

activities, documentation, and administrative functions at KEFA Cargo Solution CFS. Since the population size was manageable, a census sampling technique was employed, whereby all 80 employees participated in the study. This ensured adequate representation of employees with relevant knowledge of CFS operational activities. Primary data were collected using structured questionnaires developed from the study objectives and empirical literature. The questionnaire captured information on cargo handling time, equipment utilization, cargo handling technology, and operational performance. A five-point Likert scale ranging from 1 = Strongly Disagree to 5 = Strongly Agree was used to measure respondents' perceptions and facilitate quantitative analysis. The collected data were coded, cleaned, and analyzed using IBM SPSS Statistics version 27. Descriptive statistics were employed to summarize the characteristics of respondents and study variables. Furthermore, multiple regression analysis was conducted to determine the effect of cargo handling time, equipment utilization, and cargo handling technology on operational performance.

Result and Discussion

The following sections present and discuss the findings of the study. The results explain the influence of cargo handling time, equipment utilization, and cargo handling technology on operational performance of KEFA Cargo Solution Container Freight Station.

Cargo Handling Time

The findings in Table 1 present respondent's perceptions regarding cargo handling time and its contribution to operational performance. The results indicate moderate agreement among respondents that cargo handling processes are reasonably efficient, with mean values ranging from 3.12 to 3.18. Respondents moderately agreed that cargo removal from containers is acceptable ($M = 3.18$, $SD = 0.444$) and that the time used to handle each container is reasonable ($M = 3.18$, $SD = 0.612$). Similarly, respondents indicated that delays during cargo handling operations are relatively controlled ($M = 3.18$, $SD = 0.591$).

However, the results show that cargo handling processes supporting smooth and fast container movement recorded the lowest mean score ($M = 3.12$, $SD = 0.582$), suggesting that there are still opportunities for improving cargo flow efficiency. The relatively low standard deviations indicate consistency among respondents' perceptions. These findings suggest that while cargo handling time contributes to operational performance, improvements in processing speed alone may not sufficiently enhance CFS performance unless supported by other operational resources such as equipment and technology.

Table 1. Cargo Handling Time

Statements	N	Minimum	Maximum	Mean	Std Deviation
The time taken to load containers into trucks is short and efficient	80	2	5	3.13	.603
The time taken to remove cargo from containers is acceptable	80	2	4	3.18	.444
The time used to handle each container is reasonable	80	2	4	3.18	.612
There are few delays during cargo handling operations	80	2	5	3.18	.591

Cargo handling processes support smooth and fast movement of	80	2	4	3.12	.582
Valid N (listwise)	80				

Source: Field Data (2026)

Equipment Utilization

The findings in Table 2 show that respondents had relatively low perceptions regarding equipment utilization effectiveness at KEFA Cargo Solution CFS. The mean values ranged from 2.85 to 2.93, indicating limited agreement regarding the availability, scheduling, and productivity of cargo handling equipment. The statement regarding equipment availability when needed recorded the highest mean score ($M = 2.93$, $SD = 0.444$), while effective equipment utilization during operations recorded the lowest mean score ($M = 2.85$, $SD = 0.553$). These findings indicate that although equipment exists within the CFS, challenges related to availability, maintenance, and scheduling may reduce its contribution to operational efficiency. The results highlight the importance of improving equipment management practices, including preventive maintenance, proper scheduling, and monitoring of equipment productivity to enhance CFS performance.

Table 2. Equipment Utilization

Statements	N	Minimum	Maximum	Mean	Std Deviation
The available equipment is used effectively during operations	80	2	4	2.85	.553
Equipment is available when needed for cargo handling	80	2	4	2.93	.444
Equipment breakdowns rarely affect operations	80	1	4	2.89	.675
Equipment is properly scheduled and allocated	80	2	4	2.90	.493
Equipment use helps reduce delays in operations	80	2	4	2.90	.518
Valid N (listwise)	80				

Source: Field Data (2026)

Cargo Handling Technology

The findings in Table 3 indicate moderate perceptions regarding the use of cargo handling technology at KEFA Cargo Solution CFS. The mean values ranged from 2.93 to 3.03, suggesting that technology adoption exists but has not been fully optimized. The reliability of technological systems recorded the highest mean score ($M = 3.03$, $SD = 0.595$), followed by digital systems used for tracking container movement ($M = 3.00$, $SD = 0.450$). However, staff ability to effectively use the systems recorded the lowest mean score ($M = 2.93$, $SD = 0.612$), indicating the need for additional employee training and technology support. The findings suggest that cargo handling technology provides opportunities for improving operational efficiency; however, its full contribution depends on effective implementation and employee capability.

Table 3. Cargo Handling Technology

Statements	N	Minimum	Maximum	Mean	Std Deviation
The available equipment is used effectively during operations	80	2	4	3.00	.450
Equipment is available when needed for cargo handling	80	2	4	2.94	.559
Equipment breakdowns rarely affect operations	80	2	4	2.93	.612
Equipment is properly scheduled and allocated	80	2	4	3.03	.595
Equipment use helps reduce delays in operations	80	2	4	2.99	.562
Valid N (listwise)	80				

Source: Field Data (2026)

Multiple Regression Analysis

This section presents the regression analysis conducted to examine the effect of cargo handling time, equipment utilization, and cargo handling technology on CFS operational performance. Multiple linear regression analysis was employed to determine the extent to which the independent variables influence the dependent variable. The analysis was conducted to address the study objectives and determine the predictive power of each independent variable on operational performance.

Regression Model

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$$

Where:

Y= CFS Operational Performance

X₁= Cargo Handling Time

X₂= Equipment Utilization

X₃= Cargo Handling Technology

β₀, β₁, β₂ and β₃= Corresponding Beta coefficients

ε = Error term

Model Summary

The model summary results in Table 4 indicate a moderate relationship between the independent variables and operational performance (R = 0.632). The R Square value of 0.399 indicates that cargo handling time, equipment utilization, and cargo handling technology explain 39.9% of the variation in operational performance, while the remaining 60.1% is explained by other factors not included in the model.

The Adjusted R Square value of 0.375 confirms the explanatory power of the model after considering the number of predictors.

Table 4. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.632 ^a	.399	.375	.35633

Source: Field Data (2026)

Predictors: (Constant), Cargo handling technology, Equipment Utilization, Cargo handling time

ANOVA Results

The ANOVA results presented in Table 5 show that the regression model is statistically significant ($F = 16.833$, $p < 0.05$). This indicates that cargo handling time, equipment utilization, and cargo handling technology jointly have a significant influence on operational performance.

Table 5. ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6.412	3	2.137	16.833	.000 ^b
	Residual	9.650	76	.127		
	Total	16.062	79			

Source: Field Data (2026)

Dependent Variable: CFS Operational Performance

Predictors: (Constant), Cargo handling technology, Equipment Utilization, Cargo handling time

Regression Coefficients

The regression coefficients in Table 6 indicate that cargo handling technology had the strongest positive effect on operational performance ($\beta = 0.435$, $p < 0.001$). This was followed by equipment utilization ($\beta = 0.282$, $p = 0.013$), while cargo handling time had a positive but statistically insignificant effect ($\beta = 0.140$, $p = 0.200$).

The coefficients table shows how each factor affects CFS operational performance when the other factors are kept constant.

$$Y = 1.011 + 0.140X_1 + 0.282X_2 + 0.435X_3 + \epsilon$$

Where:

Y = CFS Operational Performance

X_1 = Cargo Handling Time

X_2 = Equipment Utilization

X_3 = Cargo Handling Technology

Table 6. Regression Coefficients

Model	Unstandardized Coefficients	Standardized Coefficients	t	Sig.
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		β	Std. Error	Beta		
1	(Constant)	1.011	.381		2.655	.010
	Cargo handling time	.140	.109	.136	1.292	.200
	Equipment Utilization	.282	.111	.245	2.548	.013
	Cargo handling technology	.435	.115	.413	3.797	.000

Source: Field Data (2026)

Dependent Variable: CFS Operational Performance

Discussions

Contribution of Cargo Handling Time to Operational Performance

Cargo handling time showed a positive but statistically insignificant effect on operational performance ($\beta = 0.140$, $p > 0.05$; standardized $\beta = .136$). In practical terms, even a full standard-deviation reduction in handling time would shift performance by only about one-eighth of a standard deviation, too small and too unreliable to be a dependable lever for improving CFS performance on its own.

The finding can be explained through Systems Theory, which views logistics operations as an interconnected system where performance depends on the combined effectiveness of multiple operational components. Therefore, improvements in cargo handling speed may not produce substantial performance gains if other factors such as equipment availability, technological capability, and operational coordination remain limited.

The findings differ from Chadenyile and Kassembe (2025), who found that cargo handling delays significantly reduce efficiency in cargo operations. Similarly, Mwaya and Mwisila (2025) highlighted that automation and improved cargo processing speed enhance operational performance. However, those studies mainly focused on broader port operations, while this study focused specifically on Container Freight Station operations where performance depends on several supporting resources.

The insignificant effect observed in this study suggests that KEFA Cargo Solution CFS should not focus only on reducing handling time but should adopt an integrated approach involving equipment improvement and technological advancement to achieve better operational outcomes.

Contribution of Equipment Utilization to Operational Performance

Equipment utilization had a positive and statistically significant effect on operational performance ($\beta = 0.282$, $p < 0.05$; standardized $\beta = .245$). Practically, a one-standard-deviation improvement in equipment utilization is associated with roughly a quarter-standard-deviation gain in operational performance, indicating that improving equipment availability, scheduling, and productivity offers a meaningful and attainable route to raising CFS efficiency.

The findings support the Resource-Based View (RBV) theory, which emphasizes that organizations achieve superior performance through effective management and utilization of valuable internal resources. In the context of CFS operations, equipment such as forklifts, reach stackers, and other handling machinery represent critical operational resources that influence cargo movement efficiency.

The findings are consistent with Ningrat et al. (2024), who found that improved equipment utilization enhances terminal productivity and operational efficiency. Similarly, Pham and Nguyen (2022) reported that inefficient equipment utilization creates operational delays and reduces cargo handling performance. Chadenyile and Kasembe (2025) also emphasized that proper management of operational resources improves CFS efficiency.

The significant contribution of equipment utilization in this study demonstrates that improving equipment availability, maintenance practices, and operational scheduling can enhance cargo flow, reduce delays, and strengthen operational performance at Container Freight Stations.

Contribution of Cargo Handling Technology to Operational Performance

Cargo handling technology had the strongest and statistically significant positive effect on operational performance ($\beta = 0.435$, $p < 0.001$; standardized $\beta = .413$). This is both the largest and most practically consequential effect in the model: a one-standard-deviation improvement in technological capability is associated with over four-tenths of a standard-deviation gain in performance, making technology investment the single most impactful lever available to CFS management among the factors studied.

The finding supports the Resource-Based View theory by demonstrating that technological capabilities represent valuable organizational resources that improve efficiency and create operational advantages. Digital cargo tracking systems, warehouse management systems, and other technological tools improve cargo visibility, reduce operational errors, enhance decision-making, and support effective coordination of activities.

The findings agree with Mwaya and Mwisila (2025), who found that automation and digital technologies significantly improve cargo handling efficiency and operational productivity. Similarly, Tsagkaris and Moschovou (2025) reported that technology adoption enables ports and logistics facilities to achieve higher efficiency through improved coordination and reduced processing delays. Zajac et al. (2023) also confirmed that technology-supported cargo handling systems improve terminal efficiency and reduce waiting time.

The strong contribution of cargo handling technology in this study highlights that investment in digital systems and technological capabilities is essential for improving operational performance at Container Freight Stations, particularly in developing logistics environments.

Novelty of the Article

This study contributes new knowledge by empirically examining the combined influence of cargo handling time, equipment utilization, and cargo handling technology on operational performance within the context of Tanzania Container Freight Stations. Previous studies have mainly focused on port terminals and general logistics operations, while limited attention has been given to CFS operations in developing economies.

The study provides a unique insight by identifying cargo handling technology as the most influential determinant of operational performance ($\beta = 0.435$, $p < 0.001$), followed by equipment utilization ($\beta = 0.282$, $p < 0.05$). Unlike previous assumptions that reducing cargo handling time is the primary driver of efficiency, this study demonstrates that technological capability and effective resource utilization play a more significant role in improving CFS performance.

By focusing on KEFA Cargo Solution CFS at the Port of Dar es Salaam, the study expands existing knowledge on operational improvement strategies within Container Freight Stations in Tanzania and similar developing logistics environments.

Conclusion

This study examined the influence of cargo handling time, equipment utilization, and cargo handling technology on operational performance at KEFA Cargo Solution Container Freight Station. The regression analysis demonstrated that cargo handling technology had the greatest positive influence on operational performance, followed by equipment utilization. Cargo handling time showed a positive but insignificant contribution, indicating that improving speed alone may not sufficiently enhance CFS performance without supporting operational resources. The findings confirm the importance of investing in technological capabilities and improving equipment utilization to achieve better operational efficiency. The study also supports the Resource-Based View theory by demonstrating that effective management of internal resources and technological capabilities contributes significantly to organizational performance.

Suggestions

Based on the findings, KEFA Cargo Solution CFS and similar Container Freight Stations should prioritize investment in cargo handling technologies, including digital tracking systems, warehouse management systems, and automated operational tools. Continuous employee training should also be provided to ensure effective utilization of technological systems. Management should strengthen equipment utilization through regular maintenance programs, proper scheduling, and monitoring of equipment productivity to minimize operational delays. Although cargo handling time was not statistically significant, the CFS should continue improving cargo processing procedures through better coordination among operational stakeholders to support overall efficiency. Future studies may consider additional factors influencing CFS operational performance, such as customs clearance procedures, employee productivity, infrastructure quality, customer relationship management, and supply chain integration.

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