



NATIONAL SINGLE WINDOW PLATFORM AND INTEGRATED BORDER RISK MANAGEMENT IN NIGERIA

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Abstract

The study rated the National Single Window (NSW) against its role in inter-agency coordination, information-sharing and the performance of Nigeria's borders in terms of its role in integrated border risk management. A quantitative survey yielded 198 valid questionnaires from 240 distributed, and a qualitative survey was conducted through interviews and focus group discussions until thematic saturation was reached. Quantitative data were analyzed descriptively to summarize findings, and through correlation analysis and multiple regression. The results showed that while the NSW has advanced the digitalization of border administration, its potential as a platform to integrate risk management systems is only partially realized. The results of the quantitative and qualitative assessments indicated that, despite progress made in the exchange of electronic information and administrative effectiveness, interoperability, coordination of risk assessment, and collaboration among institutions remain weak points. Also, the regression analysis revealed that, there exists a border risk management technology-governance relationship. The ability of the NSW to produce a positive effect on the performance of the border was statistically significant. Still, inter-agency coordination was identified as the most influential determining factor in achieving good outcomes. The study also found some institutional factors that hamper the effectiveness of the NSW. The lack of inter-agency coordination, interoperability between agency information systems, poor data-sharing, mistrust of agencies and lack of capacity remain barriers to collaborative decision-making and integrated risk assessment. Based on the findings, it was suggested that, increasing digital infrastructure capacity should be followed by strengthening institutional integration, which is the priority. Investments in information technology remain relevant in border security will be achieved through interoperable information systems, harmonized risk assessment methods, and formalized inter-agency collaboration. The National Single Window should therefore be developed as an environment in which information can be shared and intelligence exchanged in real time, with the exchange of coordinated risk information.

Keywords:

Agency coordination, Border security, Integrated, Risk management, Single window.

1. INTRODUCTION

The integrated management of boundaries has become increasingly reliant on good governance structures that can strike a balance between national security and facilitating legitimate trade

and travel. In an increasingly globalized trade environment, and with the emergence of more sophisticated cross-border threats, border officials increasingly need to adopt intelligence-led strategies that enable them to identify and intercept high-risk consignments in time while avoiding unnecessary disruption to trade that complies with the trade intelligence system. To address these challenges, countries have transitioned from document-based border controls to more integrated border risk management systems that rely on digital technologies, joint management, and inter-agency collaboration for efficient and secure operations (World Customs Organisation [WCO] 2024; United Nations Economic Commission for Europe [UNECE] 2023).

The National Single Window (NSW) is emerging as a key part of this change. The NSW aims to reduce duplication of procedures and increase transparency, information sharing, and coordinated decision-making by providing a single platform that allows traders to submit information only once to multiple regulatory agencies. In addition to its recognized role in facilitating trade, current NSW systems also contribute to integrated risk management, including interoperable information systems, intelligence sharing, joint development of high-risk indicators, and coordinated targeting of high-risk movements, as identified by WCO (2024) and UNECE (2023).

While these developments have led to progress in the field of National Single Windows, the success of NSWs relies on more than just the technology. Experience in developing economies shows that the realization of the outcomes of the digital border platforms often falls behind the process of technological modernization, while institutional reforms lag. Agencies' ability to leverage a shared digital platform to facilitate collaborative risk assessment and intelligence-led enforcement (LIFE) is often hindered by weak legal frameworks for sharing information, fragmented governance frameworks, incompatible information systems, and low organizational trust (Lomba, Nkoro, & Oladosu, 2024; WCO, 2024).

Some of these challenges are clearly highlighted in Nigeria, where the operations of border agencies are spread across various agencies such as the Nigeria Customs Service (NCS), Nigeria Immigration Service (NIS), National Agency for Food and Drug Administration and Control (NAFDAC), Standards Organisation of Nigeria (SON), National Environmental Standards and Regulations Enforcement Agency (NESREA) and the Nigeria Agricultural Quarantine Service (NAQS). The agencies have traditionally operated under distinct legal regimes, with the legal frameworks, institutional structure and information systems all different. As a result, border governance still grapples with a variety of risk assessment approaches, a lack of interoperability between information systems, fragmented intelligence sharing, and multiple inspection processes, which reduce operational effectiveness and undermine national border security.

The National Single Window offers a strong opportunity to address these institutional issues. The Nigeria NWS is designed to streamline trade documentation and simplify information sharing among border agencies, on a single digital platform. However, uncertainties remain about the extent to which the platform supports integrated border risk management beyond its administrative functions. Although previous work has explored customs modernization, agency-level risk management, trade facilitation, and border security, little empirical evidence has measured the National Single Window as a coordinated way of managing risk across agencies at borders. Previous research has mainly focused on technological implementation or institutional reforms, with little evidence on the impact of digital integration on collaborative

risk assessment and border security performance in Nigeria. Thus, this study fills this gap by analyzing the National Single Window as a platform for integrated border risk management in Nigeria. Specifically, it explores the level of inter-agency coordination, information sharing, and integrated risk assessment at the NSW level; examines the institutional and technological factors that can affect its effectiveness; and evaluates its contribution to the NSW's success in border security performance. This study contributes to the literature by empirically examining the National Single Window not merely as a trade-facilitation technology, but as a socio-technical governance mechanism linking digital integration, inter-agency coordination, risk-management formalisation and border-security performance

2. LITERATURE REVIEW

2.1 Integrated Border Risk Management and the Evolution of Risk-Based Border Governance

The internationalization of trade, movement and transnational criminal networks has revolutionized the way that national borders are governed. Over time, traditional border control systems, heavily based on manual processes of routine inspection and verification, have increasingly been replaced by risk-based approaches to balance security goals with trade facilitation measures (Grainger, 2014; Widdowson, 2018). Integrated border risk management does not equalize risk levels for all shipments or travellers; instead, it focuses efforts and resources on high-risk shipments and travellers while allowing compliant shipments and travellers to pass through with minimal delay (Bersin, 2012; Haruna, 2024).

The development of risk management reflects the broader shift in Global Governance and security policy. Early border administration operated differently; all goods and travellers were subject to regular checks without considering individual risks (Andreas, 2013). Blanket inspection systems became less effective as trade grew worldwide. Gradually, the government realized there was no practical operational or economic way to inspect all shipments, so it began implementing selective enforcement systems through intelligence, data analysis, and risk profiling (Bersin, 2012).

Modern risk management is based on the concept that different border threats have different likelihoods and consequences. Some shipments can cause severe security or health issues, while others are regular business transactions which can be handled electronically (Widdowson, 2018). Risk management is an ongoing process of identifying, assessing, analyzing, treating, monitoring, and reviewing risks (Grainger, 2014; Saunders, Lewis & Thornhill, 2019). These principles are institutionalized through international standards developed by the World Customs Organisation (WCO), including advance cargo information, risk profiling, and programmes for authorized economic operators and intelligence-led customs administration (WCO, 2021).

With the increasing focus on intelligence-led enforcement, the overall mandate of border risk management has broadened even more. Today's border agencies often harness information and data analytics, surveillance technology, biometric identification systems, and global information-sharing networks to anticipate criminal networks, smuggling routes, and emerging threats before goods or people cross the border (Bowling & Sheptycki, 2015; Igwe, 2024). The developments have reinforced the need for integrated border management. This principle

highlights the need to coordinate border management activities, including risk analysis, among different border management sectors and institutions, such as customs authorities, immigration services, health authorities, environment authorities, and law enforcement (European Commission, 2020; Haruna, 2024).

Global security events have also promoted the use of integrated risk management. Following the terrorist attacks of 11 September 2001, governments increased the scale of intelligence sharing and improved pre-border screening systems (Zedner, 2016), and the COVID-19 pandemic highlighted that border risk management must address not only customs and immigration risks but also public health risks. In the modern era, therefore, security, economic, health, environmental, and technological risks are considered part of a comprehensive risk-management framework (WCO, 2024).

2.2 National Single Window as a Platform for Integrated Border Risk Management

However, one of the most significant institutional arrangements to undertake integrated border management is the National Single Window (NSW). A Single window enables traders to provide regulatory information through a single electronic platform, accessible to various government agencies at the same time, reducing administrative duplication and enhancing transparency (UNESCAP, 2022). In addition to facilitating trade, the NSW can support coordinated risk analysis, information sharing, and joint operational decisions by providing a digital infrastructure to do so.

One of the strengths of the NSW is its ability to share data across the customs declaration, cargo manifest, immigration, quarantine and regulatory compliance systems, creating a shared information environment (WCO, 2021). Single Window platforms enable border institutions to conduct common risk profiling, coordinated targeting, and real-time intelligence exchange (UNESCAP, 2022; WCO, 2024), which was previously unavailable because of a lack of integrated datasets. This is especially significant in situations where multiple agencies share border responsibilities and need access to the same operational information.

NSW systems have been extended in terms of their analytical capabilities due to technological advances. Increasingly, border agencies process huge amounts of trade and travel information in real time, supported by artificial intelligence, predictive analytics, electronic cargo-tracking platforms, and automated risk engines (Igwe, 2024). Machine-learning algorithms can recognize unusual shipment patterns, target high-risk shipments, and provide automated alerts for enforcement officers, increasing targeting accuracy and reducing unnecessary inspections (Igwe 2024; WCO 2024).

However, border governance integration is consistently highlighted in the literature as not being a foregone conclusion. Institutional collaboration, interoperable databases, and harmonized risk criteria and legal frameworks that facilitate information sharing are important factors in the success of SW systems (UNESCAP, 2022; Nosiri & Ohazurike, 2023). If NSW does not have its own database, or is tasked with different mandates, it can become an electronic repository for documentation instead of a full-fledged risk-intelligence platform. However, to be effective, collaboration and cooperation are needed at a governance level that goes beyond technological integration, including intelligence sharing, joint inspections, and coordination of enforcement activities by the agencies (Haruna, 2024; WCO, 2024).

2.3 Risk Management Processes and Approaches in Border Security

Border agencies typically use a defined risk management process that involves risk identification, risk assessment, risk profiling, risk mitigation, monitoring, and review (WCO, 2018; Widdowson, 2018). Risk identification begins by collecting information from customs declarations, cargo manifests, passenger information, intelligence reports, and information-sharing from international networks to identify potential risks (Haruna, 2024). Customs risk-management units, immigration passenger-data systems, records of regulatory inspections, and biosecurity surveillance systems are sources of relevant intelligence in Nigeria (Okolo et al., 2022).

Risk assessment involves analyzing identified threats using risk matrices, risk-scoring systems, and predictive models to assess their likelihood and impact (WCO, 2018). The next step in risk profiling is to categorize shipments, travellers, or entities based on set criteria such as country of origin, compliance record, commodity, financial patterns, and past violations (UNECE, 2023). A complete integration of data to carry out effective profiling is a great challenge when border agencies have disjointed information systems.

Depending on the level of risk assessed, risk treatment involves appropriate control measures such as documentary verification, cargo scanning, laboratory testing, surveillance, administrative penalties, post-clearance audits, and physical inspection (Udeh & Nwkorobia, 2022). To enhance the detection capabilities whilst at the same time minimizing clearance delays, non-intrusive inspection technology has become more vital, encompassing a range of technologies corresponding to cargo scanners, radiation detectors and biometric systems (Haruna, 2024).

There are multiple alternative methods of border risk management mentioned in the literature. The risk-based selective control approach focuses inspections on high-risk movements and allows low-risk transactions to proceed (Grainger, 2014; Bersin, 2012). The intelligence-led approach is based on systematic intelligence collection and analysis and targets criminal networks and emerging threats (Bowling & Sheptycki, 2015). The compliance management approach also encourages voluntary compliance by introducing schemes like Authorized Economic Operator, which gives trusted traders access to simplified procedures. (Grainger, 2014) The joint approach to border management is based on cross-border risk assessment, harmonized procedures, and shared information systems, carried out by multiple agencies (Haruna, 2024; European Commission, 2020).

Scholars are also increasingly emphasizing the need for multi-layered, technology-driven, collaborative governance and data-driven, analytical approaches to risk management that extend beyond the border to pre-border and post-border phases of the supply chain (Zedner, 2016; Grainger, 2014; Igwe, 2024). These methods accept that inspections alone are insufficient to ensure border security and that security is maintained and enhanced through continuous monitoring, predictive analysis, public-private partnerships, and international cooperation.

2.4 Challenges of Integrated Border Risk Management in Nigeria

Despite ongoing modernization efforts, Nigeria still faces significant challenges in implementing integrated border risk management. The presence of many borders and many agencies with the responsibility of coordinating a response makes coordination a challenge

between the Nigeria Customs Service (NCS), the Nigeria Immigration Service (NIS), the National Agency for Food and Drug Administration and Control (NAFDAC), the Standards Organisation of Nigeria (SON), the National Environmental Standards and Regulations Enforcement Agency (NESREA) and the Nigeria Agricultural Quarantine Service (NAQS).

Fragmentation is one of the foremost challenges to effective risk management, as is often mentioned. Multiple, unaligned risk-assessment systems, inspection processes, and databases consequently lead to duplicated inspections and inconsistent enforcement decisions (Akinola, 2019; Akinyemi, 2013). A key drawback of complex border-management systems is that clearance times are significantly longer, and transaction costs are higher for legitimate traders, according to the World Bank (2020).

Poor data integration and information sharing also hinder risk analysis efforts. Despite the launch of a National Single Window programme by Nigerian authorities, many agencies still use standalone databases that are not easily interoperable, hindering the creation of comprehensive risk profiles (WCO, 2024). Uncoordinated information systems also limit the effectiveness of intelligence-led enforcement because agencies lack access to information generated by others (Nosiri & Ohazurike, 2023).

The lack of technology and infrastructure still poses serious challenges, especially at the land borders, where scanning equipment, surveillance technologies, reliable electricity and internet connectivity are often lacking (UNODC, 2021). These limitations often force officers to rely on manual processes, limiting the effectiveness of automated risk-analysis tools.

In addition, corruption and integrity issues pose challenges in implementing risk-based controls. In cases of high discretionary decision-making, officers can circumvent risk-management practices or influence inspection outcomes, which reduces the system's credibility (Oluwadare, 2020). Furthermore, human staff may be limited in effectively using modern analytical tools, which require specialized training in intelligence analysis, data interpretation, and digital-system management; border personnel need training in these areas (Saunders et al., 2019).

Other risks include porous borders and high volumes of informal cross-border movement of goods and people, as well as legal and policy constraints, such as outdated laws and policies that are not well suited to risk-based targeting or inter-agency data sharing (Nosiri & Ohazurike, 2023; Akinyemi, 2013). Long-term reform programmes can also be affected by political and governance issues and/or tensions between trade facilitation and security goals.

The literature indicates that the effectiveness of the National Single Window (NSW) in Nigeria depends not only on digital infrastructure but also on the overall governance landscape in which it operates. Successful implementation requires interoperable information systems, harmonized risk-management procedures, legal clarity, political commitment, and strong inter-agency collaboration. They serve as a basis for analytical evaluation of the National Single Window and whether it is currently a true platform for integrated border risk management in Nigeria.

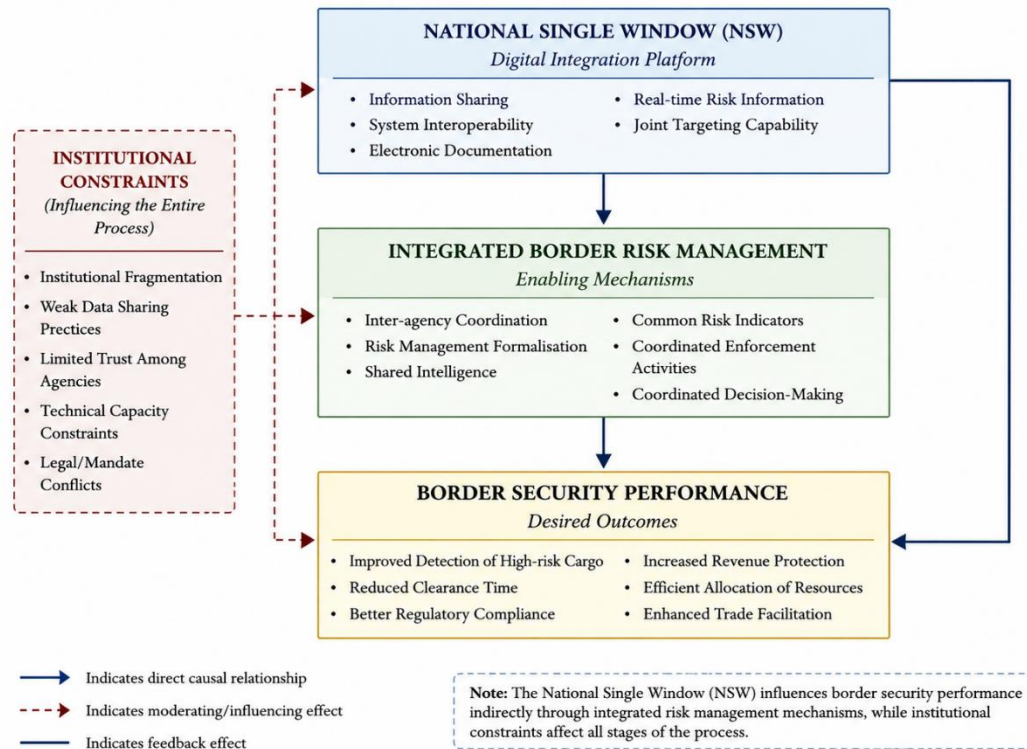


Figure 1. Conceptual Framework for Evaluating the National Single Window as a Platform for Integrated Border Risk Management in Nigeria

Source: Author's Custom Design

3. METHODOLOGY

This study used a convergent parallel mixed-methods design, collecting and analyzing quantitative and qualitative data concurrently, then integrating them when interpreting the results. This design was suitable because assessing the National Single Window (NSW) as a tool for Integrated Border Risk Management (IBRM) required both quantitative evidence of how the platform functions and qualitative evidence of how it is coordinated, how information is shared, and how challenges are overcome. The methods are suited to complex governance and policy studies because they link organizational processes to measurable outcomes (Creswell & Plano Clark, 2018).

The research was conducted in all the border control agencies in the Nigerian border, which consist of six (6) principal agencies, namely Nigeria Customs Service (NCS), Nigeria Immigration Service (NIS), National Agency for Food and Drug Administration and Control (NAFDAC), Standards Organisation of Nigeria (SON), National Environmental Standards and Regulations Enforcement Agency (NESREA) and the Nigeria Agricultural Quarantine Service (NAQS). The agencies were chosen for their statutory functions related to border governance and their important function in implementing integrated border management initiatives. The data were gathered from staff deployed at key strategic points of the land, air and sea borders.

Primary data included structured questionnaires, interviews and focus group discussions, as well as documents and other materials from operational reports, seizure records, policy

documents, and NSW-related institutional records. The use of multiple sources of data helped to triangulate the operational performance indicators with the participants' experience and institutional views, which helped to enhance the credibility of the data (Saunders, Lewis & Thornhill, 2019).

A quantitative survey yielded 198 valid questionnaires from 240 distributed, and a qualitative survey was conducted through interviews and focus group discussions until thematic saturation was reached. Quantitative data were analyzed descriptively to summarize findings, and through correlation analysis and multiple regression.

4. RESULTS AND DISCUSSION

4.1 Performance of the National Single Window as a Platform for Integrated Border Risk Management

A total of 198 valid responses were analyzed, accounting for 82.5% of the responses received. The respondents were selected from various agencies, including the Nigeria Customs Service (NCS), the Nigeria Immigration Service (NIS), the National Agency for Food and Drug Administration and Control (NAFDAC), the Standards Organisation of Nigeria (SON), the National Environmental Standards and Regulations Enforcement Agency (NESREA) and the Nigeria Agricultural Quarantine Service (NAQS). The respondents were frontline officers and middle-level managers/senior officials deployed in the different agencies of the Nigerian borders, cutting across land, air and maritime borders, thus giving the different agencies handling border risk management in Nigeria representation.

The first objective considered the level of support for integrated border risk management provided by the National Single Window (NSW) today. Table 1 shows the opinion of the respondents on the functional aspects of the platform.

Table 1. Performance of the National Single Window in Supporting Integrated Border Risk Management

Indicator	Mean	SD
NSW facilitates inter-agency information sharing	3.18	1.14
Real-time risk data accessibility	2.83	1.13
Systems are technically interoperable	2.74	1.16
IT systems support joint targeting	2.69	1.19

Source: Descriptive Statistic Result Based on Filed Survey 2026

The results show that, National SW has made limited advancements with regard to facilitating the exchange of information between border agencies. The platform moderately helps to share inter-agency information ($M = 3.18$), thus supporting the electronic submission and exchange of documentation in comparison to a paper-based process. The mean scores, however, were significantly lower for interoperability ($M = 2.74$), real-time accessibility of shared risk information ($M = 2.83$), and ability to support joint risk targeting ($M = 2.69$). The results of this study indicate that NSW's utility is more as an electronic documentation system than as an integrated border risk management system.

This is confirmed by the qualitative results. In all interviews and focus group discussions, participants identified NSW as providing mostly electronic processing of trade documentation and only limited functionality for collaborative risk assessment and operational decision-making. Officers say each agency has their own risk profile and risk assessment criteria, so there is parallel, not integrated, risk assessment processes. As a result, there has not been a significant decrease in duplication of inspections and harmonization of enforcement efforts between agencies through the digital platform.

The results align with those of the World Customs Organisation (WCO, 2024) and highlight the importance of institutional integration and joint governance mechanisms for border digital platforms to have an impact. Similarly, the United Nations Economic Commission for Europe (UNECE, 2023) notes that interoperability, common data standards, and joint risk management are needed, in addition to the exchange of electronic documents, for successful Single Window systems. In Nigeria, Okolo et al. (2022) also found that, digital customs reforms have progressed faster than institutional harmonization, limiting their impact on integrated border management.

Based on the results, it can be inferred that the National Single Window in Nigeria is in the intermediate stages of implementation, as it has partially implemented the project (digitization of administration) but has not yet fulfilled its role as a single risk intelligence platform.

4.2 Institutional Factors Influencing the Effectiveness of the National Single Window

The respondents were also asked to rate the potential benefits that would accrue with the integrated NSW and the main barriers to its implementation. Table 2 shows the results.

Table 2. Perceived Benefits and Barriers to an Integrated National Single Window

Variable	Mean
Perceived Benefits	
Improved detection of high-risk consignments	4.21
Reduced cargo clearance time	4.17
Enhanced public and trade confidence	4.14
Increased revenue collection	4.09
Implementation Barriers	
Data-sharing and trust deficits	4.03
Technical capacity constraints	3.94
Legal and mandate conflicts	3.89
Resistance to institutional change	3.87

Source: Descriptive Statistic Result Based on Filed Survey 2026

Respondents had a high level of trust in the ability of an integrated National Single Window to both improve border security and facilitate trade. All expected benefits have a mean value greater than 4.0, reflecting strong consensus that improved integration is needed to enhance risk

detection, speed up legitimate trade, strengthen revenue collection, and build stakeholders' confidence in border administration.

The qualitative results are very consistent with these quantitative results. Participants repeatedly stated that a fully integrated NSW would allow agencies to have access to shared threat intelligence, to be able to plan coordinated inspections and to avoid duplicating the process of seeking documentation. The respondents felt that these enhancements would enable limited border officials' time to focus on those products that pose a high risk, and to coordinate the movement of compliant traders through more effective border procedures.

This was positive, though, as respondents also highlighted significant institutional challenges. The key challenge identified was data-sharing and trust deficits, closely followed by a lack of technical capacity, conflicting institutional mandates, and resistance to organizational change. The interviews showed that agencies remain hesitant to release information that could support their operations because of concerns about agency autonomy and the protection and control of information. Some respondents said they already have a technological infrastructure. However, in most cases, agencies still work separately because their organizational culture does not foster collective decision-making.

The results suggest institutional challenges are more likely to hinder the National Single Window than technological ones. These findings align with those from other countries that have spent substantially on information technology (IT) but still faced institutional fragmentation that hindered the success of digital border reforms (Widdowson, 2018; WCO, 2018). Similarly, Haruna (2024) and Udeh & Nwokorobia (2022) identify institutional distrust and weak governance as significant challenges to cooperative border governance in Nigeria.

4.3 Predictors of Integrated Border Security Performance

Multiple regression analysis was performed using Border Security Performance as the dependent variable to determine whether the National Single Window has a significant contribution to integrated border risk management. This is shown in Table 3.

Table 3. Multiple Regression Analysis of Predictors of Border Security Performance

Predictor	β	t	p-value
Risk management formalization	0.28	4.01	<0.001
Inter-agency coordination	0.41	6.83	<0.001
National Single Window effectiveness	0.22	2.75	0.007
Model Statistics: $R^2 = 0.57$; Adjusted $R^2 = 0.55$; $F = 95.32$; $p < 0.001$.			

Source: Quantitative Statistic Result

The model has substantial explanatory power, assuming 57% of the variation in the performance of the border security. All three explanatory variables were statistically significant, indicating that governance structures, institutional coordination, and technological integration all affect border security outcomes.

Inter-agency coordination and risk management formalization were the two most important predictors of border security performance, with the former ($\beta = 0.41$) and the latter ($\beta = 0.28$)

being the highest coefficients. The effect of the effectiveness of the National Single Window also proved to be statistically significant with positive results ($\beta = 0.22$, $p = 0.007$); however, its coefficient is relatively small, so technology is not enough to provide risk management for the border if there is no collaboration in governance and harmonized operational procedures.

The following is qualitative evidence that supports these findings. Existing NSW infrastructure was recognized as effective in providing administrative efficiency; however, operational coordination still relies heavily on informal communication, personal relationships, and agency-specific decision-making. These ad hoc agreements can enable swift information dissemination but don't always account for staff turnover, new management, or institutional competition. For this reason, digital integration has not yet been achieved and linked with integrated operational risk management.

The results confirm previous research, which has highlighted governance integration as a key underlying element of a successful border modernization process. The WCO (2024) states that digital border systems should not be electronic documentation systems but platforms that enable the sharing of risks or pieces of risk intelligence. In the same way, UNECE (2023) has noted institutional coordination as the key ingredient of implementing an effective Single Window.

The empirical results suggest that, the NSW has considerable potential in supporting IBRM but has not fully leveraged this potential due to implementation mainly based on administrative digitalization without institutional integration. The platform has a positive impact on the performance of the borders, but it is limited by a lack of agreement in governance, interoperability issues, insufficient trust between agencies and weak institutional coordination. Implementing the NSW as a fully integrated risk management platform will thus demand governance changes that focus on common risk assessment approaches; information systems which span a range of agencies; shared intelligence architectures and formalized ways to collaborate between agencies.

5. CONCLUSION

The study rated the National Single Window (NSW) against its role in inter-agency coordination, information-sharing and the performance of Nigeria's borders in terms of its role in integrated border risk management. The results showed that while the NSW has advanced the digitalization of border administration, its potential as a platform to integrate risk management systems is only partially realized. The results of the quantitative and qualitative assessments indicated that, despite progress made in the exchange of electronic information and administrative effectiveness, interoperability, coordination of risk assessment, and collaboration among institutions remain weak points.

The regression analysis also revealed that, there exists a border risk management technology-governance relationship. The ability of the NSW to produce a positive effect on the performance of the border was statistically significant. Still, inter-agency coordination was identified as the most influential determining factor in achieving good outcomes. This finding indicates that digital platforms can support integrated border management only when accompanied by harmonized institutional arrangements, operational procedures, and cooperation among border management agencies. Thus, the NSW should be considered as much from a governance perspective as from a technological perspective.

The study also found some institutional factors that hamper the effectiveness of the NSW. The lack of inter-agency coordination, interoperability between agency information systems, poor data-sharing, mistrust of agencies and lack of capacity remain barriers to collaborative decision-making and integrated risk assessment. These challenges underscore the need to support technological modernization with governance reforms that build institutional integration, coordinate intelligence sharing, and establish common risk management standards, as argued in the literature on border management (WCO, 2024; UNECE, 2023).

Notwithstanding the limitations, the results show that there is significant institutional support for enhancing the NSW. Its ability to detect high-risk consignments, shorten cargo clearance times, improve regulatory efficiency, and increase border security and trade facilitation was consistently identified as benefits. This general agreement indicates that, the main implementation challenges are institutional rather than conceptual, and that specific governance reforms and increased inter-agency cooperation could substantially improve implementation.

Meanwhile, the findings have several practical implications for policymakers in Nigeria involved in border governance and customs modernization. Increasing digital infrastructure capacity should be followed by strengthening institutional integration, which is the priority. Investments in information technology remain relevant, but the evidence shows that greater gains in border security will be achieved through interoperable information systems, harmonized risk assessment methods, and formalized inter-agency collaboration. The National Single Window should therefore be developed as an environment in which information can be shared and intelligence exchanged in real time, with the exchange of coordinated risk information.

Second, the Government needs to put in place a full-fledged governance process that clearly assigns roles and responsibilities for data ownership, sharing, joint inspections and collaborative decision-making between the participating agencies. This would help reduce institutional fragmentation, limit duplication of inspections, and ensure consistency in border enforcement.

Third, ongoing investment in human capacity development is crucial. For the most successful implementation of integrated border management technologies, border officers need ongoing training in intelligence analysis, cyber risk assessment, data analysis, and operational cooperation.

Lastly, policymakers should use performance metrics that assess the NSW based on trade facilitation results, intelligence sharing and enforcement coordination, accuracy of risk targeting, and border security performance more generally. An integrated assessment approach would enable a more holistic view of the NSW's contribution to national border governance.

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