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## Implementation of maritime single window: selected case studies

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**IMPLEMENTATION OF MARITIME SINGLE WINDOW:  
SELECTED CASE STUDIES**

**CECIL DUMEBI OGUNLESI**

A dissertation submitted to the World Maritime University in partial fulfilment  
of the requirements for the award of the degree of Master of Science in  
Maritime Affairs

2023

## Declaration

I certify that all the material in this dissertation that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views, and are not necessarily endorsed by the University.

(Signature): 

(Date): **25<sup>th</sup> September, 2023**

Supervised by: **Associate Professor Aref Fakhry**

Supervisor's affiliation: **World Maritime University**

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Finally, I extend my gratitude to all my friends back home and colleagues at the World Maritime University who have supported me through this journey and held my hand, ensuring that i continued pushing to the end.

## Abstract

Title of Dissertation: **Implementation of Maritime Single Window: Selected Case Studies**

Degree: **Master of Science**

Transportation of goods by sea has been argued to be the mode through which the majority of goods are transported globally. Hence, there is a large volume of maritime activity that occur between many different parts of the world, from port to port.

This important sector is time-sensitive because the more time spent at the port for cargo discharge, the more the cost of fueling, port charges, chartering costs, and many other operating costs. However, the documentation required while at port is enormous because various government agencies require different documentation processes to be done at port including customs, ports authority, immigration, port health, amongst others for border control, economic revenue, safety, and security.

These many documentations cause ships to spend lots of time at ports, thereby expending a lot of money. This became a global problem which led to the birth of the maritime single window as a solution to reduce vessel's time at port and expedite required documentation in ports.

Understanding this problem, the core objectives of this study are to assess the implementation of maritime single window in different countries, identify common trends and best practices, highlight challenges faced, and recommend guidelines and suggestions for other nations venturing into maritime single window implementation. Through

To achieve this, the dissertation utilizes extensive research and cross-case analysis, to unveil crucial findings by delving into the comprehensive exploration of maritime single window implementations across seven nations, aiming to offer valuable insights and recommendations for

countries seeking to establish or enhance their own maritime single window. The research encompasses case studies from Antigua and Barbuda, Ghana, Kenya, the Netherlands, Turkey, Panama, and Singapore.

Moreover, the research identifies several challenges that these nations encountered during maritime single window implementation, including legal framework alignment, technical obstacles, and change management. Insights into the strategies employed to address these challenges reveal valuable lessons that can guide other countries in their maritime single window journeys.

Findings from this research underscore the significance of trade facilitation as the primary driving force behind maritime single window adoption in all nations, emphasizing streamlined administrative processes, reduced paperwork, enhanced transparency, and efficiency in support of economic growth.

The concluding chapters examine the results of the research and discuss the guidelines and best practices for countries intending to implement maritime single window.

**KEYWORDS:** Maritime single window, legal framework, change management, maritime trade.

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## List of Abbreviations

API – Application Programming Interface

BIMCO – Baltic and International Maritime Council

COMESA – Common Market for Eastern and Southern Africa

EAC – East African Community

FAL – Convention on Facilitation of International Maritime Traffic

IAPH – International Association of Ports and Harbors

IMO – International Maritime Organization

ITCP – Integrated Technical Cooperation Programme

JIT – Just-In-Time

MPA – Maritime Port Authority

MSW – Maritime Single Window

NCA – Norwegian Coastal Administration

NSW – National Single Window

RDM – Reference Data Model

RFD – Request for Development

SSNN – Safe Sea Net Norway

SWIFT – Single Window for Facilitation Trade

SWS – Single Window Systems

TAM – Technology Acceptance Model

TFA – Trade Facilitation Agreement

UN – United Nations

UNCITRAL – United Nations Commission on International Trade Law

UNECE – United Nations Economic Commission for Europe

UNCEFACT – United Nations Centre for Trade Facilitation and Electronic Business

UTAUT – Unified Theory of Acceptance and Use of Technology

WCO – World Customs Organization

WTO – World Trade Organization

## Chapter 1- Introduction

The majority of global trade relies on maritime transportation, involving numerous stakeholders who collaborate to ensure the smooth delivery of goods to their intended destinations. Consequently, maritime trade necessitates extensive documentation to meet the requirements of various involved parties, posing a historical challenge to efficient trade facilitation.

Numerous data-driven demands also confront the maritime sector today. Port authorities harness real-time data from the entire transportation ecosystem to optimize capacity, energy usage, and throughput. Customers increasingly expect instant updates on cargo locations and delivery schedules. Additionally, environmental and safety concerns impose new reporting obligations. As digital data transcends multiple domains, it becomes evident that a single technical standard cannot comprehensively support these functions or unlock the full potential of digitalization (Cauwer et al., 2021). Consequently, the maritime sector must strive for solutions that facilitate intelligent and seamless data exchange among all relevant parties. One way to achieve this is by using maritime single window, which brings about significant improvements.

The constant rise in commercial activity can be attributed to the modernization of economies, the advancement of technologies, and most crucially, the lowering or removal of trade barriers (Ma, 2020). Notably, the reduction of obstacles to trade has played a crucial role in this growth. The global economy has become more open and interconnected due to agreements that have lessened artificial trade barriers, particularly those related to trade policies (Ndonga, 2015).

However, cross-border trade has gotten increasingly complicated despite efforts to reduce both artificial and natural obstacles associated with transaction processes (Duval & Utoktham, 2011). Since cargo owners must submit trade documents to numerous authorities at different stages of clearance, export and import compliance requirements government permits, approvals, licenses, inspections, and customs clearance continue to hinder trade facilitation (UNCEFACT, 2005). The pressing need for trade facilitation to accommodate shippers' demand for just-in-time deliveries has also worsened the situation for both importers and exporters.

In response to these inefficiencies, nations and international bodies were compelled to explore methods for digitalizing and automating administrative processes within the maritime domain. Moreover, for many years, the maritime industry has acknowledged the necessity for efficient data exchange and streamlined procedures, prompting a more focused effort to establish a centralized platform like maritime single window.

Subsequently, UNECE (2016) points out that the United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT) proposed a solution in 2005 for the United Nations Economic Commission for Europe (UNECE) called the "Single Window System" to expedite unifying and standardize international trade procedures, including information interchange between firms and governments and between government levels.

According to the UNECE, the single window "enables parties participating in trade and transportation to register standardized data and documentation via a single-entry point to meet all import-export, transit-related and customs regulatory obligations." Thus, if provided electronically, each portion only has to be submitted once as the single window is a viable trade facilitation tool that may rapidly reduce non-tariff trade barriers for all traders (UNCEFACT, 2015).

To simplify and speed up international maritime trade, the United Nations through the International Maritime Organization (IMO) developed the Convention on Facilitation of International Maritime Traffic (FAL Convention) to cut down on the burdensome procedures and paperwork associated with shipping. The Facilitation Committee developed standards and guidelines to promote the maritime single window implementation which will assist in eliminating needless delays in maritime traffic, facilitate government collaboration, and provide the greatest possible degree of consistency in formalities and other procedures, all of which are vital to the success of data sharing in maritime transport (IMO, n.d.).

Maritime single window is regarded as a transformative solution to the problems of paper-based administrative systems and a digital platform meant to reduce maritime industry administrative processes, increase productivity, and promote information sharing (Tijan et al. 2019; Niculescu & Minea, 2016). It facilitates transparent and efficient port transactions between government and corporate organizations, reduces corruption, and ensures the port's efficiency by easing transactions between shippers, port stakeholders, and a plethora of maritime professional services which are all integral parts of the maritime transport industry (Kos et al., 2017). Thus, numerous governments have created or are creating a "one window" system to simplify importing and exporting.

## **1.1 Problem Statement**

International trade relies on ports and shipping. According to statistics, more than 80% of global trade is shipped by sea, with two-thirds of it in developing nation ports (UNCTAD, 2021). Paper-based documentation, manual interventions, and many stakeholder interactions have traditionally characterized maritime administrative processes. This strategy typically resulted in time-consuming procedures, increased costs, errors, and restricted transparency (Rodseth et al., 2011). Additionally, ports and other maritime

infrastructure were congested, delayed, and inefficient due to the global trade volume's exponential growth. The lack of a centralized platform made it difficult to manage and monitor commodities, maintain regulatory compliance, and make timely decisions (Rodseth et al., 2011).

Furthermore, recent amendments to the FAL Convention brought about a mandatory rule for the implementation of maritime single window for data exchange in ports around the world by 1<sup>st</sup> January 2024. The significant digitization advancement in shipping poses uncertainties regarding non-compliance implications. Lengthy manual processes at ports may reduce productivity and increase business costs, potentially leading to port boycotts in a competitive shipping market. Given the acceleration towards complete shipping digitization after the COVID-19 pandemic, the adoption of maritime single window is now a vital necessity not merely an option. With maritime trade facilitation being critical to global supply chains, the IMO member states bound by the FAL Convention must be fully prepared for the mandatory implementation of the maritime single window.

Therefore, this research takes on significant importance as it addresses the issues related to maritime single window implementation by investigating case studies and best practices from diverse countries where maritime single window have been successfully implemented. The challenges and barriers encountered during the deployment of maritime single window, including issues related to data security, interoperability, and regulatory harmonization will be explored. This study also highlights strategies for overcoming these hurdles and ensuring the effective adoption of maritime single window.

## **1.2 Research Objectives, Questions and Significance**

This research aims to analyze case studies to understand the effective implementation of maritime single window in the maritime sector, its benefits, and drawbacks. The specific

objective of this research is to recommend suggestions and guidelines for the countries seeking to establish or improve maritime single window.

This objective will be attained by addressing the research questions listed below:

1. What are the key challenges and barriers that countries face when implementing maritime single window?
2. What strategies can be developed to address these challenges effectively while ensuring successful adoption?
3. How can insights from one country's maritime single window implementation guide other nations looking to establish or improve their own systems?

The significance which achieving the research objectives and answering the research questions will establish by delving into the intricacies of maritime single window implementation cannot be overstated, as it serves to illuminate how this innovation can bring about positive effects for industry professionals, nations, stakeholders, and researchers alike.

The outcomes of this study will furnish valuable insights to stakeholders within the trade facilitation, shipping, and logistics sectors. These insights will aid in tackling challenges and in the development of a knowledge repository for future endeavors related to the implementation of maritime single window.

Countries also stand to reap substantial benefits from the incorporation of maritime single window. By facilitating international trade, maritime single window enhances a nation's appeal for global commerce and investments. This study will serve as a guide for countries that have yet to implement maritime single window.

Lastly, the realm of academic exploration pertaining to maritime single window systems and their implementation is an area teeming with potential research opportunities. Dissertations within this domain contribute to the scholarly body of knowledge by scrutinizing the intricacies of maritime single window. This research not only advances academic discourse but also furnishes invaluable insights into the practices and policies encircling maritime single window.

### **1.3 Structure of the Research**

The implementation of maritime single window in the maritime industry is covered in five interrelated chapters in this study.

The introduction chapter gives a brief explanation of maritime single window implementation's origins and justification. It describes the research objectives and the importance of studying maritime single window uptake in the maritime sector. This chapter emphasizes the research topic's importance in fostering international trade and effective administrative operations.

The second chapter reviews various literature and critically analyses research on maritime single window, trade facilitation, technology adoption, and organizational dynamics. A theoretical basis for the research is provided by a comprehensive synthesis of pertinent ideas, concepts, and empirical findings. This chapter points out gaps and limitations in the literature on maritime single window implementation, underlining the need for more research.

Chapter three discusses the study's research design, case study strategy, and data-gathering procedures. The chapter deliberates why case studies from different countries were chosen and how they were chosen. The findings in this research are strengthened by offering a transparent and rigorous methodological approach.

In chapter four, selected case studies that implemented maritime single window systems are analyzed by examining implementation, impact on trade and logistics, challenges and lessons learned. Cross-case study reveals common themes and patterns, improving maritime single window implementation dynamics understanding.

Chapter five is the discussion chapter which examines a detailed comparative analysis of the findings from the case studies in the preceding chapter, discusses the answers to the research questions, and analyzes the theoretical and practical contributions of the research.

The sixth chapter summarizes the research main findings, recommendations, and directions for further research. It summarizes the main findings, reviews the research aims and questions, and draws inferences from the data offered in the previous chapters.

## Chapter 2- Literature Review

### 2.1 Introduction

The previous research introduced this research, discussing the background, problem statement aims and objectives, significance, and contribution of the research, and structure of the research. This chapter will further highlight major topics, trends, and gaps in existing literature to guide future studies and help understand maritime single window deployment and its influence on the maritime industry.

In order to critically analyze and give factual answers to the research objectives, there is a need to examine existing literature relating to maritime single window and its implementation in some nations to serve as a foundation and premise upon which this research is built. This literature analysis was conducted to look at the body of knowledge and previous research that will provide reliable information to aid in making decisions and address the research objectives.

According to Tijan et al. (2019), the maritime sector holds a pivotal role in the realm of global trade and economic expansion. Their emphasis lies in the imperative need for efficient administrative procedures within ports to ensure the seamless and punctual flow of goods, given that a substantial portion of global cargo relies on maritime transportation. This intricate web of administrative tasks involves the concerted efforts of shipping companies, port authorities, customs officials, and government bodies, collectively contributing to the maritime industry's operational intricacies.

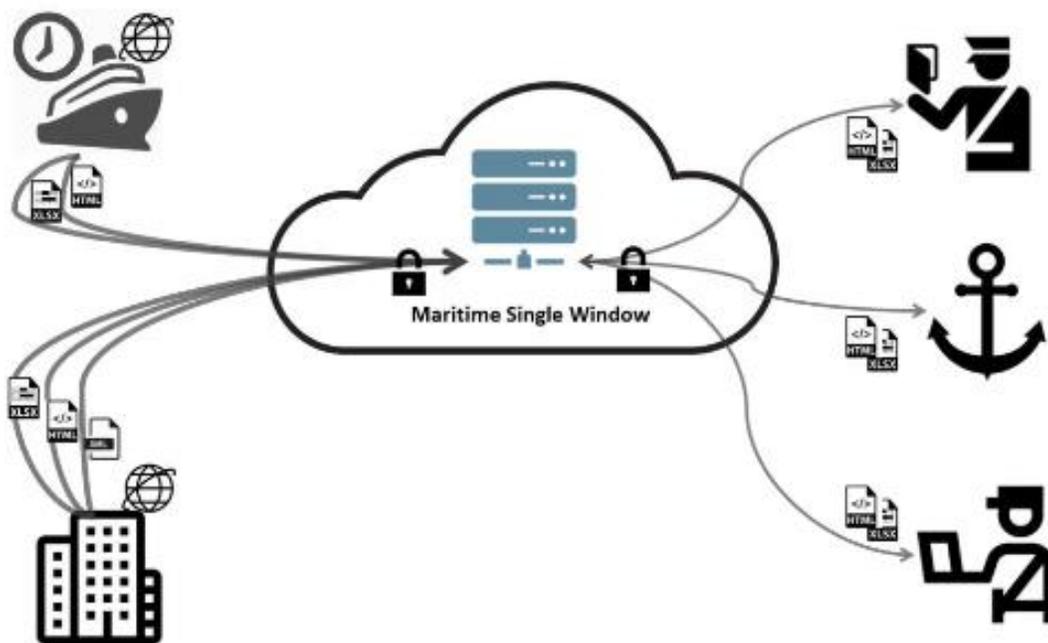
However, these administrative processes have often been plagued by inefficiencies, leading to undesirable consequences such as escalated costs, disruptions in supply chains,

and a deceleration in economic growth. To address these formidable challenges, maritime single window has been conceived and developed.

The maritime single window, as elucidated by Vasileva and Ahmed (2020), represents a paradigm shift in how documents and data are handled. This innovative system serves as a digital conduit for the acceptance, exchange, and processing of all maritime-related information. The maritime single window's primary function is to obviate the need for cumbersome paperwork, labor-intensive manual interventions, and the perennial issue of information flow bottlenecks among various stakeholders by providing them with a singular point of entry, thereby harmonizing and simplifying the multifaceted operations inherent to the maritime industry.

## **2.2 Conceptual Model**

The diagram presented below illustrates a conceptual architectural model that outlines the composition and functioning of the maritime single window. The conceptual model demonstrates that the maritime single window comprises of an environment in which providers of ship-related data can electronically submit information through either a user interface or a system-to-system interface (IMO, 2021). This information undergoes digitization, and each specific data element is submitted only once.



*Figure 1: Maritime Single Window Conceptual Architecture*

*Source: (IMO, 2021)*

Figure 1 provides a visual representation of the information exchanges occurring within the maritime single window. These exchanges encompass activities like the submission of data by the shipping sector (e.g., agent or shipmaster) and the reception of decisions from authorities. Additionally, it illustrates the dissemination of received information to the relevant authorities and the submission of their determinations back to the shipping sector.

### **2.3 Understanding Trade Facilitation and its Significance in the Maritime Sector**

Trade facilitation constitutes a multifaceted process aimed at simplifying, harmonizing, and expediting international trade protocols, with the overarching objective of dismantling

trade impediments and enhancing the fluidity of cross-border transactions. These procedures are of paramount importance as they underpin the mobility of goods and the seamless exchange of crucial information within supply chains. The purview of trade facilitation extends to encompass not only governmental entities responsible for regulating the transit of goods but also a diverse array of private enterprises engaged in overseeing operations and the transportation of commodities (Kapidani et al., 2021; Xu and Baigy, 2022). This framework aligns closely with the ongoing discussions within the World Trade Organization (WTO) concerning trade facilitation.

The core aspiration of trade facilitation is to augment cross-border trade while maintaining compliance with regulatory obligations. Within this context, it plays an important role in ensuring the expeditious and cost-effective transit of products, particularly through seaports (Kapidani et al., 2021; Xu and Baigy, 2022).

In an era characterized by budding international trade, the efficient facilitation of trade assumes an imperative role. It becomes crucial for optimizing supply chains and propelling economic development forward. Kapidani et al. (2020) provides comprehensive insights into the essential components necessary to achieve efficient trade facilitation within the maritime sector. These encompass the critical need to expedite customs procedures, establish transparent and uniform documentation protocols, optimize logistical operations, and cultivate robust communication channels among stakeholders. It is noteworthy that, the historical preference for paper-based administrative systems within the maritime domain has been an indication of inefficiencies, cost escalation, and prolonged cargo clearance processes. These antiquated practices have regrettably, acted as disruptive forces within the intricate tapestry of supply chains, leading to unintended delays in the delivery of goods.

According to Abeywickrama and Wickramaarachchi (2015); Bešković (2015), the proliferation of import, export, and transit data from various trade entities has imposed substantial burdens on both governments and businesses alike. These data must traverse numerous governmental agencies, often necessitating repetitive submission of identical information for international commercial transactions. The susceptibility to manual data entry errors also brings about the potential for costly mishaps such as shipment misdirection or incurring customs penalties. In maritime operations, where transparency and information visibility are paramount due to the multitude of stakeholders involved, such errors can have severe consequences.

International agreements and conventions also play a crucial role in trade facilitation and the development of maritime single window. These agreements set the legal framework and standards for efficient and secure trade operations, while international organizations like the International Maritime Organization (IMO) contribute to shaping maritime single window standards (IMO, 2019b).

### **2.3.1 International Agreements and Conventions**

WTO Trade Facilitation Agreement (TFA): The TFA, part of the World Trade Organization (WTO), is a landmark agreement that focuses on simplifying and harmonizing trade procedures. It encourages the use of electronic documentation and data exchange, aligning with the goals of maritime single window to streamline customs processes (WTO, n.d.).

FAL Convention: The IMO's Convention on Facilitation of International Maritime Traffic (FAL Convention) promotes the simplification of formalities, documentation, and procedures in maritime trade. Its recent amendments, including the mandatory

implementation of maritime single window by 2024, highlight the importance of digitalization in the maritime sector (IMO, 2019a).

**UNCITRAL Model Law on Electronic Transferable Records:** The United Nations Commission on International Trade Law (UNCITRAL) has developed this model law to facilitate the use of electronic transferable records in international trade, fostering the digital exchange of trade-related documents within maritime single window (UNCITRAL, 2017).

### **2.3.2 Role of International Organizations**

International organizations like the IMO develop and promote global standards for maritime operations, including data exchange. IMO's guidelines and reference data models provide a common framework for maritime single window implementation, ensuring interoperability among different systems worldwide (IMO, 2019b).

**Mandates and Regulations:** IMO's amendments to the FAL Convention set clear mandates for member states to adopt maritime single window. This regulatory role pushes countries to embrace digital solutions for maritime trade facilitation.

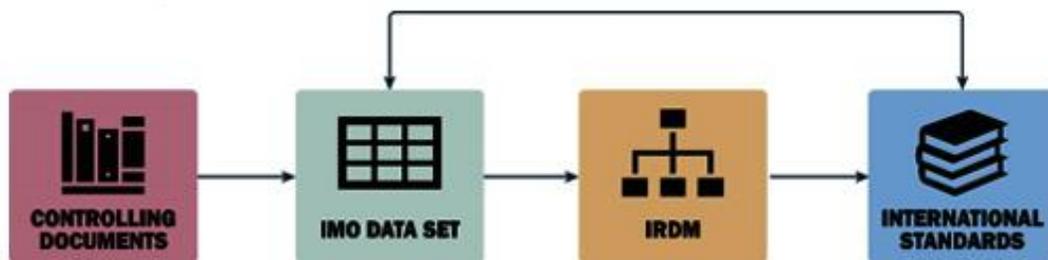
**Technical Assistance:** IMO provides technical assistance and capacity-building programs to help member states develop and implement IMO systems effectively. This support includes training, knowledge sharing, and best practice dissemination.

**Collaboration:** IMO collaborates with other international organizations, such as the World Customs Organization (WCO) and the United Nations Economic Commission for Europe (UNECE), to align efforts in enhancing trade facilitation through digitalization.

In conclusion, international agreements and conventions, along with the efforts of organizations like the IMO, are instrumental in shaping the landscape of maritime single window and trade facilitation. They provide the legal framework, standards, and support needed to transition from traditional paperwork to efficient and secure digital solutions in the maritime sector.

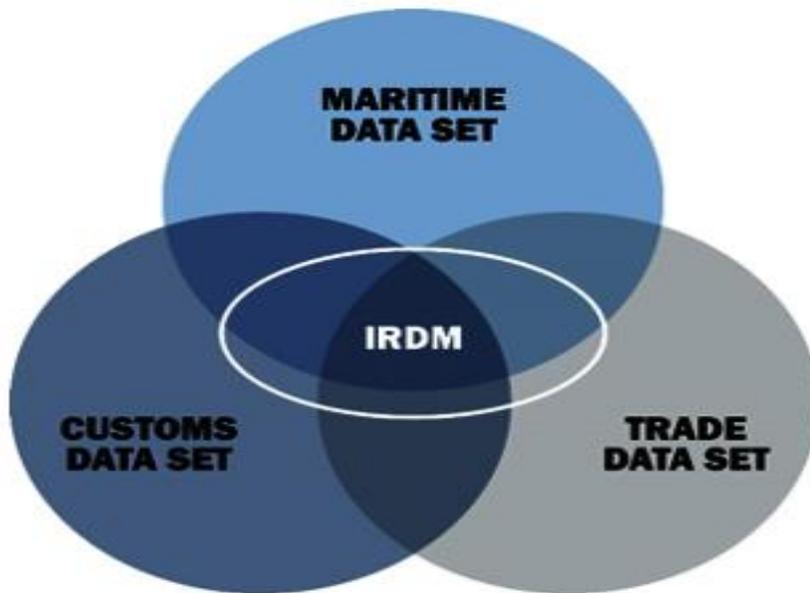
### 2.3.3 IMO Reference Data Model

The IMO Reference Data Model (RDM) serves as a foundational framework developed by the IMO to standardize and harmonize data exchange within the maritime industry (Cauwer et al., 2021). Its primary objective is to establish a shared blueprint that governs the structure and content of data communicated among the various stakeholders involved in maritime trade and logistics.



*Figure 2: The Data Model Development Process*

*Source: (Cauwer et al., 2021)*

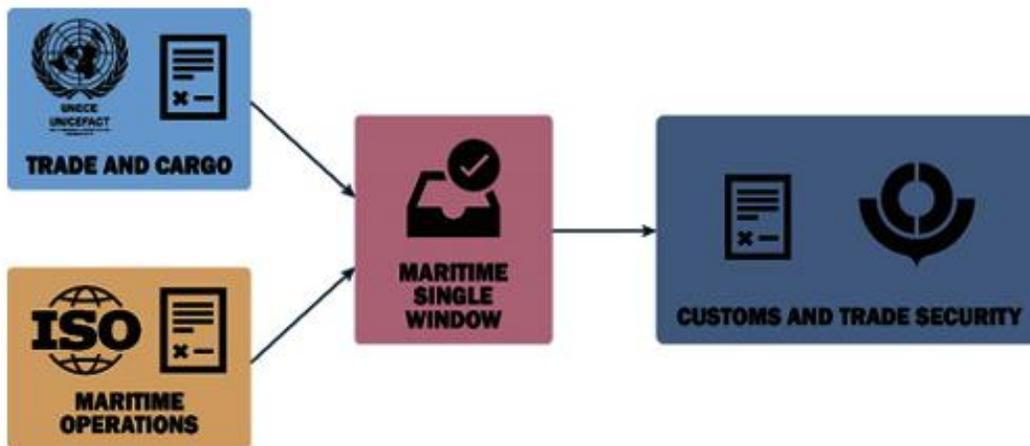


*Figure 3: IMO Reference Data Model represents the intersection of standards*

*Source: (Cauwer et al., 2021)*

The IMO RDM is instrumental in defining uniform data formats and terminologies for critical information pertaining to maritime transport. This consistency in how data is represented is paramount to ensure that different maritime single window systems and other digital platforms can communicate effectively on a global scale (Cauwer et al., 2021).

Within the model, an extensive array of data elements is outlined, encompassing diverse facets of maritime operations. These elements cover a wide spectrum of information, including details about vessels, cargo, crew, ports, customs procedures, and other vital parameters within the maritime domain (Cauwer et al., 2021).



*Figure 4: IMO RDM ensures interoperability between standards*

*Source: (Cauwer et al., 2021)*

By adhering to the principles of the IMO RDM, maritime single window systems, and other platforms for maritime data sharing can interact seamlessly. This interoperability is of utmost importance to enable efficient communication and collaboration among various entities, such as ports, customs authorities, shipping companies, and governmental agencies (Cauwer et al., 2021).

In summary, the IMO RDM plays an instrumental role in shaping the digital transformation of maritime operations. It provides a shared language and structure for data exchange, enabling maritime single window systems and other stakeholders to seamlessly collaborate while advancing efficiency and transparency in international maritime trade.

## **2.4 Maritime Single Window Origin, Development, and Global Adoption**

A single window, as defined by the WCO (2011), is a potent trade facilitation tool empowering traders and transporters to submit comprehensive product acceptability information in a standardized format through a unified interface. The WCO characterizes

the single window as a cross-border, intelligent facility that streamlines trade and transport operations by enabling the submission of standardized information, predominantly electronically, via a single-entry point, thus fulfilling all regulatory responsibilities related to imports, exports, and transit, echoing the sentiments echoed by the (WCO, 2011). In 2005, the World Customs Organization (WCO) introduced its "Framework of Standards to Secure and Facilitate Global Trade," which advocated for the adoption of single window setups (Koliouisis et al., 2015).

The extension of the single window paradigm to maritime operations stemmed from the recognition that international trade encompasses both customs clearance and maritime activities. The single window stands poised to simplify trade procedures, enhance transparency, and introduce predictability into the realm of international commerce (Koh, 2010). Consolidating trade interactions into a single point of contact effectively mitigates complexity, minimizes delays, and curtails costs, thus elevating competitiveness and fostering trade, in alignment with the assertions made by (ESCWA, 2011).

Given the global nature of commerce and the intricacies it entails, there exists a compelling argument for the adoption of a single window for trade (Koh, 2010). The adoption of the maritime single window is impacted by a country's trade volume, digitalization, dedication to trade facilitation, and partnership with international organizations. Several nations had effectively adopted and integrated maritime single window in major ports, enabling players in maritime trade and port management to efficiently communicate information and share documents. Many of these countries were members of regional trade blocks or organizations that promoted maritime single window adoption and harmonized standards (Tijan et al., 2019). However, there are countries yet to implement the maritime single window, as implementation requires major expenditures in technology, infrastructure, and capacity building, and not all countries have the means or regulatory frameworks to expedite it.



*Figure 5: IMO Maritime Single Window*

*Source: (IMO, 2019)*

According to Rodseth et al., (2011); Kapidani et al., (2015), the maritime single window was developed to improve maritime trade and port operations' efficiency, transparency, and security. Extending the single window concept to the maritime industry is important because international trade entails complex naval operations and customs clearance. Port authorities, customs, shipping lines, cargo owners, and other government agencies must share a lot of data for maritime operations. To simplify regulatory oversight and data reporting, a single window at the junction of national and international trade data exchange provides access to all essential trade systems. Optimizing trade administration and operations procedures, including data reuse and duplication reduction, needs widely utilized e-government applications and trade-related ministry and NGO systems. The goal is to have a single electronic data entry, however current methods and standards must be reduced.

The maritime single window went through numerous stages of development. The idea was conceptualized by maritime industry experts and stakeholders who saw the potential benefits of a centralized digital platform. The implementation was then tested through pilot projects, these pilot initiatives brought together port authorities, customs, shipping companies, and other relevant stakeholders to identify difficulties and test potential solutions in a controlled setting (Rodseth et al., 2011).

Maritime single window requires large expenditures in technical infrastructure and capacity creation. Countries had to improve their IT systems, implement safe data-sharing protocols, and train users and stakeholders. To improve international trade and maritime operations, interoperability between maritime single window systems was a goal. It has changed to meet maritime sector needs, trading patterns, and technological advances. Maritime single window is being implemented worldwide as more countries recognize the benefits of digitalization and strive to improve trade facilitation through these platforms. The maritime single window has the potential to modernize global maritime trade as it becomes more prevalent and networked (Tijan et al., 2018).

The IMO encourages member states to adopt maritime single window and supports capacity-building to ensure success. The maritime single window streamlines information interchange and customs procedures to reduce port clearance delays, improve supply chain management, and boost maritime trade competitiveness (Tijan et al., 2018).

Ship arrival, stay, and departure information is exchanged electronically over the maritime Single window platform. The FAL Committee based on the changes to the FAL Convention makes it mandatory for member states to deploy the maritime single window by January 1, 2024. This mandate speeds up shipping digitization and boosts maritime efficiency. By the deadline, all IMO member states must create, manage, and use the maritime single window for port data interchange.

For electronic ship data sharing, ports worldwide must run maritime single window, and this is expected to reduce administrative processes, improve stakeholder communication, and streamline maritime information flow. Maritime single window is an important step towards digitization in shipping, and along with the International Association of Ports and Harbors (IAPH) and the Baltic and International Maritime Council (BIMCO), the IMO is helping all stakeholders to understand and implement the maritime single window (Rodseth et al., 2011).

## **2.5 Objectives of Maritime Single Window Implementation**

The implementation of maritime single window aims to achieve key goals in enhancing administrative operations within the maritime industry. Traditionally burdened with extensive paperwork and manual tasks, the maritime sector faces inefficiencies and increased costs. Maritime single window offers a centralized digital platform for submitting, exchanging, and processing crucial documents and data which accelerates shipment clearance, reduces lead times, and boosts supply chain efficiency (Abdulkadir et al., 2021).

Implementing maritime single window also promotes knowledge exchange. Cargo handling and clearance in the maritime business involves shipping companies, port authorities, customs inspectors, and government organizations. For smooth operations and real-time decision-making, these entities must transmit information efficiently. Maritime single window provides a single point of entry for stakeholders to communicate vital data, track shipments, and cooperate. Improved risk management and operational coordination result from better transparency and communication (Wawruch, 2014; Radulović, 2018).

Additionally, shipment diversion, delays, and financial losses can result from data inaccuracies in the maritime sector. The implementation of maritime single window

enhances data accuracy by eliminating human data entry and automating data interchange. Through the digitization of documents and facilitation of electronic data exchange, maritime single window provides stakeholders with accurate and timely information. This, in turn, fosters industry trust, ensures data integrity and minimizes discrepancies (Meral, 2021).

## **2.6 Theoretical Framework**

Maritime single window implementation involves a complex interplay of various factors, from technological readiness to regulatory frameworks and stakeholder collaboration. To comprehensively understand and analyze this process, a theoretical framework that incorporates several key theories and concepts relevant to the successful implementation of maritime single window is required.

Trade facilitation ideas and concepts are essential to the theoretical underpinning for maritime single window implementation. The WTO TFA is a key reference point in this area as it promotes digital information and document interchange through maritime single window and other electronic networks (Ahmed, 2021). It promotes the use of technologies to simplify customs, automate documentation, and improve global supply chain communication. The TFA and maritime single window share the goal of boosting trade efficiency and easing cross-border trade.

Trade facilitation theories emphasize standardization and harmonization in international trade operations. Maritime single window creates a standardized framework for information exchange to ensure compatibility and uniformity across stakeholders and countries. It also facilitates worldwide trade by complying with uniform rules and guidelines. Information systems and technology adoption theories help explain maritime

sector stakeholders' approval of maritime single window deployment (Abdulkadir et al., 2021).

The Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) apply here. TAM believes perceived usefulness and simplicity of use are key variables in technology adoption. If stakeholders see maritime single window as simplifying administrative work, boosting communication, and increasing trade efficiency, they're more inclined to adopt especially if it is user-friendly and easy to navigate. UTAUT incorporates social influence, facilitating conditions, and human motives into TAM (Wawruch, 2014). UTAUT illustrates how external factors like industry norms and government backing can affect stakeholders' willingness to embrace maritime single window including organizational preparation and support.

Institutional and organizational theories explain how institutional factors and organizational dynamics affect the maritime single window uptake and implementation. The institutional theory examines how government policies and international standards influence the implementation of novel practices like maritime single window. It emphasizes the importance of governments and international organizations in implementing maritime single window through policy and regulation. Organizational theories like the resource-based approach and organizational change theory illuminate how organizations react to maritime single window implementation. The resource-based approach emphasizes how organizations' capabilities and resources affect their readiness for maritime single window adoption (Murray et al., 2022). However, organizational change theory examines the obstacles and techniques of shifting from old administrative processes to maritime single window-based systems.

Understanding maritime single window technical elements requires interoperability and standardization ideas. Interoperability allows systems and stakeholders to seamlessly

exchange and comprehend data. Investigating interoperability standards and frameworks, like the IMO RDM, can provide insights into the technical aspects of maritime single window implementation (Cauwer et al., 2021).

Standardization theories emphasize the significance of standard data formats, protocols, and conventions for interoperability (Vasileva & Ahmed, 2020). Maritime single window deployment involves data standards and protocols to facilitate data exchange and eliminate data conflicts. To ensure data compatibility and harmonize administrative operations among maritime stakeholders, standardization is essential.

By integrating these theoretical perspectives and frameworks, researchers can develop a comprehensive understanding of the multifaceted nature of maritime single window implementation, encompassing technological, organizational, regulatory, and human factors.

## **2.7 Existing Studies on Maritime Single Window Implementation**

Tijan et al. (2019) reviewed research on national single window and maritime single window implementation and sustainability in maritime transport and seaports. From 2010 to 2019, the study examined national single window and maritime single window from business, environmental, and social perspectives. The study found that national single window or maritime single window can boost sustainable seaport business, reduce paper-based documentation, and allow data reuse, which saves money and promotes economic seaport sustainability. The study also suggested deploying maritime single window to cut cargo loading and unloading wait times, which would increase natural resource efficiency, lower CO<sub>2</sub> and other pollution emissions, and eliminate wasteful cargo movements caused by inadequate stakeholder data interchange.

Similarly, Mwajita (2016) examined the effects of the implementation of Kenya's national electronic single window system on trade facilitation in Kenya. The findings suggest that single window is an ideal system for trade facilitation in Kenya. However, barriers like lack of a legal framework and strong policy framework have impeded the Ken-Trade single window operations in Kenya.

In another research carried out by Abeywickrama and Wickramaarachchi (2015) on the Challenges of Implementing single window concept to facilitate trade in Sri Lanka. It was revealed that Sri-Lanka has not fully implemented the maritime single window because the current system in use is not compatible with single window system. Moreover, there are challenges such as a lack of governmental support, inadequate coordination between Sri-Lanka Customs and organizations, and human resistance to change. Concurrently, Peynirci (2023) investigated the perception of ship agents' experience by analyzing perceived benefit, labour productivity, process tracking, market performance, and financial efficiency towards customer satisfaction using quantitative analysis. The finding demonstrates a noteworthy positive correlation between satisfaction, perceived benefits, labour productivity, process monitoring, and financial efficiency with respect to market performance as a result of implementing maritime single window.

Similarly, the maritime single window reduced vessel turnaround time by 30% and documentation errors by 50% in Singapore (Tijan et al., 2018). This reduction in turnaround time reduces shipping businesses' operational expenses, increases port capacity, and helps the nation's economy. Singapore's maritime single window streamlines information transmission between stakeholders by integrating all regulatory and administrative obligations into a single platform.

## 2.8 Gaps in Current Research

The literature on maritime single window implementation has shown its merits and obstacles. For an in-depth understanding of this revolutionary system, gaps must be filled and one of the shortcomings identified is the lack of long-term impact studies. Many studies examine the short-term benefits of implementing maritime single window, but few examine its long-term effects. Maritime single window feasibility, success, and development opportunities depend on understanding its long-term impacts.

Another significant gap is the lack of comparative studies, while individual case studies offer valuable insights into diverse maritime single window implementations, there is a need for direct comparisons between nations. A comparison analysis could highlight best practices, effective strategies, and lessons learned, guiding future maritime single window projects. Researchers can design solutions for diverse maritime environments by analyzing maritime single window system similarities and variations (Kapidani et al., 2020).

Maritime single window implementation in developed countries and big ports dominate the literature. This exposes a gap in understanding how smaller ports or ports in developing countries might efficiently deploy maritime single window. Addressing such ports' issues can promote maritime single window adoption by making it more inclusive and equitable.

Interoperability issues are another literature review limitation. Interoperability is important, but the technological, regulatory, and administrative difficulties of seamless data sharing between maritime single window systems have not been thoroughly examined (Koliouisis et al., 2015). Designing solutions that enable smooth information sharing between varied stakeholders and systems requires understanding interoperability hurdles.

Finally, the user perspective is generally underrepresented in current work. Studies do not adequately capture the experiences and obstacles faced by individual users, such as shipping companies, customs agents, or port operators, even while they show systemic benefits and efficiency increases (Kapidani et al., 2015). User viewpoints might show maritime single window implementation's daily challenges and areas for development from an end-user perspective.

## Chapter 3- Research Methodology

Having explored the existing literature review on the implementation of maritime single window, it is evident that there is a growing need to empirically investigate the factors influencing the successful adoption of maritime single window. The methodology guides how data will be collected and analyzed, and how the study objective will be realized. It ensures the study findings' dependability, validity, and rigor using a feasible framework (Tripathy, 2013).

### **3.1 Research Design**

This section introduces the pattern through which this research will be executed. It enumerates the research approach, sources through which data is obtained, search strategy, method of data collection, study selection, and data analysis method. This discussion will give a holistic discussion of the research methodology.

#### **3.1.1 Research Approach**

Secondary research, often known as desk research or literature review, is the basis of this study's design. Secondary research involves gathering and analyzing data from reliable sources including academic journals, papers, case studies, and official documents.

The approach aims to acquire a wide range of data without direct data gathering from human participants (Pandey & Pandey, 2021). It lets the researcher analyze past Maritime Single Window implementation trends, patterns, and advancements across areas and countries. Additionally, this technique provides a firm platform for building on existing knowledge and identifying gaps for subsequent research.

### 3.1.2 Data Sources

The initial stage in data collection is selecting suitable case studies. These case studies are chosen based on their relevance to the study's aims and objectives (Pandey & Pandey, 2021). The selected case studies will offer valuable insights into the maritime single window implementation process, its outcomes, challenges, and critical success factors. This will aid in comprehending maritime single window trade facilitation and administrative efficiency applications in the real world.

### 3.1.3 Search Strategy

A meticulous and comprehensive search strategy was developed to identify relevant studies. The present study systematically searched prominent databases for academic journals, published papers, industry reports, and official materials from recognized organizations like the United Nations Centre for Trade Facilitation and Electronic Business, the IMO, and IMO Docs (Lemon & Hayes, 2020). The journals considered for the case studies are recent peer-reviewed journals (2014 - 2023) from verifiable sources to ensure that the information relied upon is up to date. These sources will provide in-depth insights into the theoretical and conceptual aspects of maritime single window implementation. The search strategic approach involved the use of specific keywords such as maritime single window, maritime trade/ transport, and single window implementation in chosen regions.

Table 1 below shows the search terms and boolean operators used. These terms and operators were instrumental in guiding the data collection process (Gupta et al., 2018).

*Table 1: Table showing the search terms and boolean operator*

S/N	Search Term	Boolean Operator	
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1	maritime transport/ trade	AND	maritime transport AND maritime trade
2	maritime single window	OR	maritime single window OR national single window
3	single window implementation in 'selected countries'	NOT	single window implementation NOT custom window implementation

By defining the search terms and leveraging appropriate boolean operators, the precision and relevance of the data collection process were enhanced. Moving forward, the methodologies employed for data collection will be detailed, shedding light on the robustness of the research process.

### 3.1.4 Data Collection Methods

Case study reports and pertinent documentation on maritime single window implementation in select countries were reviewed to collect data. In turn, the data will be critically analyzed to extract crucial information about maritime single window, examine the establishment, stakeholders' involvement in implementation, and how impediments were overcome to ensure adoption.

The next subsection is the critical phase of study selection.

### 3.1.5 Study Selection

"Preferred Reporting Items for Systematic Reviews and Meta-Analyses" or PRISMA informed the case study selection (Vrabel, 2015). This ensued clarity and was achieved in two steps. Firstly, the titles and summaries of the articles were scrutinized to see if they were relevant, this process helped to make sure the right studies were included. Secondly, a comprehensive review was conducted for the selected studies.

### **3.1.6 Data Analysis Method**

The study uses thematic analysis to explore commonalities and divergencies in the case studies and literature to provide a thorough picture of maritime single window implementation. Afterward, cross-case study analysis will be used to identify themes and trends connected to maritime single window implementation across the case studies.

## **3.2 Case Study Approach**

“A case study research design is employed in this study, focusing on several nations as the central subject of investigation”. “A case study is a comprehensive and in-depth examination of a particular subject or phenomenon within its real-life context, making it an ideal approach for delving into the intricate dynamics of maritime single window” (Priya, 2020). Case studies from different countries/regions that have effectively implemented maritime single window with well-documented and comprehensive data sources are prioritized for selection. By selecting materials concerning these regions namely; Singapore, Kenya, Turkey, Ghana, Panama, Netherlands, Antigua, and Barbuda as case studies, this research will gain valuable insights into the specific context of the implementation, allowing for a detailed exploration of the dynamics involved.

The case study method aids the comparison of maritime single window implementation in different countries/regions based on their geographic locations, organizational structures, and regulatory frameworks. This method will help identify context-specific elements that affect maritime single window successes or failures (Priya, 2020).

## **3.3 Scope of the Research**

The scope of the research is limited to providing complete insights into maritime single window deployment trends, patterns, and advancements across countries. The worldwide

view will reveal the benefits and drawbacks of maritime single window in various situations as well as the best practices to be employed.

Stakeholder engagement and change management strategies in the maritime single window implementation will also be examined in the study, including how challenges and obstacles were overcome to integrate maritime single window systems.

## Chapter 4 - Case Studies

The previous chapter examines the methodology of this research, creating a foundation for how data is sourced in this research.

In this chapter, a comprehensive cross-case analysis is done on selected case studies: Singapore, Turkey, Panama, Ghana, the Netherlands, Kenya, Antigua and Barbuda. This analysis is important in understanding the practical aspects of maritime single window implementation. These case studies offer a comprehensive exploration of how these countries have harnessed their unique geographical advantages, historical expertise, and forward-looking approaches to build a thriving maritime sector.

### **4.1 Case Study 1: Singapore**

The first case study to be examined is Singapore and in this section, we will be looking at an overview of Singapore maritime trade, how it is implemented, its impact on trade and logistics, its challenges, and strategies developed to overcome the challenges.

#### **4.1.1 Overview of Singapore Maritime Single Window (digitalPort@SG)**

Singapore's remarkable transformation into a thriving global port and a dominant player in the international maritime sector is indeed noteworthy. The establishment of the Maritime Port Authority (MPA) in Singapore on February 2, 1996, marked a significant milestone in this journey (Singapore Maritime Port Authority, 2023). Since then, Singapore has leveraged its strategic geographical location, world-class infrastructure, and pro-business environment to ascend as a maritime powerhouse.

Despite its modest size, Singapore hosts over 170 international shipping companies, positioning itself as a pivotal maritime hub for global trade, shipping, and related services (Singapore Maritime Port Authority, 2023). The port's efficiency and cutting-edge

technological infrastructure ensure the seamless movement of goods through an extensive network of advanced container terminals, cargo-handling facilities, and specialized terminals catering to diverse commodities. Singapore's status as a maritime gateway is further solidified by its deep-water facilities capable of accommodating large vessels.

In response to the evolving landscape of the COVID-19 pandemic, Singapore's MPA embarked on a journey towards industry resilience through digitalization. In October 2019, Singapore introduced its maritime single window, known as the digitalPort@SG. This innovative digital portal was established with the primary mission of facilitating streamlined, one-stop regulatory transactions. It serves as an efficient platform for conducting a wide range of maritime regulatory and port services transactions (Singapore Maritime Port Authority, 2023).

#### **4.1.2 Implementation of Singapore Maritime Trade (digitalPort@SG)**

The implementation of the digitalPort@SG underwent a meticulous two-phase approach to ensure a smooth transition from traditional to digital operations Kapidani et al., (2021). Phase 1, which reached completion in September 2020, introduced a significant advancement. It granted users the capability to obtain approvals for both incoming and outgoing vessels from three distinct public entities: the MPA, Immigration and Checkpoints Authority, and the National Environment Agency. This achievement was realized through a unified digital portal that effectively streamlined the amalgamation of up to 16 separate forms into a single comprehensive application. The positive outcome of this consolidation was the substantial enhancement of efficiency within the maritime sector, with estimated gains of approximately 100,000 man-hours per hour (Singapore Maritime Port Authority, 2022).

Moreover, the digitalPort@SG established robust mechanisms for data interchange with crucial port community systems, including Portnet and Jurong Port Online. These mechanisms facilitated the acquisition of pertinent information, encompassing declarations related to hazardous goods operations conducted at port terminals (Singapore Maritime Port Authority, 2023).

Figure 6 shows a schematic diagram of some of the features of the portal for one-stop regulatory transactions.

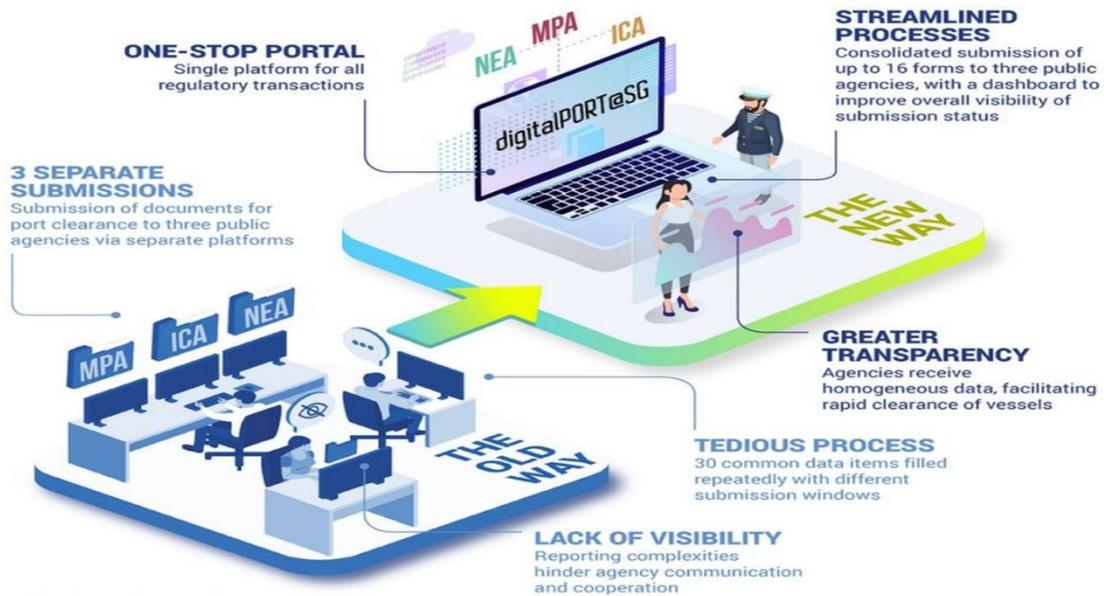


Figure 6: The portal for one-stop regulatory transactions

Source; (Singapore MPA, 2023)

Phase 2 of the digitalPort@SG initiative, which commenced in 2021, represents a progressive extension of the integrated digital framework established in Phase 1, as outlined by the Singapore Maritime Port Authority, (2023). This phase is designed to provide several key functionalities including:

a. **Facilitation of Marine Services Booking:** Phase 2 enhances the platform's capabilities by enabling users to efficiently book marine services.

b. **Introduction of Just-In-Time (JIT) Services:** The initiative introduces a JIT planning and coordination platform. This perspective takes a customer service journey approach to optimize the duration of port stays for ships calling at the Port of Singapore. The result is a reduction in the carbon footprint generated by ships, as shorter port stays and improved voyage planning contribute to environmental sustainability.

Figure 7 shows a diagram of some of the components of the JIT planning and coordination platform of the portal for one-stop regulatory transactions.

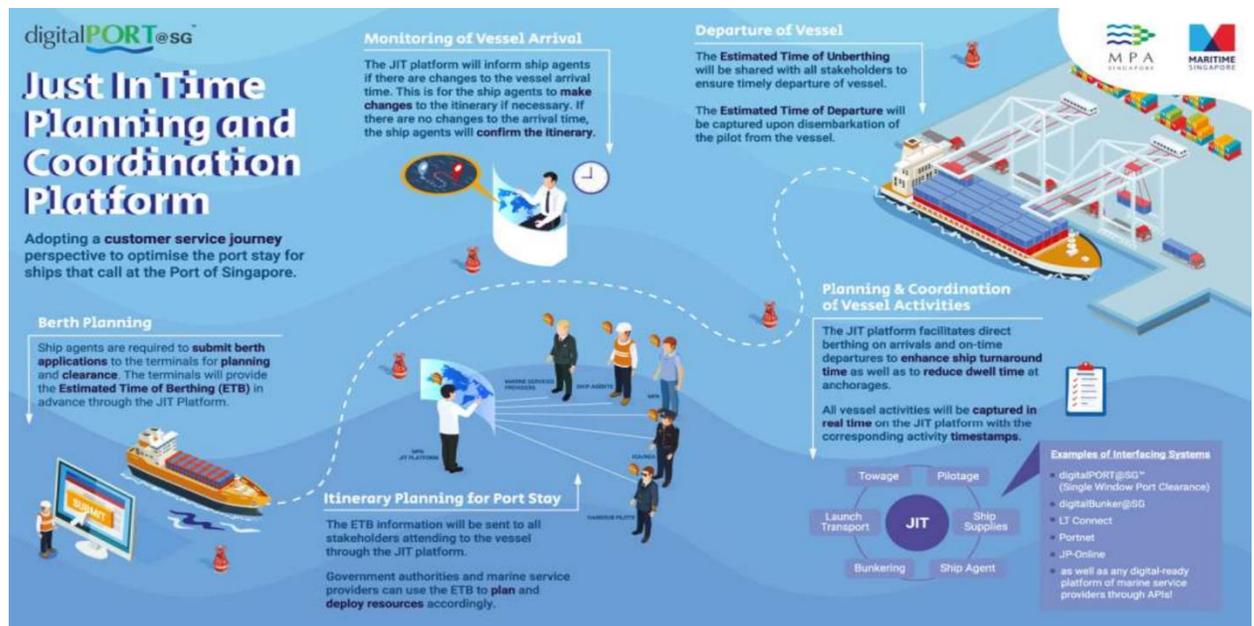


Figure 7: JIT planning and coordination platform

Source: (Singapore MPA, 2023).

**c. Application Programming Interface (API) Integration:** Phase 2 incorporates API functionality to promote interoperability with other digital platforms, enhancing connectivity within the maritime ecosystem.

The digitalPort@SG, as a unified digital platform, serves as a critical component of the broader digital ocean standardization initiative. This initiative aims to foster global interoperability among various digital platforms throughout the global maritime transport chain. By facilitating the exchange of information across different ports, this initiative streamlines the clearance process, eliminates duplicate port entry submissions, and significantly reduces the administrative workload on ship masters and agents (Maritime Port Authority of Singapore, 2023).

In March 2021, the Maritime Port Authority of Singapore (MPA), in partnership with the International Maritime Organization (IMO) through the Integrated Technical Cooperation Programme (ITCP), initiated the Single Window for Facilitation Trade (SWIFT) project, as documented by (Elias and Wong, 2021).

In the pursuit of bringing the digitalPort@SG to fruition, the MPA engaged in a collaborative effort with renowned technological experts. This collaborative endeavor was driven by the paramount objective of constructing a robust digital infrastructure capable of accommodating the diverse reporting and clearance requirements of stakeholders. To ensure accessibility for stakeholders with varying technical proficiencies, meticulous refinement was applied to the user interface, resulting in an intuitive and user-friendly design (Tijan et al., 2019).

The successful implementation of digitalPort@SG has opened doors for the seamless expansion of digital shipping corridors and maritime domains, benefitting both industry

players and governmental bodies in Singapore significantly. However, the digitalPort@SG also presents a set of challenges, including issues related to data standardization, authentication, liability for reported data, system interoperability, and cybersecurity threats (Elias, 2022).

#### **4.1.3 Impact on Trade and Logistics**

Singapore acknowledges the benefit that the maritime single window can offer to the maritime community and this joint endeavor reflects their commitment to boost capacity building and provide technical support to developing countries yet to implement the maritime single window. This collaboration will also help member states to fulfill their responsibilities under the FAL Convention and enhance their operational efficiency and connectivity. Additionally, the digitalPort@SG helps to optimize the arrival and departure time of vessels and enables faster ship turnaround in the port of Singapore, thereby increasing port efficiency and reducing business costs to the industry (Maritime Port Authority of Singapore, 2022). Minimizing vessels idling time in the port also helps to reduce carbon emissions.

#### **4.1.4 Challenges and Strategies Developed**

The emergence of maritime single window brings forth an array of fresh challenges, with one of the foremost being the need for standardization of data shared through maritime single window among various nations. This standardization is crucial to ensure that the electronic exchange of information bolsters, rather than hampers, the functioning of the shipping industry (MPA Academy Singapore, 2022). The remedy to this challenge lies in the formulation and endorsement of international standards governing the exchanged data.

Additionally, there are other pertinent issues, such as data authentication and liability for the reported information. The pursuit of interoperability among diverse systems employed worldwide, although highly advantageous, also presents a substantial challenge and will warrant future deliberations.

Maintaining the integrity and security of data is crucial in a digital port system (Maritime Port Authority of Singapore, 2023). Ensuring that data is tamper-proof and safeguarded against cybersecurity threats was a complex task. Integrating the digitalPort@SG with existing port community systems and other digital platforms also required careful planning to avoid disruptions and ensure smooth data exchange. Lastly, transitioning from traditional paper-based processes to a digital system required a cultural shift and extensive training for stakeholders who were accustomed to manual procedures.

To tackle these challenges, the implementation team developed clear data standards and protocols to ensure consistency in reporting. They collaborated with industry stakeholders to create a unified data format. Robust encryption methods and security protocols were implemented to protect data from unauthorized access and tampering. Secondly, to ensure interoperability, extensive testing and collaboration with other platforms like Portnet and Jurong Port Online were key strategies since the digitalPort@SG was designed to integrate seamlessly with existing systems (Maritime Port Authority of Singapore, 2023).

Change management strategies included stakeholder engagement, training programs, and workshops to help users adapt to the digital system. Continuous support and feedback mechanisms were also put in place. These challenges and strategies highlight the complexity of implementing a maritime single window like Singapore's digitalPort@SG.

By addressing these challenges strategically, Singapore has successfully created an efficient and innovative platform that benefits both industry stakeholders and the country's global trade position.

## **4.2 Case Study 2: Turkey**

Turkey will be the second case study to be examined, and in this section, we'll look at an overview of Turkey's maritime single window system, how it's implemented, how it affects logistics and trade, as well as the issues it has and solutions that have been adopted to address those challenges.

### **4.2.1 Overview of Turkey's Maritime Single Window**

Turkey, the world's 20th largest economy according to IMF (2021), has undertaken substantial efforts to modernize and expedite its foreign trade operations. The core objective has been to digitize and automate public service delivery, ensuring faster, more secure, and transparent facilitation of trade transactions. Moreover, streamlining customs processes efficiently and cost-effectively has long been a top priority for Turkey (Peynirci, 2023).

The journey toward modernization began with the introduction of basic information technology (IT) software at Istanbul Atatürk Airport in 1997, as documented by Peynirci (2023). However, as technology evolved, this initial software became obsolete, and after extensive discussions and recognizing the need for automated data sharing, Turkey made a significant leap by adopting the “customs single window” system for customs clearance in 2014.

At the heart of the customs single window system lies an IT software that is implemented collaboratively with various stakeholders and covers road, rail, and air (excluding

maritime) transport customs clearances. While the customs single window system significantly improved efficiency, it does not encompass maritime clearance procedures. To address this gap, the Turkish Maritime Administration developed its own maritime IT software, thus enhancing the overall landscape of customs and border controls. This digital platform serves as a central nexus for the exchange of crucial information and documentation pertaining to maritime activities, ushering in a transformative era in the country's trade practices. The primary aim of Turkey's maritime single window is to augment the efficiency of maritime trade processes. It achieves this by simplifying and rationalizing the submission of vital documentation, including customs declarations, cargo manifests, certificates of origin, and bills of lading. The elimination of cumbersome paperwork and manual administrative procedures translates into substantial time and cost savings for all stakeholders (Peynirci, 2023).

A cornerstone of this system is its real-time accessibility to critical data, encompassing vessel schedules, cargo status updates, and customs clearance statuses. This transparency not only mitigates the risk of errors and delays but also guarantees adherence to international trade regulations and security standards (Peynirci, 2023).

Crucially, Turkey's maritime single window does not operate in isolation; it is strategically designed for interoperability with other pertinent platforms like customs and port management systems. This harmonization ensures the seamless exchange of data and fosters expanded trade opportunities (Peynirci, 2023).

Turkey's unwavering commitment to advancing and refining its maritime single window system underscores its determination to assume a prominent role in the global maritime industry. As the reach of the maritime single window continues to expand, Turkey's maritime trade and logistics processes are poised to become more efficient, transparent, and globally competitive.

#### **4.2.2 Implementation of Turkish Maritime Single Window**

The inception and execution of the maritime single window in Turkey constitute a momentous stride in the nation's endeavor to modernize and enhance the efficiency of its maritime trade procedures. This undertaking signifies a strategic shift towards fostering a trade environment characterized by heightened efficiency, transparency, and interconnectedness (Peynirci, 2023).

The inception of this venture commenced with an all-encompassing evaluation of Turkey's maritime trade landscape. Thorough scrutiny encompassed government bodies, industry stakeholders, and international best practices to ascertain the prerequisites and potential advantages of adopting a single window system.

Subsequently, the pivotal phase of technological advancement ensued. This phase entailed the meticulous design and construction of a resilient digital platform with the capacity to seamlessly amalgamate data and procedures from a myriad of maritime-related entities. This was fraught with intricate technical challenges, particularly concerning data compatibility and cybersecurity, which necessitated adept handling (Peynirci, 2023).

The implementation phase mandated concerted collaboration among diverse stakeholders, including governmental entities, private-sector participants, port authorities, customs authorities, and logistics providers.

To facilitate the seamless transition from traditional paper-based processes to a digital system, initiatives for capacity-building were launched. These programs equipped individuals and organizations with the essential proficiencies required to adeptly navigate and utilize the novel system (Peynirci, 2023).

### **4.2.3 Impact on Trade and Logistics**

The investigation by Peynirci (2023), offers valuable insights into the significance of the maritime single window in the context of Turkey's maritime transport and foreign trade. The study underscores the pivotal role played by electronic applications accessible through the maritime single window in streamlining data transactions, rendering them more efficient, expeditious, and secure. This is particularly pertinent given Turkey's active involvement in maritime transport and the substantial traffic volume in Turkish Straits and ports.

Furthermore, the study reveals a high level of satisfaction among ship agencies regarding the features of the maritime single window system. Ship agencies acknowledge that the maritime single window system not only enhances financial efficiency but also positively impacts their market performance. Additionally, the research findings indicate that ship agents, to some extent, concur that the maritime single window system contributes to labor efficiency and facilitates process tracking.

### **4.2.4 Challenges and Lessons Learned**

The implementation of maritime single window in Turkey, like in many other nations, was accompanied by several challenges and valuable lessons. The challenges include legal framework problems, interoperability problems, data security, and resistance to change among stakeholders (Peynirci, 2023).

Turkey learned the importance of establishing a clear and comprehensive legal framework as well as effective collaboration among all relevant stakeholders for maritime single window. This not only helps in the initial implementation but also ensures smooth operation and regulatory compliance.

To address data security concerns, Turkey realized the need to invest substantially in cybersecurity measures. Protecting sensitive information from cyber threats is a continuous effort.

### **4.3 Case Study 3: Panama**

Thirdly, this research will evaluate the implementation of maritime single window in Panama as a case study, and understand its benefits and pitfalls.

#### **4.3.1 Overview of Panama's Maritime Single Window (VUMPA)**

Panama's maritime trade is a vital component of its economy and global trade network. Situated at the crossroads of major international shipping routes, Panama boasts one of the world's most strategic and significant maritime hubs. The Panama Canal, a modern engineering marvel, facilitates the transit of millions of tons of cargo each year, making it a linchpin in global maritime trade (Panama Canal Authority, n.d; Safety4sea, 2017).

Acknowledging the absence of established single window guidelines tailored for the maritime transport sector, the Panama Canal took the initiative to define its own data formats and standardization protocols (Panama Canal Authority, n.d; Safety4sea, 2017). This proactive approach led to the implementation of the inaugural canal single window in 2004, which served as a central platform for declaring all requisite formalities and requirements when navigating the Panama Canal.

Over the subsequent years, the Panama Canal underwent a series of significant system enhancements, a response to evolving business dynamics. By 2015, the Panama Canal had introduced a comprehensive overhaul, ushering in an entirely new iteration of the canal

single window. This transformative update not only encompassed changes to the underlying infrastructure but also introduced advanced development tools (Panama Canal Authority, n.d; Safety4sea, 2017).

Subsequently, considering Panama's membership in the International Maritime Organization (IMO), the nation was called upon to facilitate the electronic reporting of formalities via a single window, among other logistic sector challenges. This prompted Panama to leverage its existing canal single window and elevate it to the maritime single window of Panama named VUMPA, an acronym for Ventanilla Única Marítima de Panamá which is the Spanish translation of Panama maritime single window. Within the realm of VUMPA, information is reported once and subsequently made accessible to various competent authorities and other service providers (Panama Canal Authority, n.d; Safety4sea, 2017).

#### **4.3.2 Implementation of VUMPA**

VUMPA represents Panama's commitment to modernizing and streamlining its maritime trade processes. It serves as a centralized platform where all required information and formalities related to maritime trade can be submitted, thus eliminating redundant paperwork and expediting administrative processes.

VUMPA not only enhances the efficiency of trade operations but also aligns with international standards, such as those advocated by the International Maritime Organization (IMO). This digital platform facilitates smoother interactions between various stakeholders, including government authorities, shipping companies, and port operators.

In essence, VUMPA is a testament to Panama's dedication to fostering a more competitive and efficient maritime trade environment. It reflects the nation's recognition of the importance of digitalization in trade facilitation and its commitment to staying at the forefront of global maritime commerce (Panama Canal Authority, n.d; Safety4sea, 2017).

During the initial phases of implementation, VUMPA became the focal point for declaring all government formalities, and the information furnished therein was seamlessly disseminated among all relevant government entities.

#### **4.3.3 Impact on Trade and Logistics**

The implementation process of VUMPA in Panama stands out for its ability to address critical facets, such as rectifying regulatory procedures, addressing legal intricacies, and refining the methodologies of implementation (Panama Canal Authority, n.d; Safety4sea, 2017). Additionally, it has successfully reshaped the collaborative processes among stakeholders within the maritime transport domain. Notably, it has also encompassed effective change management practices, among other noteworthy aspects. The resultant advantages of this implementation are substantial, manifesting in considerable savings in both cost and time for the users involved.

#### **4.4.4 Challenges and Lessons Learned**

The introduction of VUMPA encountered formidable challenges due to the scarcity of practical guidelines and technical specifications in existence at the time as informed by (Panama Canal Authority, n.d; Safety4sea, 2017). Implementing a comprehensive system like VUMPA, which sought to digitize and streamline complex maritime trade processes, required innovative solutions and meticulous planning.

While the process of automating complex procedures was undoubtedly intricate, the most formidable challenge resided in effecting a paradigm shift in the operational processes of the individuals involved.

Panama's commitment to enhancing its maritime trade infrastructure ultimately led to the successful development and implementation of VUMPA, despite the initial lack of readily available guidance in this pioneering endeavor.

#### **4.4 Case Study 4: Kenya**

This research will now evaluate maritime single window in Kenya to understand how the implementation of the maritime single window was successful.

##### **4.4.1 Overview of Kenya's Maritime Single Window (Ken-Trade)**

Kenya's single window, known as the Kenya national electronic single window (Ken-Trade), represents a milestone in the country's journey towards modernizing and optimizing its trade processes. This innovative platform serves as a digital nexus where various trade-related procedures and documentation converge, simplifying the often-intricate landscape of international trade (Mwajita, 2016; Ken-Trade, n.d).

One of Ken-Trade's foremost objectives is to expedite customs clearance procedures. By digitizing and centralizing trade documentation, it significantly reduces the time and effort required for cargo clearance, a boon for importers, exporters, and shipping agents alike. The system also delivers tangible cost savings by diminishing the administrative burdens associated with paperwork, while simultaneously promoting transparency through real-time access to trade information.

Ken-Trade not only benefits the private sector but also enhances government efficiency. It streamlines regulatory oversight and coordination among different agencies, bolstering Kenya's trade facilitation system. Moreover, this digital platform aligns with Kenya's participation in regional trade agreements, such as the East African Community (EAC) and Common Market for Eastern and Southern Africa (COMESA), further easing trade within the region (Mwajita, 2016; Ken-Trade, n.d).

With a commitment to data security and international compliance, Kenya's single window embodies the nation's dedication to fostering a competitive and efficient trade environment. In an era of digital transformation, Ken-Trade stands as a testament to Kenya's progressive approach to trade facilitation and its pivotal role in the nation's economic growth and regional integration.

Kenya has come up with many laudable initiatives in its drive to implement a national single window and some of these initiatives are shown in table 3.

Table 2: Kenya’s national single window supporting initiative

	<b>KNESWS INITIATIVE</b>	<b>DESCRIPTION</b>
1	Implementation of the Kenya E-Trade Portal	Kenya e-Trade portal enables online publishing of national foreign trade procedures, providing the trader with full step-by-step guidance.
2	Integration with E-Citizen	To enhance electronic payment for e-slips generated via the TradeNet System, KENTRADE is working with the Digitization of Government Payments (DGP) to integrate Kenya TradeNet System with eCitizen.
3	Institutionalization of Memorandum of Cooperation (MoC) for the Port Stakeholders	The MoC can be used by stakeholders to evaluate the non-performance of individual/organizations in line with the agreed timelines and SLAs.
4	Integration with the Real Time Monitoring System (RTMS)	To facilitate transmission of Border Joint inspection details from RTMS to the Kenya TradeNet System Enable transmission of PGA releases from the Kenya TradeNet System to RTMS.

Source: (Mwajita, 2016)

#### 4.4.2 Implementation of Ken-Trade

In 2013, the Government of Kenya introduced the Kenya National Electronic Single Window System, also known as the Ken-Trade system (Ken-Trade, n.d). This system serves as a unified electronic platform designed to streamline cargo clearance procedures and facilitate international trade by automating trade processes and documentation. The adoption of this system has yielded tangible benefits, including notable reductions in the time and cost associated with obtaining essential trade regulatory documents.

Figure 8 shows a pictorial representation of Ken-Trade components.

## SINGLE WINDOW SYSTEM ENVIRONMENT

Intergrated Solutions for Cross Border E-Commerce

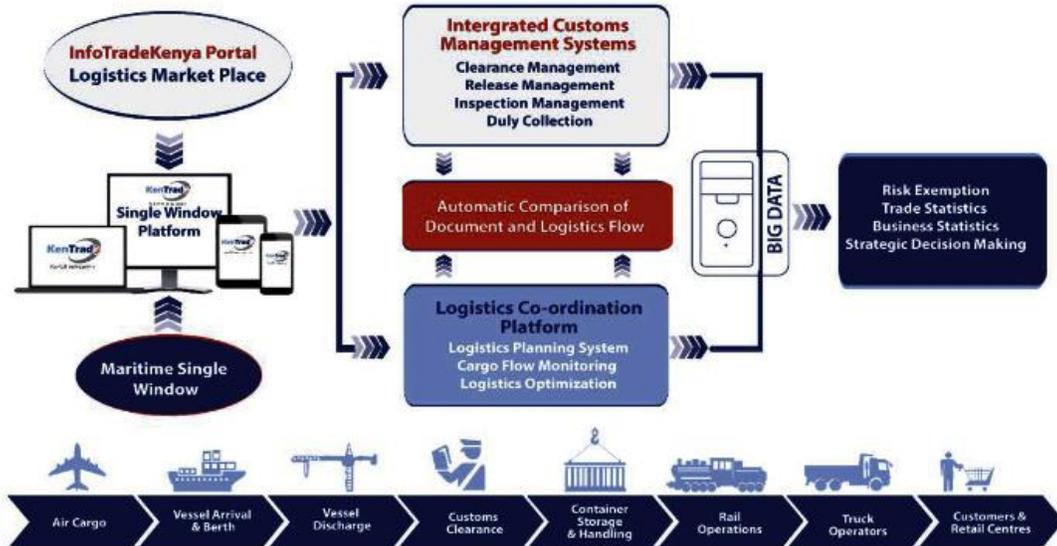


Figure 8: Kenyan Single Window System

Source: (Ken-Trade, n.d)

Building upon the achievements of the system and in a concerted effort to further enhance trade within the country, Ken-Trade, with support from TradeMark East Africa, has developed the Kenya maritime single window. The primary objective of the maritime single window is to simplify and expedite ship clearance procedures by offering a centralized online portal for the submission of information pertaining to ship arrival, stay, and departure. This innovative automation has superseded the erstwhile manual processes characterized by duplication, protracted timelines, decentralization, and fragmented procedures, which, in turn, had a detrimental impact on ship turnaround times and increased the overall costs associated with cargo processing at the port of Mombasa (Ken-Trade, n.d).

### **4.4.3 Impact on Trade and Logistics**

The influence of Ken-Trade on trade and logistics is profound, encompassing various aspects as informed by Ken-Trade (n.d) including:

1. Enhanced Ship-to-Shore Clearance
2. Accelerated Reporting Formalities
3. Cost Reduction for Traders and Agents
4. Expedited Formality Submissions
5. Administrative Savings for Authorities
6. Streamlined Information Exchange
7. Improved Turn-Around Time
8. Enhanced Risk Management
9. Reduced Compliance Burden
10. Enforcement of International Obligation

Collectively, these effects convey the substantial and multifaceted contributions of Ken-Trade to the trade and logistics landscape, reflecting its role in enhancing efficiency, reducing costs, and fostering compliance within the maritime sector.

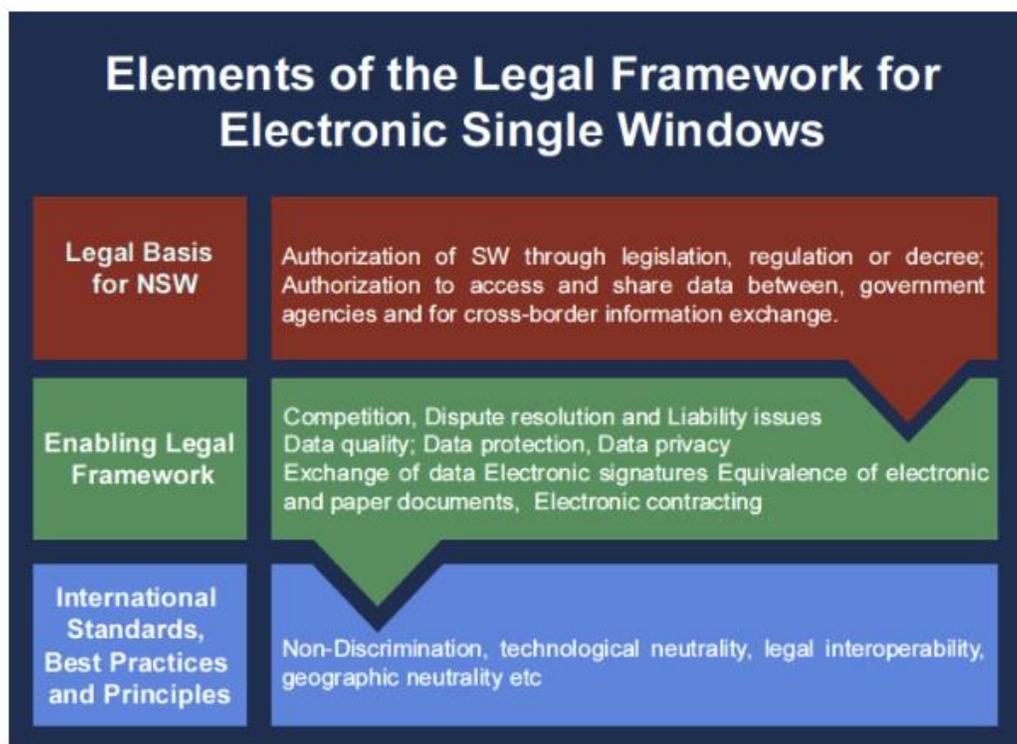
### **4.4.4 Challenges and Lessons Learned**

The absence of a well-defined legal framework governing the single window system (SWS) has posed challenges to Ken-Trade's role as a trade facilitation agency (Mwajita, 2016). The lack of a comprehensive SWS policy framework has hindered effective coordination among various government departments, agencies, regulators, and trade facilitation stakeholders. This issue, according to Mwajita (2016), can be addressed through the harmonization of the legal framework governing SWS operations, requiring collaborative efforts from all government agencies involved in the trade sector.

The deficient policy framework for SWS operations has also led to delayed issue resolution that necessitates the intervention of multiple agencies. To mitigate this, Mwajita (2016) suggested establishing an inter-ministerial steering committee to oversee and expedite such matters. Furthermore, technical challenges, including slow internet connectivity and inadequate IT equipment, have hindered the efficient use of the SWS by some government agencies across the country, particularly at border points.

To address this, it is recommended that all government agencies involved in SWS operations receive support to acquire the necessary internet and computer equipment, especially for the Participating Government Agencies (PGAs) at border crossings.

Figure 9 below shows the recommended framework for their single window.



*Figure 9: Elements of the Legal Framework for Electronic Single Windows*

*Source: (Mwajita, 2016)*

## **4.5 Case Study 5: Ghana**

The fifth case study analyzed in this research is Ghana. This section will delve into the details of the implementation of maritime single window in Ghana to further support the findings from this research.

### **4.5.1 Overview of Ghana's Maritime Trade**

Ghana's trade system has witnessed a remarkable evolution from the national single window to the maritime single window, reflecting the nation's commitment to enhancing trade efficiency, reducing bureaucracy, and embracing digitalization in the maritime sector (Government of Ghana, 2016; Djanitey, 2018).

The journey began with the establishment of the Ghana national single window (GNSW) program, a pivotal initiative aimed at simplifying trade processes and reducing the time and costs associated with cross-border trade. Launched in 2015, the GNSW streamlined various trade-related procedures, allowing traders, government agencies, and stakeholders to submit and access trade-related documents through a single electronic platform. This marked a significant departure from the traditional paper-based systems, ushering in an era of enhanced transparency and efficiency (Government of Ghana, 2016; Djanitey, 2018).

Building upon the success of the GNSW, Ghana recognized the need to further optimize its maritime trade operations. This realization led to the development and implementation of the maritime single window, a specialized extension of the GNSW tailored to the maritime sector. The maritime single window focuses on ship clearance procedures, providing a unified online portal for the declaration of information related to the arrival, stay, and departure of ships.

The transition from the NSW to the maritime single window represents a holistic approach to trade facilitation. It not only simplifies customs clearance for ships but also harmonizes the exchange of maritime information among relevant regulatory agencies. This integration aligns with international trade standards and agreements, ensuring that Ghana remains competitive and compliant in the global trade arena (Government of Ghana, 2016; Djanitey, 2018).

The impact of this transition is profound. It has led to more efficient ship-to-shore clearance procedures, timely reporting formalities, and reduced administrative costs for traders and shipping agents. Moreover, it has enhanced transparency, reduced cargo processing times, and improved risk management through dynamic data analysis.

#### **4.5.2 Implementation of Maritime Single Window in Ghana**

The maritime single window in Ghana represents a significant milestone in the nation's efforts to modernize and streamline its maritime trade processes. This digital platform aims to simplify and expedite trade procedures, enhance transparency, and promote efficient cross-border transactions. Its implementation journey offers valuable insights into the complexities and opportunities within the maritime trade sector (Government of Ghana, 2016; Djanitey, 2018).

The implementation of the maritime single window in Ghana followed a structured approach. It commenced with a pilot phase that engaged key stakeholders, including government agencies, port authorities, shipping companies, and traders. This initial testing allowed for the system's refinement and served as a learning ground for addressing early challenges.

Technical infrastructure played a pivotal role in the maritime single window success. Significant investments were made to establish the necessary hardware, software, and connectivity, ensuring the system's robustness and reliability. Simultaneously, capacity-building programs were initiated to equip stakeholders with the skills required to navigate and utilize the new digital system effectively. This focus on training was critical for a smooth transition from traditional paper-based processes to a streamlined digital workflow (Government of Ghana, 2016; Djanitey, 2018).

Legal alignment was another crucial aspect of the implementation process. Existing laws and procedures are needed to seamlessly integrate into the maritime single window framework. Legal and policy work was undertaken to ensure that customs and maritime regulations harmoniously coexisted with the digital system.

#### **4.5.3 Impact on Trade and Logistics**

Anticipated outcomes for the GNSW program within its initial five years encompass several key objectives as informed by Government of Ghana (2016); Djanitey (2018) which include:

1. A targeted goal of achieving a 50% reduction in both the time and costs associated with cross-border trade processes. This aims to streamline and expedite trade transactions while simultaneously enhancing regulatory compliance in Ghana.
2. Substantial reduction in the average cargo dwell time at major seaports, intending to decrease it from a previous duration of 20 days to a more efficient 10 days. This shift aims to significantly expedite the movement of goods through the ports, promoting trade efficiency.
3. An ambitious objective of reducing invasive cargo examinations by 90%, thereby limiting such examinations to a minimal 10%. This reduction seeks to minimize disruptions to cargo flows and enhance trade fluidity.

4. Additionally, the program strives for improved implementation of the World Trade Organization (WTO) Trade Facilitation Agreement. This aligns with international trade standards and obligations, ensuring Ghana's commitment to facilitating global trade.

These outlined goals collectively portray the GNSW's commitment to promoting trade efficiency, reducing costs, enhancing cargo processing times, and aligning with international trade standards. Achieving these objectives within the specified timeframe would signify a significant milestone in Ghana's trade facilitation efforts, positioning the nation as a more competitive player in the global trade landscape.

#### **4.5.4 Challenges and Lessons Learned**

The implementation journey was not without its challenges as identified by Government of Ghana (2016); Djanitey (2018). Technical hurdles related to data interoperability, cyber security, and system integration required meticulous attention. Change management posed another obstacle, as some stakeholders were resistant to shifting from established paper-based practices to a digital environment. Moreover, the need to ensure the security of sensitive trade and maritime data added complexity to the process.

Despite these challenges, the Ghana maritime single window implementation yielded essential lessons. First and foremost, stakeholder engagement and collaboration were identified as cornerstones of success. Continuous interaction and cooperation with stakeholders proved invaluable, fostering a sense of shared ownership and responsibility.

Capacity building emerged as a critical investment. Providing training and skill development opportunities for stakeholders was instrumental in bridging the knowledge gap and ensuring that all parties could effectively leverage the maritime single window.

Lastly, flexibility and adaptability emerged as vital traits for the maritime single window. The ability to evolve and adjust the system based on changing needs and technological advancements was deemed essential for long-term success.

## **4.6 Case Study 6: Netherlands**

Implementation of maritime single window will be discussed as the case study for further insights into the findings of this research.

### **4.6.1 Overview of Netherlands' Single Window**

The maritime single window initiative was launched to digitize and automate administrative activities related to maritime transport. The implementation involved extensive coordination among government agencies, customs, port authorities, and logistics providers (Van Kruining, 2020).

The maritime single window in the Netherlands acts as a centralized platform that enables stakeholders, such as customs officials, port authorities, and the shipping industry, to submit and exchange information electronically. It reduces redundancy by ensuring that individual data elements are submitted only once, eliminating the need for duplicate paperwork and manual interventions. The system facilitates efficient data sharing, improves decision-making processes, and enhances collaboration among various stakeholders (Van Kruining, 2020).

#### **4.6.2 Implementation of Single Window in Netherlands**

The establishment of the Single Window system in the Netherlands was a collaborative effort involving multiple ministries and government agencies, with a particular focus on cooperation between the Dutch Ministry of Infrastructure and Water Management and the Dutch Ministry of Finance (Van Kruining, 2020). These ministries played pivotal roles in the development and implementation of the Single Window, each contributing to different aspects of the project.

The Dutch Ministry of Infrastructure and Water Management took the lead in formulating policy in response to the issued Request for Development (RFD) by the European Commission. As the responsible national ministry, it played a crucial role in setting the strategic direction for the single window initiative (Van Kruining, 2020).

Concurrently, the Dutch Ministry of Finance, housing the Dutch Customs Administration, held the executive power necessary for Dutch Customs to actively participate in the development and implementation of the RFD. This enabled Dutch Customs to assume a prominent position in leading the project, aligning with international guidelines set forth by organizations such as the United Nations and the World Customs Organization (WCO) concerning the approach to the Single Window concept. Other executive departments and agencies also contributed to this collaborative effort.

Rijkswaterstaat, operating within the Ministry of Infrastructure and Water Management, played a key role in crafting policy, coordinating activities, and delegating responsibilities to various stakeholders. Additionally, the Dutch Border Control and Harbor Police made significant contributions, particularly in matters related to immigration within the context of the Single Window framework (Van Kruining, 2020). Overall, the initial objectives of the Single Window initiative in the Netherlands have largely been realized.

### 4.6.3 Impact on Trade and Logistics

The Dutch national single window successfully fulfills all five key elements that characterize a single window solution in accordance with the UN Recommendation (Van Kruining, 2020). These key elements, according to UNCEFACT (2017) include:

**a. Single Entry Point:** The Dutch Single Window provides a unified and centralized entry point for all stakeholders involved in maritime trade. This means that traders, customs officials, port authorities, and other relevant entities can submit and access required information through a single, integrated platform.

**b. Standardized Data:** The system ensures that data submitted is standardized, following internationally recognized formats and standards. This standardization promotes consistency and interoperability among different systems and facilitates seamless data exchange.

**c. Interagency Coordination:** The Dutch single window facilitates efficient coordination among various government agencies and private-sector entities. It allows for the streamlined exchange of information and data sharing, reducing duplication and delays in processing.

**d. Integrated Workflows:** This single window solution integrates workflows and processes across different stakeholders. It supports end-to-end processes, from cargo declaration to customs clearance and other relevant regulatory procedures.

**e. Security and Privacy:** The Dutch single window places a strong emphasis on data security and privacy. Robust cyber security measures and data access controls are in place

to safeguard sensitive trade and maritime data, ensuring compliance with international standards and regulations.

In essence, the Dutch national single window effectively encompasses these five essential elements, making it a robust and comprehensive solution that aligns with the UN recommendation for single window implementations (Van Kruining, 2020). This achievement demonstrates the Netherlands' commitment to facilitating efficient and secure maritime trade operations while promoting global trade standards and compliance.

#### **4.6.4 Challenges and Lessons Learned**

According to Van Kruining (2020), even though the initial objectives of the single window initiative in the Netherlands have largely been realized, some challenges persist, notably the incorporation of all transportation modalities into the single window solution as well as the decrease in the administrative burden and cost. Despite these remaining issues, the Netherlands has made substantial progress in harmonizing and streamlining its trade processes through the single window, aligning with international trade facilitation standards and fostering a more efficient and transparent trade environment.

### **4.7 Case Study 7: Antigua and Barbuda**

Finally, this research will study the case of Antigua and Barbuda and how the country has implemented the maritime single window and the challenges faced in successful implementation.

#### **4.7.1 Overview of Antigua and Barbuda Maritime Single Window**

Antigua and Barbuda and Norway have emerged as pivotal stakeholders in the implementation of the maritime single window project, signifying a collaborative effort

in the pursuit of modernizing trade facilitation. Norway has demonstrated its commitment by providing both in-kind and financial support to Antigua and Barbuda, the primary beneficiary country. The IMO has played a crucial role in this partnership, taking on the mantle of a coordinator and rendering invaluable administrative assistance throughout the project's lifecycle (Jarett, 2016; IMO, 2019).

The Norwegian Ministry of Trade, Industries, and Fisheries has been the driving force behind the project's financial backing. Moreover, the Norwegian Coastal Administration (NCA) has lent its technical expertise, leveraging Norway's Single Window system, SafeSeaNet Norway (SSN), as the project's foundational blueprint. This multifaceted endeavor commenced its journey in October 2017, with software development spearheaded by the Norwegian team in February 2018.

A series of workshops and demonstrations were meticulously organized in Antigua, spanning from October 2017 to February 2019, marking a comprehensive approach to stakeholder engagement. The project's timeline encompassed a total of 19 months, with 11 months dedicated to development, followed by six months of rigorous testing, and an additional four months focused on transitioning activities, all initiated since October 2018 (Jarett, 2016; IMO, 2019).

The inaugural iteration of the basic generic maritime single window system was unveiled to Antigua and Barbuda stakeholders during an extensive three-day training and workshop session held in St. Johns in June 2018. Notably, a team of technical experts from Norway undertook the pivotal role of elucidating the platform's fundamental functionalities to Antigua and Barbuda stakeholders during a week-long immersion from June 25<sup>th</sup> to 29<sup>th</sup>, 2018. Subsequently, the operational phase commenced, marked by regular system updates based on user feedback from various Antigua and Barbuda entities, including customs,

immigration, the port authority, health, the maritime administration, and shipping agencies (Jarett, 2016; IMO, 2019).

The latter stages of development saw an essential transition as a technical representative from Antigua joined the system development team. By December 2018, the fully functional generic maritime single window had become a reality. The official handover to Antigua and Barbuda took place during the initial week of February 2019, cementing a significant milestone in the project's progression.

#### **4.7.2 Implementation of Antigua and Barbuda Maritime Single Window**

The journey of implementing the maritime single window in Antigua and Barbuda has been marked by several key phases and collaborative efforts. The project's overarching goal is the implementation of a fully operational system, modeled after SSNN. SSNN is an internet-based maritime single window reporting system with a particular focus on FAL Forms. This single window system, akin to other concepts of a similar nature, will serve as a centralized platform connecting various terminals and involving stakeholders such as customs, defense, law enforcement, maritime authorities, and port authorities throughout the country (Lakshmi, 2017).

The project's initial phase commenced with a kickoff week in St. John's from October 9th to 13<sup>th</sup>, 2017. This week allowed stakeholders to engage in discussions regarding the project's scope, assess existing facilities, and identify specific needs (Lakshmi, 2017).

Antigua and Barbuda maritime single window phase and milestones is shown in figure 10.

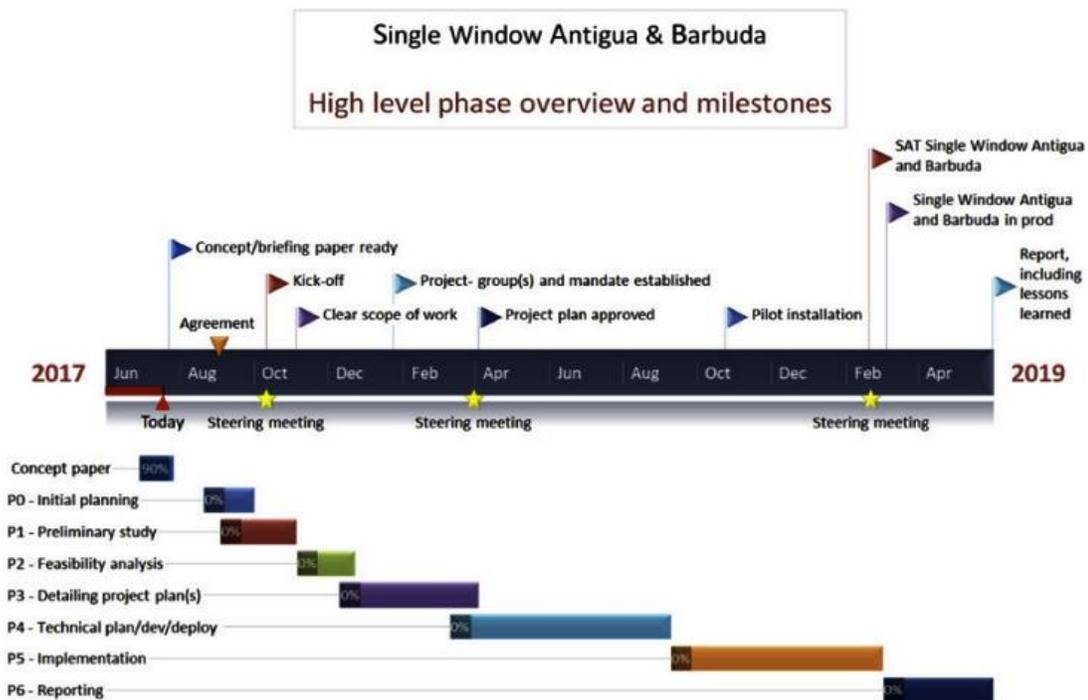


Figure 10: Antigua and Barbuda maritime single window phase and milestones

Source: (Young, 2017)

The implementation of the maritime single window in Antigua and Barbuda signifies the country's commitment to enhancing its maritime trade infrastructure, fostering economic growth, and aligning with global trends in digitalization and trade facilitation. This initiative positions Antigua and Barbuda as a forward-thinking player in the maritime trade arena, attracting businesses and strengthening its role in global trade networks.

#### 4.7.3 Impact on Trade and Logistics

Like other maritime single window enabled nations, maritime trade plays a crucial role in Antigua and Barbuda's trade and logistics industry, with significant impacts, identified by Jarett (2016); IMO (2019) including:

1. Serving as the region's economic backbone, thereby facilitating the import of goods and supporting the tourism industry.
2. It influences the country's trade balance, often leading to trade deficits due to imports exceeding exports.
3. Generation of Jobs
4. Logistical Challenges: Antigua and Barbuda face logistical challenges due to limited ports and weather vulnerabilities.
5. Trade Facilitation: Initiatives like the maritime single window aim to streamline administrative processes, enhancing trade efficiency.
6. Maritime trade connects Antigua and Barbuda to regional and global markets, making efficient logistics crucial.

Efforts to improve maritime infrastructure and logistics can boost the islands' trade competitiveness.

#### **4.7.4 Challenges and Lessons Learned**

The implementation of maritime single window in Antigua and Barbuda presented both challenges and valuable lessons. While NCA provided technical expertise to Antigua and Barbuda in their maritime single window implementation, there was still an absence of a concrete legal framework to guide the implementation of maritime single window (Jarett, 2016; IMO, 2019). This created uncertainties regarding the regulatory environment and the alignment of national laws with international standards. Technical issues, including limited internet connectivity and a lack of information and communication technology (ICT) equipment, hindered the smooth adoption of maritime single window across government agencies. These challenges affected the readiness of some agencies to fully utilize the system.

Lastly, the transition from paper-based processes to a digital system required a significant shift in processes and mindset. Change management emerged as a crucial challenge, particularly in getting stakeholders accustomed to the new digital workflows.

These challenges made Antigua and Barbuda recognize the need to establish a comprehensive legal framework to govern their maritime single window operations. Furthermore, to overcome technical challenges, capacity-building programs were implemented. Training and providing necessary ICT equipment were essential to enhance the readiness of government agencies.

Recognizing that the successful implementation of maritime single window required a cultural shift, Antigua and Barbuda prioritized change management strategies. These included extensive stakeholder engagement, training programs, and awareness campaigns.

## Chapter 5 – Discussion

Chapter four extensively discusses the implementation of maritime single window, taking seven countries as case studies and examining an overview of maritime single window in those countries, how it was implemented, its impact on trade and logistics in those countries, challenges faced and lessons learned.

This chapter will now carry out a comparative analysis of the findings from the case studies in chapter four, analyze the answers to the research questions, and discuss the theoretical and practical contributions of the research.

### **5.1 Comparative Analysis**

Further to the analysis of the implementation of maritime single window in Singapore, Turkey, Panama, Kenya, Ghana, the Netherlands, and Antigua and Barbuda, this section of the research delves deeper to carry out a comparative analysis of the implementation of maritime single window in all seven countries.

#### **5.1.1 Cross-Case Analysis of Maritime Single Window Implementation**

A comprehensive cross-case analysis of the implementation of maritime single window in the countries listed above reveals common themes, challenges, and lessons learned as informed by the case studies employed. They offer valuable insights into the complexities and impacts of maritime single window adoption globally.

##### **5.1.1.1 Identified themes in line with the study's aims:**

For emphasis, this study aims to analyze case studies in order to understand the effective implementation of maritime single window in the maritime sector, its benefits, and

drawbacks. As per the case study analysis, to ensure effective implementation of maritime single window, these five (5) points should be taken note of:

**a. Trade Facilitation:** Across all the seven nations reviewed, the fundamental aim of introducing and integrating maritime single window was to enhance the facilitation of trade. Maritime single window streamlines administrative processes, reduces paperwork, enhances transparency, and fosters efficiency, ultimately aiming to promote economic growth. This central theme aligns seamlessly with the findings articulated by Kapidani et al. (2021), who emphasized the pivotal role of these streamlined administrative processes in facilitating the smooth movement of commodities and efficient exchange of critical information within intricate supply chains.

**b. Stakeholder Collaboration:** Collaboration among government agencies, private sector entities, port authorities, customs officials, and logistics providers is also critical for maritime single window success. This is observed as an important step in the maritime single window implementation phase in most of nations. Nonetheless, notable exceptions are observed in Kenya and Ghana as highlighted by (Government of Ghana, 2016; Mwajita, 2016; Djanitey, 2018).

In these instances, the absence of required collaboration amongst the relevant parties caused a significant challenge in the implementation of maritime single window in their nations. It is imperative to note that, collaboration amongst these entities is not merely a consideration but rather a keystone in the seamless functioning of the maritime single window. This collaboration can lead to more efficient and cohesive information exchange and streamlined decision-making process.

**c. Capacity Building:** This emerges as a critical and recurring theme across all the nations examined in the research. It stands out as a fundamental element underpinning the successful implementation of maritime single window. In each of the reviewed nations,

the significance of capacity-building programs cannot be overstated, as they play a pivotal role in preparing individuals and organizations for the transformative shift from traditional paper-based procedures to digital platforms.

This encompasses the development of technical proficiency required to navigate the intricacies of digital tools and platforms. Without adequate training and technical know-how, stakeholders would find themselves ill-equipped to leverage the capabilities of maritime single window, rendering these innovative solutions virtually unusable (Merino & de los Ríos Carmenado, 2012). This emphasis reflects a shared understanding that successful adoption and integration of maritime single window necessitate a workforce and stakeholder base that is not only aware of the technologies at hand but also possesses the requisite skills to operate them effectively.

**d. Data Security:** Data security is another critical factor observed in the nations examined. It encompasses a set of practices (including robust cyber security measures, encryption protocols, and data access controls), technologies, and policies implemented to safeguard sensitive trade and maritime data within the context of maritime single window. The encounters faced by Singapore, Ghana, and Turkey, particularly in their efforts to integrate this factor, shed light on the complex nature of this undertaking implementations. This demonstrates that even countries with advanced capabilities wrestle with the multifaceted nature of this undertaking.

Ultimately, data security can be said to be a foundational element in ensuring the confidentiality, integrity, and availability of maritime information while promoting seamless trade processes.

e. **Interoperability:** Interoperability also emerged as a critical and recurring factor in the implementation of maritime single window, as evidenced by the case studies examined in the research. Interoperability, in the context of maritime single window, refers to the ability of diverse systems, organizations, and entities to seamlessly and efficiently exchange data and interact with one another. Its significance is paramount in fostering the success of maritime single window implementations, as it directly impacts various aspects of maritime trade and logistics (European Maritime Safety Agency, 2022).

Firstly, interoperability plays a pivotal role in facilitating the exchange of data among different stakeholders involved in the maritime sector. This encompasses government agencies, shipping companies, customs authorities, and port authorities. The ability of these entities to communicate effectively through interoperable systems is fundamental for the streamlined flow of information, which, in turn, contributes to smoother trade processes (UNECE, 2017).

Secondly, international trade is a central component of many nations' economies. Interoperability is crucial for these countries to exchange data with their foreign counterparts efficiently. It ensures that the maritime single window aligns with global standards and conventions, such as those recommended by IMO and UN (UNECE, 2017). As countries seek to establish or improve their maritime single window systems, prioritizing interoperability is essential for reaping the benefits of streamlined maritime trade and logistics.

f. **Regulatory Alignment:** The degree to which a country's regulations and policies are harmonized with the objectives of the maritime single window, varies among the nations reviewed in this research. Regulatory alignment is not uniformly present in all nations but differs based on their legal frameworks, government structures, and the specific goals of their maritime single window implementations.

While some countries may have made significant efforts to align their regulations with the maritime single window objectives, others may face challenges in this regard. As discussed earlier, factors such as legal reforms, policy adjustments, and coordination among stakeholders play a crucial role in achieving regulatory alignment.

It's important to note that regulatory alignment is an ongoing process, and nations may continually work to refine and adapt their regulatory frameworks to better facilitate trade and maritime operations through the maritime single window. Therefore, the degree of regulatory alignment can vary, and nations may be at different stages of achieving alignment with the goals of their maritime single window implementations.

#### **5.1.1.2 Challenges of Maritime Single Window Implementation**

While analyzing the case studies, several recurring challenges came to light. These challenges encompass a range of issues, including but not limited to the legal framework, technical complexities, and the intricacies of change management.

**a. Interoperability:** Interoperability stands out as a critical challenge in the implementation of maritime single window across various countries, impacting the efficiency and effectiveness of trade and maritime operations. This challenge has been particularly evident in countries such as Kenya, Ghana, and Turkey as highlighted by Government of Ghana (2016); Mwajita (2016); Djanitey (2018); Peynirci (2023).

These nations struggled to achieve the necessary collaboration among relevant stakeholders, including government agencies responsible for trade and maritime operations. The lack of alignment between these entities' systems and data exchange protocols hindered the smooth flow of information. As a result, trade processes became less efficient and more cumbersome.

Antigua and Barbuda, despite receiving technical expertise from the Norwegian Coastal Administration, faced interoperability challenges, particularly related to legal frameworks. The foreign technical support may not have fully accounted for the specific legal requirements and regulations in Antigua and Barbuda, leading to discrepancies in how data was processed and exchanged. This highlights the need for a deep understanding of each country's legal context when implementing maritime single window (Jarett, 2016; IMO, 2019).

**b. Data Security Challenges:** Another critical challenge is data security, which is essential to protect sensitive trade and maritime data. Turkey, Singapore, and Ghana, for instance, encountered data security challenges during their maritime single window implementations. As the digitalization of maritime operations progressed, concerns about data breaches and cyber-attacks emerged (Government of Ghana, 2016; Djanitey, 2018; Maritime Port Authority of Singapore, 2022; Maritime Port Authority of Singapore, 2023; Peynirci, 2023). Each country had to invest in robust cyber security measures, encryption protocols, and access controls to safeguard sensitive information. Ensuring the security of data exchange within the maritime single window system was paramount to maintaining the integrity of trade processes.

Antigua and Barbuda, while benefiting from technical expertise, may also have faced data security challenges related to protecting sensitive information within their maritime single window system. Regardless of the level of technical support received, the need to safeguard data and prevent unauthorized access or breaches remains a universal concern.

As maritime single window adoption continues to expand globally, addressing these challenges will be essential to realizing the full potential of streamlined and secure maritime trade processes.

**b. Legal Framework:** The absence of a concrete legal framework can hinder maritime single window implementation. One common challenge across the case studies is the diversity of legal environments in different countries. Each nation has its own set of laws, regulations, and procedures, making it challenging to harmonize these with the standardized processes of maritime single window. Kenya, Ghana, and Panama had to undergo legal reforms to adapt their existing frameworks to accommodate the requirements of maritime single window (Government of Ghana, 2016; Mwajita, 2016; Ken-Trade, n.d; Panama Canal Authority, n.d; Safety4sea, 2017; Djanitey, 2018). This process can be time-consuming and may require changes at multiple levels of government.

**c. Technical Challenges:** Maritime single window implementation often involves overcoming technical challenges, such as data integration and slow internet connectivity, which can impede the adoption of digital systems. Integrating data from various stakeholders and ensuring interoperability between different systems and databases was also observed as a common technical challenge. Inadequate data standardization can lead to data inconsistencies and processing delays. Protecting sensitive trade and maritime data is paramount. Robust cyber security measures, encryption protocols, and access controls must be implemented to safeguard information. Both Singapore and Ghana faced technical difficulties in this area (Government of Ghana, 2016; Djanitey, 2018; Maritime Port Authority of Singapore, 2022; Maritime Port Authority of Singapore, 2023).

**d. Change Management:** Transitioning from traditional processes to digital systems requires change management efforts to ensure smooth adoption. Shifting from traditional, paper-based processes to a digital maritime single window requires significant change in

the way stakeholders operate. Resistance to change, lack of user training, and difficulties in transitioning to new workflows were observed as challenges.

Other challenges experienced by some nations include; the need for standardization of data shared through maritime single window among various nations. This standardization is crucial to ensure that the electronic exchange of information bolsters, rather than hampers, the functioning of the shipping industry (MPA Academy Singapore, 2022). There are other important challenges as well, such as data authenticity and responsibility for the reported information. Even if it is extremely beneficial, the quest for interoperability across the many systems used around the world is a significant problem and will necessitate more discussion.

#### **5.1.1.3 Lessons Learned**

From the strategies employed to tackle the above challenges, valuable lessons have emerged that hold considerable significance for other nations embarking on the implementation of maritime single window. These lessons include:

- a.** Actively involving stakeholders in the planning and implementation process of maritime single window is crucial for gaining their support and buy-in.
- b.** Pilot phase implementations: Implementation of pilot phases is paramount as it allows for rigorous testing, fine-tuning, and feedback collection, ensuring a smoother transition to the fully electronic system.
- c.** Awareness Campaigns: Carrying out public awareness campaigns is also important as it helps to educate businesses and the public about the benefits of maritime single window, fostering acceptance of digital transformation.

**d.** It is important to establish efficient data integration and standardized documentation practices as they are vital for reducing administrative costs and improving trade efficiency.

**e.** Lastly, nations should establish robust monitoring and evaluation mechanisms as it ensures ongoing system performance assessment and identifies areas for improvement.

In summary, the implementation of maritime single window in these nations demonstrates a commitment to modernizing trade processes, improving efficiency, and aligning with global digitalization trends. While each case has unique challenges and contexts, common themes and lessons learned shed light on the importance of collaboration, capacity building, and regulatory alignment in successful maritime single window adoption. These insights can inform future maritime single window implementations globally.

## **5.2 Research Questions**

Recall that there were three research questions identified to be answered at the beginning of this research. The answers to these research questions based on the extensive study in this thesis are discussed below.

### **1. What are the key challenges and barriers that countries face when implementing maritime single window?**

The answer to this question has been discussed in section **5.1.1.2**. These challenges encompass a range of issues, including but not limited to Data Security, legal framework, technical complexities, and the intricacies of change management

## **2. What strategies can be developed to address these challenges effectively while ensuring successful adoption?**

As observed from the case study review, to effectively address the challenges mentioned earlier and ensure the successful adoption of maritime single window, the following practical strategies can be developed:

- 1) Make changes to existing laws to match the requirements of maritime single window. This means adjusting customs and maritime laws to fit with digital trade.
- 2) Capacity Building: Make a good plan to help people switch from paper to digital processes. Offer training programs to teach people in government agencies, customs, and others the technical skills they need to use the maritime single window system.
- 3) Stakeholder Collaboration: Make sure different groups like government agencies, private companies, ports, and customs officials all work together. They should have a clear way to share information and make decisions.
- 4) Data Security: Keep data safe by using strong cyber security measures, encryption, and controls on who can access the data.
- 5) Stick to international data interoperability standards that help different countries share data seamlessly.
- 6) Tech Support: Have a team ready to help with technical problems and support users. This keeps the system running smoothly.
- 7) Launch public awareness campaigns to inform businesses and the general public about the benefits of maritime single window adoption.
- 8) Collaborate with international bodies and neighboring countries to leverage best practices and share experiences in maritime single window implementation.

By using these strategies, countries can deal with the challenges of adopting maritime single window effectively and make their maritime trade smoother and more efficient. Each country should adjust these strategies to their specific needs while keeping the goal of making trade easier in mind.

### **3. How can insights from one country's maritime single window implementation guide other nations looking to establish or improve their systems?**

Insights from one country's maritime single window implementation as was discussed in this research serve as a valuable knowledge base for other countries. By studying the experiences, challenges, and strategies of those who have already embarked on this journey, countries can make informed decisions, tailor their approaches, and increase the likelihood of successful maritime single window implementation.

### **5.3 Theoretical Contribution**

The theoretical contributions of this research on the implementation of maritime single window are multifaceted and significantly advance our understanding of several key theoretical domains.

Firstly, within the realm of trade facilitation theory, this research provides valuable insights into how maritime single window systems align with and enhance the principles of trade facilitation. It explores how maritime single window simplifies, harmonizes, and expedites international trade procedures, thus contributing to a deeper theoretical understanding of how trade facilitation measures can lead to economic growth and increased global competitiveness. Analyzing the impact of maritime single window on reducing bureaucratic obstacles, paperwork, and administrative delays, underscores the importance of trade facilitation in modern trade environments.

Secondly, in the context of technology adoption, this research enriches our theoretical understanding of how digital platforms like maritime single window are embraced by governments, maritime agencies, and trade stakeholders. It delves into the theoretical drivers and barriers to technology adoption, highlighting the complexities of transitioning from traditional paper-based systems to digital solutions. This theoretical exploration sheds light on the dynamics of technological change in the maritime sector.

Furthermore, within the domain of change management theory, the study contributes by examining the strategies employed during maritime single window implementation in various nations. It offers theoretical insights into how governments and organizations manage the behavioral and organizational changes required for a successful transition to maritime single window. This research underscores the pivotal role of change management practices in facilitating the adoption of innovative digital solutions.

Additionally, in the realm of entity coordination theory, this research enhances our theoretical understanding of how different government agencies and stakeholders collaborate, share information, and coordinate efforts to streamline maritime trade processes through maritime single window.

Concerning policy framework development, this study advances theoretical discussions by emphasizing the importance of creating legal and regulatory frameworks that support maritime single window systems. It provides theoretical insights into how policy formulation plays a pivotal role in enabling trade facilitation through digitalization. Theoretical considerations of policy development are essential for understanding the regulatory underpinnings of maritime single window.

In terms of data security theory as well, the research delves into the complexities of safeguarding sensitive trade and maritime data within digitalized trade environments. It offers theoretical insights into the foundations of data security and privacy, contributing to broader discussions on data protection in the context of maritime single window.

Lastly, the research aligns with theoretical discussions on global trade trends and digitalization, exploring how countries adapt to and participate in these trends. Theoretical insights provided in this context contribute to a deeper understanding of the evolving dynamics of international trade.

In conclusion, this research significantly enriches various theoretical domains, deepening our understanding of trade facilitation, technology adoption, change management, entity coordination, policy development, data security, and global trade trends. These theoretical contributions are essential for both academics and practitioners seeking to navigate the complex landscape of modernizing maritime trade processes through digitalization and the implementation of maritime single window systems.

#### **5.4 Practical Contribution**

The implementation of maritime single window has emerged as a critical endeavor in modernizing maritime trade processes globally. This research offers significant practical contributions that hold implications for various stakeholders engaged in international trade and logistics. These practical insights are derived from empirical sources and serve as actionable guidance for real-world application.

One of the primary practical contributions lies in the realm of trade efficiency. The research highlights how the adoption of maritime single window systems can result in substantial reductions in both time and cost associated with cross-border trade procedures. This practical insight is of paramount importance to stakeholders who aspire to streamline their trade processes, mitigate delays, and elevate the overall efficiency of their trade ecosystem.

Furthermore, the study provides pragmatic recommendations for the simplification and harmonization of administrative procedures tied to maritime trade. By offering insights into how governments can simplify and standardize documentation requirements, the research addresses the real-world issue of administrative burdens on traders, shipping companies, and regulatory bodies. Such streamlining of procedures can practically translate into reduced paperwork and expedited cargo clearance processes.

In an era where data security is a paramount concern, the research underscores the practical measures necessary to enhance data security within maritime single window systems. It emphasizes the criticality of robust cyber security measures, encryption protocols, and stringent data access controls. These practical recommendations hold practical significance in safeguarding sensitive trade and maritime data, addressing real-world challenges related to data breaches and cyber threats.

Additionally, the study emphasizes the practical importance of entity collaboration. Governments and regulatory bodies can gain practical insights from the case studies, which underscore the significance of fostering cooperation among diverse stakeholders involved in maritime trade. Such collaboration can practically translate into more efficient information exchange and streamlined decision-making processes.

Policy development and alignment are other areas where practical contributions are evident. Governments can leverage these practical recommendations to create the necessary legal and regulatory frameworks that support the implementation of maritime single window systems. This includes policies related to data protection, alignment with international standards, and the seamless integration of existing laws into the digital ecosystem.

The research also provides practical guidance on technology adoption strategies. It offers insights into how organizations can navigate the transition from traditional paper-based systems to digital solutions. This practical guidance encompasses change management strategies, capacity-building initiatives, and the provision of essential technical resources. In the same vein, the research offers practical insights into how countries can align with global trade trends and the era of digitalization. By understanding and adeptly responding to these trends, governments and trade stakeholders can position themselves competitively in the global trade landscape.

Lastly, lessons learned from successful maritime single window implementations serve as valuable practical takeaways. These lessons provide actionable guidance for other countries considering similar initiatives, shedding light on best practices while cautioning against potential pitfalls.

With these, it can be concluded that the research objective of recommending suggestions and guidelines for countries seeking to establish or improve maritime single window has been successfully met.

## Chapter 6 – Conclusion and Recommendation

### 6.1 Summary of Findings

This study delved into the implementation of maritime single window by examining seven diverse nations as case studies. It meticulously analyzed a selection of scholarly publications to fulfill its objectives. Within this research, trade facilitation emerged as a primary objective across all the nations studied. Maritime single window systems were found to streamline administrative processes, reduce paperwork, enhance transparency, and promote efficiency, ultimately contributing to the facilitation of international trade. These systems played a pivotal role in supporting the movement of commodities and facilitating the efficient exchange of vital information within global supply chains.

Moreover, the study highlighted the critical role of collaboration among government agencies, private sector entities, port authorities, customs officials, and logistics providers in the successful implementation of maritime single window. While most nations emphasized the importance of this collaboration, some, like Kenya and Ghana, faced challenges in achieving effective cooperation among relevant parties, hindering the maritime single window implementation process.

Data security and interoperability also emerged as significant challenges in the case studies. Singapore and Ghana, for instance, encountered technical difficulties in integrating data security and data interoperability into their maritime single window systems, highlighting the complexity of these issues even for advanced nations.

In conclusion, this study provided valuable insights into the implementation of maritime single window, its role in trade facilitation, and the challenges and lessons learned from seven diverse case studies. It underscores the importance of legal frameworks, technical issues, standardization of data, collaborative efforts, data security, and interoperability in

the successful deployment of maritime single window, offering valuable lessons for countries seeking to establish or improve their own maritime single window systems in the future.

## **6.2 Recommendations**

1. To tackle the challenges stated, countries should provide training programs to help stakeholders and users adapt from traditional paper-based processes to digital systems. Also, it's crucial to create a culture of teamwork among government agencies, private companies, and others involved in maritime trade.
2. **Stronger Data Security:** To deal with data security issues, countries should put strong measures in place to protect sensitive trade and maritime data from cyber threats. They should follow international guidelines for data security to make sure information is safe in their maritime single window.
3. **Interoperability:** Given the importance of interoperability, countries should adopt internationally accepted standards for data exchange. These standards should make it easy for different maritime single window systems around the world to share information without any problems.
4. The maritime industry keeps changing and new technologies keep coming up. Countries should keep researching and improving their maritime single window to keep up with these changes. This way, they can continue to make international trade and maritime operations smoother and more efficient.

## **6.3 Limitations of the Research**

This study's use of secondary data is a drawback. Data availability and completeness may limit secondary research's usefulness. The researcher analyzed case studies, academic literature, and reports to provide a comprehensive overview of maritime single window

implementation to overcome this constraint. However, the lack of primary data collecting, such as stakeholder interviews or surveys, restricted the depth of understanding of maritime single window implementation. Biases in data sources are another issue. Case studies, reports, and scholarly publications may be biased due to their authors. The researcher carefully evaluated each data source to detect and acknowledge any biases, ensuring an objective study.

The research's generalizability may also be limited because each country and region's regulatory framework, organizational structure, and cultural factors may affect maritime single window implementation differently. The conclusions may not apply to all littoral states despite efforts to cover a diverse set of case studies.

Due to the maritime industry's dynamic nature and maritime single window systems' ongoing evolution, time restrictions also hindered the research. Maritime single window implementation may have changed since the study was conducted. Another drawback was language difficulties, as some significant information and insights were only available in languages not addressed in the study.

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