

Manager's Performance and Technology Withdrawal: Are They Related? An Empirical Study in the Maritime Industry

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ABSTRACT

This study aims to determine the relationship between manager performance and technology withdrawal within Malaysia's maritime industry. The Structural Equation Modelling (SEM) analysis, based on a survey of 357 respondents, indicates that mandatory technology usage impacts manager performance and subsequently predicts technology withdrawal. The results also suggest that mandatory usage serves as a predictor of the intention to withdraw from technology. As anticipated, the intention to withdraw from technology affects manager performance and predicts technology withdrawal. This study is likely the first to examine how new dimensions, such as the intention to withdraw from technology, significantly predict manager performance and technology withdrawal. The findings provide insights into how the Malaysian maritime industry can better address issues related to technology usage and withdrawal.

Keywords: Managers' performance, technology withdrawal, maritime industry, Malaysia.

INTRODUCTION

Global technological advancements are rapidly progressing, impacting not just the manufacturing sector but also driving a transformation in the maritime industry. Singapore, the USA, and China are at the forefront of this evolution, integrating advanced technologies across terminal operations, logistics, shipping, customs, and more. For example, Singapore is modernizing its maritime sector through digitalization, sustainability initiatives, and eco-friendly technologies. Major projects include OCEANS-X, a platform for data sharing, and CERT, which enhances carbon management and reporting. Singapore is also prioritizing the development of hydrogen storage and refueling solutions, as well as energy storage systems at ports to increase efficiency and reduce emissions. The Maritime and Port Authority of Singapore (MPA) is encouraging maritime innovation by supporting startups within the Marine Tech ecosystem. In the USA, efforts are centered on wind energy ports and green energy projects aimed at decarbonizing maritime operations. Massachusetts is expanding its wind port facilities to bolster renewable energy initiatives, while the US is also adopting advanced hull coatings and stricter regulations to promote cleaner maritime practices. Meanwhile, China is making substantial investments in smart port technologies, particularly in automating terminal operations and utilizing AI-powered logistics. The country is also at the forefront of developing green technologies, such as e-methanol and LNG-powered vessels, to reduce emissions and improve efficiency in global maritime trade (Chee, 2024; Jeroen and Alessio, 2024).

Besides, Malaysia is developing its information and communication technology (ICT) strategy to become a leader in ICT growth, particularly in the maritime sector (Norzaidi, 2024). Nevertheless, achieving this objective would be hindered without coordinated monitoring and performance evaluation of both government and commercial entities, as technological advancements and new variations in parameters influencing usage emerge, ultimately impacting Return on Investment and Quality of Life. Numerous terminal operators, including Northport, Westport, Penang Port, Tanjung Pelepas Port, Pasir Gudang Port, Kuantan Port, Miri Port, and Sabah Port, have utilized government support to develop and enhance their internal networks (Norzaidi, 2024). Northport, a prominent Malaysian terminal operator, has invested millions of dollars in developing the Northport Online Port Pass, Web Client Access System, E-Billing, Real-Time Vessel

Management, and E-Gatepass systems for employee use. Westports Malaysia, another significant terminal operator, implemented the G-Link, an advanced computer network system that enables employees to manage every aspect of port operations, including an e-terminal, security systems, e-procurement, corporate financial controls, corporate telephone directories, and customer databases (Norzaidi et al., 2023). Executives at these terminal operators assert that adopting these technologies will boost usage and enhance Return on Investment and service quality. For instance, Westport Malaysia reported a 5% increase in overall revenue to RM508.2 million in the first quarter of 2021, driven by a 5% rise in the container segment to 2.66 million TEUs. Northport's net profit rose by 25% to RM82 million in the fiscal year ending December 31, 2020 (Norzaidi, 2023).

However, technology has its drawbacks. For example, the electronic data interchange (EDI) systems, introduced to create a paperless environment in the maritime industry, failed to improve service and increased operating costs. Terminal operators connected with shipping agents still needed physical documents despite using e-customs. Managers found the system difficult to use and poorly designed, leading to its rejection. Some workers considered leaving or did leave the company due to technology-related stress. Consequently, many agencies related to terminal operators did not effectively comply with e-customs, resulting in lost efficiency and financial performance. In summary, the drawbacks of technology can lead to the intention and actual withdrawal from technology due to inefficiency, poor system design, and inadequate training (Susan and Al Endres, 2017). As a result, the company may face higher costs for new recruitment and investments in suitable new technology and training (Solmaz, 2019).

Given the identified knowledge gaps, this study is essential for both theoretical and practical purposes. It aims to benefit the industry, the community, and policymakers, adding valuable insights to the current understanding of the subject. This research is particularly important because there is a discrepancy in the initial findings regarding the necessary use of technology and its impact on withdrawal after several years. Additionally, there is no empirical data linking technology use, manager performance, and withdrawal intentions or actions. Few studies consider all these factors together, resulting in significant information gaps (Norzaidi, 2024; Asongu, and Nwachukwu, 2018). Much of the previous research is outdated, highlighting the need for new studies to account for the rapid pace of technological advancements and the introduction of new applications. Moreover, none of the prior studies have used structural equation modeling (SEM) to examine intention to withdraw because of technology structures, particularly concerning mandated technology use. In response to these gaps, it is crucial to consider the negative effects of technology use, especially when employees struggle to use it effectively in their roles. For instance, the introduction of new technology may lead to employee stress and even resignation if they cannot adapt to it. Hence, this study aims to address the following research questions based on these considerations:

1. Does mandatory usage predict managers' performance?
2. Does managers' performance predict technology withdrawal?
3. Does mandatory usage influence technology withdrawal?
4. Does mandatory usage predict the intention to withdraw from technology?
5. Does the intention to withdraw from technology predict technology withdrawal?

This study aims to address the research questions by creating a research framework based on an examination of existing literature in this field. The next section reviews the literature, and subsequent propositions will be formulated for this study.

REVIEW OF LITERATURE

Mandatory usage, and managers' performance

Usage, defined as the amount of time spent interacting with information systems (I.S.) or the number of reports

or information products generated per unit of time, bridges the gap between intent to use and performance, enforcing performance or success metrics (Petter et al., 2013). However, Goodhue and Thompson (1995) defined utilization as the use of technology to complete tasks and explained how user attitudes, societal conventions, and other situational factors influence the number of systems used, thereby increasing usage. Many technology studies focus on attitudes and behavior (Norzaidi et al., 2023; Martinko et al., 1996). Aspects such as high-quality systems (Bukhari, 2005) or change-back procedures shape user attitudes (belief, affect) about systems (Igbaria, 1990), including their utility (Davis, and Venkatesh, 1993) or user-information satisfaction (Goodhue and Thompson, 1995).

Theoretically, utilization is considered an intervening variable linking IT and performance (Solmaz, 2019). IT characteristics influence utilization to some extent, and it is one of several factors impacting overall performance. Backward links between IT and usage are referred to as backward linkages, and forward linkages between usage and performance are referred to as forward linkages. Solmaz argued that if systems affect performance, forward linkages must exist because IT cannot impact performance unless utilized. However, increased usage may result in performance degradation, for example, if tasks are designed inefficiently, requiring more effort than necessary, or if systems are so personally desirable that users expend considerable effort using them in non-productive ways (Norzaidi, 2024; Bukhari, 2005; Igbaria, 1990).

In summary, numerous studies indicate that technology improves work quality and enhances both financial and non-financial performance for individuals and organizations. Traditional methods of task completion often take more time, particularly for non-routine tasks. Modern technology enables terminal operations and vessel operators to monitor the real-time location of vessels. Furthermore, the marine department can predict climate conditions to ensure the safety of vessels and marine activities for fishermen. Technology also streamlines the logistics process from water-based to land-based operations, assisting shipping agents and hauliers in efficiently transporting cargo. Consequently, we propose the following hypotheses to examine the relationship between mandatory technology usage and managers' performance.

H1: Mandatory usage is a predictor of managers' performance

Mandatory usage, intention to withdraw and technology withdrawal

The intention to withdraw from technology refers to staff contemplating quitting their job because they struggle with new technology. On the other hand, technology withdrawal occurs when employees leave the company due to discomfort with the introduction of new technology or its mandatory use imposed by management. The utilization of technology can aid managers in handling both routine and complex tasks. In the maritime industry, the adoption of technology can enhance the quality of work, effectiveness, and efficiency for individuals and organizations (Goodhue and Thompson, 1995; Baroudi et al., 1986). Additionally, technology can streamline tasks compared to manual or traditional methods. However, some workers may struggle with technological advancements and not find the new technology beneficial. If the technology is difficult to use due to poor design or misalignment with their tasks, they are less likely to adopt it (Joshi, 2005, 1992). Over time, this can lead to increased stress for managers, causing them to consider leaving the company (Norzaidi, 2024). Without adequate training and support from top management, the number of managers facing difficulties with new technology and intending to quit will rise. Furthermore, if managers cannot effectively use the new technology, it will impede their ability to meet task expectations, resulting in poor performance. This poor performance can diminish their chances of receiving financial rewards at the end of the year, prompting them to leave their positions and seek opportunities elsewhere (Susan, and Al Endres, 2017). As a result, the following theories emerge:

H2: Managers' performance is a predictor of technology withdrawal

H3: Mandatory usage is a predictor of technology withdrawal

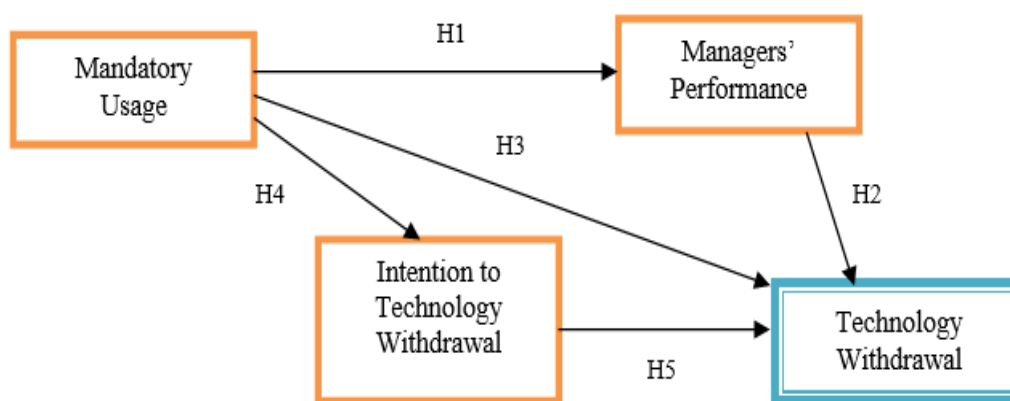
H4: Mandatory usage is a predictor of intention to technology withdraw

H5: Intention to technology withdrawal is a predictor of technology withdrawal

Development and storyboard of the proposed research framework

The proposed research model is built upon the Technology Acceptance Model (Davis and Venkatesh, 1993) and the Technology Improved Usage Model (Norzaidi et al., 2007). According to Davis and Venkatesh (1993), technology usage enhances performance. However, when technology usage is mandatory, managers have no choice but to use it, even if they are reluctant due to poor design and perceived difficulty, often exacerbated by discouragement from colleagues. Past negative experiences with new technology can lead to stress, particularly when supervisors expect timely completion of tasks related to operations and strategic decision-making. This stress can cause burnout and prompt an intention to quit, as leaving the company seems easier. In severe cases, managers may resign due to the challenges of using new technology. Although the number of affected staff remains low, developing a new model is crucial to assist management and policymakers in the marine industry in effectively addressing this issue. In summary, figure 1 shows the propositions proposed to be tested in this study.

Figure 1: Research Framework and Hypotheses of the Study



RESEARCH METHODOLOGY

Research design

This study utilizes a survey questionnaire approach, which is well-suited to the research design, effectively addressing the research objectives and bridging the knowledge gaps. The target respondents, consisting of managers from the major terminal operators, are chosen based on specific qualifications, such as having at least three years of experience in terminal operations, using maritime technology in their work environment, and holding a role of executive level or higher, up to general manager.

Sampling

The researcher established specific guidelines for the study, targeting all managers within Malaysia's marine industry, including those at the major terminal operators in Malaysia. Approximately 500 self-administered questionnaires were distributed to the HR departments of these terminal operators after identifying the managers. The identification was based on criteria from existing literature, encompassing roles such as general managers, department managers, division heads, directors, department or agency heads, unit chiefs, district managers, division managers, and executives. Of the 500 questionnaires sent out, 357 were returned, resulting in a 71% response rate. This high rate is both significant and representative of the target population, facilitating the generalization of the findings (Sekaran, 2003).

The instrument

The questionnaire is organized into five sections, each addressing a specific hypothesis of the study. The first section includes five questions aimed at collecting demographic information from respondents, such as their age, gender, department, educational background, and job titles. The following sections feature three items each that evaluate respondents' perspectives on mandatory technology usage (Davis and Venkatesh, 1993),

assess managers' performance (Norzaidi et al., 2007; Igbaria, 1990), and measure intentions to withdraw from technology (Norzaidi, 2024). The final set of three items examines technology withdrawal (Norzaidi, 2023). All responses were recorded on a 7-point Likert scale, with 1 indicating strong disagreement and 7 indicating strong agreement.

ANALYSIS OF DATA

Sample characteristics

The majority of respondents are male, accounting for 70 percent. Most of the respondents (38%) are between the ages of 40 and 49, and 77.3 percent work in non-IT departments. Additionally, 60 percent of respondents hold a bachelor's degree, while 16 percent have diplomas and 10.7 percent have Master's degrees. This indicates that most respondents have pursued post-secondary education, with only a few holding a PhD or DBA. This trend aligns with the expectation that executive positions typically require tertiary education. Moreover, the educational levels of the interviewees match their age demographics, with senior executives and executives representing the largest group (28%), followed by managers, assistant managers, and department heads.

Assessing validity and reliability

A common benchmark for determining the reliability of an instrument is a Cronbach's alpha of 0.6 or higher (Nunnally, 1978). Given that the Alpha scores in this study range from 0.67 to 0.95 (see Table 1), we can conclude that the questionnaire is reliable and the data are suitable for analysis.

Descriptive Analysis and Model Fit Test

Table 1 displays the mean and standard deviation scores for all items. The results indicate that the majority of managers consider factors such as mandatory usage, managers performance and intention to technology withdraw as crucial for technology withdrawal.

Table 1: Internal Consistency of the Constructs

Construct	Mean	Standard Deviation	Cronbach's Alpha
Mandatory usage	6.77	0.97	0.95
Managers' performance	6.11	0.93	0.90
Intention to technology withdrawal	5.41	0.87	0.79
Technology withdrawal	5.02	0.74	0.67

This study examines both construct validity and content validity to ensure the instrument's reliability, following Sekaran's (2003) recommendations. Principal component analysis was used with Varimax rotation to establish construct validity. No factors were removed, with a cut-off loading of 0.40 and eigenvalues greater than 1.0 (see Table 2). Moreover, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy indicated a satisfactory level of common variance.

Table 2: Confirmatory Factor Analysis (CFA) Results

Construct	Kaiser-Meyer-Olkin Measure of Sampling Adequacy	Eigenvalue	Per cent of total variance explained
Mandatory usage	0.71	2.33	66.28

Manager’s performance	0.66	1.82	49.02
Intention to technology withdrawal	0.61	1.62	32.63
Technology withdrawal	0.53	1.24	30.51

Additionally, the Analysis of Moment Structures (AMOS) with maximum likelihood was used to evaluate the construct validity of the model’s scales. AMOS was chosen for its user-friendliness and advanced technical capabilities (Miles, 2000; Nunnally, 1978), offering a more accurate evaluation of an instrument's discriminant validity compared to exploratory analysis. Although there is no single accepted fit measure for structural equation models, various metrics are recommended in the literature (Segar and Grover, 1993).

Table 3: Goodness-of-Fit Measures of the Research Model

Goodness-of-fit-measure	Recommended value	Approximate boundary as a good fit
Relative chi-square	<3.00	2.920
Ratio of chi-square	p>0.05	p=0.149
GFI	Close to 1.0 is better	0.955
IFI Delta 2	Close to 1.0 is better	0.932
TLI rho2	Close to 1.0 is better	0.900
CFI	Close to 1.0 is better	0.911
RMSEA	<0.08	0.079

The chi-square test results show that the model fits the data (Chi-square=366.14; p>0.05; p=0.149). Other multiple fit criteria, such as model chi-square (2/DF), relative chi-square, comparative fit index (CFI), Goodness of Fit Index (GFI), incremental fit index (IFI Delta2), TLI rho2, and root mean square error of approximation, were also used to assess the model (RMSEA). The value of 2/DF is 2.920, which is lower than Segars and Grover's (1993) suggested cut-off value of 3.000. Furthermore, the GFI (0.955), IFI Delta 2 (0.932), TLI rho2 (0.900), and CFI (0.911) values are all within a few percentage points of the required value. Despite this, the model's RMSEA score (0.079) indicates that it meets a tolerable error of approximation cut-off of 0.080. (Browne and Cudek, 1993). As a result, the model utilized in this study may be valid. The findings show that the managers' replies typically support the theoretical and conceptual distinctions made between all of the variables in this study. As a result, the data is available for further analysis. The outcomes of the five hypotheses examined in this study are shown in the next section.

RESULTS

Table 4: Hypotheses testing

Hypothesis	Causal Relationship		Factor	β	Sig.	Result
H1	Mandatory usage	→	Managers’ performance	0.801	***	Supported
H2	Managers’ performance	→	Technology withdrawal	-0.462	0.047	Supported

H3	Mandatory usage	→	Technology withdrawal	-0.385	0.049	Supported
H4	Mandatory usage	→	Intention to technology withdrawal	-0.477	0.044	Supported
H5	Intention to technology withdrawal	→	Technology withdrawal	0.334	0.050	Supported

The findings of the five hypotheses constructed are shown in Table 4. According to the Structural Equation Modelling (SEM) investigation, mandatory usage is a crucial predictor of manager’s performance (p=0.000). In the same way, manager’s performance predicts technology withdrawal (p value=0.047). Next, mandatory usage predict technology withdrawal (p-value = 0.049). Also, mandatory usage will influence intention to technology withdrawal (p-value=0.044) and finally influence technology withdrawal (p=0.050).

DISCUSSION AND PRACTICAL IMPLEMENTATIONS

By investigating the causal relationships between technology usage, management performance, intention to withdraw from technology, and actual technology withdrawal, this study advances current knowledge and addresses existing research gaps. What sets this study apart is its comprehensive approach to understanding the key factors that affect both the adoption and withdrawal of technology. Additionally, the model aims to help decision-makers understand the connections between variables that have been relatively underexplored. By integrating and analysing these variables within a single framework, we have created a clearer picture of the causal relationships among them.

Accessing certain information is crucial for protecting data from unauthorized access and ensuring its availability to legitimate users. However, if obtaining authorization is the main obstacle to completing tasks, it is considered a significant barrier. Many managers at terminal operators face challenges such as work complexity, interdependence, and ambiguity. They seek diverse and comprehensive information to perform their duties, and technology is one way to obtain this information, though access to high-quality data is limited. If authorization is granted, the chances of completing projects improve, but managers may still not have full access to all needed information. Additionally, the reliability of systems can impact managerial productivity. Trustworthy and effective systems can lead to better performance, while inadequate technology can hinder it.

Finally, compatibility is recommended as an additional factor. If information from different sources is not consistent, it may erode managers' trust in technology and negatively affect performance. Difficulties with information compatibility can result in poor performance. Overall, this research suggests that the suitability of technology influences its use, which in turn affects managers' performance. Furthermore, technology use can predict intentions to withdraw from technology, with managers' performance serving as a predictor for technology withdrawal. Managers are likely to resign if they are underperforming and fail to meet Key Performance Indicators (KPIs), and stress related to technology use can also drive them to leave.

In summary, understanding these relationships enables senior managers to identify strategies for improving technology use within their organizations. This study emphasizes essential strategies for successful technology implementation, particularly for industries like maritime that are currently adopting new technologies. Key actions include securing top-level support, aligning technology with task requirements, providing adequate training, encouraging user engagement, and offering a comprehensive training manual.

CONCLUSION AND FUTURE RESEARCH

The recommendations in this paper, derived from survey data, offer insights into how port companies could enhance their technology implementation. Additionally, these suggestions could serve as a model for other industries on how to effectively adopt new technology. It would be valuable to examine the voluntary technology utilization of non-supervisory and non-managerial employees. Conducting a cross-cultural study to explore potential variations in results could also be insightful.

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