

Integrating Sustainability Risk into Transportation Risk Management Practices: A Holistic Systems Thinking Paradigm

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Abstract

Globally, Sustainable risk management is a growing paradigm, making the integration of sustainability issues into strategic planning areas crucial to responsible transport business philosophy. This paper examines the complexities of developing a Sustainable Enterprise Risk Management (SERM) framework for the road transport sector in the Global South (GS). Transportation is fundamental to economic growth and healthy living. It is a prerequisite for globalisation, sustainable tourism and a critical driver supporting the achievement of at least 8 of the 17 SDGs. However, the current transport systems, rapid urbanisation and population growth in the GS has led to several sustainability challenges. Preliminary findings have evidenced that current risk management practices do not adequately address sustainability risks due to lack of suitable ERM framework, tools and associated implementation guidance customised to the need of the GS transport sector. There has been a very limited literature regarding alignment of ERM with transportation sector. This paper seeks to address these challenges. It adopted a Contingency theory and employs Critical Realism as a philosophical approach with a strategic focus on Nigeria. Three transport specific ERM frameworks used in the Global North (GN) and two prominent ERM frameworks (COSO, 2017 and ISO:31000, 2018) were synthesised in the development of SERM. Application of Systems Thinking (ST) is utilised as a way improving the understanding of the complex relationship in the pursuit of SERM development. Secondary and primary data were analysed using Excel and SPSS software. Major benefits of ERM are revealed as well-informed risk-adjusted decision making and a strategic enterprise-wide view of key risks. The unique contribution this research is the development of customised SERM Framework offering a better understanding of organisational factors critical to the ERM implementation. It will potentially help risk practitioners, policy makers and their advisers with improved decision making, planning and prioritisation. As ERM is still guided by global perspectives, the Researcher recommends further investigation into how the framework can add

value to the organisation and possibly capture new factors into the proposed framework to enhance performance.

Keywords: Enterprise Risk Management (ERM), Global North/South (GN/GS), Risk Management (RM), Sustainability, Sustainable Enterprise Risk Management (SERM), Sustainable Transportation, Systems Thinking

1. Introduction

Sustainable development is crucial to the sustenance and growth of any nation. Transportation is fundamental to support economic growth and expanding access to essential services critical to poverty alleviation and inequality reduction. It is the engine of the global economy and helps stimulate human development [1].

It contributes to sustainability of health, energy and environment. In both the GN and GS and particularly in Nigeria, there is a forecasted [2] increasing GDP contribution from transportation and [3] report confirm increasing energy consumption worldwide (see Figures 1, 2, and 3).

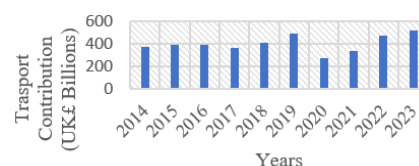


Figure 1. GDP Contributions from Nigeria Transport Sector [2]

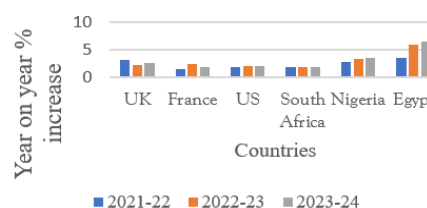


Figure 2. Year on Year Percentage GDP Contribution-Transport [2]

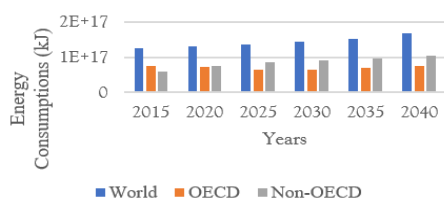


Figure 3. Global Energy Consumption (Transport) [3]

This research posits that the increasing GDP contribution from transportation in a GS country, i.e., Nigeria is expected to have a significant strain on the existing dilapidated transport infrastructure inclusive of increasing energy-related global greenhouse gas (GHG) emissions and other sustainability issues which directly impact health and well-being leading an increasing deaths and injuries from road traffic accidents (Figure 4 and 5). Sustainable development applied to the transport sector requires the promotion of linkages between environmental protection, economic efficiency and social progress. In this context, Table 1 illustrate the scope of sustainability (ESG-related) risks in the transport sector.



Figure 4. State of Nigeria Road [11]



Figure 5. Evidence of Environmental Pollution Nigeria [11]

The [4] research has evidenced that sustainability risks could lead to a significant impact on business, however, current risk management practices are not adequately addressing sustainability risks. In the Nigeria context, [5], [6] also noted various organisational /institutional challenges in the Transport sector driving the breakdown in sustainable ERM (e.g. Lack of ERM implementation guidance,

Table 1. Scope of Sustainability Risks in the Transport sector

3 Pillars	Theme	Key Issues
Environmental	Climate Change Pollution/Waste Natural Resources Environmental Opportunities	Carbon emissions and waste, Climate change Vulnerability Opportunities in clean technology and renewable energy
Social	Human Capital Product Reliability Stakeholder Opposition Social	Health and Safety and Demographic risks, Human Capital development Access to health care
Governance	Corporate Governance. Corporate Behaviour	Board Diversity, Business ethics, Corruption and instability

Lack of specific legal framework, Poor RM/ERM awareness culture, Lack of Leadership support, Budget-constraint, Technological Advancement, Poor coordination with Stakeholders etc.). Sustainability risks are often more challenging to quantify, manage and have longer timeline, therefore, the effectiveness with which organisations are identifying, and disclosing these risks are limited. Literature from the public domain has revealed that most of the challenges mentioned above are rooted in the poor management control systems put in place in the transport sector.

Under the Volatile, Uncertainty, Complex and Ambiguity (VUCA) scenario of 21st century organisations, managing complex and multiple human, technological, political and natural resources in the transport sector is crucial to ensure success. This call for holistic risk management innovative solutions such as SERM which is critical to sustainable transportation. It has been established that organisational resilience starts at the top with a customised ERM paradigm to achieve good risk governance and organisational objective in normal, volatile and crisis situations [7].

To provide further understanding and insight into the role of ERM in enhancing transport sector performance, a holistic paradigm will complement the proposed framework as a way of simplifying the inherent complexities, feedback, non-linearity and delays as captured in Figure 6.

Sustainable Transportation is a prerequisite for international integration of regions, trade competitiveness and participation in the process of globalisation. It is pivotal to climate mitigation, energy efficiency, sustainable tourism, and urban planning. Fundamentally, it is a critical driver [8] supporting the achievement of at least 8 of the 17 SDGs including SDG 9 (Industry, Innovation and Infrastructure), SDG 11 (Sustainable Cities and Communities), SDG 3 (Good Health and Well-being), and SDG 13 (Climate Action) to foster sustainable economic and social development and improve the overall quality of life (see Figures 7 and 8).

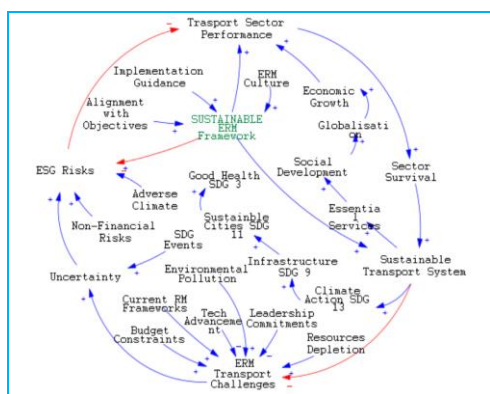


Figure 6. CLD Paradigm- Enhancing Transport Sector Performance [30]

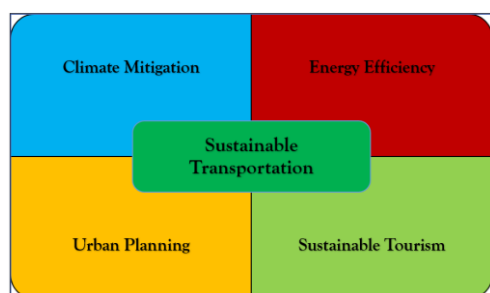


Figure 7. Sustainability Dimensions of Transport Systems [30]



Figure 8. Sustainable Transport-SDG Critical Drivers [8]

According to [9] the prospect of sustainable transportation in Nigeria seems promising considering various recent initiatives such as EV-taxi, public transit revolution (such as Bus Rapid Transit (BRT) systems and light rail networks) Figures (9and10). Emerging Alternative fuels (Compressed Natural Gas (CNG), smart mobility solutions (with companies like Shuttlers and Bolt leading the charge), ride-sharing apps, real-time traffic updates, e-ticketing systems and Autonomous Vehicles (though, still in their infancy). Benefits such as: Reduced congestion, Energy efficiency, Cleaner Air, Economic opportunity have been noted.

The academic arguments above underscores the need for a holistic and structured approach to running and managing public and private agencies (including transport sector). It highlights the urgent need to address and manage systemic global risks by involving and creating synergies among all stakeholders to enhance the transport sector performance.



Figure 9. Nigeria First-ever Electric Vehicle Taxi [9]



Figure 10. The Lagos Mass Transit System in Nigeria [9]

2. Literature Review

Global South (GS) is a term used to refer to developing countries that are mostly situated in the southern hemisphere, with generally low levels of income. It refers to developing countries with emerging economies and different structural problems [10]. The author argues that one of the hindrances to the development of (GS) is inadequate financial capital to invest in technology. However, it is acknowledged that the region is rich in natural resources. Though, this has led to a situation of a natural resource curse, considering the fact that despite the abundance of natural resources, the economies experience low-income levels, slow development and high levels of corruption.

The Federal Republic of Nigeria is a multi-ethnic and culturally diverse federation of thirty-six (36) autonomous states, six geopolitical zones and the Federal capital territory. Studies on transportation sector in Nigeria have become so important because of the need to formulate better policies for an efficient and effective transport systems. Road transport was noted to be the most commonly used mode of transportation accounting for more than 90 per cent of

the sub-sector's contribution to the Gross Domestic Product [11]. It constitutes one of the major features of the economic development of Nigeria, fostering inclusive economic growth, social development and expanding access to essential services critical to poverty alleviation and inequality reduction. Development plans for the sector are incorporated into the Nigeria Integrated Infrastructure Master Plan (NIIMP) a 30-year roadmap established in 2014 [12]

The concept of Sustainability

The idea of a sustainable society in which the needs of the present are met without compromising the ability of future generations to meet their own needs is compelling Brundtland Report [13]. It emphasises that technology and social organisation can be both managed and improved to make way for a new era of economic growth. Similarly, the report from [14] noted that sustainability practices encourage businesses to frame decisions in terms of Economic, Environmental and Social effects to ensure resilience and long-term value creation. It argues that sustainability is a paradigm for thinking about a future in which interactions and interdependencies between environmental, social and economic variables are balanced in the pursuit of development and an improved quality of life. Figure (11) below illustrates how these three pillars add value to global, sustainable societies. In addition, the areas of overlap, such as socio-environmental, socio-economic, and eco-economic also create further opportunities for sustainable development [15]. Despite its many dimensions and uncertainties, sustainability is generally agreed to be important and worth pursuing.

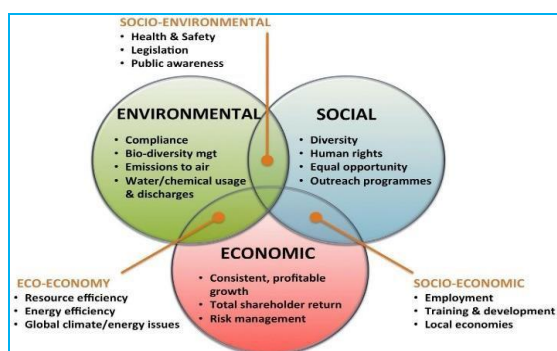


Figure 11. Balancing the Pillars of Sustainable Development [15]

Sustainability in Transportation

Sustainability risks are uncertain social, governance or environmental event that, if it occurs, can cause significant negative and positive (opportunities) impact on an organisation [16]. Current trends in transportation contribute to unsustainable conditions, including climate change,

energy insecurity, congestion, fatalities and injuries, noise/air/water pollution and ecological impacts as illustrated in Table 2. Widespread uncertainty exists about how to address the goal of a sustainable transportation system. Many author and practitioners [17] have noted that the current risk management practices are not adequate in addressing sustainability risks (Figure 12). The continuously volatile business setting emphasised and contributed to the importance and awareness of ERM, where market survival depends on retaining the organisation's competitiveness and reputation.

Table 2. Transportation impact on Sustainability [15]

Economic	Social	Environment
▪ Traffic Congestion ▪ Mobility barriers ▪ Accident damages ▪ Facility costs ▪ Consumer cost ▪ Depletion of Non-renewable resources	▪ Inequality of impacts ▪ Mobility Disadvantage ▪ Human health impacts ▪ Community interaction ▪ Community liveability ▪ Aesthetics	▪ Air and Water pollution ▪ Habitat loss ▪ Hydrologic impacts ▪ Depletion of Non-renewable resources

Table 3. Scope of Sustainability Risks in the Transport sector [17]

3 Pillars	Theme	Key Issues
Environment	▪ Climate Change ▪ Pollution/Waste ▪ Environmental Opportunities	▪ Carbon emissions, Product carbon footprint, Climate change vulnerability ▪ Air/water pollution, Toxic-emission ▪ Depletion of Non-renewable resources ▪ Opportunities in clean technology ▪ Opportunities in renewable energy
Social	▪ Human Capital ▪ Product Reliability ▪ Stakeholder opposition ▪ Social opportunities	▪ Health & Safety, Human Development ▪ Mobility Disadvantage ▪ Responsible investment, Health and demographic risk ▪ Access to communications, Access to finance, Access to health care
Governance	▪ Corporate Governance. ▪ Corporate Behaviour.	▪ Board Diversity, Business ethics, Tax transparency, Corruption and instability.

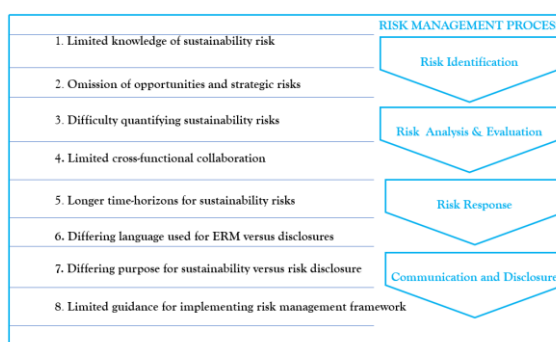


Figure 12. Break down in ERM process for Sustainability Risks [18]

Majority of business practices are now aware of the dangers to the environment and social responsibility concern, therefore, incorporating sustainability risk management (SRM) and sustainability agendas into transportation corporate strategy could have an impact on the transport organisation's performance as well as ensuring its long-term viability in the transport sector. Properly

executed sustainability policies could promote faster growth, reduce risk associated with transport operations and enhance transport sector performance. Best practice approach demands that sustainability should be integrated as a critical component of the ERM processes.

3. Embedding Sustainability in ERM Process

Integrating an organisation's sustainability strategy into ERM governance is one technique to embed and build-in sustainability into the organisation's overall business operations. As noted by [17] joint partnership report, the ERM function of an organisation is critical to monitoring and managing the risks and opportunities that stem from internal and external forces – whether social, environmental, legal, political, technological or economic as illustrated in Figure 13 below. The report further noted that although many sustainability risks are emerging, complex and longer-term, leveraging and enhancing an organisation's ERM framework can support identification, assessment and mitigation of these risks.

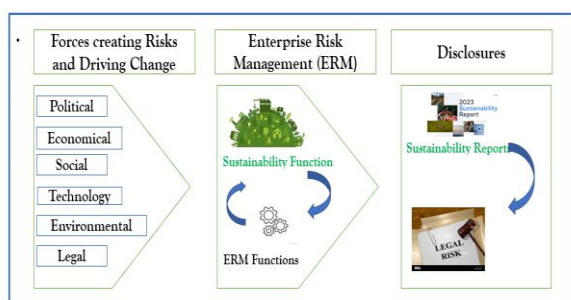


Figure 13. The Role of ERM in transport organisation [30]

The [17] guidance (see Figure 14) consists of five sections that mirror the five components of COSO Framework further discussed in Section 5. The components are: 1) Governance and culture; 2) Strategy and objective-setting; 3) ERM process focusing on Performance (identifying, assessing, prioritizing and responding to sustainability risks); 4) Review and revision and 5) Information, communication and reporting. The guidance is expected to be used in conjunction with an established ERM framework such as [18], [19] among others as demonstrated in Figure 15.

To support these activities, the ERM function will typically engage with the other business functions, including finance, supply chain, human resources, legal and sustainability practitioners. An enterprise-wide focus allows the organisation to filter out the risks that would have the most significant impact on

the entire organisation and aggregate those which might be present across multiple departmental silos.



Figure 14. Guidance on Managing Sustainability Risk [18]

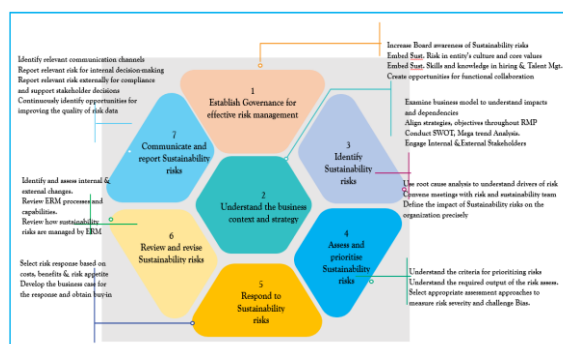


Figure 15. Applying ERM to Sustainability Risks [17] Adapted

As noted by [17] incorporating sustainability into ERM can strengthen the organisation's understanding of its full suite of risks, improve its sustainability management, likewise, incorporating an ERM lens into materiality assessments can help to translate results into language relevant to the business organisation. Figure 16 shows potential benefits of this integration

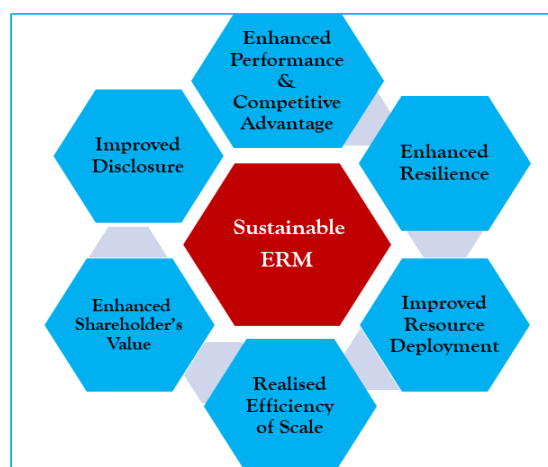


Figure 16. Role of Sustainable Enterprise Risk Management [30]

4. ERM in the Transportation Sector

The 21st-century technological-driven organisations are embedded in a dynamic and increasingly complex environment, where risk has a multitude of forms and sources and where adaptability, resilience and forward-thinking innovative strategies are key [20]. Various authors have established that ERM research is limited in terms of exploring the coupling and fluidity of ERM in organisational settings [20]. In this context, contingency theory perspective has been suggested for developing customised ERM systems [21]. According to [22], [23] globally, risk management has been recognised as implicit in the transportation business practices as shown in Figure (17). Risk management does not replace performance or asset management but rather it complements them. [24] identified four (4) ERM practices at Agency, Program, Project, and Activity management levels, they confirm that transport agency personnel could be managing risk daily, however, holistic risk management, from the agency level to the program, to project and activity level is not a common practice.

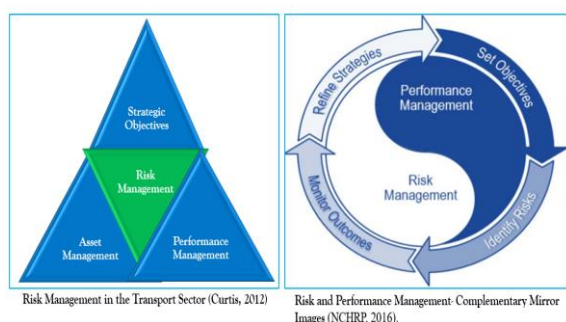
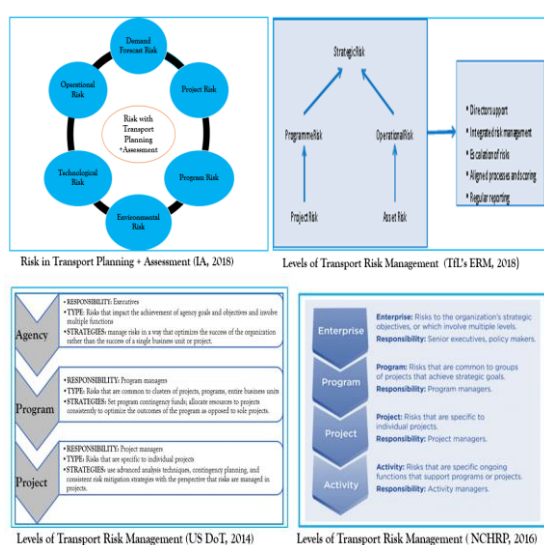


Figure 17. Risk Management in Transport Sector [24]



Figures 18,19 Levels of Transport Risk Management [24]

Similarly, [23] identified five (5) key areas of transport risk management practice which include: 1) Strategic risks (2) Operational risks (3) Asset risks (4) Program risks and 5) Project risks. In transport planning and assessment, risk and uncertainty of varying degrees exist about future socio-demographic, economic, technological and environmental trends. [24] identified similar sources of risks with respect to ERM in the transportation business practices (Figures 18 and 19)

5. Relevant Transport ERM Frameworks

Risk management approaches in transportation are influenced by an interplay of institutional and technical factors and among others, by the business environment, the hazardous nature of transportation operations, regulatory framework, organisational risk profiles and associated organisational aims and objectives [27]. As the concept of ERM gained prominence, scholars have analysed a multiplicity of driving forces of both the institutional and technical nature behind ERM adoption and implementation. [28] Identified: regulatory requirements, internal audit effectiveness, human resource competency and top management commitment; other driving forces includes: the importance of demonstrating legitimacy to shareholders and the influence of risk specialists within organisations; the relevance of agency ratings (e.g. Moody, Standard and Poor) and the propensity of large organisations to adopt ERM was empirically demonstrated to drive ERM adoption.

Figures 20, 21, and 22, illustrates the Canada guide to Integrated Risk Management Framework, Transport for London (TfL)'s ERM Framework (ERMF, 2018) and Australian Transport Assessment and Planning Framework (2022).

The Frameworks illustrates activities and decision support system, with a logical, multi-step approach aimed at achieving the high-level goals and transport system objectives. [29] conducted a comparative analysis of the landmark ERM frameworks and concluded that updated [18] and [19] are the most recognised and applied worldwide (see Figures 23, 24).

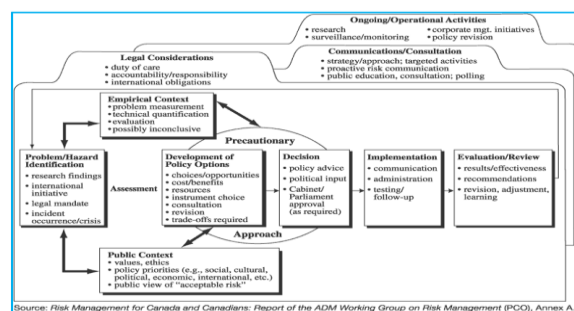


Figure 20. Canada Integrated Risk Management Framework [26]

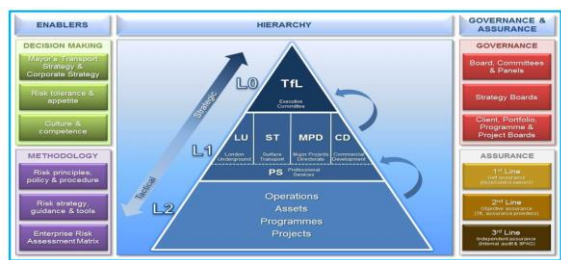


Figure 21. TfL's ERM Framework. [23]

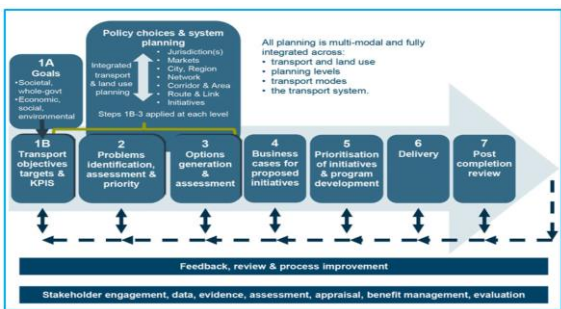


Figure 22. Transport System Management Framework [25]

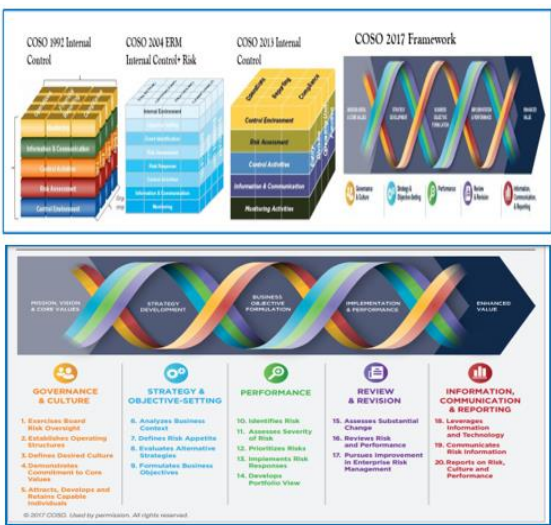


Figure 23 COSO ERM Process Guide [18]

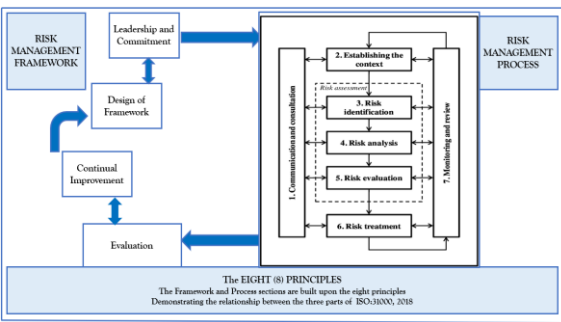


Figure 24. ISO 31000 Risk Management Architecture [19]

Synthesis (see Table 4) of these landmark frameworks highlights the same continuous and consistent risk management processes customised to the organisational context and emphasises the importance of integrating the risk management function within the organisation's culture, core strategies and business processes (see Figure 25).

Table 4. Synthesis of the Stages of RM Process [30]

Phase	RM Guide Framework for Management of Risk Canada (2010)	RM Guide NCHRP 604 (2017) Guidebook on Risk Analysis	RM Guide AS/NZS 4360 2009: Risk Management	RM Guide COSO: 2017 Enterprise Risk Management	RM Guide ISO 2009, 2018 Risk Management	RM Guide Australia Transport (ATAP, 2022) Framework
1	Planning and Designing the Approach and Process	Establishing the context	Establishing the Context	Governance and Culture, Strategy and Objective-Setting	Communication and Consultation, Establishing the context	Goals: ESG Establishing the context, Transport objectives and KPIs
2	Implementing Integrated Risk Management	Identify, Assess, Analyse	Risk Assessment Risk Treatment	Risk Assessment Risk Treatment	Risk Assessment Risk Treatment	Problem Identification and Risk Assessment
3	Practicing Integrated Risk Management	Mitigate and Plan	Risk Treatment Monitoring and Review	Review and Revision	Risk Treatment Monitoring and Review	Risk Treatment, Prioritisation of initiative + Program Develop, Communicate and Consultation, Recording and Reporting
4	Continuously Improving Integrated Risk Management	Allocate, Monitor and Control	Information and Communication and Consult	Information and Communication and Reporting	Communicate and Consult, Recording and Reporting	



Figure 25. Cyclical nature of Risk Management Process [30]

The guidelines provide organisations with recommendations regarding the design of enterprise-wide risk governance structures and risk management processes, developing positive risk cultures and formal frameworks of policies and procedures and adopting adequate risk management tools and technological solutions. Further, a literature review from the public domain has confirmed the potential benefits that implementation of ERM frameworks may bring to organisations such as increased capital efficiency, improved risk-based decision making, increased firm value and recognition among important external stakeholder groups [18]. As mentioned earlier, this is of particular relevance for organisations in the transport sector, as the nature of their operations is by default challenged by a diverse set of hazards and risks.

6. Derivation of Theoretical Framework

In this research, the derivation of the SERM model (see Figure 26) was theoretically based on the evaluation of the existing literature of ERM approaches (see Tables 5) and the gaps identified (see Figure 27). These gaps are the major organisational factors that significantly influence the stage of ERM implementation along with the deficiencies of the current ERM frameworks. The theoretical framework works as a tool to reveal the important organisational dynamics with both internal and external environments. The key aim of this framework is to ensure a consistent and enhanced transport sector performance, through reducing volatility of their portfolios and increasing predictability of value creation. It also aims to seize opportunities and manage possible risks that could have negative impacts on the transport organisation’s performance, by improving methods used to achieve business goals and objectives at corporate, program and project levels.

The theoretical framework guides the collection and analysis of data on transport risk management presented in the subsequent sections. Based on the literature in Tables 6 and 7, the proposed framework comprises of four (4) strategic (interrelated) ERM components which are: inputs, core pillars, integration and outputs. The ability to explain the ERM process clearly is a key attribute of this framework to ensure its simplicity and applicability.

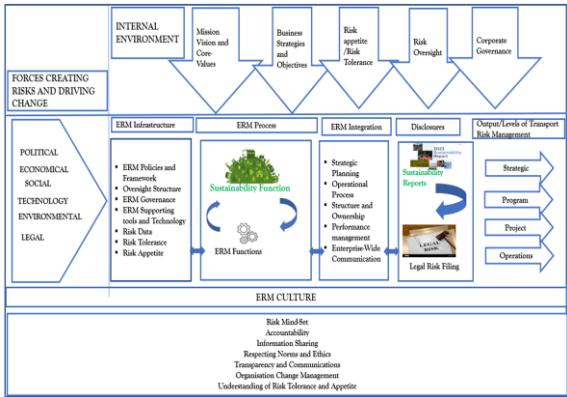


Figure 26. Theoretical Framework-for Enhanced Performance [30]

6.1. Underpinning Theories

Related theories that were relevant to ERM include Contingency theory, Stakeholder theory, Complexity theory, Portfolio theory and Organisational theory etc. This research discusses Stakeholder theory, Complexity theory and Contingency theory and concludes that Contingency is the most appropriate as illustrated in Table 5.

Table 5. Underpinning Theories

S/ N	Underpinning Theories	Justifications
1	Stakeholders Theory	- Aims to maximise Stakeholders' value. - Transportation RM is conducted in a complex environment in which the views of government, community, shareholders and other with different stakes need to be understood and ensure their views are considered in RMP - The existing RM frameworks need to be expanded to include the role of sustainability risks practitioners and tools to identify emerging sustainability risks. E.g. Carbon reporting software.
2	Complexity Theory	- The transport sector is a complex system. - Its challenges, including emerging sustainability risks are multidimensional, dynamic and complex in nature. - Increasing complexity due to transport networks, technological evolution and business cycles can produce more risks related to strategy, therefore presents feedbacks, delays and nonlinearity. - Higher sophisticated systems, faster and cheaper solutions with less environmental impact will be demanded in the future in line SDG 11- sustainable cities and communities. - However, it has not been tried in the Nigeria context
3	Contingency Theory	- Every organisation has its own approach to RM specific to their context. - Contingency theory sees organisations as a complex system faced with uncertainty while being subjected to rational criterion at the same time. - Contingency theorists believe that organisations are able to rationally align their structures to contingencies existing in their environment. - Dominant generic frameworks have generalised standards that could be risky to implement in the transport sector. - The 1st. Step in transportation RM is based on internal and external organisational context. - Based on Literature review coverage in Chapters (2-4), contingency theory has been suggested for developing a customised ERM (Woods, 2009, 2011; Kaplan and Mikes, 2014, 2015). Consequently, this research deems it to be the most appropriate theory considering the need for alignment of the Framework to the specific context of Nigeria road transport sector

Table 6. Literature References- Theoretical Framework [30]

SERM Framework Factors	Literature References
SERM Framework Factor: INPUTS	
Key Strategies and Objectives	Liebenberg and Hoyt (2003); Gates (2006); Fraser and Simkins (2007); Frigo (2008); Hofmann (2009) Towers Watson (2010); Kaplan, (2014); Beasley, Branson and Hancock (2010); Althonayan, Keith and Misiura (2011a; 2011b); Mikes and Kaplan (2013); Keith (2014); Protiviti (2016); Misha (2018); Rubino et al. (2018)
Embedding Sustainability in the ERM Principles and Practices.	Anderson and Anderson, (2009); Godfrey et al., (2009); KPMO International, (2011); Aziz et al. (2016); (COSO-WBCSD, 2018).
Risk Appetite/Limits	Lam (2003; 2010); Power (2009); Beasley et al (2009; 2010)
Risk Oversight	Liebenberg and Hoyt, (2003); Gordon et al. (2009); Beasley et al. (2012); RIMS (2012); Florio and Leoni, (2017); Malik et al. (2020); Villanueva et al. (2022).
Risk mindset and Awareness	Moody (2009); IRM (2012); Althonayan, Keith, and Killackey (2012a, 2012b; 2013)
Corporate Risk Governance	(COSO-WBCSD, 2018; ISO, 2018)
SERM Framework Factor: Core Pillars	
ERM Process and framework	Lam (2003; 2005); updated (COSO, 2017; ISO, 2018); WBCSD, (2018)
Risk Culture	Moody (2009); Paape and Spekle, (2012); Farrell and Gallagher, (2014); Keith et al. (2014), Protiviti (2016); Chen et al., (2019); Allini et al., (2022)
Infrastructure	Althonayan et al. (2013); Brooks, (2017); TL, (2018); ATAP, (2022).
ERM Tools and Techniques + Tools to quantify sustainability risks.	Curtis et al. 2012; NCHRP, 2016; ISO. IEC 31010:2019; updated (COSO, 2017; ISO, 2018) International Integrated Reporting Framework, Social and Natural Capital Protocols

Sustainable ERM Framework Factor	Literature References
SERM Framework Factor: INTEGRATION	
ERM Structure and Ownership	Liebenberg and Hoyt (2003); IRM, (2012)
Enterprise-wide Communication	Beasley, Pagach and Warr (2008a); Fox (2009); (Oliveira et al., (2018); updated (COSO, 2017; ISO 2018); WBCSD, (2018)
Risk training and Education	Paape and Spekle (2012); Curtis et al. (2012); NCHRP, (2016).
SERM Framework Factor: OUTPUTS	
Corporate (Strategic)	Lam (2003); Curtis et al. (2012); NCHRP, (2016), updated (COSO, 2017 and ISO, 2018)
Business (Tactical), Project, Program	Nocco and Stulz (2006); Chapman, (2007); Protiviti (2016); Curtis et al. (2012); NCHRP, (2016), updated (COSO, 2017 and ISO, 2018)
Operational	Curtis et al. (2012); NCHRP, (2016), updated (COSO, 2017; ISO, 2018)

Table 7. ERM Literatures Gaps [30]

ERM Areas	ERM Literature Research Gap	Research Author (Year)
ERM Concept	Existing frameworks are often criticized for failing to consider the specificity of organisations Contingency theory perspective has been suggested for developing customised ERM	Arena et al. 2010) Woods, (2011); Kaplan and Mikes, (2014), Chen et al (2019)
Top Management Support	Lack of intensive support by the management, Lack of meaningful risk reporting. Boardroom is lacking adequate set of skills in risk management	Rubino Michele (2018), Mishal (2018)
ERM integration with strategy and processes	Unclear understanding of the link between aligning ERM with strategy and decision-making Risk aware culture is a significant component of ERM Implementation Low consideration of the changes occurring in internal and external environments.	Protiviti, 2016), Misha (2018), Rubino et al, (2018) Keith (2014); Misiura (2015) Chen et al., (2019); Allini et al., (2022)
ERM Challenges	ERM is still guided by the global perspectives. Existing risk management frameworks lack effective understanding and implementation	Anton and Nucu, (2020), IRM (2018a), Albasteki (2021)

Figure 27. Research Gaps [30]

7. Adopted Research Methodology

The study approaches the complexity of the design of the SERM framework through the conjoint application of contingency, stakeholder and complexity theories with a holistic view of the interconnectedness of how the systems feed into each other. The research employs the Critical Realism Philosophy which aligns well with the potential benefits of applying sequential mixed methods research design as proposed in this research. It recognises the historical causal explanation and experiential verbal explanation in data collection and aligns well with the proposed Case study (Nigeria’s transport sector) strategies using abductive approach. A Systems Thinking paradigm has been utilised to simplifying the inherent complexities, feedback, non-linearity and delays in the pursuit of SERM development. Secondary and primary data were analysed using Excel and SPSS software. See Figure (28) for the summary of the research methodology.

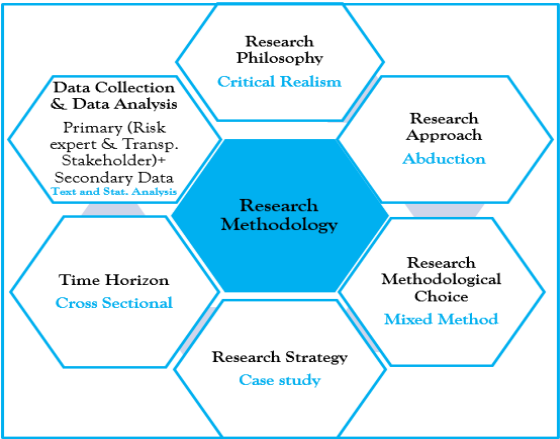


Figure 28. Summary of Research Methodology [30]

7.1. The Research Design

This paper applied mix-methodology, using a case study focusing on the Nigeria road transport sector as the main strategy of enquiry. The initial finding from literature review was the need to bridge gaps in knowledge associated with current ERM practices in GN and GS and the need for practical implementation guidance that is specific in nature to the transport sector in GS (i.e. Nigeria). To do so, this research explores the two dominant ERM frameworks [18], [19] and the three [20], [21], [22] transport ERM Framework and then modifies it accordingly. Figure (29, 30, 31) below depicts other components and the main dimensions of the research design.

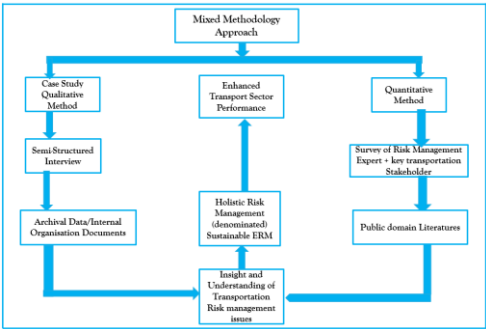


Figure 29. Research Methodology [30]

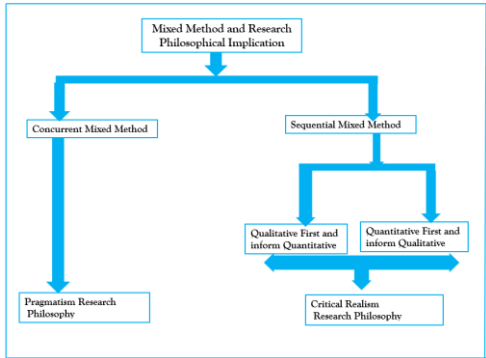


Figure 30. Mixed Method Research-Implication [31]

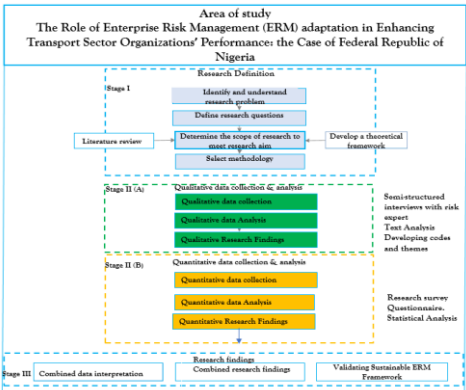


Figure 31. Research Strategy and Design [30]

8. Data Presentation

The descriptive profile of our research work is presented in Figures 32 to 52. And discussed in section 9.

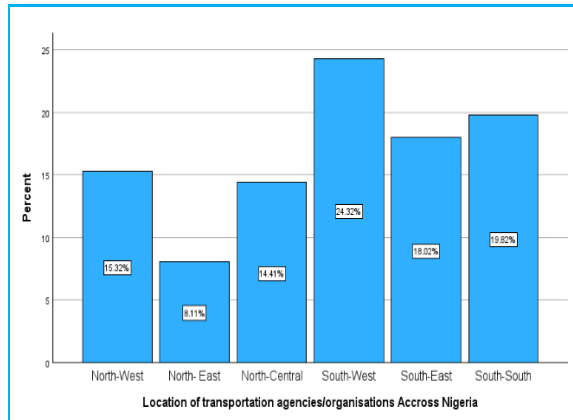


Figure 32. Geographical locations of Transportation Agencies

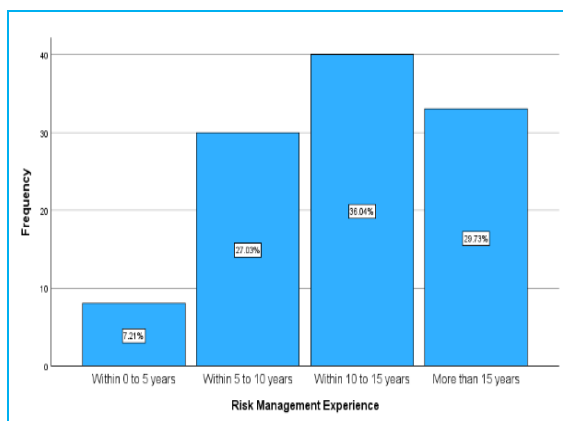


Figure 33. Participants' Risk Management Experience

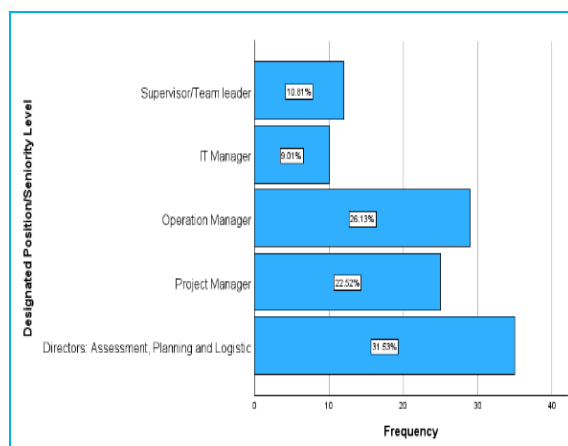


Figure 34. Participants' Designated role within transportation Agency

Current RM/ERM Practice Analysis

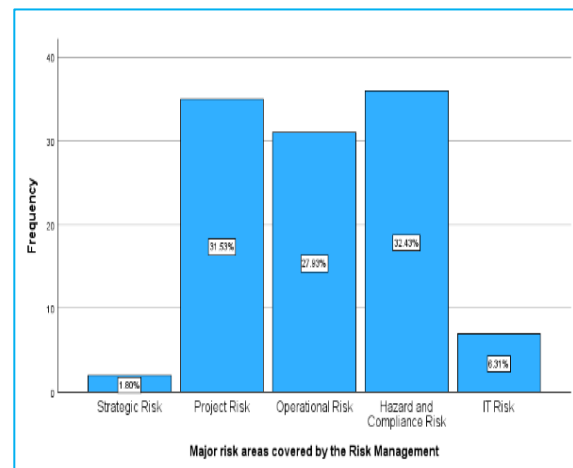


Figure 35. Risk Areas covered by Corporate Risk Management

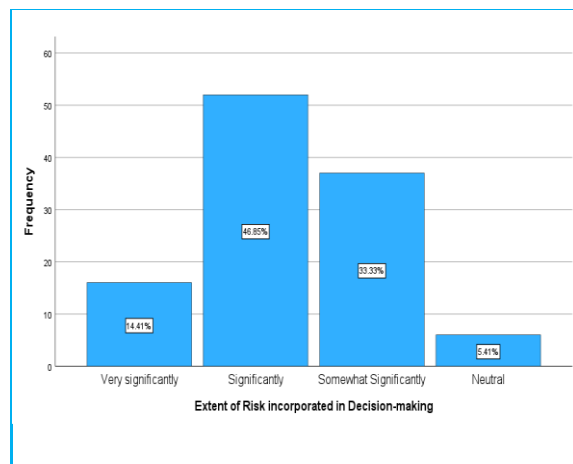


Figure 36. Extent of Risk incorporated in Decision-making

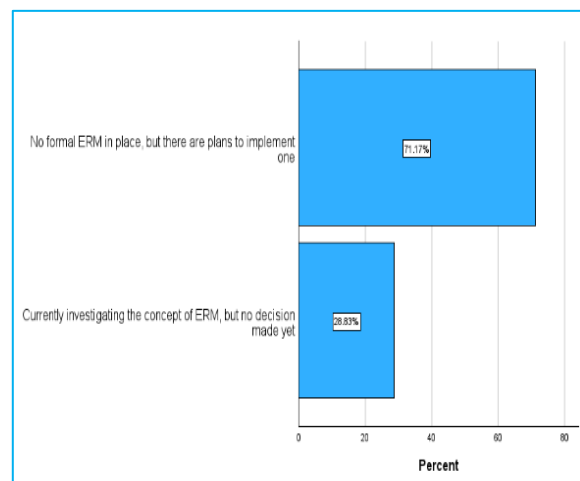


Figure 37. Current State of ERM implementation in selected Agencies

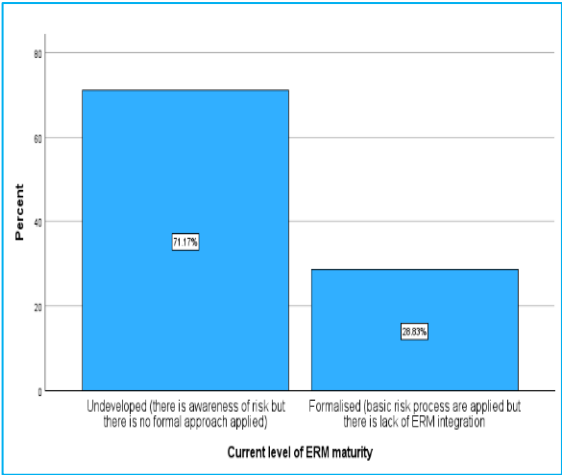


Figure 38. Current level of ERM maturity- Transport Agencies

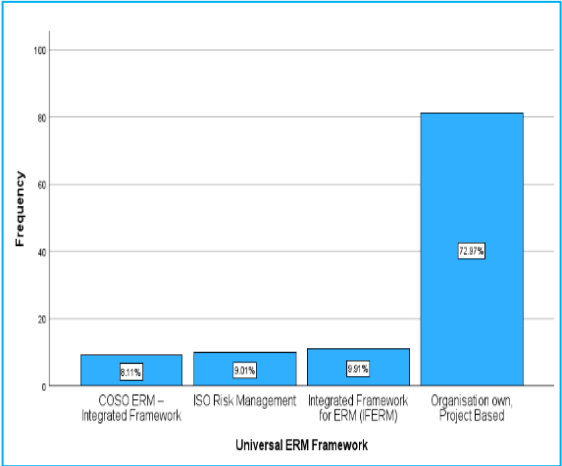


Figure 39. Participant’s view- Choice of Universal ERM Framework

Sustainability Practice Analysis

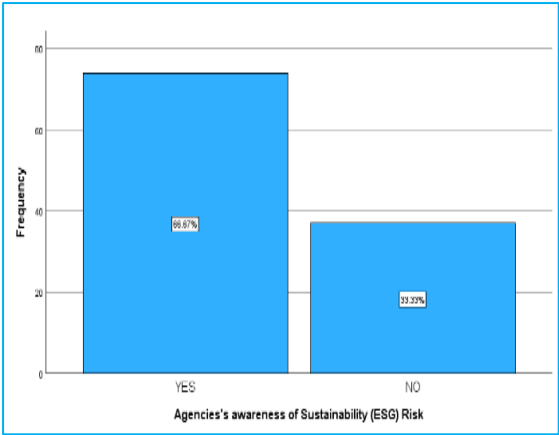


Figure 40. Participants’ view - Awareness of Sustainability Risk

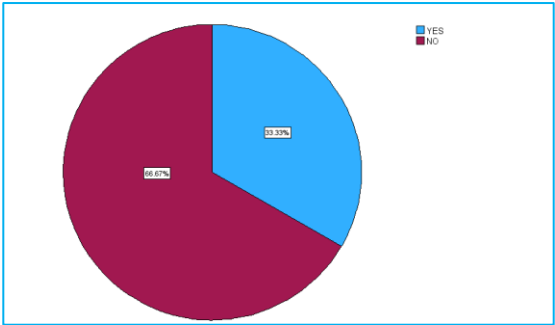


Figure 41. Participants’ view- Separate Sustainability Dept.

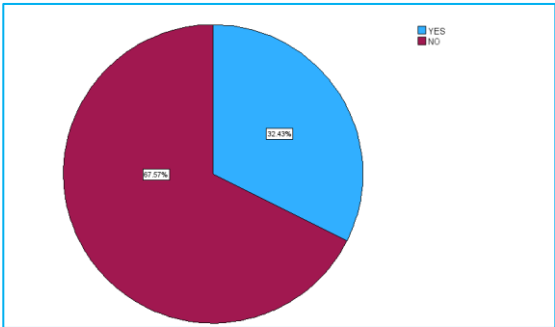


Figure 42. Participants’ View-Policy on Sustainability Disclosure

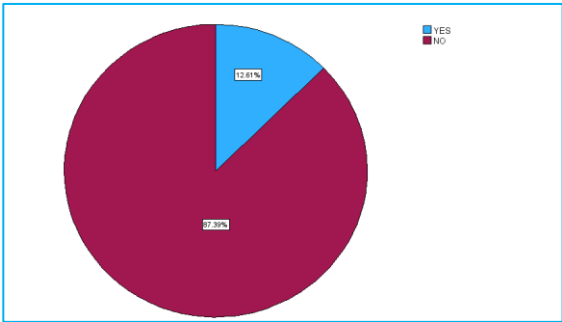


Figure 43. Participants’ view- Functional Collaboration- RM and Sustainability Team

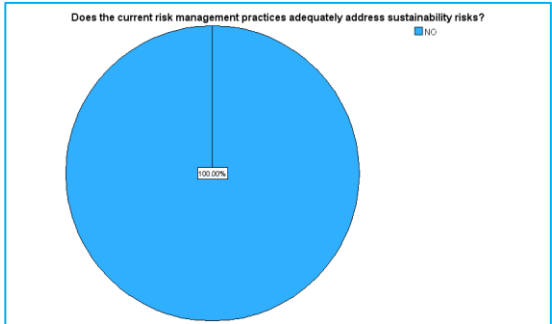


Figure 44. Participants’ view - Current RM Practices- Sustainability Risk.

Developing a Sustainable ERM Framework Analysis

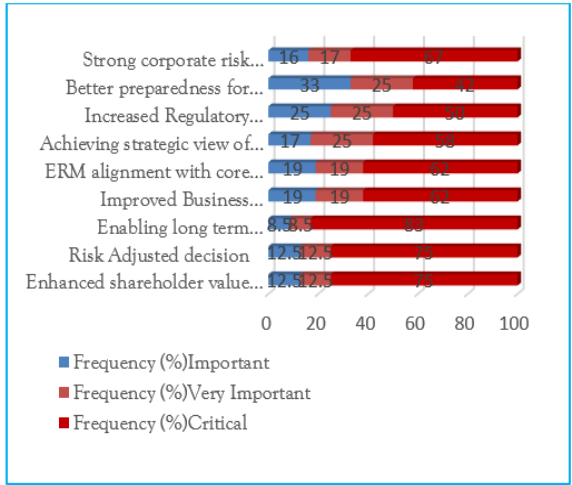


Figure 45. Rated Benefits of Sustainable ERM Framework

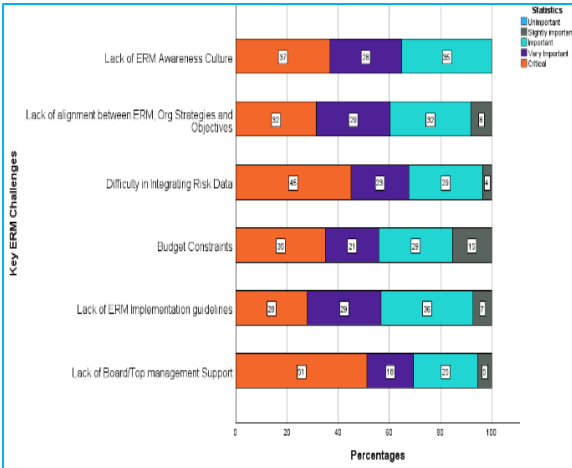


Figure 46. ERM Key Challenges

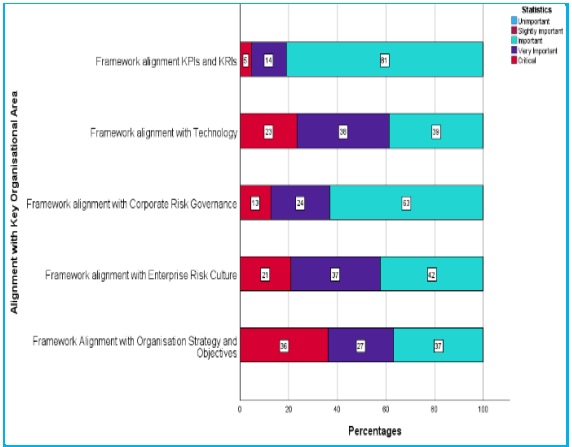


Figure 47. Framework Alignment with key Organisational Areas

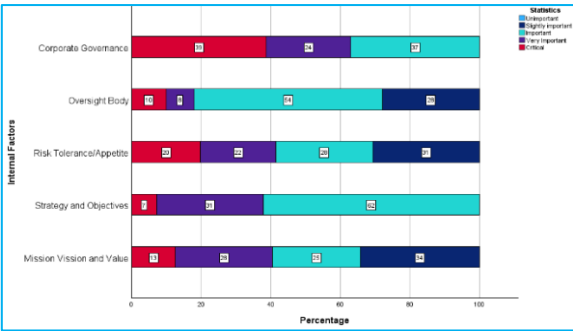


Figure 48. Framework Alignment with Internal Org. Factors

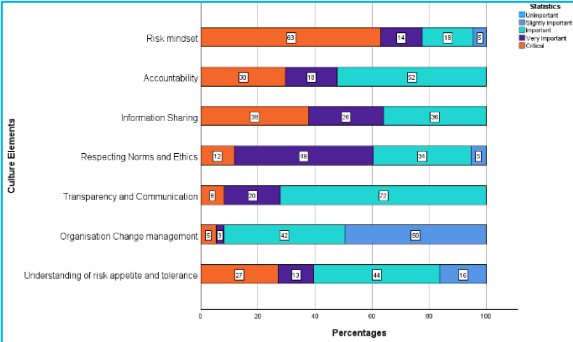


Figure 49. Role of Cultural Elements on SERM Implementation

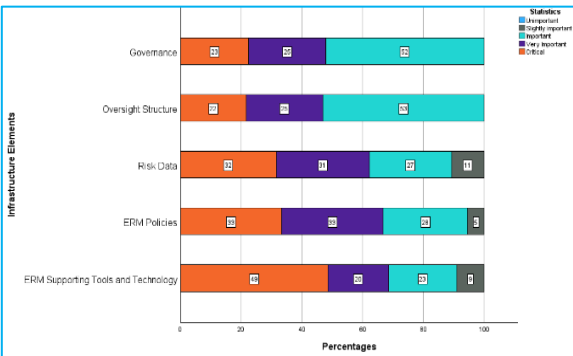


Figure 50. Role of Infrastructure on SERM implementation

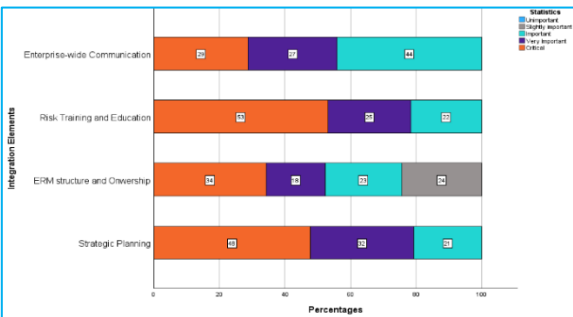


Figure 51. Role of Integration factors on SERM Implementation

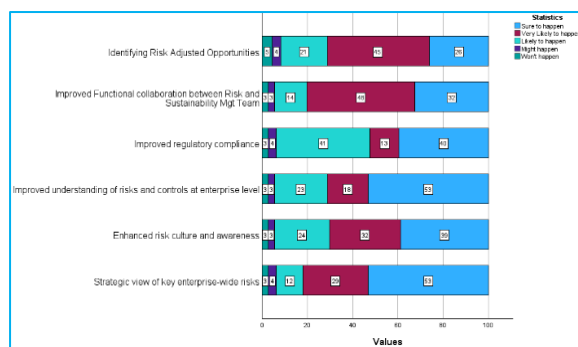


Figure 52. Drivers of SERM Value in order of likelihood

9. Results and Discussions

This section (9.1 to 9.4) provides an explanation and justification of empirical findings in order to support the validity of the proposed SERM Framework. It considers earlier literature and empirical results previously outlined in sections (8.1 to 8.4)

9.1. Descriptive Profile

From the descriptive profile, the research participants, drawn from the Nigeria six-geographical locations have sufficient knowledge and experience in Transport Risk Management which is required to provide valuable insights and input into this research.

9.2 RM/ERM Current practice

Project, operational and hazard risks are at the top of the risk areas covered by the agencies due to the nature of operations performed in the transport sector. Strategic and IT risks have been identified with a very low percentage of 2% and 6% as risk areas covered by the corporate RM. This low percentage is also consistent with the interview findings and strongly supports the need for this study, which aims to develop a strategic and sustainable alignment risk management framework. Both strategic risk and IT risk, generally require long-term planning. So, it is not surprising that they have been identified poorly by the respondents.

Regarding ERM Current Practice, 71% stated that there is no ERM in place but there are plans to implement one, the remaining 29% stated that their organisations are currently investigating the concept of ERM but no decision made yet. With question on ERM maturity level, 29% stated there is awareness of risk, but, there is no formal approach to risk management. i.e. basic risk processes are applied but there is lack of ERM integration across the agency. 73% of the respondents have their own project-based risk management approach and almost 10% of the respondent are aware and intend to customised the

generic guidance of either updated [18] or [19]. The empirical findings are consistent with the academic literature review. [5] and [6] Found that the practice of ERM is an evolving practice among public sector organisations globally. In Nigeria, 60% of Nigeria organisations (public and private) have are no risk processes, no experience of using risk management and no application to projects or the business.

9.3 Sustainability Practice

Almost 70% of the participants confirm their awareness of sustainability issues, however, there are no separate sustainability department, i.e. there are no functional collaboration between the risk and sustainability team. Almost 70% of the survey respondents confirm that they have no policy around sustainability disclosure as consistent with the interview data. It was unanimously agreed (100%) that current risk management practices do not adequately address sustainability risks. Further, 92% agreed that sustainability risks could lead to a significant impact on the organisation's performance. Therefore, sustainability risks should be supported in the mainstream ERM function. This is consistent with [17] observation report of (89%) in a similar context. Academic and practice Literature from public domain agree with the majority of participants' views that revealed challenges in integrating sustainability risk into mainstream risk management.

The findings on the potential benefits of SERM show that there was a general agreement among survey and interview participants that SERM can help management align risk management with core organisational strategies and objectives, enhance functional collaboration with sustainability team to make more informed risk-adjusted decisions, improved performance and enhanced stakeholder value. It can therefore be concluded that ERM's image is changing from being driven purely by a regulatory mandate to a management tool that can actually enhance organisational performance across various enterprise-wide areas. This notion is supported by various academics [7], [29]. More forward-looking organisations now see ERM, and value creation as closely correlated.

9.4. Developing SERM Framework

The foremost critical ERM challenges noted were as follows: lack of top management support (69%), consistent with the work of (Beasley et al; 2010 and Rubino, 2018), RM/ERM awareness culture (65%), alignment of RM/ERM with Organisational strategies/objectives (61%), ERM implementation guidelines (57%), Budget constraints (56%) and difficulties in integrating risk data across the organisation (68%). These findings were consistent with the interviewees results and underscore the needs

for developing a sustainable ERM alignment framework, which is the main aim of this research. Coupled with the general organisational components such as people and operational process. Majority of the participants believed that it is important to align SERM with the following key organisational areas: 1) Organisational strategies/Objectives 2) ERM culture 3) Cooperate risk governance 4) Key Risk and Performance Indicators, and 5) Technology, 6) Mission, vision and core values; 7) Risk appetite aligned with risk tolerance.

Almost all participants considered all of the cultural elements as either important, very important or critical to successful implementation of the sustainable framework. Some of the important risk infrastructure components, which could potentially affect sustainable ERM implementation include: 1) ERM policies; 2) ERM governance; 3) Oversight structure 4) ERM supporting tools and technologies; 4) Risk tolerance and appetite and 5) Quality Risk data. The identified risk integration enablers at a high level of importance are: 1) Strategic planning; 2) Risk training and education; 3) Enterprise-wide communication and 4) ERM Structure and ownership.

10. Analysis of ERM Implementation Challenges

The second objective of this research was to identify the inherent limitations in the literature review with specific reference to the Federal Republic of Nigeria. Through this review, the identified research gap helps in understanding what challenges affect ERM implementation which constitutes the foundation of developing the SERM framework customised to the transport sector in the GS (Research aim). As confirmed from the empirical findings, transportation agency's main challenges pertain to projects, operational and hazard risks and the lack of a sector-specific risk management strategy.

It has been identified that risk consideration during decision making at project initial phase represents a high percentage. Internal and external factors present challenges as stated by the participants as explained below.

10.1. Lack of Integration of Sustainability into Risk Management Functions

This empirical research finding shows that almost all of the participants (70% survey, 83% interviewees) confirm their awareness of sustainability (ESG) risk. However, almost all participants (70% survey, 100% interviewees) confirm that they do not have a separate sustainability department, there is no functional collaboration between the risk management team and sustainability practitioner. It was further unanimously agreed (100%) that current risk management practices do not adequately address sustainability risks.

Despite these, almost all participants (82% survey, 92% interviewees) agreed that sustainability risks could have a significant impact on the organisation's performance. Various authors [17], [18], [32] agreed with the majority of participants' view and they have suggested that best practice approach demands that sustainability risks should be integrated as a critical component of the organisation's strategy and ERM processes since sustainability risks are essentially business risks.

The authors further noted that although many sustainability risks are emerging, complex and longer-term, leveraging and enhancing an organisation's ERM framework can support identification, assessment and mitigation of these risks. The continuously volatile business setting emphasised and contributed to the importance and awareness of SERM, where market survival depends on retaining the organisation's competitiveness and reputation. Therefore, incorporating sustainability risk management (SRM) and sustainability agendas into transportation corporate strategy could have an impact on the transport organisation's performance as well as ensuring its long-term viability. (detailed in Section 3 and 2.1.1)

10.2. Lack of Top Management and Leadership Support

As emphasised by [19] top management should ensure that risk management is integrated into all organizational activities and should demonstrate leadership and commitment by issuing a policy that establishes a risk management approach, ensure that the necessary resources are allocated to managing risk and assign authority, responsibility and accountability at appropriate levels within the organization. Similarly, [17] posits that risk management structure and culture need to be understood and imbibed from the board of directors to all staff; top management must demonstrate commitment through actions, by exemplifying and embodying the values they espouse. Ultimate responsibility for ERM starts at the top.

The guidelines argue that everyone who matters within an organization should participate in the ERM process. While several executives have significant responsibilities for ERM, including the Chief Risk Officer, Chief Financial Officer, Chief Legal Officer and Chief Audit Executive, the ERM process works best when all key managers of the organization contribute. [19] further states that managers of the organization support the entity's risk management philosophy, promote compliance with its risk appetite and manage risks within their respective spheres of responsibility consistent with risk tolerances. Therefore, identifying leaders throughout the organization and gaining their support is critical to successful implementation of ERM. The goal of ERM is to incorporate risk considerations into the

organization's agenda and decision-making processes. ERM is integral to running and managing a business Organisations (Transport department included).

10.3. RM/ERM Awareness Culture

A strong risk culture is a prerequisite for a sustainable ERM program [24]. The ERM cultural alignment establishes a new focus for risk-based decisions that is sustainable over time and influences management and all employees. It also allows effective ERM implementation and becomes a source of sustainable competitive advantage. It inspires staff to promote integrity, enhance share-holder value, meet regulatory compliance and generate long-term sustainability. In the context of ERM, culture is a value that impacts business decisions and determines the way the organization identifies, understands, and acts on the risks it faces and the risks it takes.

ERM culture affects the decisions of management and employees, regardless of whether they consciously weigh benefits and costs. In a sound risk culture, everyone not only knows and understands the policies, but also shares the values behind them. Employees and managers alike are aware of risk and adjust their behaviour accordingly. However, organizations that do not have an ERM culture fail to reap the benefits of a functional ERM program. When there is no ERM culture, business units work in silos and do not align themselves to manage risks and achieve strategic objectives. The result is low reliability and lack of consistency in executing risk management processes.

Regarding the ERM Practices in Nigeria, [6] specifically noted that; no private or public organization in Nigeria has a risk-aware culture that drives the organization into proactive risk management, seeking to gain full advantage from its uncertain environment and no private or public organization in Nigeria has best-practice processes that are implemented at all levels of the business, with regular updating, active feedback, and learning. Various organisational and institutional challenges such as poor accident reporting and investigating culture; poor coordination with different stakeholders; poor policy and regulatory framework; lack of proper industry-specific guidance material; keeping up with the technology, integration with existing systems, budget constraints, lack of leadership commitment, etc. have been reported.

The report emphasized that Nigeria is not exempted from the current volatility, uncertainty, complexity, and ambiguity in today's organisational business context. These statements underscore the need for a holistic and structured approach to running and managing public and private agencies and their projects. It highlights the urgent need to address and manage systemic global risks, by involving and

creating synergies among all stakeholders. This is particularly relevant for organizations in the transport sector, especially, since the nature of operations is by default challenged by a diverse set of hazards and risks.

10.4. ERM Implementation Guidance

The literature on ERM generically addresses how ERM should be implemented. Too generic in their nature, existing risk management frameworks often have different structures, requirements and terminology that prevent their effective understanding and implementation [16]. Taking into consideration that in theory, organisations know how to deal with risks (due to guidelines, frameworks, scholarly literature, and legislation), the events of the last decade reflect that issues have only been partly resolved.

Theoretical guidance of implementing ERM varies quite widely among industries. In the context of GS countries, Fragmented policy formulation and implementation, lack of proper industry- specific guidance material; keeping up with the technology, integration with existing systems, lack of leadership commitment, limited human resources and funding capacities, a lack of qualified in-house personnel to implement ERM are clear obstacles and an undesirable challenge.

10.5. ERM Alignment with Organisational Objectives

Increasing complexity due to transport networks, shifts in technology and business cycles can produce more risks related to strategy than ever before. By establishing a close link between the transport organisation's strategic planning and risk management processes. Managers can help ensure that new strategic initiatives are connected to appropriate risk mitigation strategies, that changes in the organisation's strategic direction are accompanied by timely assessment of new or emerging risks, thereby organisations are better prepared to identify risk related competitive advantages. Integrating ERM practices throughout an organization improves decision-making in governance, strategy, objective-setting and day-to-day operations.

Just as ERM requires customization to suit a company's unique objectives, culture and business model, the integration of risk management and strategic planning also requires a company to consider its objectives and culture before deciding the best way to align the two processes. The diligence required to integrate ERM provides an organisation with a clear path to creating, preserving and realizing value. While a company's strategy drives its value creation, it also entails risk-taking; when strategies change or new initiatives are implemented, new risks may be

introduced, or existing risks could change. The greater the degree of integration between strategy and risk management, the more likely it is that an organisation will be able to successfully implement its strategy

10.6. Access to Quality Data Risk and Integration for Effective Risk Reporting

Given the recent technological advancements, it is imperative to leverage it to look at different indicators in context of the risk data being collated for an organization. Advanced data analytics and artificial intelligence (AI) enhance risk assessment processes, enabling organisations to identify emerging risks and opportunities. Additionally, technology facilitates real-time monitoring of risks, providing individual business units with the flexibility to respond promptly to changing risk environments and enables judicious use of resources to address the most significant risks. More than two-third of the participants (61% Interview, 68% Survey) rated Risk data to be critical to a successful ERM implementation.

In the context of GS countries, Poor coordination with different stakeholders, lack of collaboration among multiple ministries and transport agencies, lack of political will to face the challenges of change, fragmented policy formulation and implementation, bureaucratic constraints on transport infrastructure project delivery couple with energy crisis means that lack of data risk integration across an organisation presents a great challenge. The flow of information about risk sustains operations and provides effective risk report to the management and executive boards; useful in both strategic planning and execution, and consequently enhances the decision-making capabilities.

10.7. Synthesis of Empirical Findings

The following are the summaries of the empirical findings in response to the problem questions as illustrated in Tables 7 and 8.

Table 7. Synthesis of Empirical Evidence

Research Objectives	Key variables	Empirical findings		
Analysis of current adaptation of RM/ERM in the transport sector	ERM key risks	Sustainability risks, Hazard risks, IT risks, Operational risks, Compliance risks, Strategic risks, Project risks, Finance risk and Political risks		
Analysis current risk challenges facing transportation agencies/ organisations	Key challenges in the implementation of ERM		Interviewees	Survey
		Budget constraint +Lack of Top Management Support.	80%	69%
		Lack of Risk Awareness Culture	75%	65%
		Difficulties in integrating Risk Data	70%	68%
		Lack of ERM Implementation guide	70%	57%
		Lack of Alignment between ERM + Org. Strategy and Objectives	60%	61%
		Lack of in-house skills + Experience	50%	52%
		Lack of understanding of ERM		
		Implementation benefits +challenges	50%	52%
		Lack of Integration of Sustainability Risk into Mainstream Risk Management Functions.	100%	100%

Table 8. Synthesis of Empirical Evidence

Empirical findings (significance in percentage)				
	Key variables		Interviewees	Survey
Review of current RM/ERM approaches	Current state of ERM and its maturity	71% stated that there is no ERM in place but there are plans to implement one, the remaining 29% stated that their organisations are currently investigating the concept of ERM but no decision made yet as illustrated in Figure (6.5). Regarding maturity, Consistently, 71% stated that there is no ERM in place but there are plans to implement one, the remaining 29% stated it is underdeveloped, meaning, there is awareness of risk, but, there is no formal approach to risk management, there is lack of ERM integration across the agencies under study as illustrated in Figure (6.6)		
		Strategy and Objectives	58%	63%
To develop sustainable framework applicable GS transportation Agencies/organisations	Aligning ERM with key organisation area	Enterprise Risk Culture	50%	58%
		Corporate Risk Governance	42%	37%
		Technology	50%	61%
		KPIs and KRIs	27%	39%
		An important finding is that all factors listed in the questionnaire were viewed by most participants as either important, very important or critical to ERM alignment		
		Corporate governance or internal risk oversight	58%	63%
	Internal environment	Appetite aligned with risk tolerance	33%	42%
		Strategies and objectives	50%	38%
		Mission, vision and core values	50%	41%
	Roles and the effect of risk culture on ERM implementation	Information sharing	67%	64%
		Risk mindset	67%	77%
		Accountability	50%	48%
		Transparency and communication	42%	38%
		Understanding of risk appetite and tolerance	33%	40%
		Respecting norms and ethics	33%	61%
	Roles and the effect of ERM infrastructure in ERM framework implementation	Organizational change management	50%	28%
		ERM supporting tools and technologies	73%	69%
		ERM policies and framework	67%	66%
Risk data		50%	65%	
Oversight structure		42%	47%	
ERM governance		42%	48%	
Roles and the effect of ERM integration in ERM	Risk Training and Education	50%	78%	
	Strategic planning	67%	80%	
	Enterprise-wide communication	67%	56%	
	Structure and ownership	50%	52%	

11. Validation of SERM Framework

Figures 53, 54, and 55 show the validated Framework along with the implementation stages. It reflects some essential empirical findings that had an impact on the evaluation of the theoretical version of the framework shown in Figure 26. It also shows which organisational factors have been re-aligned based on empirical findings; all significant changes to the theoretical framework are highlighted in the red. Table 9 shows the Research validation strategies.

The components undergoing the most significant changes as a result of the empirical finding is the ERM core components. A new component, ERM Governance, has been inserted so that the implementation of the sustainable Framework is now seen to consist of three stages as shown in Figure. This new component shows that the collaborative efforts of a (CRO), Sustainability Risk Officer, ERM / Sustainability risk Committees and ERM / Sustainability risk Champions are critical in the ERM implementation cycle. Building internal support for functional collaboration between sustainability team and risk management professionals and including the right resources in the implementation of the sustainable Framework are among the first steps in building the right risk culture.

The inclusion of this component further illustrates the importance of strong risk governance in ERM initiatives emphasised by the participants (survey and interviewees). It is suggested that this initiative will enhance the application of sustainability risks across the risk management framework, uniform risk management processes and a common language between sustainability and risk professionals.

Another change to the core pillar is the emphasis

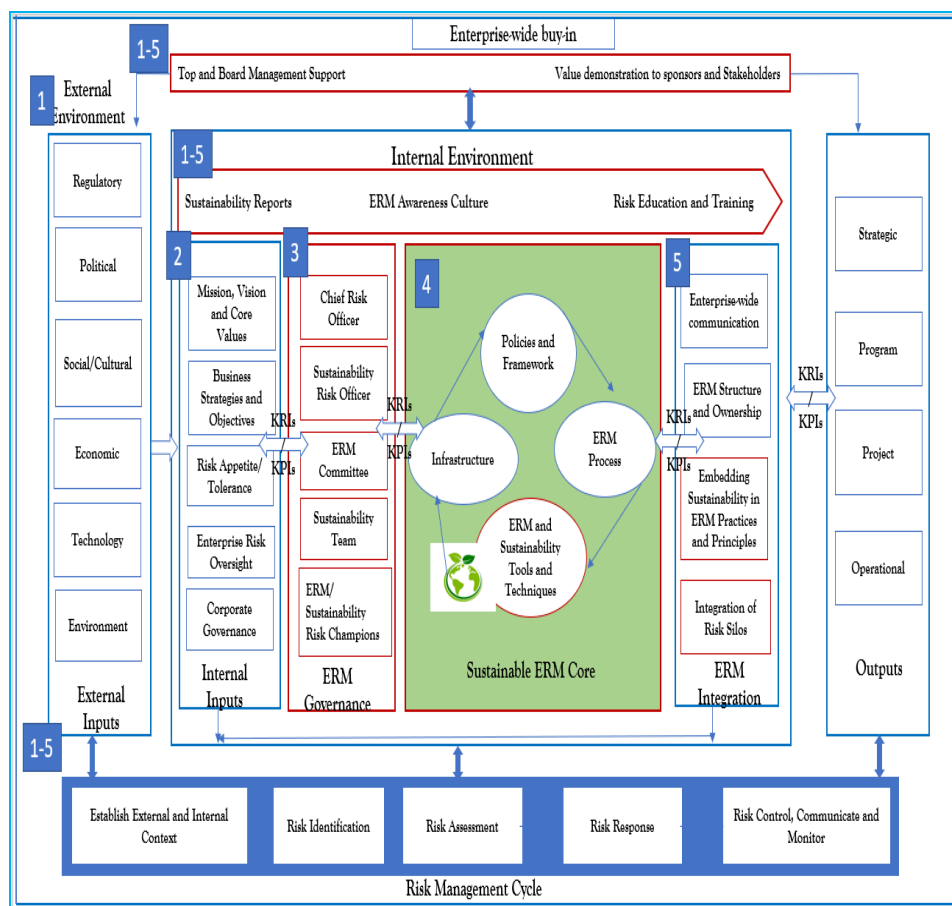


Figure 53. SERM Framework after Validation [30]

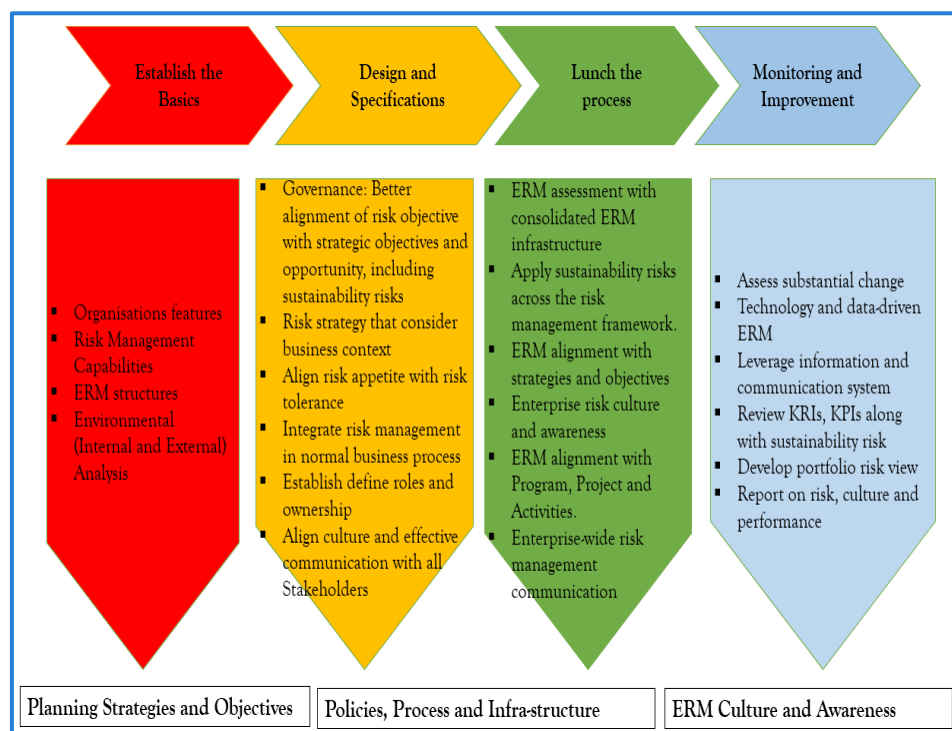


Figure 54. SERM Framework Implementation Stages [30]



Figure 55. Plan-Do-Check-Act Cycle [30]

Table 9. Research Validation

Validation Strategies	Adoption in the present research
Research Collaboration	Peer review: This research was supervised by academic researchers with extensive experience, who reviewed the data and research process. Researcher collaborated at the research preparation stage with others PhD colleagues from various fields of knowledge (SEAD platform)
Rich and thick description	Qualitative data collected in semi-structured interviews supported by the findings of the Quantitative research survey The researcher has published part of the research in international journals at PhD candidate-related conferences . 1) DOI: 10.20533/ijbs.2046.3626.2024.0079 2) DOI: 10.20533/WCST.2023.0011 3) dx.doi.org/10.22624/AIMS/ACCACROSSBORDER2023/7P9 4) DOI: 10.20533/ij.1742.4712.2022.0221 5) https://doi.org/10.20533/WCST.2022.0008
The researcher solicits participants' views of the credibility of the findings and interpretations	Participation in the quantitative survey in each organisation were selected from the six geo-political zones in Nigeria
Randomisation	
Sample sufficiency	Samples were sized appropriately to achieve statistically significant and reliable results . They consisted of 111 transport risk management professionals who have knowledge of the research topic
Sequential data collection and analysis	Qualitative data first and this inform quantitative survey

on the cyclical nature of the Framework elements, now consisting of Policy and Framework, Processes, ERM/Sustainability tools and techniques, supported by Infrastructure and by KRIs and KPIs. Furthermore, ERM awareness culture has been reassigned as a standalone enterprise-wide continuous effort in conjunction with sustainability report and risk training/education as shown near the top of the framework.

Moreover, the KPIs/KRIs performance metrics developed and tracked throughout the implementation process help in reporting key strategic risks to the management and enable focus on real threats and opportunities during risk discussions. In addition, based on the combined empirical results, the researcher determined that the following elements should be considered at an enterprise level as a continuous effort throughout the ERM implementation stages, rather than as discrete steps:

- Risk management cycle.
- Senior management support and sponsorship.
- Risk education and learning.
- Enterprise risk culture.
- Enterprise-wide buy-in.

- Value demonstration to sponsors and stakeholders.

12. Conclusion

A number of conclusions can be drawn from this study as summarised in this section. Based on the literature review, the Researcher concludes that ERM is still guided by global perspectives. Literature has established that organisational resilience starts at the top with the use of ERM paradigm to achieve good risk governance and organisational objective in normal, volatile and crisis situations. However, there has been a very limited literature regarding alignment of ERM with transportation sector. Generic study that addresses various management issues is more prevalent, most of the contributions made to the ERM literature have only been descriptive in their nature, being mainly visionary, rather than implementational.

In the Nigerian transport sector, it has been evidenced that current risk management practices do not adequately address sustainability risks. The current road transport in Nigeria is seriously challenged by under-investment in critical transport infrastructure, lack of maintenance, lack of diversity in modes of transportation, this is further compounded by the increase in population and urbanisation-induced congestion. Preliminary findings have shown various organisational /institutional challenges. This includes lack of RM/ERM implementation guidelines, RM/ERM culture and awareness, leadership support, managerial confidence in the existing practices of risk management, stakeholders' coordination and updated technology. It was further reported that changing internal and external context as well as knowledge of sustainability risks pose further challenges.

In an attempt to address these RM/ERM challenges, the Researcher recommended the development of a holistic and sustainable ERM framework, tailored to the Nigerian transport sector as consistent with contingency theory, as a proposal to overcome the shortcoming of the current literature. It employs Critical Realism as a philosophical approach that involves sequential mixed method using abductive approach that combine both the qualitative and quantitative data and analysis generated from the six-geo-political zones of Nigeria. The findings confirmed the key ERM implementation challenges as discussed in Section 10.

A key research finding is that corporate risk governance is vital to support any ERM initiative. The findings also revealed lack of in-house skills and the impact of culture, infrastructure and ERM integration as significant factors influencing the implementation of ERM in the road transportation sector. Moreover, the findings revealed the need to embed sustainability in key ERM principles and practices. Whilst a number of tools exist to identify, assess or measure key risks,

the researcher concludes that limited knowledge of, and difficulties in quantifying sustainability risks still present a great challenge. There is an evident need for sustainability tools to enhance correct categorisation of risk and combination of qualitative expertise with quantitative modelling. The findings further revealed poor understanding of the potential benefits of ERM as a strategic tool capable of capitalising on opportunities to generate value through reduced cost, risk-adjusted capital management, a strategic view of key enterprise risks and how to measure such ERM-driven value effectively.

Finally, the Researcher argues that future progression of ERM depends critically on continued training, education and learning, along with an increased involvement of top management in ERM development. It can be concluded that the research findings are based on three key derivatives, which are: literature review, research gap, supporting theory and frameworks evaluation. On these grounds, the Researcher recommends the proposed ERM Framework.

13. Contributions to Knowledge

The first valuable contribution to knowledge is the in-depth review of various concepts and themes around ERM and Sustainability Concepts. To the best of the researcher's knowledge, this is one of the few researches specific to the transport sector which has investigated key organisational factors that can be detrimental to sustainable ERM implementation. Secondly, this research contributes to literature by its development of SERM framework for the transport sector along with its practical implementation guidance. Specifically, it will provide informed knowledge and understanding regarding ERM practical implementation guidance, which is intended to help policy maker with improved decision making, planning and prioritisation on sustainable transportation in the GS. Despite its specificity to the Nigerian context, a slight customisation of the framework's components will make it more practicable for other GS transport organisations to adopt.

14. Recommendations for Future Work

- As ERM is still guided by global perspectives, future research could capture new factors into the SERM framework to enhance its performance.
- Future research might also investigate how the framework can add value to the organisation.
- Moreover, research can be undertaken to investigate this framework's applicability to other geographical areas such as airline, healthcare sector or an enterprise in the manufacturing sector.

- Future research might explore simplification of the framework, both visually and structurally.

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