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Technology and Performance of Maritime Industry in Malaysia

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ABSTRACT

The aim of this study is to examines the link between technology and the performance of the maritime industry in Malaysia. There are four distinct factors under technology that may influence the performance of the maritime industry, which are management information system functionality, intranet quality, information system integration, and network capability. The methodology of this study is a discussion of the issues from several past literature reviews. The link between the technology and the performance of the maritime industry discussed in this study will contribute to the knowledge that is certainly limited in the literature, and the maritime industry will better understand how to improve its technology, thus improving its performance. This study adapts the elements of technology under Open System Theory (OST) and will be proposed in the context of the maritime industry in Malaysia. The proposed theoretical framework in this study can be used as a benchmark for quality accreditation in the future.

1. Introduction

Maritime industry is a global transporter of the goods of modern globalized economies. It plays a vital role in today's economy, with more than 90% of Malaysia's exports are by sea. Maritime industry is regulated by the International Maritime Organization (IMO) which is responsible for the safety, security and performance of shipping. In order to improve the performance of maritime industry, it is inevitable to use the technology when collecting, storing, processing, presenting and distributing relevant data and information to the workers in maritime organization [1]. This is because, Ko [2] stated that most of procedures and the documents are done by conventional paperwork which can cause delay for more than one week and making a significant economic loss for all the stakeholders. The information that transmitted by telephone, fax, and email can cause duplicated and difficult to reuse the data because the information is not gathered and saved in the database.

According to Hosseini *et al.,* [3], technology is referring to collecting, storing, and providing an access to the data just in time in order to achieve better performance of organization. This is in line with Igbinovia and Ikenwe [4] which stated that technology can create value to the organization as it

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requires less time and effort to gain the data, less space to store the data, as well as allows the managers or maritime pilots to access the data easily compared to the paper-based ones.

Apart from that, technology also will result in an effective of sharing the knowledge as it allows the workers to trace and access the data in the system [5,6]. This can be supported by Alhawari *et al.,* [7] which stated that the technology helps to ensure that the data is being transmitted effectively and efficiently especially in maritime industry. Therefore, to provide a better understanding and to identify the important contribution of technology in enhancing the performance of maritime industry in Malaysia, a comprehensive literature review has been conducted. Based on the past literature review, factors under technology elements which are which are management information system functionality, intranet quality, information system integration, and network capability are said to be a driving force behind the performance of maritime industry.

Hence, in the following section the link between technology (management information system functionality, intranet quality, information system integration, network capability) and performance of maritime industry in Malaysia were examined. The third section provides the explanation on the proposed research model in this study. Then, the research methodology was identified in the fourth section. Finally, in the last section, a conclusion and future research were provided. In particular, this study suggests that the contribution that the technology makes to enhance the performance of maritime industry in Malaysia consists not just of a sole dimension, management information system functionality, but rather four dimensions, which also includes intranet quality, information system integration and network capability.

2. Literature Review

Operationalization of variables in this research has been defined based on previous research as summarized in Table 1.

Table 1
Areas of technology elements proposed for this study

Elements		Operational definition
Technology	Management information system functionality	The capability of the system to gather, manage, store and retrieve information or data, which can improve workflow [8]
	Intranet quality	The platform to facilitate the interaction in problem solving process and provide access for collaboration as well as to data or information [9-13]
	Information system integration	Organizational infrastructure that is used to exchange the data or information within organization in order to enhance the knowledge [14,15]
	Network capability	The capability of the network through portal to support the interdepartmental of work and knowledge sharing to facilitate the collaborations in different areas [16]

2.1 Management Information System (MIS) Functionality

According to Agahifar and Tavallaei [17], MIS functionality can produce more reliable data collection, and more accurate in controlling the data as well as processing and transforming the data into information rapidly for the utilization of decision making and problem solving within the organization. In the context of maritime industry, it is defined as the capability of the system to gather, manage, store and retrieve information or data which can improve safety, security and its performance [1].

Numerous prior researchers had proved that MIS can positively contribute to organizational performance [18-20]. Al-Mamary *et al.,* [21] also stated that MIS has been recognized as one of the most significant elements towards enhancing the performance of organization. Other than that, Osodo and Jemaiyo [22] stated that MIS will be considered as effective when it is able to produce and provide appropriate data to end users in order to achieve better performance.

Therefore, all the workers in the maritime organization should cooperate with the MIS to ensure the effectiveness and that desired outcomes are accomplished. Hence, this indicated that MIS may contribute to the effective performance of the organization. This argument can be supported by Hashim *et al.,* [23] who revealed a positive relationship between MIS and the performance of organization. This is also in line with Al-Gharaibeh and Malkawi [6], which they found that MIS has a significant impact on organizational performance.

Hence, by having ineffective MIS in the organization, it could contribute to many disadvantages especially in maritime industry. This can be supported by Oldenburg *et al.,* [24], which stated that Maritime pilots need 24 hours to standby in order to navigate ships, thus lead to very stressful working situation. As maritime pilots are key stakeholders in maritime industry, it will give many advantages to them if there is effective management by using MIS [2]. Without effective MIS, maritime pilots have to deal with stress and strain because of poor management in maritime industry.

Accordingly, the maritime industry in Malaysia needs to have an effective MIS that has appropriate functionality to improve the processing time of application and notification to be sent to the port authority in order for the maritime pilot to navigate the ships quicker, thus enhancing their performance.

2.2 Intranet Quality

The intranet is seen as the platform for interaction between workers in the organization and providing an access to the data or information as well as facilitating the interaction in problem solving process and supporting the communication among work [25]. According to Rodriguez and Edwards [26], the usage of high quality of Intranet in organization may enhance the performance of the organization. This is because, it allows the real time of sharing the data and accessing the data across the level of the organization [27]. Empirically, Iyengar *et al.,* [28] found that the usage of Intranet acted as a learning mechanism for organization and the data that been transferred through Intranet, will eventually enhances the organizational performance. This is also in line with Al-Mamary *et al.,* [21] which revealed that the Intranet was positively influence the organizational performance.

Furthermore, the high quality of Intranet allows the effective of information management and business processes within an organization, which will lead to the improvement of overall performance of organization [29]. Similarly, Odiaka and Okoro [10] also revealed that high quality of Intranet was positively affects the organizational performance, as it leads to better and faster work fulfilment. This finding can be supported by Roshan and Rao [30], which indicated that the better quality of intranet will lead to the better organizational performance as the task can be completed within the stipulated time frame.

Therefore, by looking into the discussion on the association between Intranet and organizational performance, this indicated that the maritime industry in Malaysia also need to have high quality of Intranet in order to access the required data, thus contribute to the better performance. This was supported by Daud *et al.,* [31] which stated that high quality of Intranet in maritime industry will allow the managers to conveniently exchange the operational and trade information. They also found that the Intranet quality are one of the most reliable variables towards the performance of maritime industry.

2.3 Information System Integration

Information system integration can be defined as organizational infrastructure that is used to access and exchange the information in real-time [32]. Besides, Maiga *et al.,* [33] stated that the information system integrations were related to cost reduction and quality improvement through exchanging the information in real-time. Apart from that, it has been found that there are direct and indirect association between information system integration and organizational performance [34-37]. These prior researchers were investigated the direct effect of information system integration on organizational performance since it was able to create the value of business process as well as improving the performance of the organization. This is in line with Gu *et al.,* [38], which also stated that information system integration might be an effective business practice in order to improve the organizational performance.

Fayard *et al.,* [11], Flynn *et al.,* [12] and Maiga *et al.,* [33] also confirmed that information system integration has a positive effect on organizational ability to achieve higher levels of performance as it can provide the access to the data and information. Therefore, this has implied that the information system integration is a vital factor towards organizational performance.

Hence, based on the arguments, this indicated that maritime industry in Malaysia need to consider this factor under technology in order to enhance their performance. This is because as stated by Heilig *et al.,* [39], information system integration in the maritime industry was able to improve the planning, controlling, and management of organizational operations. Besides, it is not only for effective maritime transport operations but also for improving the coordination and performance of maritime industry [40]. Thus, in order to stay competitive, maritime industry in Malaysia must ensure that they have good information system integration in order to effectively exchange the data, thus attaining the better performance of their organization.

2.4 Network Capability

Bengesi *et al.,* [16] had defined network capability as the capability of the network through portal to support the interdepartmental of work to facilitate the collaborations among workers. Therefore, trust and confidence are the essential factors that enable the share of information through network. Trust and confidence can be established when the skills to search the information from trusted sources are existed which then will improve the organizational performance.

It seems reasonable that organizational involved in coordination activities across a network will more likely have access to valuable information [41]. Apart from that, Zhang *et al.,* [42] stated that network capability also been suggested as one of the factors that can enhance performance of maritime industry as it allows to discover the opportunities easily.

In the context of maritime industry, network capability is designed with high levels of reliability due to business-critical data generated by a suite of sensors and the necessity to manage communications. The networked information systems gather and process data from sensors and execute on the exchanges the information. It also provides the real time of location, speed of ships and time remaining to destination [43].

Therefore, by looking into the discussion on previous study, this indicated that the maritime industry in Malaysia need to have high capability of network in order to communicate and exchange the information. As stated by Papastergiou *et al.,* [44], by having a high-capability network, the risk of stealing identities due to insecure network services or weak authentication can be avoided, which will positively contribute to the performance of the maritime industry.

3. Proposed Theoretical Framework

Open System Theory (OST) was founded in 1956 by a biologist, Ludwig Von Bertalanffy. Basically, OST fall into three parts which are input, throughput and output, together with the organizational process which feedback. Input is referring to people, raw materials, capital and technology. While the throughput is referring to the different processes that involved in organization such as transformation process within a system and the output is referring to the value-added output of the system. Lastly, feedback is referring to the information regarding the input that evaluates the adequacy of the output and objectives of the system.

This OST has been cited by many of previous studies such as Benton *et al.,* [45], Capps III and Hazen [46], Jin *et al.,* [47] and Thien and Nordin [48] in various field. As such, this study will adapt this theory as part of key basic theory due to the relationship between the variable construct namely input and output which fit and suited to the purpose of this study to show the link between the technology elements and performance of maritime industry. The input variable in this study will only focus on technology elements consisting of management information system functionality, intranet quality, information system integration, and network capability. Meanwhile, the output will be the performance of maritime industry in Malaysia. The relationship of three variables construct in OST has been illustrated in Figure 1. Therefore, based on literature review, to understand the link between technology elements performance of maritime industry in Malaysia, the following hypothesis is set up to be tested:

(i) H1 There is a positive relationship between management information system functionality and performance of maritime industry.
(ii) H2 There is a positive relationship between intranet quality and performance of maritime industry.
(iii) H3 There is a positive relationship between information system integration and performance of maritime industry.
(iv) H4 There is a positive relationship between network capability and performance of maritime industry.

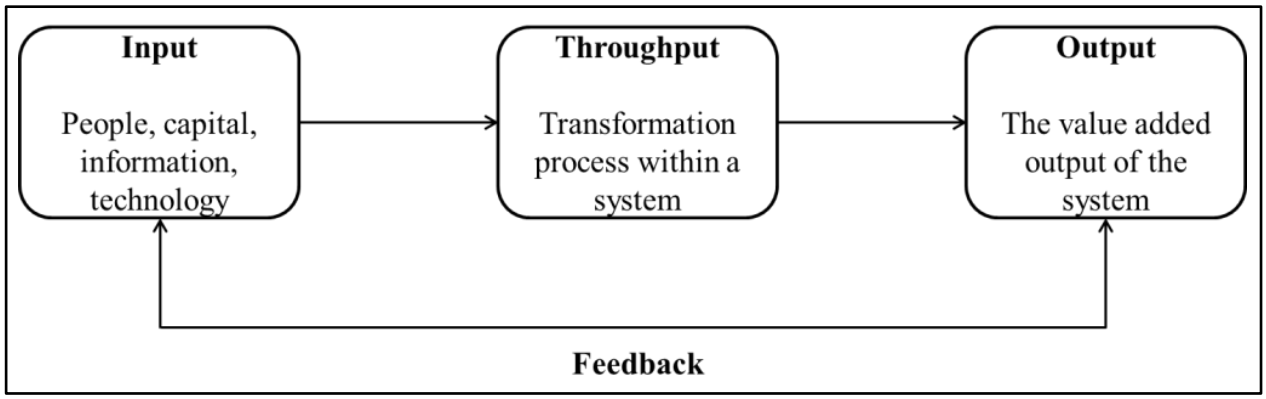

Fig. 1. Open system theory (OST) [1,2]

Deriving from OST, a proposed theoretical framework that designed for performance of maritime industry in Malaysia is developed. Figure 2 depicts the theoretical framework constructed based on the relationship between independent) variables and dependent variables.

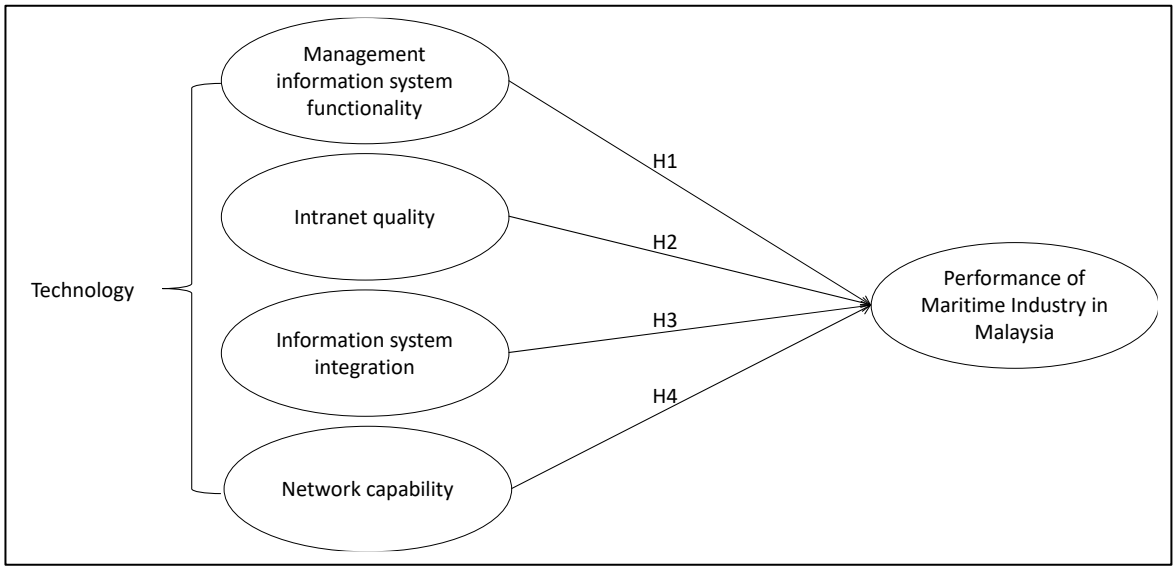

Fig. 2. Proposed theoretical framework

4. Methodology

To provide a better understanding of technology elements which can influence the performance of maritime industry, a comprehensive literature review has been conducted. The methodology was partially adapted from Dreyer *et al.,* [49]. Figure 3 shows the methodological steps of the research. The search was carried out using six research databases: Web of Science, Scopus, Science Direct, ProQuest, Emerald Insight and Google Scholar. In this study, the authors used advanced search for the database engines and basic search for Google and have focused on the following keywords:

(a) Technology in maritime industry
(b) Management information system AND Maritime industry
(c) Intranet quality AND Maritime industry
(d) Information system integration AND Maritime industry
(e) Network capability AND Maritime industry

A search was performed in the aforementioned databases in order to determine whether publications contained at least one of the search terms in the title or abstract. The criteria for including the article should be:

(a) peer-reviewed
(b) written in English
(c) clearly stated the objective of the study
(d) clearly stated the methodology used
(e) report the results
(f) articles were read several times to obtain a sense of the content.

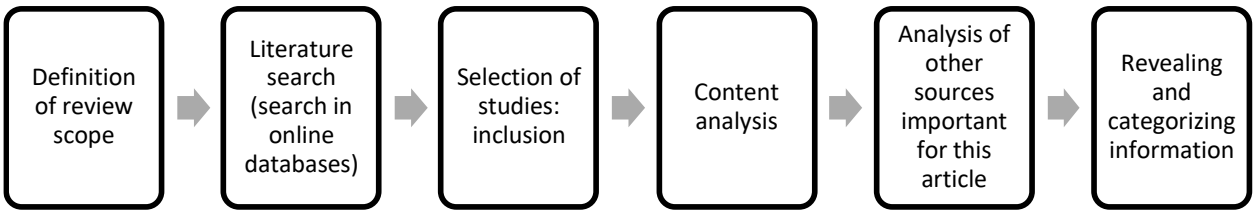

Fig. 3. Methodological steps

5. Conclusion and Future Research

In conclusion, the aim of this study is to propose the framework that may influence the performance of maritime industry in Malaysia by using Open System Theory (OST) by Von Bertalanffy [50] and Katz and Kahn [51]. However, it is still needs to discuss more depth in future.

This study examines the link between technology and the performance of the maritime industry in Malaysia. This study had identified four different factors under technology that may influence the performance of maritime industry in Malaysia. Therefore, there are four hypotheses that have been developed and have to be empirically tested. Furthermore, these hypotheses provide an opportunity for further investigation for researcher to examine through variety of research designs and settings. This is because, there were very limited existing literature that been discussed which related to the link between the technology and performance of maritime industry. Therefore, it may be the role of the maritime industry in Malaysia to initiate in considering these factors in order to enhance their organizational performance. This is because, management information system functionality, intranet quality, information system integration, and network capability may ultimately prove to be the most significant and compelling factors for them.

Besides, further researchers that intending to adopt the theory should also consider other variables that may influence the performance of PHE. The proposed theoretical framework in this study can be used as a benchmark for quality accreditation in the future. Last but not least, this study is expected to give relevant government agencies an insight into formulating new policies or strategies on issues related to maritime industry in Malaysia.

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