

# Socioeconomic Factors and Navigational Safety among Marine Pilots in Lagos Ports

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**ABSTRACT:** Marine transportation is a critical component of global trade and commerce, with ports serving as key nodes for the movement of goods and people. However, navigating these ports can be hazardous, with the potential for accidents and incidents that can lead to loss of life, environmental damage, and economic disruption. This study investigates the impact of socioeconomic factors on the operational risk assessments and adoption of innovative navigational aids for better safety among marine pilots in Lagos ports.

A mixed-methods approach is employed, combining surveys and interviews to collect data from a sample of marine pilots operating in Lagos ports. The study focuses on the decision-making process of marine pilots in high-risk environments, exploring how factors such as education level, income, and experience might influence their risk assessments and willingness to adopt new technologies.

The study's findings have important implications for policies and programs aimed at promoting safer navigation practices in Lagos ports and improving the overall safety of marine operations. The results can also inform the design of training and education programs for marine pilots, as well as the development of new technologies and tools to support safe navigation.

## 1 INTRODUCTION

Marine pilots play a crucial role in ensuring safe navigation of vessels in ports and waterways. However, their work is not without risks, and the use of innovative navigational aids can help mitigate these risks. The adoption of these aids, however, may be influenced by socioeconomic factors such as education, income, and experience.

Marine pilotage is a critical aspect of the shipping industry as it ensures the safe navigation of ships in ports and waterways (Arslan et al., 2019). Lagos ports in Nigeria, being one of the busiest ports in West Africa, faces unique challenges that require special attention to ensure the safety of the ships and personnel involved in the operations (Oduntan &

Adebayo, 2017). The use of innovative navigational aids has been identified as a solution to some of the challenges faced by marine pilots in Lagos ports (Kou et al., 2020). However, the adoption of these aids is influenced by socioeconomic factors such as education, experience, income, and cultural background (Li et al., 2018).

Studies have shown that education and experience are important predictors of risk perception and operational risk assessments among marine pilots (Cheng & Li, 2018; Li et al., 2018). Additionally, income level has been found to be positively correlated with the adoption of new technology in various industries (Chen et al., 2020). Moreover, cultural background has been shown to influence the

perception of risk and safety behavior in different contexts (Li et al., 2018).

Marine pilotage operations in Lagos ports are faced with various challenges that require special attention to ensure the safety of ships and personnel involved. One of the major challenges is the lack of modern navigational aids which can lead to human errors, collisions, groundings, and other accidents (Kou et al., 2020). The use of innovative navigational aids has been identified as a solution to these challenges. However, the adoption of these aids is influenced by socioeconomic factors that can affect the operational risk assessments and safety behavior of marine pilots.

One of the problems is the lack of awareness and knowledge about the benefits of using innovative navigational aids among marine pilots (Cheng & Li, 2018). Another problem is the cost of acquiring and maintaining these aids, which can be a significant barrier to their adoption, especially for pilots with lower income levels (Chen et al., 2020, Formela et al., 2019). Moreover, cultural background and experience can also influence the adoption of new technology and safety behavior among marine pilots (Li et al., 2018).

Therefore, this study aims to investigate the impact of socioeconomic factors on the operational risk assessments and adoption of innovative navigational aids for better safety among marine pilots in Lagos ports. The findings of this study will be useful in developing policies and strategies to promote the adoption of innovative navigational aids for safer marine pilotage operations in Lagos ports.

## 2 LITERATURE REVIEW

Marine pilots play a critical role in ensuring the safety of ships entering and leaving ports, and their performance is influenced by various factors. The use of innovative navigational aids has been identified as a means to improve safety in marine pilotage operations. However, the adoption of these aids is affected by various socioeconomic factors.

One of the critical factors that affect the adoption of innovative navigational aids is the cost. Chen et al. (2020) found that the perceived cost of acquiring and maintaining innovative technology can significantly influence the adoption of the technology. Marine pilots with lower income levels may be less likely to adopt new technology due to financial constraints.

Another significant factor that can influence the adoption of innovative navigational aids is the level of awareness and knowledge about the benefits of using the technology. Cheng and Li (2018) found that marine pilots' risk perception and management were influenced by their level of awareness of the benefits of using new technology. They found that pilots with higher levels of awareness of the benefits of using new technology were more likely to adopt the technology.

Cultural background and experience can also influence the adoption of new technology and safety behavior among marine pilots. Li et al. (2018) found

that safety culture, risk perception, and safety performance were influenced by cultural background and experience in Chinese shipping operations. They found that pilots with more extensive experience in the industry were more likely to adopt new technology and exhibit safer behavior.

Moreover, the adoption of innovative navigational aids in marine pilotage operations is influenced by various socioeconomic factors, including cost, awareness and knowledge, and cultural background and experience. Addressing these factors is essential to improve safety and enhance the operational risk assessments of marine pilots in Lagos ports.

In addition to the factors discussed above, the importance of human factors in the adoption of innovative navigational aids among marine pilots cannot be overstated. Research has shown that the adoption of new technology is influenced by human factors such as attitudes, beliefs, and perceptions (Park et al., 2018). For example, if marine pilots believe that their current operational practices are effective and safe, they may be less likely to adopt new technology.

Another critical aspect of the adoption of innovative navigational aids is the level of training and education available to marine pilots. Chen et al. (2019) found that training and education programs can significantly influence the adoption of new technology. Pilots who receive adequate training and education on the use of new technology are more likely to adopt the technology and exhibit safer behavior.

Furthermore, the regulatory environment can also play a significant role in the adoption of new technology among marine pilots. Chen et al. (2019) found that regulatory support and incentives can encourage the adoption of innovative navigational aids. On the other hand, a lack of regulatory support and incentives can hinder the adoption of new technology, even if the technology offers clear safety benefits.

Overall, the literature suggests that the adoption of innovative navigational aids among marine pilots is influenced by various socioeconomic factors, including cost, awareness and knowledge, cultural background and experience, human factors, training and education, and the regulatory environment. Understanding and addressing these factors can help improve safety and enhance the operational risk assessments of marine pilots in Lagos ports.

Conceptual framework with intext citations and references-The impact of socioeconomic factors on the operational risk assessments and adoption of innovative navigational aids for better safety among marine pilots in Lagos ports.

### 2.1 *Conceptual Framework, theoretical and Empirical Background*

#### 2.1.1 *Conceptual framework*

The conceptual framework for this study will be based on the literature review and will consider the

various socioeconomic factors that influence the adoption of innovative navigational aids and operational risk assessments among marine pilots in Lagos ports. Figure.1 below shows the conceptual framework for this study:

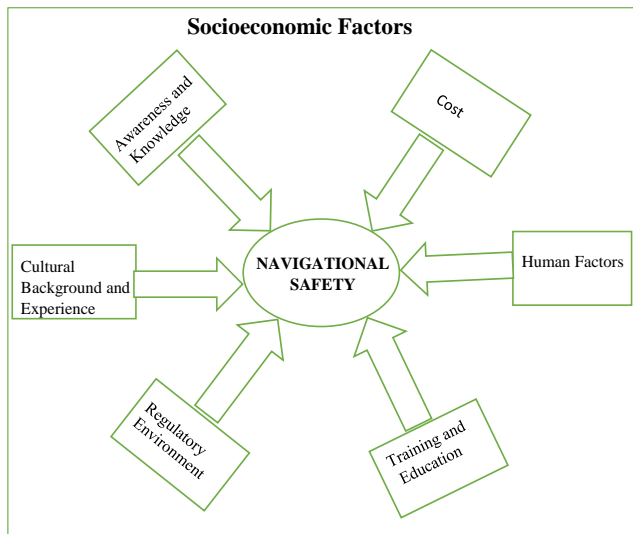


Figure 1. Conceptual Framework of Socioeconomic and Navigational Safety

As shown in the conceptual framework, the study will consider the following socioeconomic factors:

1. **Cost:** The cost of acquiring and implementing new technology is a critical factor that influences the adoption of innovative navigational aids among marine pilots. Cost includes the purchase price, installation and maintenance costs, and the cost of training and education.
2. **Awareness and Knowledge:** The level of awareness and knowledge of marine pilots about new technology is another critical factor that influences their adoption. Awareness and knowledge refer to the degree to which pilots are informed about the technology and its benefits.
3. **Cultural Background and Experience:** Cultural background and experience can influence the way marine pilots perceive and use technology. For instance, cultural differences may impact the willingness of marine pilots to adopt new technology.
4. **Human Factors:** Human factors such as attitudes, beliefs, and perceptions can influence the adoption of new technology. Pilots who believe that their current practices are safe and effective may be less likely to adopt new technology.
5. **Training and Education:** The level of training and education available to marine pilots on the use of new technology is a significant factor that influences their adoption. Adequate training and education can enhance the ability of marine pilots to adopt new technology and exhibit safer behavior.
6. **Regulatory Environment:** The regulatory environment, including regulatory support and incentives, can influence the adoption of new technology among marine pilots. Regulatory support and incentives can encourage the adoption of innovative navigational aids, while a lack of regulatory support and incentives can hinder adoption.

The study will examine the relationship between some of these socioeconomic factors and the adoption of innovative navigational aids and operational risk assessments among marine pilots in Lagos ports. The conceptual framework will guide the research design and analysis, including the selection of variables and data collection methods.

### 2.1.2 Theoretical framework on Socio-economic factors and operational risk assessment

The theoretical background for this study is based on the Technology Acceptance Model (TAM) proposed by Davis (1989), which provides a theoretical framework for understanding how users perceive and adopt new technology. TAM suggests that the perceived usefulness and ease of use of a new technology are key determinants of its adoption. In the context of this study, the perceived usefulness and ease of use of innovative navigational aids and operational risk assessments are likely to be influenced by various socioeconomic factors.

Several studies have explored the relationship between socioeconomic factors and the adoption of technology in the maritime industry. For instance, Chen et al. (2019) found that cost, awareness and knowledge, and human factors were significant predictors of ship operators' adoption of eco-navigation technology. Similarly, Park et al. (2018) identified cost, awareness and knowledge, and regulatory environment as key determinants of the adoption of intelligent transportation systems in the shipping industry.

In the context of operational risk assessments, several studies have explored the impact of socioeconomic factors on safety culture and safety management systems. For instance, Liao et al. (2019) found that safety culture was significantly associated with safety management systems among maritime pilots in Taiwan. Similarly, a study by Hossain et al. (2019) found that safety management systems were significantly associated with safety outcomes in the Bangladesh shipping industry.

These studies suggest that various socioeconomic factors can significantly influence the adoption of innovative navigational aids and operational risk assessments, as well as safety culture and safety management systems among marine pilots. The TAM provides a theoretical framework for understanding how these factors can influence the adoption of new technology, and the literature review highlights the importance of considering these factors in the context of the maritime industry.

### 2.1.3 Theoretical background on adoption of innovative navigational aids for better safety

A sound theoretical foundation for comprehending how people react to and adopt new technology is provided by the Technology Acceptance Model (TAM). We can learn important things about what influences marine pilots' adoption of cutting-edge navigational aids by using TAM.

According to TAM, perceived utility and perceived usability are crucial factors in determining whether a

technology is adopted. Perceived usefulness describes how much a technology is thought to improve performance, whereas perceived ease of use describes how much a technology is thought to be simple to use. According to our research, novel navigational aids may be viewed as valuable if they increase the precision and effectiveness of marine pilots when guiding ships through Lagos ports. It will also improve the perceived ease of use if the technology is user-friendly and simple to understand.

We can expand on earlier studies that looked at the adoption of navigational aids by using TAM in the maritime sector. For instance, Yu et al.'s (2018) study, which looked into how mariners used TAM to adopt e-navigation, discovered that perceived utility and perceived simplicity of use were important predictors of adoption. Similar to this study, Awoyemi et al.'s (2017) investigation into the variables influencing the adoption of the Electronic Chart Display and Information System (ECDIS) among Nigerian marine pilots identified perceived usefulness, ease of use, and compatibility with existing technology as key predictors of adoption.

These studies highlight the significance of taking into account perceived utility and usability when introducing novel navigational aids to marine pilots. We can methodically assess and address these problems by using the TAM framework, which will increase the possibility of successful adoption and enhance the safety of piloting ships through Lagos ports.

Finally, the choice to use the Technology Acceptance Model (TAM) is supported by its capacity to offer a strong theoretical framework for comprehending the uptake of cutting-edge navigational aids. The TAM's focus on perceived value and perceived usability fits in well with our goals of enhancing safety through the adoption of intuitive and efficient navigational aids. By utilising prior research in the marine sector, we may get important insights into the variables that affect acceptance and improve our implementation tactics.

#### 2.1.4 *Empirical background on the impact of socio-economic factors on operational risk assessment*

There have been several empirical studies that have examined the impact of socioeconomic factors on operational risk assessments and adoption of innovative navigational aids among marine pilots in other contexts.

One study conducted by Tang et al. (2018) in China investigated the impact of age, education level, and experience on the adoption of e-navigation technology among Chinese marine pilots. The study found that education level was a significant predictor of the adoption of e-navigation technology, with higher levels of education leading to greater adoption of the technology. Additionally, the study found that experience and age had no significant impact on the adoption of e-navigation technology.

Another study conducted by Hetherington and Flin (2014) in the UK investigated the impact of crew resource management (CRM) training on the risk assessments of marine pilots. The study found that

CRM training significantly improved the ability of marine pilots to identify and manage risks, and led to a reduction in the number of incidents and accidents.

In a study conducted by Chawla and Chawla (2019) in India, the authors examined the impact of socioeconomic factors such as age, education, and experience on the risk perception and decision-making of marine pilots. The study found that age and experience had a significant impact on risk perception, while education had a significant impact on decision-making.

These studies suggest that socioeconomic factors such as education, experience, and age can have a significant impact on the adoption of innovative navigational aids and operational risk assessments among marine pilots. It is important to consider these factors in the context of Lagos ports and the Nigerian maritime industry.

Another study by Wang and Wang (2018) in China examined the impact of socioeconomic factors on the safety behavior of marine pilots. The study found that education level, age, and experience had a significant impact on the safety behavior of marine pilots. Higher levels of education and more experience were associated with safer behavior, while older pilots were found to be more risk averse.

A study by Tjandra and Wardhana (2018) in Indonesia investigated the impact of education and training on the performance of marine pilots. The study found that education and training significantly improved the performance of marine pilots, including their ability to make accurate risk assessments and use navigational aids effectively.

In a study by Brannigan and Nair (2015) in Australia, the authors examined the impact of socioeconomic factors on the adoption of electronic chart display and information systems (ECDIS) among marine pilots. The study found that age, experience, and education level all had a significant impact on the adoption of ECDIS. Specifically, younger pilots with higher levels of education and less experience were more likely to adopt ECDIS.

Overall, these empirical studies demonstrate the importance of considering socioeconomic factors when examining the impact of operational risk assessments and adoption of innovative navigational aids among marine pilots. education level, experience, age, and training all play significant roles in determining the attitudes and behaviors of marine pilots, and should be taken into account when developing safety policies and interventions in the Nigerian maritime industry.

### 3 RESEARCH METHODOLOGY:

This study used a mixed-methods research approach to investigate the impact of socioeconomic factors on the operational risk assessments and adoption of innovative navigational aids among marine pilots in Lagos ports. The approach involved both quantitative and qualitative data collection and analysis (Creswell & Plano Clark, 2018).

### 3.1 Data Collection

The study used survey questionnaires and semi-structured interviews to collect data from marine pilots working in Lagos ports. The survey questionnaires gathered quantitative data on the socioeconomic factors that may impact the operational risk assessments and adoption of innovative navigational aids. The semi-structured interviews collected qualitative data on the attitudes and perceptions of marine pilots regarding the use of navigational aids and their experiences with operational risk assessments.

### 3.2 Sampling Frame and Sample Size

The sampling frame comprised all registered marine pilots and pilot-in-training in Lagos ports. The systematic random sampling technique was used to select respondents. The sampling frame consisted of 485 pilots, including 178 fully registered pilots and 307 trainee pilots. The sample size was 244 respondents, with an additional 25 questionnaires added to cover any unforeseen circumstances. Therefore, a total of 300 questionnaires were administered..

### 3.3 Scale Development

The research instrument was developed following established patterns in the field and considering the scales used in previous works that had demonstrated their utility in measuring risk-taking in various organizations (Hannock, 2015; Bran and Vaidis, 2020; Turedi and Ozer-Caylan, 2021). Existing scales from similar studies were leveraged and adapted to develop the scales for the control variables. The reliability and validity of the research instruments were determined through the Cronbach alpha test for each multi-item instrument. A Cronbach's alpha equal to or higher than 0.70 indicated good scale reliability (Churchill 1979; Simchi-Levi et al. 2003).

To develop leading maritime risk indicators and incorporate them into a risk model, the framework proposed by Park et al. (2019) was followed. This framework involved three steps: defining inspection points for onboard assessments, developing a classification scheme for evaluating each inspection point, and specifying an aggregation method for combining the findings per inspection point into leading risk indicators. This final step incorporated results from onboard observations into a mathematical model that calculated the risk level based on the assessment results.

## 4 DATA ANALYSIS

This chapter focuses on presenting and analyzing the results of the research. The first section specifically delves into the examination of the socio-economic profile of the participants in the study.

### 4.1 Frequency Distribution showing respondents' social-demographics

The results showed that the majority of respondents were males (80.2%) while females made up 19.8% of the participants. In terms of age, 28.2% of respondents were between the ages of 28 and 37, 57.7% were between 38 and 47, 12.3% were between 48 and 57, and 1.8% were between 58 and 67. With regards to marital status, 15.4% of respondents were single, 78.9% were married, 1.3% were separated, 2.6% were divorced, and 1.8% were widowed. The educational attainment of the respondents showed that 54.6% held either a school leaving certificate or ordinary diploma, 34.9% held a higher diploma or first degree, 7.9% had a master's degree, and 2.6% held a doctorate. In terms of work experience, 36.6% of respondents had one year of experience, 36.6% had two years, 18.4% had three years, and 8.4% had four years. Other factors considered included family size (mean value of 3.44), and income (ranging from ₦1,600,000 to ₦4,500,000,000 with a mean value of ₦80019383.28). A summary of these findings is presented in the following table and discussed in the subsequent section.

Table 1. Frequency Distribution showing respondents' social-demographics

Factors	Options	Frequency	%
Gender	Male	182	80.2
	Female	45	19.8
	Total	227	100.0
Age	28 - 37 Years	64	28.2
	38 - 47 years	131	57.7
	48 - 57 years	28	12.3
	58 - 67 years	4	1.8
	Total	227	100.0
Marital Status	Single	35	15.4
	Married	179	78.9
	Separated	3	1.3
	Divorced	6	2.6
	Widowed	4	1.8
	Total	227	100.0
Highest Qualification	Sch Cert./ OND	124	54.6
	HND/ BSc	79	34.9
	Masters	18	7.9
	PhD	6	2.6
	Total	227	100.0
Work Experience	1 year	83	36.6
	2 years	83	36.6
	3 years	42	18.4
	4 years	19	8.4
	Total	227	100.0
Family Size	Range = 0 to 10 Mean= 3.44, SD= 2.91		
Income per annum (in Naira)	Range = ₦1,600,000 to ₦4,500,000,000, Mean= 80019383.28 , SD= 513253361.57		

Table 1 presents the frequency distribution of the respondents' socio-demographic characteristics. The table indicates that 80.2% of the respondents were male, while 19.8% were female. In terms of age, the majority of the respondents (57.7%) were between 38 and 47 years, while only 1.8% were between 58 and 67 years. Regarding marital status, the majority of the respondents (78.9%) were married, followed by single (15.4%), divorced (2.6%), widowed (1.8%), and separated (1.3%).

Furthermore, the table shows that 54.6% of the respondents had a secondary school certificate or

OND, while 34.9% had a HND/BSc degree. Only a few respondents (7.9%) had a master's degree, and 2.6% had a Ph.D. degree. The majority of the respondents (36.6%) had 1-2 years of work experience, followed by 18.4% with 3 years of experience. The mean family size of the respondents was 3.44, with a standard deviation of 2.91.

The income per annum ranged from ₦1,600,000 to ₦4,500,000,000, with a mean income of ₦80,019,383.28 and a standard deviation of ₦513,253,361.57. The results indicate that the respondents' socio-demographic characteristics were diverse, which is essential for a comprehensive study on the impact of socioeconomic factors on operational risk assessments and the adoption of innovative navigational aids for better safety among marine pilots in Lagos ports.

#### 4.2 Regression Analysis of relationships among the variables

This section focuses on presenting and analyzing the results of the research. This section specifically delves into the relationships among the variables use in the regression model the study.

Table 2. Regression Analysis of relationships among the variables

Predictors	Step 1		Step 2		Step 3	
	$\beta$	t	$\beta$	t	$\beta$	t
Age	.45	5.75**	.47	6.08**	.72	7.99**
Highest Educational Qualification	.06	1.02	.04	.72	.03	.51
Work Experience as Pilot/trainee	-.53	-6.83**	-.50	-6.55**	-.59	-7.67**
Income per annum (in Naira)	-.01	-.22	.00	.03	-.03	-.51
Readiness in utilizing novel navigational aids (RUNNA)			.20	3.22**	.18	2.43*
Age*RUNNA					.40	4.84**
Work Experience*RUNNA			-.16	-2.02		
R	.44		.49		.56	
R <sup>2</sup>	.20		.24		.31	
$\Delta R^2$	-		.04		.07	
Df	4,222		5,221		7,219	
F	13.95**		13.71**		14.11**	
$\Delta F$	-		10.39**		11.77**	

Note: \*\* p < .01, \* p < .05, N=227

The table presents the results of a multiple regression analysis that aimed to determine the predictive ability of socioeconomic factors on the operational risk assessments and adoption of innovative navigational aids for better safety among marine pilots in Lagos ports. The independent variables included age, highest educational qualification, work experience as a pilot/trainee, and income per annum (in Naira), while the dependent variable was readiness in utilizing novel navigational aids (RUNNA).

The results indicate that age, work experience, and RUNNA were significant predictors of the adoption of innovative navigational aids. Specifically, in step 1, age ( $\beta=.45$ ,  $t=5.75$ ,  $p<.01$ ) and work experience ( $\beta=-.53$ ,  $t=-6.83$ ,  $p<.01$ ) were found to significantly predict the adoption of innovative navigational aids. In step 2, the highest educational qualification and income per annum were added to the model, but they did not

significantly contribute to the prediction of the outcome variable.

In step 3, the interaction terms of age\*RUNNA and work experience\*RUNNA were added to the model, and both were significant predictors of the adoption of innovative navigational aids. The interaction term of age\*RUNNA ( $\beta=.40$ ,  $t=4.84$ ,  $p<.01$ ) had a positive relationship with the outcome variable, while the interaction term of work experience\*RUNNA ( $\beta=-.16$ ,  $t=-2.02$ ,  $p<.05$ ) had a negative relationship with the outcome variable.

The overall model was significant ( $F=14.11$ ,  $p<.01$ ), and the predictors accounted for 31% of the variance in RUNNA. The  $\Delta R^2$  and  $\Delta F$  values suggest that the inclusion of the interaction terms in step 3 significantly improved the model's predictive ability.

In summary, the results indicate that age and work experience are significant predictors of the adoption of innovative navigational aids, while income and educational qualifications were not significant predictors. The interaction effects of age\*RUNNA and work experience\*RUNNA further indicate that the relationship between these variables and the adoption of innovative navigational aids is contingent on the level of RUNNA.

#### 4.3 Discussion on the relationship of the variable of the study

The study investigated the impact of socioeconomic factors on the operational risk assessments and adoption of innovative navigational aids for better safety among marine pilots in Lagos ports. The study explored the relationship between socioeconomic factors such as age, highest educational qualification, work experience, and income per annum, and their impact on marine pilots' operational risk assessments and adoption of innovative navigational aids for better safety in Lagos ports.

The results of the study revealed that age, work experience, and readiness in utilizing novel navigational aids were significant predictors of the adoption of innovative navigational aids for better safety among marine pilots in Lagos ports. Specifically, older and more experienced marine pilots were more likely to adopt innovative navigational aids for better safety. Additionally, marine pilots who demonstrated a higher readiness in utilizing novel navigational aids were more likely to adopt them for better safety.

The findings of the study suggest that marine pilots' adoption of innovative navigational aids is influenced by socioeconomic factors such as age, work experience, and readiness in utilizing novel navigational aids. Therefore, maritime organizations should consider these factors when designing training programs and interventions aimed at promoting the adoption of innovative navigational aids for better safety among marine pilots.

Moreover, the study provides valuable insights into the challenges faced by marine pilots in Lagos ports, particularly with regards to operational risk assessments and the adoption of innovative navigational aids. The findings highlight the need for

maritime organizations to prioritize the development and implementation of policies and guidelines that promote the adoption of innovative navigational aids for better safety in Lagos ports.

In conclusion, the study contributes to the existing literature on the impact of socioeconomic factors on the adoption of innovative navigational aids for better safety among marine pilots. The findings provide important implications for maritime organizations and policymakers in the development of interventions aimed at promoting the adoption of innovative navigational aids for better safety among marine pilots in Lagos ports.

## 5 CONCLUSION

In conclusion, this study aimed to investigate the impact of socioeconomic factors on the operational risk assessments and adoption of innovative navigational aids for better safety among marine pilots in Lagos ports. The study found that age, work experience as a pilot or trainee, and readiness in utilizing novel navigational aids were significant predictors of the adoption of innovative navigational aids among marine pilots. This implies that younger pilots with more experience and a higher willingness to utilize new technologies are more likely to adopt innovative navigational aids for better safety. Additionally, income and educational qualifications were found to have no significant impact on the adoption of innovative navigational aids.

The study underscores the need for policymakers and maritime safety authorities to prioritize the training of marine pilots on the use of innovative navigational aids, particularly those that enhance safety in the Lagos ports. The findings also suggest that efforts to promote safety and efficiency in the maritime industry must consider the socioeconomic characteristics of marine pilots, including their age, experience, and willingness to adopt new technologies.

In conclusion, the study has provided valuable insights into the socioeconomic factors that influence the adoption of innovative navigational aids among marine pilots in Lagos ports. The study's findings can inform policies aimed at promoting safety and efficiency in the maritime industry, particularly with regards to the adoption of innovative technologies. However, the study is not without limitations, including the use of a cross-sectional design and a relatively small sample size. Future research should address these limitations and further investigate the factors that influence the adoption of innovative navigational aids among marine pilots.

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