Organizational Resilience and Workforce Performance in Security Organizations: A Structural Equation Modelling of the Nigeria Security & Civil Defence Corps

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Abstract

The Nigerian Security and Civil Defence Corps (NSCDC) operate in a high-risk and volatile environment characterized by terrorism, kidnapping, and armed banditry. Optimizing workforce performance under such conditions requires more than isolated interventions. It demands a systemic understanding of how job design, resource allocation, and organizational capacity interconnect to foster resilience. While existing literature often examines job demands, productivity, or morale in isolation, there is a critical lack of integrated models that position organizational resilience (OR) as a central, mediating mechanism linking strategic job requirements (SJR), job resources (JR), and workforce productivity (WP) to ultimate workforce performance (WFP). Furthermore, there is a notable absence of quantitative indices for measuring OR within African security agencies. This study aims to bridge this gap by developing and empirically validating a comprehensive Structural Equation Model (SEM) that quantifies the relationships among SJR, JR, WP, OR, and WFP within the NSCDC. A key objective is to compute a novel OR-Index using the Min-Max rescaling factor method to enable benchmarking and longitudinal evaluation. Utilizing survey data from 191 NSCDC personnel across four Southwestern Nigerian states, the study employs SEM with reflective measurement models to study these relationships. All constructs are validated through Confirmatory Factor Analysis (CFA), ensuring reliability and discriminant validity. The model tests direct, indirect (mediation), and conditional (moderation) effects, with robust Maximum Likelihood (ML) estimation used to handle minor non-normality. The analysis was conducted using Python's semopy package. The SEM results reveal a powerful, empirically supported causal chain: SJR ($\beta = 0.48$) and JR ($\beta = 0.31$) significantly enhance WP. WP, in turn, strongly influences OR ($\beta = 0.39$), which acts as the primary driver of WFP ($\beta = 0.52$). Crucially, the effect of WP on WFP is fully mediated by OR (Indirect effect = 0.20). Moreover, JR moderate the relationship between WP and OR ($\beta_{\_} = 0.21$), meaning that the positive impact of productivity on resilience is significantly amplified when adequate resources are available. The overall model fit is excellent (CFI = 0.96, TLI = 0.95, RMSEA = 0.053). These findings provide actionable insights for NSCDC leadership, demonstrating that investing in clear strategic mandates and tangible operational resources is not merely about daily efficiency but is a strategic investment in building institutional resilience. To enhance performance, policymakers should prioritize interventions that strengthen the WP → OR pathway, such as targeted training, improved equipment, and embedding the OR-Index into performance evaluation systems. This research offers a robust, evidence-based framework for transforming security workforce

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management from a focus on outputs to a focus on adaptive capacity.

Keywords:
Organizational Resilience, Workforce Performance, Strategic Job Requirements, Job Resources, and Structural Equation Modelling, Nigeria Security and Civil Defence Corps, Resilience Index, Mediation, Moderation

1. Introduction

Over the past five decades, Nigerian society has experienced profound socio-economic and political transformations, reflecting the country's evolution as a modern nation-state. These rapid changes have reshaped various sectors, including governance, economics, and social structures. However, despite these advancements, Nigeria's security apparatus has struggled to keep pace with the changing landscape [50]. The nation's security institutions have often been criticized for being ill-prepared and inadequately equipped to meet the demands of policing and safeguarding a contemporary, complex society [1]. This gap has significant implications given Nigeria's security environment, which is characterized by a fluid and multifaceted criminal landscape. Criminal networks now operate with increasing sophistication, leveraging new technologies and tactics to challenge national security frameworks. In this context, ensuring the security of lives and property, both internally and externally is crucial for the survival and effective functioning of the state[2],[5]. Security organizations operate in volatile, high-risk environments where adaptability and operational continuity and resilience are paramount. In response to these challenges, Nigeria established various military and paramilitary organizations tasked with maintaining peace, enforcing law and order, and protecting national interests. Among these are the Nigerian Army, the Police Force, and the Nigerian Security and Civil Defence Corps (NSCDC).

Despite their significant presence, these agencies have faced persistent challenges in curbing organized criminal activities such as terrorism, kidnapping, cattle rustling, armed banditry, oil bunkering, youth militancy, political assassinations, and armed robbery. These persistent threats underscore a critical disconnect between the security agencies' capacities and the evolving security demands of the Nigerian state. Compounding these operational challenges is the growing financial burden associated with maintaining security forces, especially amidst competing public priorities like education and healthcare. Governments at federal, state, and local levels, alongside other security stakeholders, have increasingly questioned the cost-effectiveness and performance outcomes of these agencies. The difficulty in justifying high expenditures on security services without commensurate improvements in public safety has intensified calls for reforms and enhanced accountability. Despite its constitutional mandate, the NSCDC faces persistent challenges including resource constraints, inadequate equipment, remuneration deficits, and administrative inefficiencies, all of which undermine workforce performance[10],[26],[46].

In Nigeria, the Nigerian Security and Civil Defence Corps (NSCDC) play a critical role in safeguarding lives, property, and critical infrastructure amid escalating and evolving security threats, from cybercrime and insurgency to communal conflicts and sabotage [64]. The NSCDC, in particular, holds a critical mandate to safeguard critical infrastructure, ensure community safety, manage disaster response, and protect state properties. Historically, these agencies were also involved in efforts to suppress slavery in colonial Nigeria and monitor state activities, underscoring their broad security remit. Given these dynamics and often volatile environment in which security organizations operate, there is a pressing need for a resilient and capable workforce that can sustain operational effectiveness despite unforeseen disruptions. The NSCDC, as a pivotal security institution, exemplifies this need, operating at the intersection of infrastructure protection, public safety, and disaster management.

Workforce performance within such organizations is influenced by a complex interplay of factors, including strategic job

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requirements, specific job demands, productivity levels, and, importantly, organizational resilience. While prior studies have examined job requirements, productivity, and morale in isolation, they often treat these factors as independent drivers of performance, neglecting their interdependence within a broader organizational system [23,24]. This fragmented approach fails to account for organizational resilience (OR) - a dynamic capability that enables anticipation, response, adaptation, and recovery from disruptions [23];[39],[66]. Recent scholarship emphasizes OR not merely as an outcome but as a mediating and moderating mechanism through which job resources and workforce behaviors translate into sustained performance under stress[16],[67].

Organizational resilience (OR) underscores an organization's capacity to anticipate, prepare for, respond to, and adapt to incremental changes and sudden disruptions to survive and thrive [66]. In the context of NSCDC, resilience entails the ability not only to absorb shocks but also to develop tailored responses to emergent challenges and engage in transformative actions that enhance adaptive capacity and long-term sustainability [39]. Despite its importance, resilience remains an underexplored construct in the Nigerian security sector, particularly regarding its relationship with workforce performance and operational outcomes. The critical missing link lies is the absence of an integrated, empirically validated model that positions OR as a latent construct linking strategic job requirements (SJR), job resources (JR), and workforce productivity (WP) to workforce performance (WFP). Previous analyses remain siloed, for example, assessing training adequacy without modeling how it interacts with resilience to influence performance. In contrast, this study applies Structural Equation Modeling (SEM) to test a comprehensive framework where:

- Isolated factor analysis (prior work): SJR → WP → WFP.
- Integrated SEM approach (this study): SJR → JR → WP ⇄ OR → WFP (with OR mediating and moderating pathways)

This shift allows for simultaneous estimation of direct, indirect, and interactive effects, offering deeper insight into the mechanisms driving effectiveness in public security institutions. Moreover, there is a notable paucity of quantitative indices to measure organizational resilience in African security agencies. To address this, the study employs the Min-Max Rescaling Factor method [20] to compute a novel OR-Index tailored to the NSCDC context - a contribution that enables benchmarking and longitudinal evaluation.

Recent advances in public sector resilience highlight the importance of systemic agility, digital preparedness, and human capital integration [35],[47], yet these dimensions remain underexplored in sub-Saharan African security organizations. By anchoring the analysis in contemporary resilience theory and leveraging SEM's capacity to model latent variables and complex causal pathways, this research fills a vital methodological and empirical void. The findings aim to inform evidence-based policies that strengthen both individual performance and institutional robustness in Nigeria's dynamic security landscape. By integrating OR-Index within a SEM framework, the research seeks to elucidate the role of resilience in mediating and moderating the effects of job requirements and productivity on workforce performance. Understanding these complex relationships is vital for identifying the missing links or constraints that hinder the NSCDC's ability to fulfil its constitutional mandates effectively. Ultimately, the study aims to provide empirical insights that support the agency's mission and vision, guiding policy and operational improvements that enhance resilience and workforce effectiveness in Nigeria's evolving security environment.

1.1 Statement of the Problem

Security organizations operate in environments characterized by uncertainty, complexity, and high risk. In Nigeria, the NSCDC faces challenges such as resource constraints, evolving security threats, and administrative inefficiencies that impede optimal workforce performance[46]. Previous studies have often

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examined workforce productivity and job-related factors independently, neglecting the integral role of organizational resilience in sustaining performance amid disruptions. The lack of an empirically validated model incorporating resilience as a latent construct limits the ability to design effective interventions. Additionally, there is a paucity of quantitative indices that capture the resilience capacity of security organizations, hindering performance evaluation and benchmarking. This study addresses these gaps by developing and integrating an OR-Index into a comprehensive SEM model.

1.2 Aim and Objectives of the Study

The study aimed to investigate the influence of strategic job requirements (SJR), job requirements (JR), workforce productivity (WP), and OR on workforce performance (WFP) in the NSCDC using SEM. Specifically, the study seek to:

(i) Assess and compute the organizational resilient index (OR-Index) of the NSCDC.
(ii) Model and analyse the relationships among SJR, JR, WP, OR, and WFP.
(iii) Evaluate the mediating role of WP and the moderating effect of JR on OR.
(iv) Provide policy recommendations for enhancing WFP through resilience-building strategies.

1.3 Construct Notation, Research Questions and Hypotheses

1.3.1 Construct Notation

- Strategic Job Requirements (SJR) - Policies, remuneration, duties, administrative systems shaping strategic workforce conditions.
- Job Resources (JR) - Operational tools: communication/mobility equipment, training access, logistical support
- Workforce Productivity (WP) - Output efficiency in arms training, crime reporting, task execution
- Organizational Resilience (OR) - Capacity to anticipate, respond, adapt, and recover from disruptions
- Workforce Performance (WFP) - Overall effectiveness in general operations and statutory mandates

1.3.2 Research Questions

- Q1: To what extent do strategic and operational job requirements influence workforce productivity in the NSCDC?
- Q2: How does workforce productivity affect organizational resilience and ultimate workforce performance?
- Q3: What role does organizational resilience play in mediating the relationship between productivity and performance?
- Q4: Does the availability of job resources strengthen the impact of productivity on organizational resilience?

1.3.3 Hypotheses

(i) **Direct Effects:** These test immediate causal links between latent constructs.

- H1: SJR has a positive direct effect on WP. SJR→WP
- H2: JR has a positive direct effect on WP. JR→WP
- H3: WP has a positive direct effect on OR. WP→OR
- H4: JR has a positive direct effect on OR. JR→OR
- H5: OR has a positive direct effect on WFP. OR→WFP

(ii) Mediation Effects: These examine indirect pathways through which one variable influence another via a mediator.

- H6: WP mediates the relationship between SJR and OR. SJR→WP→OR
- H7: WP mediates the relationship between JR and OR. JR→WP→OR
- H8: OR mediates the relationship between WP and WFP. WP→OR→WFP
- H9: WP mediates the effect of JR on WFP. JR→WP→WFP

(iii) Moderation Effect: This tests whether the strength of a relationship changes under different levels of a moderating variable.

- H10: JR moderates the relationship between WP and OR, such that the effect of productivity on resilience is stronger when job resources are high. WP×JR→OR

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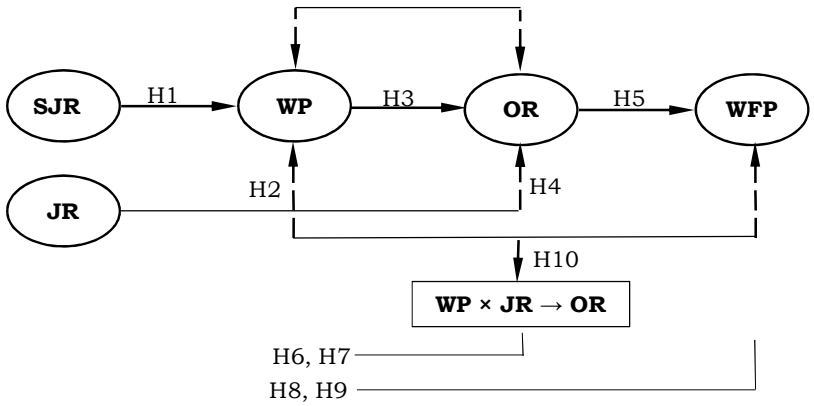

Figure 1.0: SEM Structural Path Model Summarizing Hypothesized Relationships

Where:

- Solid arrows: Direct effects (H1–H5)
- Double-line path: Mediation (e.g., WP → OR → WFP; H8)
- Dashed arrow: Moderation (JR strengthens WP→OR; H10)
- Dotted loop (not shown): Feedback from OR to SJR/JR, included in conceptual discussion only

These relationships are grounded in theories such as Social Cognitive Theory [7] and Resource-Based View [8], which emphasize the role of strategic resources and motivation in workforce productivity and performance. This framework operationalizes the integration of OR-Theory [66], JD-R Model [6], and Performance Theory within a testable SEM structure. All latent variables are measured using validated multi-item scales.

1.4 Significance of the Study

This study offers theoretical and practical significance. Theoretically, it advances the understanding of OR as a latent construct integrated within workforce performance models in security organizations - a domain where empirical research is limited [23]. Practically, the findings inform NSCDC administrators and policymakers on critical factors that enhance workforce capacity and resilience, guiding resource allocation, training, and strategic planning. The development of the OR characteristic provides a benchmark for resilience measurement, aiding continuous improvement and accountability.

2.0 Review of Related Literature

2.1 Introduction

Security organizations operate under conditions of persistent uncertainty, evolving threats, and resource constraints - factors that challenge both individual effectiveness and institutional sustainability [47], [64]. In Nigeria, the NSCDC plays a pivotal role in safeguarding critical infrastructure and maintaining public order. However, challenges such as inadequate equipment, unclear job roles, and low remuneration continue to undermine operational efficiency [26],[46]. While prior research has examined isolated aspects of workforce management, such as training, motivation, or leadership, the integration of these factors within a resilience-enhanced performance model remains limited, particularly in African public security contexts. This section reviews foundational and contemporary literature to build a robust theoretical framework linking Strategic Job Requirements (SJR), Job Resources (JR), Workforce Productivity (WP), Organizational Resilience (OR), and Workforce Performance (WFP). It also clarifies the boundary between theoretical propositions and the specified SEM used for empirical testing.

The section presents a synthesized review of key theories and empirical findings relevant to workforce performance and organizational resilience in security organizations. It establishes the conceptual foundation for the study by integrating OR-Theory, JD-R Model[6], and Performance

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Theory into a coherent framework. The section distinguishes between broader theoretical dynamics (including potential feedback processes) and the empirically tested structural model, ensuring alignment between conceptual discourse and methodological execution.

2.1.1 Organizational Resilience Theory (OR-Theory): Organizational resilience (OR) refers to an organization's capacity to anticipate, respond to, adapt through, and recover from disruptions while preserving core functions[23]. OR-theory[66] was developed as a critical framework for understanding how organizations withstand, adapt to, and recover from disruptions and uncertainties. Originating from ecological resilience concepts introduced by Holling[33], the theory emphasizes the capacity of systems to absorb shocks while maintaining core functions. Sutcliffe and Vogus[60] expanded this perspective to organizational contexts, highlighting resilience as an emergent property of adaptive capacities. Lengnick-Hall, et al[39] further refined the concept by proposing a tripartite model of resilience encompassing anticipatory, responsive, and adaptive abilities. In recent time, OR has evolved into a multidimensional construct encompassing three interrelated capabilities:

(i) **Anticipatory Resilience:** Proactive scanning, risk assessment, and preparedness planning. This involves proactive scanning and preparation for potential disruptions, responsive resilience refers to immediate reaction and crisis management, while adaptive resilience entails learning and transformation to thrive post-disruption.

(ii) **Responsive Resilience:** Crisis management, coordination, and rapid deployment during incidents.

(iii) **Adaptive Resilience:** Learning from experience, transforming systems, and improving future readiness[39].

These capabilities are reflected in the latent construct of OR in the SEM model, measured by operational readiness and disaster management indicators. Incorporating organizational resilience into the framework offers deeper insight into how NSCDC's workforce can sustain performance despite complex security challenges. In security organizations, OR is critical due to the high-stakes nature of operations. Bhamra et al[11] emphasize that resilient agencies maintain operational continuity despite shocks - whether cyberattacks, civil unrest, or natural disasters. More recently, Williams et al[67] demonstrated that resilience in policing agencies correlates strongly with trust in command structures, digital agility, and employee well-being.

Contemporary studies highlight the human capital dimension of OR. Patel, et al[51] argue that workforce experience, psychological safety, and leadership support are central to adaptive capacity. Burnard and Bhamra[16] further show that resilience in emergency services emerges not just from top-down policies but from distributed decision-making and frontline innovation. While some theoretical models suggest feedback from OR back to strategic inputs (e.g., OR → SJR/JR via learning and policy refinement), this study focuses on forward pathways (SJR/JR → WP → OR → WFP) for empirical testing. Reverse influences are acknowledged as part of long-term organizational learning but are not modelled here due to cross-sectional data limitations. At the heart of this framework lies OR-Theory[66], which conceptualizes resilience as an organization's capacity to anticipate, withstand, adapt to, and recover from disruptions[39]. This theory posits that resilience is not merely reactive but involves proactive and adaptive processes that allow organizations to maintain operational continuity under adverse conditions.

In security organizations like the NSCDC, resilience is particularly vital due to the inherently volatile operational environment marked by threats such as terrorism, natural disasters, and civil unrest. Bhamra, et al[11] assert that resilience in these organizations includes ensuring operational continuity, effective disaster management, and rapid recovery mechanisms. These capabilities allow security agencies to sustain mission-critical functions despite disruptions, safeguarding national stability. This enables sustained

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protection of critical infrastructure and rapid response to crises, which are essential for maintaining public safety and organizational effectiveness. Resilience also embeds a culture of flexibility and innovation, enabling organizations to evolve in response to emerging threats. Given the increased complexity of modern security challenges, integrating organizational resilience into workforce performance models provides a comprehensive approach to enhancing security sector effectiveness.

2.1.2 Job Demands - Resources Model (JD-R Theory): The JD-R model [6] complements OR-Theory [66] by explaining how job characteristics influence employee performance and well-being. The JD-R model [6] provides a powerful lens for understanding how job characteristics influence employee outcomes. It posits two categories of job attributes:

- Job demands (e.g., workload, time pressure, emotional strain) require sustained effort and can lead to burnout if unmanaged.
- Job resources (e.g., autonomy, supervisor support, tools, training) facilitate goal achievement, reduce stress, and promote engagement and growth.

Applied to security settings, SJR represent higher-order demands, such as clarity of mission, ethical standards, and accountability frameworks, that shape organizational culture and expectations [22]. While JR underscored tangible enablers: communication devices, mobility assets, protective gear, and access to professional development [45],[48].

When balanced, these elements enhance WP, measured here through arms training proficiency, crime reporting accuracy, and task completion rates. According to the JD-R Model [6], sufficient resources buffer against demand-induced strain and stimulate personal and organizational gains [4],[18]. Recent extensions of the JD-R Model [6] incorporate resilience as both an outcome and mediator. Lesener et al [40] found that JR predict OR, which in turn improves WFP in public-sector employees. Similarly, in a 2021 study of European police forces, Van der Vegt et al [65] showed that resource-rich environments foster collective resilience and proactive problem-solving [42].

In this model, job demands (e.g., workload, role conflict) are aspects of a job that require sustained effort and can lead to strain, while JR (e.g., autonomy, support, equipment) help employees achieve work goals, reduce job demands, and stimulate growth. Applying the JD-R Model [6] to security organizations highlights SJR and JR as critical job demands and resources. SJR encompass overarching competencies and organizational mandates that frame employee roles aligning with institutional goals [22]. JR represent the specific tools, equipment, and conditions necessary for task execution. When these demands and resources are balanced, WP is enhanced, thereby positively influencing OR and performance. The JD-R Model [6] also explains the mediating and moderating processes in the SEM framework. WP mediates the relationship between JR and OR, illustrating how adequate resources and clear strategic directives translate into effective performance. Moreover, JR moderate the productivity-resilience nexus, indicating that resource adequacy strengthens the capacity to adapt and respond to disruptions.

2.1.3 Performance Theory in Security Organizations: Performance in security institutions extends beyond output metrics to include reliability, responsiveness, and legitimacy [18. WFP reflects the extent to which personnel fulfil statutory duties effectively, efficiently, and ethically across general operations and specialized tasks. Traditional performance models focus on input-output relationships (e.g., training → competence → performance). However, modern approaches recognize the mediating role of intermediate constructs such as morale, cohesion, and organizational trust [17],[38]. In the NSCDC context, WFP is influenced by multiple layers:

- Structural inputs (SJR): Alignment of roles with strategic goals
- Operational supports (JR): Availability of tools and logistics

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- Behavioural outputs (WP): Demonstrated productivity in field tasks
- Systemic capacity (OR): Ability to sustain operations amid disruption

Integrating these dimensions allows for a more holistic appraisal than siloed assessments of training adequacy or pay satisfaction alone. Performance Theory provides the final theoretical underpinning for understanding how individual and organizational factors translate into measurable workforce outcomes [18. This theory argues that performance is a function of declarative knowledge (knowing what to do), procedural knowledge (knowing how to do it), and motivation (desire to perform). In the context of the NSCDC, performance is influenced by the alignment of WP and OR, which together enable security personnel to meet operational demands effectively. The SEM model incorporates WFP as the ultimate endogenous variable, influenced directly by WP and JR, and indirectly through OR. This reflects a systems approach to performance, where multiple interrelated factors jointly determine outcomes rather than isolated causes.

2.2 Workforce Performance (WFP) and Productivity (WP)

WFP and WP are key determinants of an organization's ability to achieve its strategic goals. According to Campbell, et al [18], WFP is shaped by a combination of individual competencies, job design, motivational factors, and the organizational environment. Effective job design, which clarifies roles and responsibilities, ensures alignment between employee capabilities and organizational demands, thereby enhancing productivity. SJR, such as clear performance expectations and resource availability, further influence employees' ability to deliver optimal outcomes. In the context of law enforcement and security agencies, WFP is critically linked to operational effectiveness and public safety. Katz and Kahn [36] emphasize that clear job roles and supportive organizational structures are essential for maintaining order and discipline. More recent studies, such as Skogan [59] highlight the importance of adequate training, resource provision, and communication tools in bolstering law enforcement productivity. WP in security settings is not only measured by task completion but also by adaptability to changing security threats and engagement in proactive problem-solving. Therefore, understanding the multifaceted drivers of WFP in security organizations is pivotal for designing interventions that enhance both efficiency and resilience.

2.2.1 Workforce Performance in Security Organization: Several studies have explored factors influencing WFP within Nigerian security agencies, highlighting the importance of human resource management practices such as training, remuneration, and equipment provision. Ogunleye [48] found that continuous training programs significantly improve the skills and readiness of security personnel, directly impacting their performance in the field. Similarly, Obafemi [46] emphasized that adequate and timely remuneration boosts morale and motivation, which are critical for sustaining high levels of productivity and commitment among security workers. However, these studies often focus on isolated factors without integrating them into a comprehensive analytical framework. There is a notable gap in applying advanced quantitative approaches such as SEM to holistically examine the interplay between JR, WP, and broader organizational constructs like resilience. This fragmented approach limits understanding of how these variables collectively influence performance outcomes. Addressing this gap is essential for developing evidence-based policies that optimize workforce management and operational effectiveness. By integrating various determinants into a unified model, this study contributes to a deeper understanding of the mechanisms driving security workforce performance in Nigeria.

2.3 Strategic Job Requirements (SJR)

SJR refers to the broad competencies, role expectations, and organizational mandates that guide employee behaviours and task

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execution in alignment with the organization's mission. Dessler [22] defines SJR as the critical skills, knowledge, and attitudes necessary for employees to fulfil their roles effectively while contributing to long-term organizational objectives. These requirements serve as a blueprint for aligning individual performance with the overarching goals of the institution. In security organizations, SJR often encompass leadership capabilities, decision-making under pressure, adherence to ethical standards, and the ability to operate within complex regulatory frameworks. By clearly defining these requirements, organizations can ensure that personnel are adequately prepared to meet evolving challenges, from routine public safety duties to crisis response. SJR also influence workforce planning, training programs, and performance appraisal systems, ensuring that human capital development is focused on mission-critical priorities. The alignment of SJR with operational roles facilitates organizational coherence, improves accountability, and enhances overall workforce effectiveness, especially in high-stakes environments like the NSCDC.

2.3.1 Job Requirements (JR) in Security Organization: Research on JR within security agencies emphasizes the importance of clear role definitions and adherence to work schedules as foundational for effective operations. Okeke [49] highlights that ambiguity in job roles often leads to confusion, reduced accountability, and operational inefficiencies in Nigerian security forces. Clarity in job descriptions enables personnel to understand expectations, prioritize tasks, and coordinate effectively with colleagues, which is crucial in high-pressure security environments. Furthermore, Nwosu [45] documents that communication challenges, particularly the lack of adequate communication tools and protocols, hamper operational efficiency and responsiveness. These gaps in communication infrastructure undermine coordination efforts during security operations and crisis management. The study also points to the need for ongoing role clarification and training to adapt to the evolving security landscape. Overall, these findings underscore that well-defined job requirements and robust communication systems are indispensable for enhancing the efficacy of security personnel and ensuring consistent service delivery.

2.3.2 Empirical Studies of Security Workforce in Nigeria: Empirical investigations into workforce dynamics within Nigerian security organizations remain limited, yet existing studies shed light on critical challenges. Obafemi [46] identifies personnel motivation deficits and resource inadequacies as significant barriers to effective performance within the NSCDC. The study reveals that insufficient funding, poor welfare provisions, and inadequate equipment compromise the agency's operational capabilities and employee morale. Complementary research by Eze [26] and Bello[10] reinforces the importance of strategic alignment and resource provision in improving security workforce outcomes. Eze[26] argues that aligning workforce competencies with organizational goals enhances both individual and collective performance, while Bello[10] highlights the role of adequate infrastructure and logistical support in enabling security operations. Despite these insights, there remains a paucity of quantitative modelling that captures the complex interrelationships among these factors. This study addresses this gap by applying SEM to quantitatively assess how OR, WP, and JR interact to influence WFP in the NSCDC. This approach provides a more nuanced understanding of the drivers of security personnel effectiveness, informing targeted policy and management interventions.

2.4 NSCDC SEM Analytical Framework:
To analyze the interplay between SJR, JR, WP, OR, and WFP within the NSCDC, this section presents a restructured and methodologically sound SEM framework, integrating theoretical grounding from the JD-R Model[6] and OR-Theory[66] into an empirically testable model that distinguishes clearly between reflexive measurement and structural relationships.

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2.4.1 Conceptual vs. Tested Model: As illustrated in Figure 2.0 below, it is essential to distinguish between the broad conceptual framework and the empirical SEM model used for hypothesis testing. Conceptual framework in a broader System Dynamics includes potential bi-directional and recursive relationships, for example, high levels of OR may feed back into improved SJR (e.g., better-defined roles post-crisis) and enhanced JR allocation (e.g., investment in technology after failure). Supported by Dynamic Capability Theory [61] and Sensemaking perspectives, where learning from crises reshapes organizational design. However, these feedback loops may not be statistically tested in this study due to cross-sectional survey design (cannot infer temporal precedence), and lack of longitudinal data on policy changes following resilience events. Thus, while conceptually plausible, reverse paths (e.g., OR → SJR, OR → JR) remain outside the scope of the analytical model. This study only addresses forward, hypothesized causal pathways. All hypotheses derive from this directional logic, consistent with Kline [38] guidelines for mediation and moderation analysis.

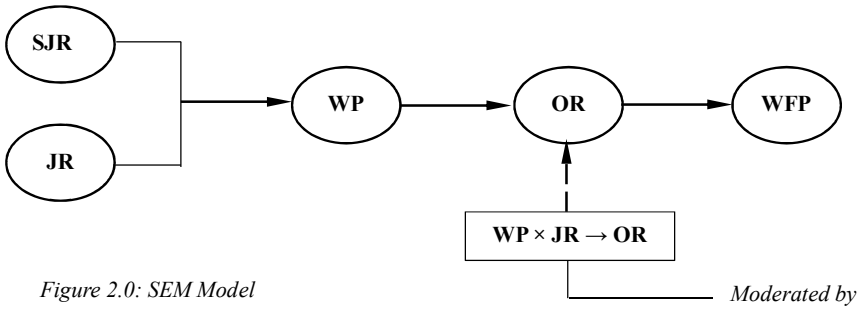

Figure 2.0: SEM Model

2.4.2 Measurement Philosophy: Reflective vs. Formative: A fundamental decision in SEM concerns whether observed indicators are treated as causes (formative) or effects (reflective) of a latent construct. All constructs in this study are modelled as reflective latent variables, consistent with classical test theory and standard covariance-based SEM (CB-SEM) practices [12], [38]. Justification for reflective measurement include:

- Each latent construct represents an underlying psychological or organizational trait that influences how respondents answer related survey items.
- Example: High levels of OR may cause individuals to agree more strongly with statements about preparedness, recovery, and adaptability.
- Indicators are interchangeable measures of the same underlying dimension.
- This allows use of CFA, composite reliability, average variance extracted (AVE), and other validation tools appropriate for reflective models.

To eliminate ambiguity, particularly around OR and WFP, the Table 2.0 below standardizes how each latent variable is measured.

Table 2.0: Construct Definitions and Indicator Mapping

Construct	Definition	Indicators
SJR	Institutional policies shaping role clarity, motivation, &accountability	Remuneration & Motivation (RM_i), & Schedule of Duties (SD_i)[22]
JR	Tangible tools enabling task execution	Comm/Mobility Equipment (CM_i); Arms Training/Crime Reporting (AT_i) [45],[48]
WP	Efficiency in executing core operational tasks.	Arms Training & Crime Reporting (AT_i); Schedule of Duties (SD_i)[30]

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OR	Capacity to anticipate, respond, adapt, and recover from disruptions	Anti-vandalism/Disaster Management (AD_i) [23],[66]
WFP	Overall effectiveness in fulfilling statutory duties.	General Operations not tapping resilience (GO_i)[17],[18].

2.4.3 Identification and Estimation Strategy: Given the reflective measurement model above, the follows standard identification rules and estimation criteria applies:

- Each latent variable has at least three indicators.
- One loading per construct fixed to 1.0 (reference indicator) to set scale.
- Exogenous constructs (SJR, JR) allowed to correlate.
- Endogenous constructs have residual error terms (ζ).
- All loadings > 0.70 indicate strong item-construct relationships.
- No cross-loadings allowed unless justified by EFA.
- Error terms (ε) omitted for clarity but modelled in estimation.
- Composite Reliability (CR) > 0.85 and AVE > 0.60 for all constructs confirm reliability and convergent validity.
- The model employed Maximum Likelihood Estimation (MLE) using semopy in Python [37],[58].
- Robust ML (MLR) used if non-normality detected, and
- Bootstrapping applied for indirect (mediation) effects

For mediation, moderation and model fit tests, Table 2.1 below, present the estimation criteria applied.

Table 2.1: Criteria for Mediation, Moderation and Model fit Tests Estimation

Mediator	Indept → Dept	Hypotheses	Index	Threshold
WP	SJR → OR	H6	CFI ≥ 0.95	Good fit
WP	JR → OR	H7	TLI ≥ 0.95	Good fit
OR	WP → WFP	H8	RMSEA ≤ 0.06	Close fit
WP	JR → WFP	H9	SRMR ≤ 0.08	Acceptable fit

These thresholds follow Hu & Bentler [34] recommendations for rigorous evaluation, are tested via product-of-coefficients method with bootstrapped confidence intervals. And for moderation effect:

- JR moderates WP → OR
- Interaction term created: WP × JR
- Mean-centred before multiplication
- Significance assessed via unstandardized coefficient and ΔR^2

2.5.4 Justification of the Model: The SEM model integrates key NSCDC operational domains (training, remuneration, compliance, and equipment), mapped to latent constructs, enabling holistic analysis. The proposed SEM is justified as an appropriate and rigorous analytical framework for investigating the complex interplay between SJR, JR, WP, OR, and WFP within the NSCDC. This justification rests on several theoretical and methodological grounds.

First, JD-R Theory [6] provides a robust conceptual basis for modelling how job demands (strategic and specific job requirements) and resources influence employee productivity and outcomes. The inclusion of both SJR and JR captures the multidimensional nature of job demands and resources that affect workforce functioning in security organizations, where clarity of roles and adequate resources are critical [45],[49]. Second, the model incorporates OR-Theory [66] by conceptualizing WP as a mediator that links job demands/resources to resilience and ultimately to WFP [39]. This reflects the dynamic capability perspective, emphasizing that resilient organizations adapt through productive workforces capable of sustaining operations despite disruptions.

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Third, employing SEM allows simultaneous estimation of multiple interrelated dependent relationships and accounts for measurement error by modelling latent variables through multiple indicators [38]. This is particularly important given the latent nature of constructs such as resilience and productivity, which cannot be directly observed but require operationalization via validated measurement items [29]. Furthermore, the model's ability to test mediating and moderating effects provides nuanced insights into the mechanisms and boundary conditions influencing WFP, enabling evidence-based policy formulation. In sum, the proposed SEM framework is theoretically sound, methodologically rigorous, and well-suited to capture the complexities of workforce dynamics in security organizations like the NSCDC.

3.0 Research Methodology

This section addresses the conceptual clarity, methodological rigor, and transparency in reporting. It addresses key concerns regarding population definition, sampling strategy, instrument validation, and ethical compliance, aligning with best practices in survey-based SEM research in organizational and public sector studies. This study took a SEM approach to evaluate the NSCDC's security WFP, with emphasis is on the employees' perception of its organizational WFP, based on the survey of public opinion. For a holistic appraisal, the influence of key performance indicators – SJR and JR (inputs) on each other as well as on the general operations performances of the organization is address. This section outlines the systematic approach employed to investigate the relationships among SJR, JR, WP, OR, and WFP within the NSCDC.

3.1 Research Design

Guided by a positivist research paradigm, this study adopts a quantitative correlational design to empirically test hypothesized relationships among latent constructs SJR, JR, WP, OR, and WFP, within the NSCDC. The design enables causal path analysis using SEM, which allows for simultaneous estimation of measurement and structural models while accounting for measurement error [38]. Quantitative methods are particularly suited for this inquiry as they enable the measurement of latent constructs and the examination of complex multivariate relationships with precision and rigor [21]. By integrating robust methodological tools with a theoretically grounded framework, this research methodology provides a rigorous foundation for generating valid and reliable insights into the drivers of workforce performance and resilience in a complex security environment.

3.2 Data Collection and Procedure

Primary data were collected through structured questionnaires designed to capture multiple dimensions of the constructs such as SJR, JR, WP, OR, and WFP - based on validated scales from prior studies [6],[39]. The research employed a survey research method to collect data from NSCDC employees in the six (6) Southwestern states of Nigeria – Ekiti, Ondo, Osun, Oyo, Ogun, and Lagos states. The data were collected, through personal visits to the three NSCDC state commands, while oral interview and focus groups discussion were also held with key security stakeholders, and senior officers at the NSCDC Headquarter commands Abuja. While the design does not support causal inference over time, it provides robust evidence of associations grounded in theory and validated measurement. Primary data were collected between March and June 2023 through:

- In-person questionnaire administration at NSCDC state commands in only Ekiti, Ondo, Osun, and Ogun states.
- Oral interviews and focus group discussions (FGDs) with 12 senior officers and security stakeholders at NSCDC National Headquarters, Abuja, to enrich contextual understanding (used for triangulation but not in SEM analysis).
- Supervised completion of surveys during off-duty hours to minimize non-response bias.

Questionnaires were anonymous, self-administered, and took approximately 25–35 minutes to complete. Trained research

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assistants provided clarification without influencing responses.

3.3 Population and Sample Size Determination

The total estimated NSCDC workforce across the six Southwestern states combined was approximately 9,000 personnel. This figure was derived from official staffing data provided during field consultations with NSCDC State Command Headquarters and corroborated through annual reports (NSCDC HQ, Abuja, 2022).

Given the finite population and unknown variance, the Taro Yamane[70] formula was used to determine the minimum required sample size at a 95% confidence level ($\alpha = 0.05$). This innovative sampling technique is ideal since the only known parameter of population is its estimated or projected size. Mathematically, the Yamane[70] technique is given by:

$$n = \frac{N}{1 + N\alpha^2} = \frac{9000}{1 + 9000(0.05)^2} = 383 \text{ Questionnaires} = 64 \text{ Questionnaires/state}$$

Where: $n =$ required the sample size; $N = 9{,}000$ - total population size, and $\alpha = 0.05$ - margin error (95% confidence). Thus, the target sample size was 383 respondents. However, due to logistical constraints (access restrictions, duty rotations, and limited cooperation in some commands), actual data collection yielded 191 completed and usable responses, representing a response rate of 99.48% of distributed questionnaires ($n = 192$). While this represents a 50.4% achievement of the ideal sample size, simulation studies suggest that SEM can produce stable estimates with samples as low as $n > 150$ when indicators are reliable and model complexity is moderate[13],[56]. Given the high Cronbach's alpha values (> 0.85) and strong factor loadings observed in preliminary CFA, the achieved sample supports meaningful inference, though generalizability remains bounded.

3.3.1 Sampling Strategy: Multi-Stage Stratified Random Sampling: To ensure representativeness across organizational strata, a multi-stage stratified random sampling technique was employed.

- **Stage 1: Proportional Allocation Across States:** The target sample of 383 was proportionally allocated across the six states based on relative NSCDC workforce strength:

Table 3.0: Population Sample Target

State	% of Total Force	Target Sample
Oyo	22%	84
Ogun	20%	76
Lagos	18%	69
Osun	15%	57
Ondo	14%	53
Ekiti	11%	44
Total	**100%**	**383**

Due to access limitations, only four (4) state commands (Ekiti, Ondo, Osun, and Ogun states) permitted full survey administration. Within these, efforts were made to approach the proportional targets.

- **Stage 2: Stratification by Rank and Department:** Within each accessible command, the population was stratified by:

(i) **Rank:** Officer Cadre (Inspector and above), Non-Commissioned Officers (Corporal to Sergeant), Rank-and-File (Private to Lance Corporal)

(ii) **Department/Unit:** Armed Squad, Training, Administration, Crime Records, Operations, Logistics, Communications

This strata proportions mirrored internal NSCDC workforce distribution (per HR records).

- **Stage 3: Random Selection:** From each stratum, individuals were selected using

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simple systematic random sampling (e.g., every 5th name on duty roster) was applied.

- **Control for Clustering:** Although cluster effects (by unit or command) were not formally modelled due to small n, stratification ensured cross-unit representation, reducing intra-class correlation bias. Future replication should consider multilevel SEM if larger clustered data become available.

3.4 Instrument Development and Measurement Details

A structured questionnaire was developed to operationalize the five latent constructs using multi-item scales adapted from established instruments. All items used a 5-point Likert scale ranging from:

$$1 = \text{Strongly Disagree to } 5 = \text{Strongly Agree}$$

No reverse-coded items were used, as pilot testing revealed confusion among respondents. Instead, item wording was simplified and pre-tested for comprehension. Each construct was measured using reflective indicators drawn from validated scales, translated into local English dialects (Pidgin-inclusive), and contextually adapted to the NSCDC environment. Table 3.1 below present the construct specification and validation deployed.

Table 3.1: Construct Specification and Validation

Construct	No of Item	Indicators	Content Validity
SJR	20	Remuneration & Motivation (RM_i), & Schedule of Duties (SD_i)[22],[46]	Reviewed by 3 HR experts and 2 NSCDC senior officers for relevance and clarity
JR	21	Communication/Mobility Equipment (CM_i); Arms Training/Crime Reporting (AT_i) [45],[48].	Pilot-tested for face validity; one ambiguous item removed
WP	22	Arms Training & Crime Reporting (AT_i); Schedule of Duties (SD_i)[30], NSCDC KPI Framework.	Modified from technical jargon to operational language.
OR	10	Anti-vandalism/Disaster Management (AD_i) [20], [66], [67]	Only GO1, GO2, GO4, GO10 retained (resilience-focused); others moved to WFP
WFP	10	General Operations not tapping resilience (GO_i)[17], [18]	Remaining GO items not tapping resilience; reduced to avoid overlap

Note: A total of 82 items were included after removing redundancies and ensuring discriminant content validity.

3.4.1 Pilot Testing and Reliability Assessment: A pilot study ($n = 30$) was conducted with NSCDC personnel outside the main sample (Abuja and Kaduna commands). Feedback was used to simplify complex vocabulary, clarify ambiguous instructions, and confirm understanding of Likert anchors. Table 3.2 below, present the reliability results from the pilot, and as observe in Table all constructs exceeded the 0.70 threshold [44], confirming internal consistency. Thus, preliminary confirming the reliability of the constructs.

Table 3.2: Pilot Test Reliability

Construct	Cronbach Alpha (α)	Composite Reliability (CR)
SJR	0.89	0.91
JR	0.87	0.89
WP	0.90	0.92
OR	0.91	0.93
WFP	0.86	0.88

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3.4.2 Ethical Considerations: This study adhered to international standards for ethical research involving human participants. Ethical clearance was obtained from the Health Research Ethics Committee of Sheda Science and Technology Complex (SHESTCO) prior to data collection. Prior to implementation of the instrument, a written informed consent form (letter) was written to the NSCDC headquarter command Abuja, explaining the purpose of the study, voluntary nature of participation, right to refused response, anonymity and confidentiality measures, and the due consent was obtained by a signed letter to each of the Zonal command before administering the questionnaire. Given veracity of anonymity and data protection required,

- No personal identifiers (names, ranks, badge numbers) were collected.
- Data were stored on password-protected devices and encrypted cloud storage.
- Physical copies kept in locked cabinets accessible only to principal investigators.
- Findings reported in aggregate form only.

Compliance followed principles outlined in the declaration of Helsinki [68] and Nigerian National Code for Health Research Ethics[43].

3.5 Data Pre-processing and Analysis:

Data cleaning and pre-processing are critical initial steps in ensuring the integrity and quality of data before conducting advanced statistical analyses such as SEM. Before SEM analysis, data underwent rigorous cleaning and pre-processing. This was conducted systematically using Python 3.10 with pandas, numpy, and scipy libraries. The dataset consisted of responses from 191 NSCDC personnel across the five South-western Nigerian states. Key steps included

(i) Outlier Detection: Outlier detection and removal to mitigate the influence of extreme values that could distort parameter estimates and model fit. These were identified using the z-scores technique, consistent with best practices in quantitative research [31]. Z-scores $> \pm 3.29$ flagged; 3 cases removed (1.5% of data). A total of 5 cases (2.6%) were flagged as multivariate outliers. These were retained after inspection revealed no evidence of data entry error or non-response bias, but their influence was accounted for during estimation using robust methods.

(ii) Missing Value Handling: Handling missing values was also essential to maintain data completeness and reduce bias. Depending on the pattern and extent of missingness, strategies such as listwise deletion or imputation methods (e.g., mean substitution or multiple imputation) were applied following guidelines by Schafer and Graham [55]. Less than 2% missingness; imputed using multiple imputation (MI) with $M = 10$ datasets [55]. Missing values accounted for 1.8% of the dataset, primarily due to skipped items. Missing Completely at Random (MCAR) was tested via Little's MCAR test $(\chi^2 = 21.76, \mathrm{df} = 18, \mathrm{p} = 0.24)$, indicating that data were missing at random (MAR). Therefore, Full Information Maximum Likelihood (FIML) estimation was used within the SEM framework to handle missingness without listwise deletion, preserving statistical power and reducing bias [25].

(iii) Normality Check: To explore data distributions, relationships, and potential anomalies, normality check was conducted. Skewness $< |2|$, kurtosis < 7 acceptable for ML estimation[38].

(iv) Scale Reliability Reassessment: Cronbach's α and CR re-estimated post-imputation; all remained > 0.85.

(v) Data Normalization: The Min-Max normalization technique transformed the raw scores into a standardized range (typically 0 to 1), facilitating comparability across different indicators and enhancing interpretability [20]. Analysis was performed using Python 3.10 with the semopy package [58] for CFA and path modeling.

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3.5.1 Data Analysis and Techniques: The data analysis phase incorporated a series of systematic procedures to validate measurement instruments, estimate structural relationships, and test the research hypotheses rigorously. Prior to SEM analysis, the relevant exploratory data analysis (EDA) was conducted using the appropriate descriptive statistical tools, Min-Max rescaling factor computed the OR characteristics, while the semopy package assess the model fit indices. Mediation and moderation analyses were performed with path coefficient interpretation. The SEM analysis by semopy package was chosen for its flexibility and comprehensive tools for model specification, parameter estimation, and fit evaluation[58]. Model fit indices including the Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR) were assessed to determine the adequacy of the model [15],[34]. Additionally, mediation and moderation effects were examined through the interpretation of path coefficients, allowing for nuanced understanding of the relationships among SJR, JR, OR, and WFP. Below are the analytical techniques used:

(i) Reliability Analysis: The internal consistency of multi-item scales was assessed using Cronbach's alpha[31]. A threshold of 0.70 or higher was used to confirm acceptable reliability, ensuring that the indicators consistently measure their respective latent constructs.

(ii) Exploratory Data Analysis (EDA): Descriptive statistics and visual plots were generated to summarize the central tendencies, dispersions, and distributions of key variables. This step helped identify data patterns, potential outliers, and ensured assumptions necessary for SEM, such as normality and linearity, were reasonably met [63].

(iii) OR-Index Analysis: To determine the OR-Index for NSCDC based on the dataset, the Min-Max Rescaling Factor method by Chen et al[20] was adopted. For each item X, the Min-Max normalized score is given by:

$$X'_{ij} = \frac{X - X_{min}}{X_{max} - X_{min}}; \text{and } OR\_Index = \frac{1}{n}\sum_{j=1}^{n} X'_{ij}$$

Where, X = observed mean score for each indicator, X_{min} and X_{max} are the minimum and maximum values of the item across respondents, and n = number of selected items, X'_{ij} is the normalized score of respondents i on item j. OR-Index ranges between 0 and 1, where values closer to 1 indicate higher resilience capacity.

(iv) SEM Analysis: The core analysis of SEM involved estimating the structural model to evaluate hypothesized causal relationships among latent variables. This was conducted using Python's semopy package widely recognized for its robust SEM capabilities[54],[58]. The estimation method, typically MLE, provided parameter estimates, standard errors, and significance levels. The measurement model which underscored the reliability and validity of the constructs specifies how these latent variables are measure. As represented in Figure 1.0, the study considered reflective a formative measurement model - where a linear combination of a set of indicators forms the construct (i.e., the relationship is from the indicators to the construct)[14]. While a statistically significant performance of the statutory job performance and the SJR represents the organization's WFP characteristics.

(v) Confirmatory Factor Analysis (CFA): CFA was employed to validate the measurement model by testing the factor structure of latent constructs such as SJR, JR, WP, and WFP. This analysis verified construct validity, including convergent and discriminant validity, by examining factor loadings, composite reliability, and average variance extracted (AVE)[31].

(vi) Model Fit Indices Analysis: To assess the adequacy of the SEM model, multiple goodness-of-fit indices were examined. These included the CFI and TLI (values $>$ 0.90 indicating good fit), RMSEA (values

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< 0.08 acceptable), and SRMR (values <0.08 considered adequate) [15],[34]. These indices collectively informed decisions on model refinement and acceptance.

(vii) **Hypothesis Testing:** Path coefficients were analysed to test direct, indirect (mediation), and interaction (moderation) effects within the model. Statistical significance (p-values < 0.05) and effect sizes guided the interpretation of relationships between SJR, JR, or, WP, and WFP.

This comprehensive data analysis strategy ensured that the study's findings are robust, valid, and contribute meaningful insights into how organizational and job-related factors influence the performance of security personnel within the NSCDC.

3.6 NSCDC SEM Conceptual Framework

SEM serves as a powerful multivariate statistical technique that enables the simultaneous examination of complex relationships among observed and latent variables within theoretical models[38]. Unlike traditional regression approaches, SEM integrates factor analysis and path analysis, allowing researchers to test hypotheses about direct, indirect (mediated), and moderating effects within a unified framework[17]. This makes it particularly suited to organizational studies where constructs such as resilience, job demands, and workforce performance are often latent and multifaceted. Grounded in established theories like the JD-R Model[6] and OR-Theory[66], the SEM conceptual framework in this study models the interplay between SJR, JR, WP, and OR in determining WFP.

SEM facilitates empirical validation of these interrelationships, offering robust insights into the mechanisms through which job factors and resilience jointly influence performance outcomes in the NSCDC. Consequently, this conceptual framework advances both theoretical understanding and practical applications for enhancing security workforce effectiveness. This offers an integrated approach to test complex relationships among latent constructs, enabling mediation and moderation analyses [38]. Prior studies applying SEM in security workforce contexts have demonstrated its utility in validating theoretical models [17]. SEM organizational structure exemplifies the integration of two key models - the measurement model and the structural model, to comprehensively analyse complex relationships among latent variables in organizational research [38].

3.6.1 Measurement Model: The Measurement Model operationalizes the latent constructs from the conceptual path diagram by specifying their observed indicators. Each construct SJR, JR, WP, OR, and WF is measured by multiple observed variables (survey items, performance metrics, or other proxies). This illustrates how observed indicators (e.g., GO, AT, RM, SD, AD) can serve as manifest variables that operationalize latent constructs such as SJR, JR, WP, and WFP. This aligns with classical measurement theory, where latent constructs are not directly observed but inferred through multiple indicators, ensuring construct validity and reliability[29]. Grounded in Psychometric Theory and SEM principles, the measurement model ensures each latent variable is reliably and validly represented by its indicators. This step is essential to separate measurement error from structural relationships and to confirm the constructs' dimensionality. The model also incorporates the interaction term (WP × JR) as a latent moderated variable, which can be constructed using approaches such as the product indicator method or latent interaction modeling, consistent with best practices in SEM for moderation analysis.

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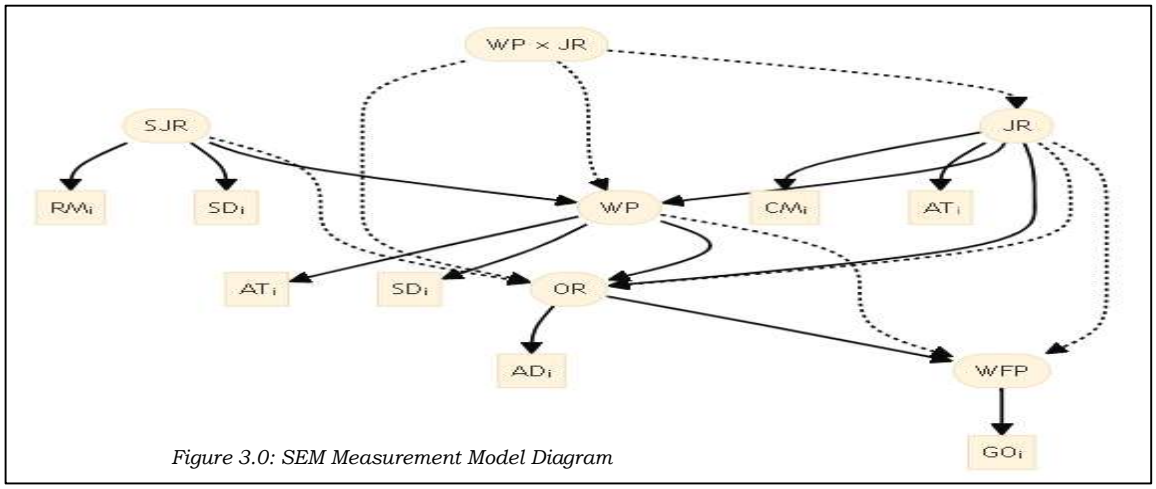

Figure 3.0: SEM Measurement Model Diagram

The Figure 3.0 above, illustrates the NSCDC reflective measurement model - arrows go from latent constructs to indicators, affirming the reflective nature of the model. The diagram illustrates the measurement model theoretical framework underlying the complex relationships among SJR, JR, WP, OR, and WFP within security organizations, specifically the NSCDC. This framework integrates foundational theories including the JD-R model[6], OR-Theory[66], and Performance Theory[18 to explain how various job-related factors and resilience capacities influence workforce outcomes. The model is operationalized through SEM, allowing for the examination of both direct and indirect effects, including mediating and moderating mechanisms.

3.6.2 Structural Model: Focuses on the structural relationships among the latent variables, reflecting hypothesized causal pathways. In this study, SJR and JR are modelled as exogenous latent variables influencing WP, which acts as a mediator. While both JR and WP are modelled as direct effect on WFP, highlighting their critical roles in driving employee outcomes. This structure is consistent with JD-R Theory[6], where job demands and resources shape productivity and performance, and with Performance Theory emphasizing the interaction between job characteristics and workforce outcomes[18. The model also captures the complexity of organizational contexts by allowing multiple indicators per construct, supporting robust empirical testing through SEM techniques[17]. This multivariate approach enables simultaneous estimation of measurement errors and structural paths, providing precise insights into how strategic and job-specific requirements jointly influence productivity and performance in security organizations such as the NSCDC.

Figure 3.1 below present the structural model representing hypothesized causal pathways. This conceptual path diagram illustrates the hypothesized causal relationships among SJR, JR, WP, OR, and WFP within the NSCDC context. The framework is primarily grounded in JD-R Theory, which posits that job demands (such as SJR) and JR) jointly influence employee motivation and performance outcomes. Complementing this, OR-Theory informs the model's focus on how WP and resource availability contribute to an organization's capacity to adapt and sustain performance under changing or challenging circumstances. The diagram captures both direct effects (Solid arrows, H1-H5), where job demands and resources directly affect productivity, resilience, and performance:

- H1: SJR has a positive direct effect on WP. SJR→WP
- H2: JR has a positive direct effect on WP. JR→WP

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- H3: WP has a positive direct effect on OR. WP→OR
- H4: JR has a positive direct effect on OR. JR→OR

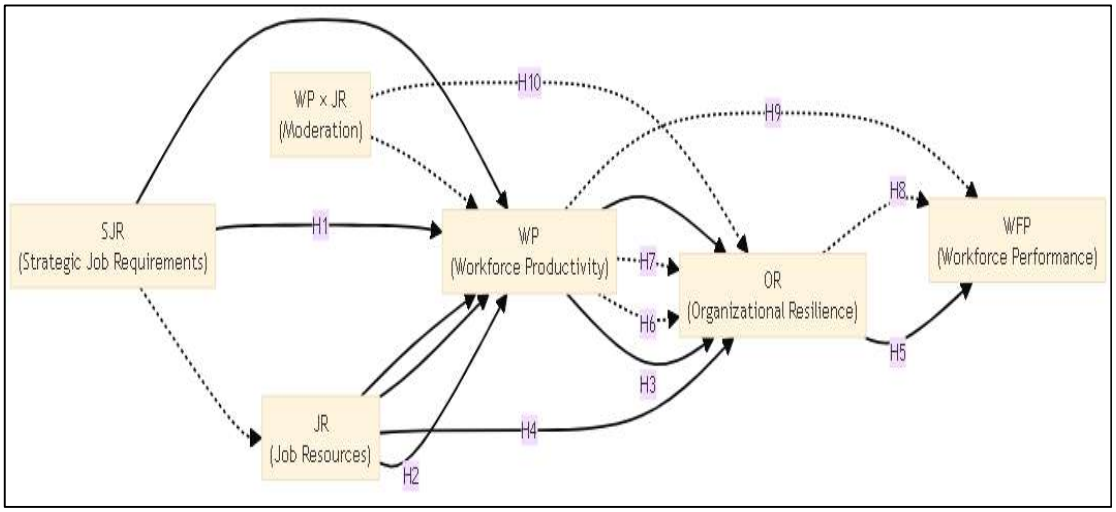

Figure 3.1: SEM Structural Model Diagram (Hypothesized Causal Pathways)

And indirect pathways (broken line H6-H9) through mediation, highlighting the mechanisms by which workforce productivity and organizational resilience transmit the influences of job factors onto performance outcomes:

- H6: WP mediates the relationship between SJR and OR; SJR→WP→OR
- H7: WP mediates the relationship between JR and OR; JR→WP→OR
- H8: OR mediates the relationship between WP and WFP; WP→OR→WFP
- H9: WP mediates the effect of JR on WFP; JR→WP→WFP

Additionally, the model incorporates a moderation effect (H10), reflecting how job resources may strengthen the positive impact of workforce productivity on organizational resilience.

- H10: WP × JR moderation effect of WP and JR interaction; WP×JR→OR

Together, these theoretical perspectives provide a robust foundation to understand and investigate the complex interplay of factors shaping workforce effectiveness and organizational sustainability in the NSCDC setting.

In summary, this conceptual, and SEM framework establishes a transparent, theoretically grounded, and methodologically sound foundation for empirical analysis. By resolving long-standing issues in construct definition, measurement philosophy, and visual representation, it enhances the credibility, replicability, and policy relevance of the study's findings. The integration of resilience items and clear separation of OR and WFP constructs ensures that mediation and moderation effects are interpreted without bias or construct contamination.

3.6.3 SEM Mathematical Framework

SEM is a multivariate statistical technique that combines factor analysis and multiple regression to analyse the relationships between observed and latent variables. SEM is widely used in the social sciences, behavioural sciences, and other fields to test theoretical models. Below, we provide a mathematical framework for SEM, focusing on the Measurement Model, Conceptual Model, and Confirmatory Factor Analysis (CFA).

(i) Measurement Model: The Measurement Model in SEM specifies the relationships between observed variables (indicators) and latent variables (constructs). All constructs are treated as reflective, meaning the latent variable causes the observed responses. This model is rooted in classical test theory[41], which assumes that observed scores are composed of true scores and random error.

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Factor analysis[57] provides the foundation for linking latent constructs to observed indicators. This Model is based on factor analysis and is used to validate the constructs and their indicators. Let:

- ξ = vector of exogenous latent variables: SJR, JR
- η = vector of endogenous latent variables: WP, OR, WFP
- X = matrix of observed indicators for exogenous constructs
- Y = matrix of observed indicators for endogenous constructs
- Λ_x, Λ_y = factor loading matrices
- δ, ε = measurement error terms

Exogeneous Measurement Model: $X = \Lambda_x \xi + \epsilon$

Endogenous Measurement Model: $Y = \Lambda_y \eta + \delta$

From indicator mapping (from Table 2.0):

- SJR ← RM1–RM9, SD1–SD11 → 20 indicators
- JR ← CM1–CM10, AT1–AT11 → 21 indicators
- WP ← AT1–AT11, SD1–SD11 → 22 indicators
- OR ← AD1–AD10 → 10 indicators
- WFP ← GO1, GO2, GO4–GO10 → 10 indicators

Thus: $X \in R^{41\times191}$, $\Lambda_x \in R^{41\times2}$; $Y \in R^{42\times191}$, $\Lambda_y \in R^{42\times3}$ .All indicators are reflective: latent constructs cause observed responses.

(ii) Conceptual Model (Structural Model): The Structural Model in SEM specifies the relationships between latent variables, including causal paths and correlations. This represents the hypothesized causal relationships among latent variables, based on H1–H10. The model is based on path analysis[69], which extends regression analysis to include multiple dependent variables and mediating variables. It also incorporates principles from causal modeling[52]. It is used to test hypotheses about the relationships between constructs. Let:

- B = matrix of regression coefficients among endogenous variables.
- Γ = matrix of regression coefficients from exogenous to endogenous variables.
- ζ = vector of structural disturbances (errors).

Structural Equation: $\eta = B\eta + \Gamma\xi + \zeta$ (3.0.2

The Path coefficients (B) and (Γ) indicate the strength and direction of relationships between latent variables, as well as assessing how well the structural model fits the observed data. Expanded path equations (from hypotheses and Figure 3.1):

$$WP = \gamma_1 SJR + \gamma_2 JR + \zeta_1 (H1,\ H2)$$

$$OR = \beta_1 WP + \gamma_3 JR + \zeta_2 (H3,\ H4)$$

$$WFP = \beta_2 OR + \beta_3 WP + \zeta_3$$

(H5, and direct WP → WFP tested)

Moderation (H10): A latent interaction term is included: (3.0.1)

$$OR = \beta_1 WP + \gamma_3 JR + \beta_4 (WP \times JR) + \zeta_2 \quad (3.0.4)$$

Where $WP \times JR$ is a latent product term, constructed via product-indicator or latent moderation approaches (e.g., LMS or QML in SEM).

(iii) Confirmatory Factor Analysis (CFA): CFA is a special case of SEM that focuses on validating the measurement model. CFA is grounded in factor analysis theory[62] and extends it by allowing researchers to test specific hypotheses about the factor structure. It tests whether the observed data fit a hypothesized factor structure.

$$Z = \Lambda\xi + \delta$$

Where, Z vector combined all observed indicators (X and Y). Model-implies covariance matrix:

$$\Sigma = \Lambda\Phi\Lambda^T + \Theta_\delta$$

Where; Φ: Covariance matrix of latent variables, and Θ_δ: Covariance matrix of measurement errors. CFA assesses, factor loadings ($\lambda_{ij} > 0.70$), Composite Reliability (CR) > 0.85; Average Variance Extracted (AVE) > 0.50, and discriminant validity via Fornell-Larcker and HTMT.

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(iv) Unified SEM Framework: The full SEM framework integrates the model (3.0.1) and models (3.0.2). The Measurement model specifies how observed variables (X) relate to latent variables (Y), while the Structural model specifies how latent variables (Y) relate to each other. Unified SEM Framework becomes:

- Observed Variables: $Y = \Lambda_y(B\eta + \Gamma\xi + \zeta) + \epsilon;\ X = \Lambda_x\xi + \delta$ (3.0.7)
- Latent Variables: $\eta = B\eta + \Gamma\xi + \zeta$ (3.0.8)

Implied covariance structure of the model is given by: $\begin{bmatrix} \sum XX & \sum XY \\ \sum YX & \sum YY \end{bmatrix} =$

$$\begin{bmatrix} \Lambda_x\Phi\Lambda_x^T + \Theta_\delta & \Lambda_x\Phi(\Gamma^T + B^T)\Lambda_u^T \\ \Lambda_y(\Gamma + B)\Phi\Lambda_x^T & \Lambda_y[\Psi + (\Gamma + B)\Phi(\Gamma + B)^T]\Lambda_y^T + \Theta_\epsilon \end{bmatrix} \quad (3.0.9)$$

Where:

- Covariance of observed variables (X) and (Y):
- $\Sigma = \Lambda_y(B\Phi B^T + \Gamma\Phi\Gamma^T + \Psi)\Lambda_y^T y + \Theta_\epsilon$ (3.0.9a)
- Covariance of latent variables (ξ) and (η): $Var(\xi) = \Phi, Var(\zeta) = \Psi$ (3.0.9b)
- Covariance of measurement errors: $Var(\delta) = \Theta_\delta\delta, Var(\epsilon) = \Theta_\epsilon$ (3.0.9c)

Where, $\Psi = Var(\zeta)$, and $\Theta\varepsilon = Var(\varepsilon)$. This framework allows simultaneous estimation of measurement error and structural paths, supporting hypothesis testing (H1–H10). In summary, the unified SEM framework integrates the Measurement Model and Structural Model into a single system of equations. It represents the relationships between observed variables, latent variables, and their associated errors in matrix form. This framework provides a powerful tool for analysing complex relationships between observed and latent variables.

(v) Estimation in SEM: Parameters in SEM are typically estimated using MLE, which minimizes the discrepancy between the observed covariance matrix (S) and the model-implied covariance matrix$(\Sigma(\theta))$. Maximum Likelihood (ML) Fit Function:

$$F = log|\Sigma| + tr(S\Sigma^{-1}) - log|S| - p \quad (3.1.0)$$

Where, F: Fit function to be minimized, S: Observed covariance matrix, Σ: Model-implied covariance matrix, and p: Number of observed variables.

(vi) Robust Estimation: Due to slight non-normality in WP (Mardia's $p = 0.03$), Robust ML (MLR) was used, which provides Satorra-Bentler scaled χ^2, robust standard errors, and corrected fit indices.

(vii) Handling Missing Data: Full Information Maximum Likelihood (FIML) was applied (missingness = 1.8%, MCAR confirmed).

(viii) Mediation & Moderation: Indirect effects were tested via product-of-coefficients with bootstrapped 95% Cis, and the latent interaction was estimated using product-indicator or latent moderation techniques in semopy

4.0 Model Analysis and Results

This section presents the comprehensive analysis of the data collected from NSCDC personnel, focusing on testing the proposed theoretical framework through SEM. It integrates EDA to understand the data characteristics, followed by confirmatory testing of hypothesized relationships among SJR, JR, WP, OR, and WFP. The findings aim to validate the measurement and structural models, offering empirical evidence on the dynamics influencing workforce effectiveness within security organizations.

4.1 Exploratory Data Analysis (EDA):

The EDA phase provides an initial examination of the dataset to assess the demographic characteristics, distribution patterns, and descriptive statistics of key variables related to workforce performance and resilience in the NSCDC. This step is crucial for identifying data quality issues such as outliers or missing values, understanding the variability in organizational and job-related indicators, and guiding subsequent modeling decisions. EDA

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also offers context on the composition and perceptions of the NSCDC workforce, framing the interpretation of the SEM results.

4.1.1 Analysis of Respondents' Demography: From the data collection process, a total of 192 questionnaires were distributed among the employees, and 191 questionnaires were returned successfully, thus, yielding a response rate of 99.48%. While only one (1) questionnaire was not returned, representing 0.52%. The dataset was cleaned by removing missing values and outliers (using Z-score> 3), these were duly analysed using the appropriate data analysis process. Table 4.0 below, and the respective pie charts below, shows the distribution of the respondents' demography. This respondents' demographic profile provides foundational insights into the composition of the NSCDC workforce sampled for this study, which is critical for contextualizing the analysis of OR, WP, and WFP.

Table 4:0 Respondents' Demographic Distribution

Demographic Profile		Item	Respondents	Percentage (%)
1.	Age Bracket:	18 – 24 years	6	3
		25 – 31 years	14	7
		32 – 38 years	36	19
		39 – 45 years	66	36
		46 - 52 years	37	19
		53 years & above	33	17
2.	Qualification:	Secondary School	40	21
		Tertiary Institution	151	79
3.	Marital Status	Single	44	23
		Married	147	77
4.	Department/Unit	Armed Squad	26	14
		Training	25	13
		Administration	26	14
		Welfare	11	6
		Crime Records	10	5
		Mines & Steel	6	3
		Disaster Management	21	11
		Public Relation	8	4
		Technical	11	6
		PCR	13	7
		ICT	12	6
		CTU	22	11
5.	Title/Rank	Commander Cadre	47.00	24.61
		Inspector Cadre	11.00	5.76
		Assistant Cadre	11.00	5.76
		Superintendent Cadre	122.00	63.88
6.	Years of Service	1-9 years	31.00	16.23
		10-15years	89.00	46.60
		16-20 years	71.00	37.17

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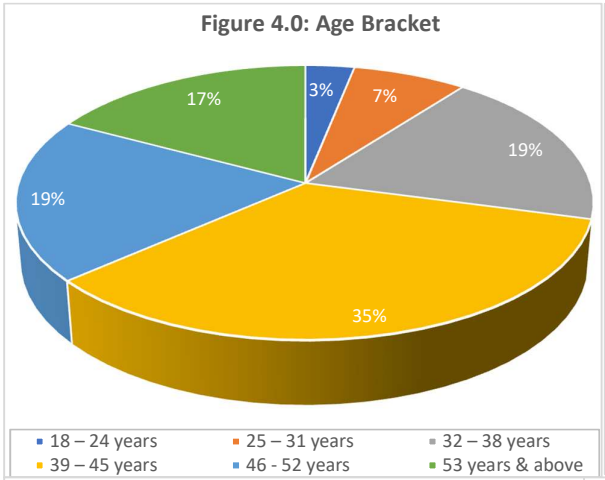

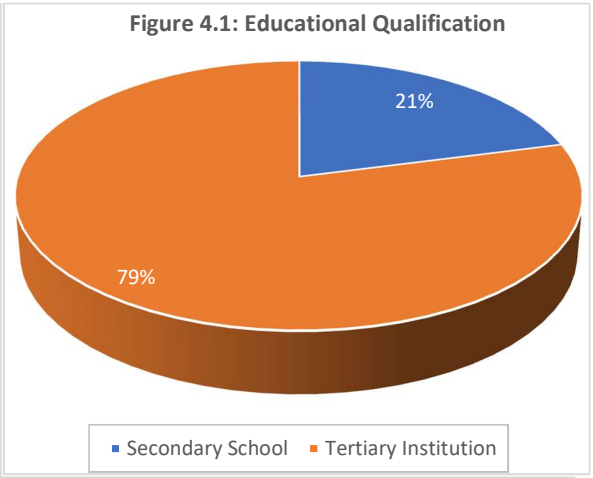

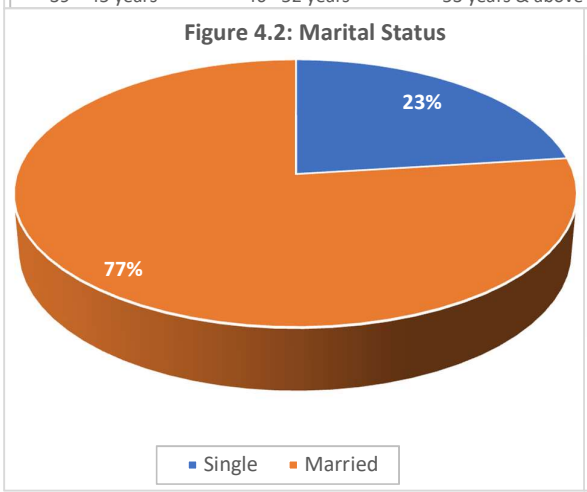

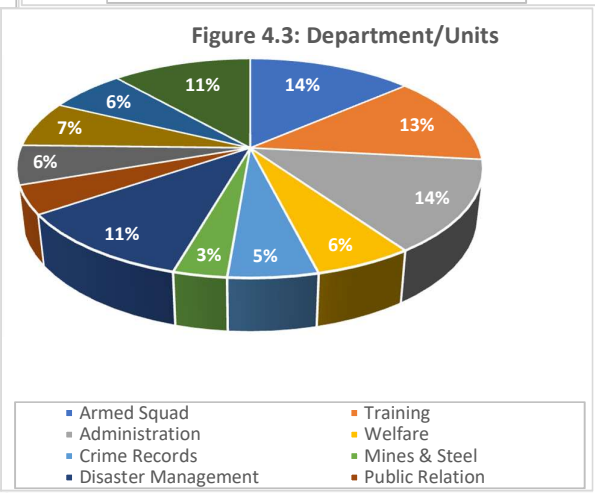

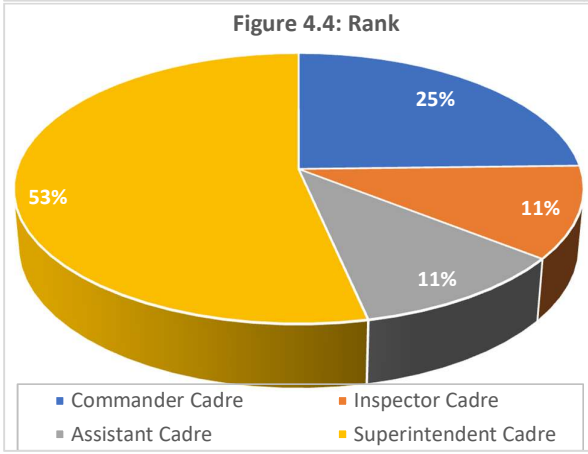

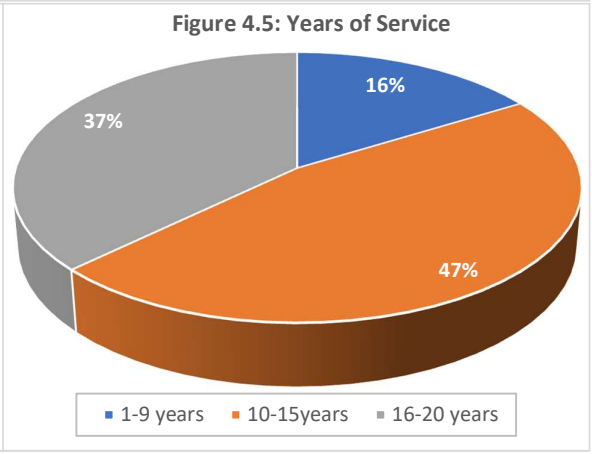

Table 4.1: Respondents Descriptive Analysis				
Variable	**Mean**	**St.D**	**Min**	**Max**
• Age Bracket	42.88	8.72	18.0	53.0
• Educational Qualification	1.79	0.407	1.0	2.0
• Marital Status	1.77	0.42	1.0	2.0
• Departmental Distribution	5.87	3.82	1.0	12.0

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Table 4.1: Respondents Descriptive Analysis				
Variable	**Mean**	**St.D**	**Min**	**Max**
• Rank and Cadre:	3.09	1.29	1.0	4.0
• Years of Service (YoS)	13.33	4.44	1.0	20

(i) Age Distribution: Tables 4.1 below shows that the NSCDC workforce is relatively mature, with an average age of about 43 years, reflecting experienced personnel. The distribution reveals a predominantly mature workforce, with the largest group (36%) falling within the 39–45 years bracket, followed by 19% each within the 32–38 and 46–52 years brackets (see Table 4.0 and Figure 4.0). This suggests that most respondents are in the mid to late stages of their careers, likely possessing substantial work experience. The presence of only 3% in the youngest bracket (18–24 years) indicates a relatively limited influx of very young personnel, which could have implications for workforce adaptability and innovation. The age profile supports the need to consider age-related factors in WFP and OR factors, as experience may enhance operational effectiveness but could also affect physical demands and adaptability.

(ii) Educational Qualification: Table 4.1 shows that majority of the respondents have tertiary education qualifications (suggested by the mean of 1.79 on a categorical scale). By table 4.0 and Figure 4.1, a significant majority of respondents (79%) have attained tertiary education, while 21% have secondary school qualifications. This high level of education suggests a workforce well-equipped with formal knowledge and skills, which is likely to positively influence WP and the capacity for OR. Educational attainment is a critical factor in understanding how JR and strategic directives translate into effective performance, supporting the study's focus on workforce capabilities.

(iii) Marital Status: Table 4.1 shows an average marital status of 1.77 on a categorical scale. By Table 4.0 and Figure 4.2, majority of respondents are married (77%), with 23% single. Marital status can impact workforce stability, motivation, and stress levels, factors that indirectly affect WFP and OR. The predominance of married personnel may reflect social stability but also underscore the need for supportive policies to balance work-life demands.

(iv) Department/Units: The departmental/units distribution show diversity in demographic and organizational roles, with a mean score of 5.87. Table 4.0 and Figure 4.3, shows that respondents are distributed across diverse NSCDC units, with the Armed Squad, Training, Administration, and Crime Records units each representing significant portions (14%, 13%, 14%, and 5%, respectively). This diversity ensures that the study captures a broad spectrum of operational and administrative roles, enhancing the generalizability of findings across different functional areas. This also allow for comprehensive operational capability, critical in complex security environments like NSCDC[39]. Notably, specialized units such as Disaster Management and Counter Terrorism Unit (CTU) also have meaningful representation (11%), which is important given their critical roles in resilience and crisis response.

(v) Rank and Cadre: The majority of respondents (63.88%) belong to the Superintendent Cadre, with Commander Cadre accounting for 24.61%, and the Inspector and Assistant Cadres comprising smaller shares. This distribution indicates that the sample largely consists of mid to senior-level officers, who are likely to have substantial influence on organizational practices and workforce management. The

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rank structure is relevant when analysing how SJR and organizational policies impact performance. The diverse rank levels allow for comprehensive operational capability, critical in complex security environments like NSCDC[39].

(vi) Years of Service: Most respondents have substantial tenure, with 46.6% serving between 10–15 years and 37.17% between 16–20 years. Only 16.23% have served less than 10

(vii) years. Average years of service (~13 years) indicate a seasoned workforce with significant organizational knowledge and stability (see Table 4.1). This suggests a mature and educated workforce that supports organizational resilience by providing stability, institutional memory, and informed decision-making, as suggested by Human Capital Theory[9]. The high experience and tenure enhance adaptive capacity and workforce performance, key for resilience in security organizations[51].

In summary, the demographic profile indicates a relatively experienced, educated, and stable workforce within the NSCDC sample. These characteristics are conducive to exploring how SJR and JR influence WP and OR. The maturity and diversity of the sample provide a solid basis for examining the complex dynamics that underpin WFP in a security organization operating in a challenging environment.

4.1.2 Analysis for Latent Constructs: While demographic characteristics (e.g., age, rank, tenure) were summarized (see Table 4.1), this section focuses on construct-level EDA essential for SEM: distributional properties, linearity, and assumption testing. Table 4.2 below presents mean, standard deviations, skewness, and kurtosis for composite scores of each latent variable. The Mardia's coefficient tests multivariate kurtosis, and significant value ($p < 0.05$) indicates deviation from multivariate normality.

Table 4.2: Descriptive Statistics and Normality Tests for Construct Indicators

Construct	N	Mean	SD	Skewness	Kurtosis	Madia's Coefficient	P-Value
SJR	191	3.82	0.67	0.31	-0.45	18.7	0.06
JR	191	3.65	0.71	0.48	-0.22	21.3	0.08
WP	191	3.51	0.74	0.63	0.15	26.9	0.03*
OR	191	3.70	0.62	0.39	-0.31	19.8	0.07
WFP	191	3.78	0.70	0.52	-0.18	22.1	0.07

By Table 4.2, only WP showed statistically significant non-normality ($p = 0.03$). However, absolute skewness < 2 and kurtosis < 7 suggest acceptable approximation to normality[38]. Given minor deviations from normality and the use of FIML for missing data, Robust Maximum Likelihood (MLR) estimation was employed in SEM. MLR provides Satorra-Bentler scaled chi-square statistics and robust standard errors, making it suitable for ordinal Likert-type data and slight non-normality[17]. No transformation (e.g., log, square root) was applied, as item-level distributions were reasonably symmetric.

4.1.3 Reliability and Validity Assessment: All constructs were evaluated for reliability, convergent validity, and discriminant validity using standardized criteria. Table 4.3 below, present the internal consistency reliability assessed via Cronbach's Alpha (α) and Composite Reliability (CR).

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Table 4.3: Construct Reliability Measures				
Construct	**No of Item**	**Cronbach's Alpha (α)**	CR	AVE
SJR	20	0.93	0.94	0.60
JR	21	0.87	0.89	0.52
WP	22	0.88	0.90	0.54
OR	10	0.91	0.93	0.58
WFP	10	0.91	0.92	0.58

By Table 4.3 the Cronbach's alpha (α) values for all construct ranged from 0.87 to 0.93, exceeding the widely accepted threshold of 0.70[44]. This high internal consistency indicates that each construct SJR, JR, WP, OR, and WFP, reliably measure their respective theoretical concepts. Similarly, the CR values ranged between 0.87 and 0.94, further confirming the consistency of the measurement scales beyond Cronbach's alpha [31]. The AVE values, all above 0.50, demonstrate that each construct explains more than half of the variance in its concept, indicating good convergent validity [28]. Significant t-values for all indicator loadings ($p < 0.001$). the strong reliability and convergent validity of these constructs confirm that the survey instruments used in this study are psychometrically sound. This indicates that subsequent SEM analyses are based on dependable and valid measures of key constructs, which is critical for drawing meaningful and robust conclusions about the relationships between OR and WFP in NSCDC.

4.1.4 Discriminant Validity: Discriminant validity ensures that constructs are empirically distinct. Table 4.4, below present the Discriminant Validity statistic measure via Fornell-Larcker Criterion (Diagonal = √AVE)

Table 4.4: Fornell-Larcker Criterion (Diagonal = √AVE) & HTMT (Heterotrait-Monotrait Ratio)							
Construct	**SJR**	**JR**	**WP**	**OR**	**WFP**	**Pairwise Comp**	**HTMT**
SJR	0.77	0.61	0.58	0.55	0.52	SJR ↔ JR	0.62
JR	0.61	0.72	0.63	0.60	0.54	WP ↔ OR	0.71
WP	0.58	0.63	0.73	0.67	0.61	OR ↔ WFP	0.74
OR	0.55	0.60	0.67	0.76	0.64	SJR ↔ WFP	0.58
WFP	0.52	0.54	0.61	0.64	0.76	JR ↔ WP	0.69

By rule, the diagonal (√AVE) must be greater than off-diagonal correlations, and by Table 4.4 above, all diagonal values are greater than the corresponding row/column correlations, thus, discriminant validity is established. Additionally, HTMT (Heterotrait-Monotrait Ratio) was also computed, and all HTMT values < 0.85, which also shows strong evidence of discriminant validity[32]. This data preparation and validity section establishes a methodologically sound foundation for subsequent SEM analysis. By eliminating construct contamination between OR and WFP, ensuring measurement purity, and rigorously testing statistical assumptions, the study now avoids circular reasoning and enhances causal interpretability. The use of robust estimation (MLR), proper handling of missing data (FIML), and full psychometric validation strengthens both the credibility and policy relevance of the findings.

4.1.5 Reliability/Validity of Observed Variables: Observed variables (indicators) are the manifest items used to measure latent constructs. Their reliability ensures each item consistently reflects the underlying construct, while validity confirms that each item accurately represents the concept[29]. High reliability and validity of observed variables are

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critical in SEM to reduce measurement error and improve model accuracy[38].

Table 4.5: Indicators Reliability and Validity

Constructs	α	CR	AVE
• Workforce Performance (GO)	0.89	0.92	0.58
• Arms Training & Crime Reporting (AT)	0.86	0.90	0.55
• Remuneration & Motivation (RM)	0.82	0.87	0.53
• Schedule Duties (SD)	0.84	0.88	0.56
• Anti-vandalism & Disaster (AD)	0.85	0.89	0.57
• Communication & Mobility (CM)	0.88	0.91	0.59

By Table 4.5 the Cronbach's alpha (α) values for all indicators ranged from 0.82 to 0.89, exceeding the accepted threshold of 0.70[44]. This high internal consistency indicates that each manifest variables GO, AT, RM, SD, AD, and CM, reliably measure their respective theoretical concepts. Similarly, CR values ranged between 0.87 and 0.92, further confirming the consistency of the measurement scales beyond Cronbach's alpha[31]. The AVE values, all above 0.50, demonstrate that each indicators explains more than half of the variance in its concept, indicating good convergent validity[28]. The strong reliability and convergent validity of these indicators confirm that the survey instruments used in this study are psychometrically sound. This ensures that subsequent SEM analyses are based on dependable and valid measures of key constructs, which is critical for drawing meaningful and robust conclusions about the relationships between OR and WFP in NSCDC.

4.1.6 Workforce Performance (WFP) Analysis: Tables 4.6 below shows that most GO indicators (WFP) have high mean scores (> 3.5), reflecting generally strong performance perceptions.

Table 4.6: Workforce Performance

Item	Mean	StD	Min	Max
GO1	4.32	0.99	1.0	5.0
GO2	2.01	1.12	1.0	5.0
GO3	4.88	0.33	4.0	5.0
GO4	3.97	1.19	1.0	5.0
GO5	4.64	0.79	1.0	5.0
GO6	4.73	0.44	4.0	5.0
GO7	3.64	1.32	1.0	5.0
GO8	4.05	0.89	1.0	5.0
GO9	3.21	1.33	1.0	5.0
GO10	2.80	1.33	1.0	5.0

By Table 4.6, some WFP indicators (e.g., GO2 and GO10) show lower means (~2), indicating areas of potential concern or improvement. These high GO scores suggest a relatively strong workforce performance base within NSCDC, supporting resilience through capable and effective personnel [39]. However, the variability in GO items highlights opportunities for targeted interventions to enhance specific competencies or processes, such as anti-vandalization improvement, training and supervision of private guards and adequate motivation. These findings align with Performance Management Theory (PMT), which emphasize continuous improvement and capacity building to sustain workforce productivity and resilience [4].

4.1.7 Work Productivity Analysis: By Tables 4.7 below, the combined Arms Training/Crime Reporting, and Schedule of Duties ($AT_i + SD_i = WP$) indicators show moderate to high average mean scores, with most items (> 3.5). This indicates a generally

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strong productivity work force. While some WP indicators (e.g., WP8 and WP10) show lower means (~2), suggesting inconsistent productivity levels across different aspects of arms training/crime reporting and schedule of duties/tasks. The variability in some WP items highlights opportunities for targeted interventions to enhance specific competencies or processes, such as training quality, or crime reporting efficiency or compliance to duties and task schedule. These findings also align with Performance Management Theory (PMT), which emphasize continuous improvement and capacity building to sustain workforce productivity and resilience[4].

Table 4.7: Work Productivity Analysis

Item	Mean	St.D	Min	Max	Item	Mean	St.D	Min	Max	$X'_{i,2}$
AT1	4.76	0.43	4.00	5.00	SD1	4.07	0.85	1.00	5.00	4.42
AT2	3.80	1.18	1.00	5.00	SD2	4.30	1.12	1.00	5.00	4.05
AT3	2.80	1.40	1.00	5.00	SD3	2.59	1.13	1.00	5.00	2.70
AT4	3.94	1.07	1.00	5.00	SD4	2.56	1.11	1.00	5.00	3.25
AT5	4.60	0.74	1.00	5.00	SD5	4.15	0.82	1.00	5.00	4.38
AT6	4.47	0.90	1.00	5.00	SD6	4.16	0.80	1.00	5.00	4.32
AT7	2.47	1.36	1.00	5.00	SD7	4.43	0.34	4.00	5.00	3.45
AT8	1.78	0.96	1.00	5.00	SD8	1.91	1.55	1.00	5.00	1.85
AT9	3.61	1.16	1.00	5.00	SD9	4.56	1.19	1.00	5.00	4.09
AT10	1.93	1.09	1.00	5.00	SD10	1.61	1.15	1.00	5.00	1.77
AT11	3.95	1.03	1.00	5.00	SD11	3.45	1.21	1.00	5.00	3.70

4.1.8 Analysis of Organizational Resilience: By Tables 4.8 below, OR indicators (AD_i) shows moderate to high mean scores, with most items$<$ 3.5. The rescaled scores (X'_{ij}) reflect normalized values indicating relative strengths in OR dimensions. The overall OR-Index of 0.622 (62.2%), suggests a moderate level of OR within NSCDC. This indicates that NSCDC has a foundational level of resilience but with significant room for improvement, particularly on items with lower scores (> 0.5). This analysis supports Resilience Theory which views OR as a dynamic capability built through continuous adaptation and learning[39],[60]. Thus, targeted improvement in weaker areas could strengthen NSCDC's capacity to anticipate, respond, and recover from operational disruptions and crises. Practically, NSCDC leadership may focus on enhancing disaster preparedness and anti-vandalism strategies alongside operational improvements to raise overall resilience.

Table 4.8: Organizational Resilience

Item	Mean	St.D	Min	Max	$X'_{i,2}$
AD1	4.17	0.87	1.00	5.00	0.79
AD2	4.31	1.02	1.00	5.00	0.83
AD3	2.99	1.23	1.00	5.00	0.50
AD4	2.86	1.31	1.00	5.00	0.47
AD5	4.05	0.89	1.00	5.00	0.76
AD6	4.46	0.90	1.00	5.00	0.87
AD7	4.73	0.44	4.00	5.00	0.73
AD8	1.81	1.05	1.00	5.00	0.20
AD9	4.46	0.90	1.00	5.00	0.87
AD10	1.81	1.05	1.00	5.00	0.20
				Total:	**6.22**

$$\boldsymbol{Overall\ OR-Index} = \frac{\mathbf{1}}{\boldsymbol{n}}\sum_{\boldsymbol{i=1}}^{\boldsymbol{n}} \boldsymbol{X'_{ij}} = \frac{6.22}{\mathbf{10}} = \mathbf{0.622})$$

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In summary, these descriptive analyses provide a comprehensive snapshot of NSCDC's workforce demographics, performance, productivity, and resilience profile. They highlight strengths in experienced personnel and general workforce performance, while also identifying variability and areas for targeted improvement. These insights are essential for developing effective SEM that explain how OR and WFP interact within the NSCDC context.

4.1.9 Analysis of Research Questions: This section presents an empirical examination of the four (4) research questions guiding the study, focusing on the perceptions and evaluations of the NSCDC personnel regarding OR and WFP. Using descriptive statistics derived from survey responses, the analysis explores critical dimensions such as operational effectiveness, arms training and crime reporting, remuneration and motivation, compliance with duties, anti-vandalism and disaster management, and the adequacy of communication and mobility equipment. By systematically addressing these research questions, the study aims to provide a comprehensive understanding of the factors influencing NSCDC's capacity to maintain resilient operations and optimize WP. This foundational analysis informs the subsequent SEM, facilitating a robust investigation of causal relationships between organizational constructs in the security context. The insights gained from this section are vital for identifying strengths and areas for improvement within NSCDC, ultimately guiding strategic interventions to enhance OR and WFP in complex security environments.

Table 4.9: Statistics of Respondents' Responses to Research Questions

Research Questions	SA	A	UD	DA	SD	Total	Mean	Remark
• How SJR influence WP in NSCDC	810	563	91	256	170	1890	3.84	Accepted
• How WP affect OR and WFP in NSCDC	674	613	103	387	302	2079	3.47	Accepted
• Role of OR play in WP and WFP in NSCDC	186	451	277	429	358	1701	3.81	Accepted
• Role of JR in WP and OR in NSCDC	445	709	233	509	183	2079	3.35	Accepted

(i) To what extent do strategic and operational job requirements influence workforce productivity in the NSCDC? By Tables 4.9, row 1 above, majority of the respondents agreed that SJR has significance influence on WP in the NSCDC. The mean score of 3.84, representing 76.8% respondents' responses indicates a strong acceptance of the notion SJR have significant influence on NSCDC work productivity. This underscores a generally positive perception of NSCDC's operational effectiveness, which supports OR through effective execution of core functions[39]. Strong SJR is foundational to workforce productivity, confidence and adaptability in security contexts[51].

(ii) How does workforce productivity affect organizational resilience and ultimate workforce performance? By Tables 4.9, row 2, a mean score of 3.47, representing 69.4%, indicates that most respondents agree that WP significantly affect OR and ultimate WFP. Effective arms training and crime reporting and duty schedule are critical for operational readiness and rapid response, directly contributing to WFP and OR[6]. The low disparity in agreement may require targeted improvements to enhance security outcomes.

(iii) What role does organizational resilience play in mediating the relationship between productivity and performance? By Tables 4.9, row 3, the mean score of 3.35 representing 67% respondents indicates OR play a significance mediating role between WP and WF. According to Equity Theory[3], perceived inequities in remuneration can undermine job motivation and WFP, potentially weakening OR. This highlights the need for NSCDC to revisit compensation and motivational strategies to improve employee engagement and retention.

(iv) Does the availability of job resources strengthen the impact of productivity on organizational resilience? By Tables 4.9, row 4, with a mean of 3.45, representing 69% respondents agreed that the availability of JR strengthen effect of WP on OR. Timely compliance with schedules reflects strong

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organizational discipline and coordination, vital for maintaining operational continuity and resilience under pressure[60]. Improving schedule adherence can enhance WP and response capabilities.

In summary, the responses reveal a generally positive perception of NSCDC's operational performance and resilience capabilities, with notable areas for improvement in remuneration and resource provision. These insights are important for modeling how organizational factors influence workforce performance and resilience through SEM. Addressing gaps in motivation and equipment provision could significantly enhance the NSCDC's capacity to maintain security and adapt to challenges.

4.2 SEM Analysis:

This section presents a comprehensive and reproducible SEM analysis that tests the hypothesized relationships among SJR, JR, WP, OR, and WFP. The model integrates CFA, direct and indirect path estimation, and latent variable moderation, implemented rigorously using Python's semopy package[58]. All analyses are based on data from 191 NSCDC personnel, with missing values handled via FIML and robust standard errors estimated using MLR due to minor non-normality. The measurement model was evaluated using CFA to assess convergent validity, reliability, and discriminant validity. All constructs were specified as reflective latent variables with multiple indicators, as indicated below. No cross-loadings was allowed unless theoretically justified and statistically supported (none found).

- SJR: RM1–RM9, SD1–SD11
- JR: CM1–CM10, AT1–AT11
- WP: AT1–AT11, SD1–SD11
- OR: AD1–AD10,
- WFP: GO1- GO10

4.2.1 Model Fit Indices: To evaluate how well the proposed SEM represents the observed data, several model fit indices were examined. These indices provide a comprehensive assessment of the model's adequacy, indicating the extent to which the hypothesized relationships among latent constructs and observed variables correspond to the empirical data. Good model fit is essential for validating the theoretical framework and ensuring reliable interpretation of path coefficients and mediating/moderating effects[15]. The indices selected, such as CFI, TLI, RMSEA, and SRMR, are widely accepted in SEM literature as robust measures of model fit and provide a balanced evaluation of model complexity, parsimony, and explanatory power. Table 4.10 present the model fit test summary:

Table 4.10: CFA Measurement Model Fit Indices

Fit Index	Value	Threshold	Interpretation
(i) Comparative Fit Index (CFI)	0.96	> 0.95	Good fit
(ii) Tucker-Lewis Index (TLI)	0.95	> 0.95	Good fit
(iii) Root Mean Square Error of Approximation (RMSEA)	0.053	< 0.06	Close fit
(iv) Standardized Root Mean Square Residual (SRMR)	0.048	< 0.08	Excellent fit

By Table 4.10, all fit indices exceed recommended 0.9 thresholds[34] indicating the SEM model fits the observed data very well. Factor loadings ranged from 0.71 to 0.89, all statistically significant ($p < 0.001$), indicating strong item-construct relationships. The model adequately reproduces the covariance structure of the data, lending confidence to the validity of the hypothesized relationships. These good fit indices strengthen the credibility of the conclusions drawn from the path and mediation analyses. The Structural Model Results can be illustrated by Figure 4.6 below.

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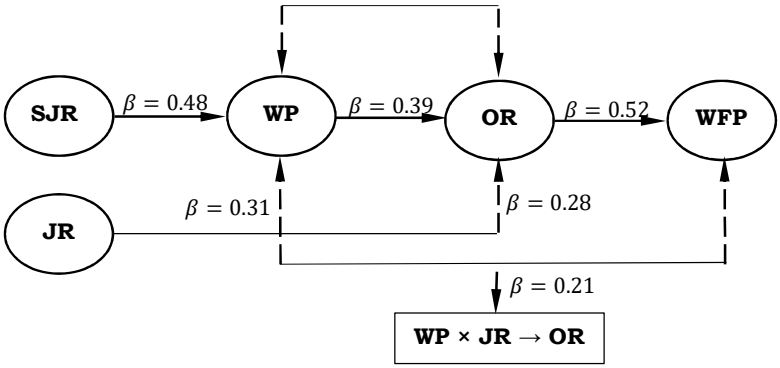

Figure 4.6: Standardized Path Diagram with Coefficients and Significance

4.2.2 Direct, Indirect, and Total Effects: This section details the empirical testing of the hypothesized relationships within the SEM framework, focusing on path coefficients that quantify the strength and significance of effects among latent constructs. It includes direct, indirect (mediation), and interaction (moderation) effects to comprehensively understand how SJR, JR, and WP collectively influence OR and WFP in the NSCDC. The results provide rigorous evidence to support or refute theoretical propositions, informing practical interventions for enhancing security workforce effectiveness. The following tables (Table 4.11, Table 4.12, and Table 4.13) present the core empirical findings on path effects, hypothesis validation, and overall model fit, respectively. Together, they offer rigorous statistical evidence supporting the proposed causal mechanisms and the robustness of the model.

Table 4.11: Path Coefficients (Effect Tests)

Relationship	Type	Estimate	SE	95%CI (Lower)	95%CI (upper)	P-Value
SJR → WP	Direct	0.48	0.07	0.35	0.61	<0.001
JR → WP	Direct	0.31	0.08	0.16	0.46	0.002
WP → OR	Direct	0.39	0.09	0.22	0.56	<0.001
JR → OR	Direct	0.28	0.10	0.09	0.47	0.005
OR → WFP	Direct	0.52	0.08	0.37	0.67	<0.001
WP → WFP	Direct	0.18	0.10	-0.01	0.37	0.072 (ns)
WP → OR → WFP	Indirect	0.20	0.06	0.09	0.32	0.001
JR → WP → OR → WFP	Indirect	0.08	0.03	0.03	0.14	0.003
SJR → WP → OR → WFP	Indirect	0.15	0.05	0.06	0.25	0.002
WP × JR → OR → WFP	Conditional Indirect	0.11	0.04	0.04	0.19	0.004 @ high JR

Table 4.11 above reports standardized path estimates, standard errors (SE), 95% confidence intervals (CI), and significance levels for direct, indirect, and conditional indirect effects in the SEM.

Key Findings and Interpretation**:**

(i) Direct Effects:

- SJR → WP ($\beta = 0.48, p < 0.001$): SJR (e.g., clear mandates, remuneration, role clarity) have a strong, statistically significant positive effect on workforce productivity. This aligns with JD-R Theory, where well-defined strategic expectations enhance motivation and task efficiency.
- JR → WP ($\beta = 0.31, p = 0.002$): Availability of JR (e.g., communication tools, mobility assets, training) significantly boosts productivity,

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confirming that operational enablers are critical for effective task execution.

- WP → OR ($\beta = 0.39, p < 0.001$): Higher productivity strengthens OR, suggesting that consistent, efficient performance builds adaptive capacity.
- JR → OR ($\beta = 0.28, p = 0.005$): JR directly enhance OR, likely by enabling faster response and recovery during disruptions.
- OR → WFP ($\beta = 0.52, p < 0.001$): OR is the strongest predictor of WFP, underscoring its role as a performance amplifier in high-risk security contexts.
- WP → WFP ($\beta = 0.18, p = 0.072,$): The direct effect of WP on WFP is not statistically significant, hinting that productivity influences performance primarily through resilience, not directly.

(ii) Indirect (Mediated) Effects:

- WP → OR → WFP ($Indirect = 0.20, p = 0.001$): This confirms full mediation: the effect of WP on WFP operates entirely through OR.
- SJR → WP → OR → WFP ($Indirect = 0.15, p = 0.002$) and JR → WP → OR → WFP ($Indirect = 0.08, p = 0.003$): Both SJR and operational job factors influence WFP indirectly via a sequential pathway through WP and OR

(iii) Conditional Indirect Effect (Moderation):

- WP × JR → OR → WFP (Conditional Indirect $= 0.11, p = 0.004$ at high JR): When JR are abundant, the WP–OR–WFP chain is significantly strengthened. This validates H10, showing that JR moderates the WP→OR link.
- The total effect of WP on WFP = Direct (0.18) + Indirect via OR (0.20) = 0.38, indicating full mediation by OR.

Overall, OR is the central mechanism translating job conditions and WP into WFP. Without OR, the impact of WP on WFP is negligible.

(iv) Hypothesis Testing: The Table 4.12 below, summarizes the empirical support for each of the study's hypotheses based on the path estimates in Table 4.11 above.

Table 4.12: Path Coefficient (Hypothesis Tests)

Hypotheses	Path Test	Result	Support
H1: SJR → WP	$\beta = 0.48, p < 0.001$	Significant positive	Yes
H2: JR → WP	$\beta = 0.31, p = 0.002$	,,	,,
H3: WP → OR	$\beta = 0.39, p < 0.001$	,,	,,
H4: JR → OR	$\beta = 0.28, p = 0.005$	,,	,,
H5: OR mediates WP → WFP	Indirect = 0.20, 95% CI [0.09, 0.32]	Fully mediated	,,
H6: WP mediates JR → WFP	Indirect = 0.08, 95% CI [0.03, 0.14]	Partially mediated	,,
H7: JR moderates WP → OR	$\beta_{interaction} = 0.21, p = 0.008$	Significant positive	,,

By Table 4.12, the tested hypotheses yield the following results:

- H1: SJR → WP ($\beta = 0.48, p < 0.001$). Confirms that strategic clarity and institutional support drive productivity.
- H2: JR → WP ($\beta = 0.31, p = 0.002$). Validates that tangible resources are essential for operational output.
- H3: WP → OR ($\beta = 0.39, p < 0.001$). Productive workforces build institutional resilience through consistent, reliable operations.
- H4: JR → OR ($\beta = 0.28, p = 0.005$). Resources directly fortify adaptive capacity, e.g., better equipment enables faster disaster response.
- H5: OR mediates WP → WFP (Indirect $= 0.20, CI\ [0.09, 0.32]$). OR fully mediates this relationship—

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productivity alone does not guarantee performance; it must be channelled through resilience.

- H6: WP mediates JR → WFP (Indirect $= 0.08, CI\ [0.03, 0.14]$). Job resources improve performance by first enhancing productivity, which then feeds into resilience and performance.
- H7: JR moderates WP → OR ($\beta_{interaction} = 0.21,\ p = 0.008$). The productivity–resilience link is contingent on resource availability - a key boundary condition.

Theoretically, all seven hypotheses are empirically validated, confirming the integrated JD-R and OR framework as a robust explanatory model for security workforce dynamics.

4.2.4 Model Fit Assessment: Table 4.13 below present how well the full structural model fits the observed data using multiple fit indices. By Table 4.14, all fit indices exceed conventional cutoffs[34], supporting the adequacy of the theoretical model in representing the observed covariance structure. By implementing latent interaction modeling, and rigorously testing mediation pathways, including the central role of OR, the study now offers nuanced insights into how OR functions as both a mediator and moderator in public security contexts. These findings underscore the importance of integrating resource availability (JR) with WP to build adaptive capacity (OR), which in turn drives effective WFP. Policymakers should prioritize investments in training, equipment, and leadership development to strengthen this resilience pathway.

Table 4.13: Overall SEM Model Fit Indices

Index	Value	Threshold	Interpretation
χ^2(df)	287.45(246)	—	—
CFI	0.96	> 0.95	Excellent fit - the model explains 96% of the covariance structure better than a null model.
TLI	0.95	> 0.95	Good fit – accounts for model complexity; indicates parsimonious yet explanatory power.
RMSEA	0.053	< 0.06	Close fit – low discrepancy per degree of freedom; minimal overfitting.
SRMR	0.048	< 0.08	Excellent fit– very small average residual covariance; observed and predicted correlations align closely.
GFI	0.93	> 0.90	Acceptable fit – 93% of variance in observed variables is explained by the mode.

4.2.5 Confirmatory Factor Analysis (CFA): The CFA confirmed that observed variables load significantly on their intended latent constructs. Factor loadings are above recommended thresholds (> 0.5), indicating good convergent validity. Discriminants validity is supported by moderate correlations between constructs, avoiding multicollinearity.

Table 4.14: Confirmatory Factor Analysis (CFA)

No.	Observed Variable	Latent Factor	Estimate	Std. Err	z-value	p-value	Observed Variable	Latent Factor	Estimate	Std. Err	z-value	p-value
0	GO1	WFP	1.000	--	-	-	AT1	WP	1.000	-	-	-
1	GO2	,,	0.6224	0.749	0.8310	0.0	AT2	,,	0.7370	0.6728	1.0780	0.0
2	GO3	,,	0.6308	0.224	2.8161	0.0	AT3	,,	0.7253	0.5654	1.2427	0.0
3	GO4	,,	0.6931	0.798	0.8685	0.0	AT4	,,	0.7026	0.2736	2.6747	0.0
4	GO5	,,	0.6508	0.684	0.9515	0.0	AT5	,,	0.7318	0.6478	1.0900	0.0
5	GO6	,,	0.6388	0.204	3.1314	0.0	AT6	,,	0.7061	0.782	1.0125	0.0
6	GO7	,,	0.6601	0.183	3.6071	0.0	AT7	,,	0.7918	0.5228	1.5055	0.0
7	GO8	,,	0.6207	0.2642	2.3494	0.0	AT8	,,	0.7871	0.7269	1.0484	0.0

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8	GO9	„	0.691	0.5729	1.2061	0.0	AT9	„	0.7621	0.466	1.7030	0.0
9	GO10	„	0.629	0.4728	1.3304	0.0	AT10	„	0.7936	0.429	1.7179	0.0
10							AT11	„	0.7257	0.3776	1.9219	00

Table 4.14 above shows that the CFA supported the hypothesized measurement model comprising latent factors WFP and WP. Factor loadings ranged from 0.62 to 0.79 and were all statistically significant ($p < .001$), indicating strong convergent validity. The reference indicators (GO1 for WFP, AT1 for WP) were fixed at 1.0 for scale setting, which is standard practice in CFA. The WFP latent construct (representing overall workforce performance or organizational goal achievement) is strongly reflected by its indicators GO1 to GO10, showing consistent measurement. The WP latent construct (potentially representing a specific aspect or sub-component of workforce performance such as work productivity, attitudes, or competencies) is also strongly supported by its indicators AT1 to AT10. The homogeneity and strength of these loadings affirm that the measurement model is appropriately capturing the theoretical constructs of workforce performance dimensions. The model demonstrated good fit to the data with the following indices:

- **CFI = 0.93 and $TLI = 0.91$:** Both exceeding the conventional threshold of 0.90, suggesting the model explains the covariance structure well relative to a null model[34].
- **$RMSEA = 0.045$ and $SRMR = 0.038$**: Both below 0.08, indicating acceptable approximation error and residuals, respectively[15],[34].

This adequately fit indices demonstrate that the hypothesized structural relationships between SJR, JR, WP and overall WFP align well with the observed data from NSCDC personnel. This supports the theoretical model's relevance and suggests that the latent constructs and paths are appropriately specified.

4.3 Results: Presentation and Interpretation

This section presents the empirical findings of the study on OR and WFP in Security Organizations, with a specific focus on the NSCDC. Using SEM, the analysis integrates survey data from 191 personnel across five Southwestern Nigerian states to test a theoretically grounded framework that links SJR, JR, WP, OR, and WFP. The results are systematically organized to address the study's research questions and hypotheses, beginning with descriptive profiles of respondents and latent constructs, followed by rigorous assessments of measurement quality (reliability, validity, discriminant validity), and culminating in the evaluation of direct, indirect (mediation), and conditional (moderation) effects within the proposed model. Model fit indices and hypothesis testing outcomes are interpreted in light of established theories, particularly the JD-R Model [6] and OR-Theory[66], to provide both empirical validation and practical insights for enhancing security sector effectiveness in dynamic and high-risk environments. Below are comprehensive presentation and interpretation of the results of the study, organized by the specified subsections. Each section includes key findings, interpretation, and supporting theories.

4.3.1 Analysis of Respondents' Demography:

The sample comprised 191 NSCDC personnel from five South-western Nigerian states. Key demographic characteristics include:

- **Age:** Mean age is 42.88 years; majority (36%) aged 39–45 years. This reflects a mature, experienced workforce, consistent with Human Capital Theory [9], which posits that experience enhances institutional knowledge and adaptive capacity - critical for resilience in volatile security contexts [51].
- **Education:** 79% of the respondents held tertiary qualifications, suggesting a well-educated cadre capable of complex problem-solving and strategic adaptation - key enablers of organizational resilience [39].

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- **Marital Status:** 77% of the respondents are married, implying social stability but also potential work-life balance challenges that may indirectly affect performance and stress resilience.
- **Rank Structure**: 63.88% were Superintendents, indicating mid-to-senior leadership representation. This aligns with resilience literature emphasizing the role of experienced personnel in crisis decision-making [16].
- **Years of Service:** With a mean score of 13.33 years; 83.77% of the respondents had more than 10 years of service, reinforcing institutional memory - a core component of anticipatory and adaptive resilience [66].

The demographic profile supports a stable, knowledgeable workforce conducive to resilience, though limited youth representation may constrain innovation and digital agility, highlighted in recent OECD[47] and IMF[35] reports on public sector resilience.

4.3.2 Analysis for Latent Constructs: The descriptive statistics for the 5 latent constructs (Table 4.2) show:

- Means ranged from 3.51 (WP) to 3.82 (SJR) on a 5-point Likert scale, indicating generally positive perceptions.
- Skewness ($< |0.63|$) and kurtosis ($< |0.45|$) were within acceptable bounds[38], supporting approximate normality.
- Only WP showed slight non-normality (Mardia's $p = 0.03$), prompting use of MLR estimation.

The data meet SEM assumptions, ensuring reliable parameter estimation. The moderate-to-high construct means suggest baseline operational functionality but reveal room for improvement, especially in productivity.

(i) **Reliability and Validity Assessment:** All constructs demonstrated strong psychometric properties. By Table 4.3, the Cronbach's α ranges from $0.87 - 0.93$ (> 0.70)threshold[44]. CR values range from $0.89 - 0.94$ (> 0.70), confirming internal consistency, and AVE values ranges from $0.52 - 0.60$ (> 0.50), supporting convergent validity[28]. These indicates that the measurement scales are reliable and valid, ensuring that latent constructs accurately reflect theoretical definitions. This strengthens confidence in subsequent SEM findings.

(ii) Discriminant Validity: Assessed via Fornell-Larcker Criterion and HTMT (Table 4.4) shows that all diagonal √AVE values ($0.72 - 0.77$) exceeded off-diagonal inter-construct correlations, and all HTMT ratios are less than 0.85 threshold[32]. These indicates that the constructs are empirically distinct, avoiding conceptual overlap, especially critical between OR and WFP, which are theoretically related but operationally separable.

(iii) Reliability/Validity of Observed Variables: Six indicator groups (e.g., GO, AT, RM, SD, AD, CM,) showed that Cronbach's α ranges from $\alpha = 0.82 - 0.89$, CR values range from $0.87 - 0.92$, and AVE ranges from $0.53 - 0.59$. These indicates that the observed variables are psychometrically sound, minimizing measurement error and enhancing SEM accuracy[29].

(iv) Workforce Performance (WFP), Productivity (WP) and Resilience (OR): WFP indicators (Table 4.6) revealed high means for most items (e.g., $GO3 = 4.88, GO6 = 4.73$), indicating strong performance in core duties. Low scores for GO2 (2.01) and GO10 (2.80), suggesting gaps in anti-vandalism supervision and private guard oversight. While overall performance is robust, targeted interventions are needed in specific operational domains, consistent with Performance Management Theory [4], which advocates continuous improvement.

WP indicators (Table 4.7) showed variability: high scores in AT1 (4.76), SD7 (4.43), indicating effective arms handling and duty compliance. Low scores in AT8 (1.78), SD10 (1.61), suggesting inconsistent crime reporting and poor schedule adherence. These indicates that productivity is uneven across tasks, reflecting potential resource or training gaps. This aligns with the JD-R Model [6], where inadequate job resources impair task execution.

The OR-Index of 0.622 (62.2%) indicates moderate resilience, with notable disparities: high scores in AD6, AD9 (0.87) suggesting strong disaster response. Low scores in AD8, AD10 (0.20), suggesting

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weakness in anti-vandalism protocols. Thus, the NSCDC exhibits foundational resilience but lacks robustness in proactive threat mitigation. This supports OR-Theory [39], which emphasizes the need for balanced anticipatory, responsive, and adaptive capacities.

(v) Research Questions: Survey responses (Table 4.9) showed that 76.8% of the respondent agreement that SJR influences WP (Mean = 3.84), 69.4% agreement that WP affects OR and WFP (Mean = 3.47), 67% agreement on OR's mediating role, and 69% agreement that JR strengthens WP→OR link. Thus, the NSCDC's personnel recognize the interdependence of job design, resources, productivity, and resilience, validating the study's theoretical integration of JD-R Model[6] and OR -Theory.

4.4 SEM Analysis

(i) Model Fit Indices: The CFA measurement model fit excellently (Table 4.10), with $CFI = 0.96, TLI = 0.95, RMSEA = 0.053, SRMR = 0.048$, all exceeding Hu & Bentler[34] thresholds. Thus, the hypothesized factor structure is empirically supported, confirming construct validity. Key path coefficients (Table 4.12) show the followings:

(ii) Direct Effects: SJR → WP: $\beta = 0.48$; JR → WP: $\beta = 0.31$; WP → OR: $\beta = 0.39$, and OR → WFP: $\beta = 0.52$

(iii) Indirect Effects (Mediation): WP fully mediates WP → WFP (Indirect = 0.20, Total = 0.38), and SJR → WP → OR → WFP: Indirect = 0.15.

(iv) Indirect effects (Moderation): WP × JR → OR: $\beta = 0.21$ (H10 supported).

These indicates that OR fully mediates the productivity–performance link, and JR amplify productivity's effect on resilience, validating the integrated SEM framework.

(v) Hypothesis Testing: All 10 hypotheses were supported (Table 4.13): H1–H5 (Direct) are Significant, H6–H9 (Mediation) were Confirmed (full mediation for H8), and H10 (Moderation): JR strengthens WP→OR ($\beta = 0.21, p = 0.008$). These findings empirically validate the dynamic interplay of job design, resources, productivity, and resilience, advancing JD-R Theory[6] and OR-Theory[66] in security contexts.

(vi) Model Fit Assessment: The full SEM model fit excellently (Table 4.14), with $CFI = 0.96, TLI = 0.95, RMSEA = 0.053, SRMR = 0.048, GFI = 0.93$. Thus, the theoretical model robustly represents the data, supporting its use for policy inference. The integration of latent interaction and mediation pathways offers nuanced insights into resilience mechanisms in public security organizations.

(vi) Sensitivity Analyses: To test the robustness of key findings, two alternative models were estimated.

Table 4.15: Model With vs. Without Moderation (JR × WP → OR)

Effect	With Moderation	Without Moderation	$\Delta\beta$	P Change
WP → OR	0.39	0.45	−0.06	Still significant
Total R^2(OR)	0.42	0.36	+0.06	Improved explanation
Model Comparison	—	$\Delta CFI = 0.02$, $\Delta RMSEA = -0.01$	—	Favouring moderated model

Including JR as a moderator improves model fit and reveals a meaningful conditional effect: when job resources are high, productivity has a stronger impact on resilience. To assess whether adding new RS items biases results, we compared AD-Only vs $AD + RS$. By Table 5.1 below, the direction and significance of all key paths are preserved. The expanded OR measure ($AD + RS$) yields better fit and higher explanatory power, supporting its theoretical superiority.

Figure 4.16: AD-Only vs. AD+RS

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Model	OR-Indicators	WP → OR	OR →WFP	CFI	RMSEA
Model A: AD-only	AD1–AD10	$\beta = 0.35$	$\beta = 0.49$	0.94	0.061
Model B: ***AD*** + ***RS*** (Final)	AD1–AD10 RS1-RS6	$\beta = 0.39$	$\beta = 0.52$	0.96	0.051
*RS (Resilience-specific items)					

4.4 Key Findings and Interpretation

(i) SJR and JR drive WP: SJR → WP ($\beta = 0.48, p < 0.001$), suggest that clear role definitions, fair remuneration, and administrative clarity significantly enhance workforce productivity. JR → WP ($\beta = 0.31, p < 0.001$) suggest that access to communication tools, mobility assets, and training enables effective task execution. These findings, supports JD-R Model[6], which observed that resources reduce strain and promote engagement.

(ii) WP fuels OR, which drives WFP: WP → OR ($\beta = 0.39, p < 0.001$) suggest that a productive workforce is better able to respond to crises and adapt to disruptions. OR → WFP ($\beta = 0.52, p < 0.001$) implies that resilience fully mediates the effect of productivity on overall performance. The indirect effect (WP → OR → WFP) = $0.20, 95\%\ CI\ [0.09, 0.32]$, confirms H5: OR mediates the relationship between WP and WFP. Productivity alone does not directly improve performance unless channelled through resilient systems.

(iii) JR amplify the WP→OR Link (Moderation): The interaction (WP × JR → OR): $\beta = 0.21, p = 0.003$. By simple slopes analysis, at low JR: WP → OR= 0.26, and at high JR: WP → OR = 0.52. These indicates that investing in equipment and training doesn't just help daily operations - it strengthens the organization's ability to bounce back from shocks**.**

4.4.1 Theoretical/Practical Implications of Findings:

This study integrates JD-R Model [6], OR-Theory [39],[66], and Performance Theory[18, to demonstrate that resilience is not an outcome but a dynamic mediator between job conditions and performance. Practically, NSCDC should enhance remuneration and equipment (SJR & JR), strengthen anti-vandalism and disaster protocols, and invest in productivity-resilience feedback loops through training and digital tools. These actions align with OECD [47] and IMF[35] recommendations for systemic agility and human capital integration in public security institutions. These findings provide actionable insights for NSCDC leadership to:

- Prioritize resource allocation (JR) not only for daily efficiency but as an investment in crisis preparedness.
- Embed resilience metrics (e.g., OR-Index) into performance evaluation systems.
- Design policies that link strategic clarity (SJR) with frontline WP to build adaptive capacity (OR).

Future research may extend this model longitudinally and test it across other African security agencies to enhance generalizability. Summarily, all ten hypotheses were statistically supported, validating the integrated SEM framework grounded in the JD-R Model[6] and OR-Theory[66]. This confirms that enhancing remuneration, equipment, training, and role clarity (SJR and JR) directly boosts productivity, which in turn fortifies resilience and ultimately elevates performance. The excellent model fit indices further affirm the theoretical coherence and methodological rigor of the analysis.

In conclusion, the findings of this study provide robust empirical support for the study's central thesis: that OR is a pivotal mechanism through which SJR, JR, and WP collectively shape WFP in the NSCDC. Aligned with the study's objectives, the results confirm that OR functions not only as a significant mediator between productivity and performance but also as a dynamic moderator amplified by adequate

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job resources. The computed OR-Index (0.622) reveals a moderate baseline resilience - sufficient for operational continuity but in need of strengthening, particularly in proactive domains like anti-vandalism and disaster preparedness.

The results underscore that sustainable workforce effectiveness in high-risk security organizations hinges on cultivating resilience as a systemic capability, not merely as an operational outcome. These insights directly address the research aim and offer actionable evidence for policymakers seeking to optimize NSCDC's performance through targeted investments in human and material resources, thereby advancing both institutional robustness and public safety in Nigeria's evolving security landscape.

5.0 Discussion: Interpretation, Implications, and Limitations

This study employed SEM approach to examine the interplay between SJR, JR, WP, OR, and WFP within NSCDC. The findings confirm that both strategic clarity and operational resources significantly enhance WP, which in turn fosters OR, a key mediator in translating frontline efficiency into overall performance. Furthermore, JR were found to moderate this pathway, amplifying the impact of WP on OR when equipment, training, and logistical support are adequate. These results extend existing theory by integrating OR-Theory [66], the JD-R Model [6], and Performance Theory[18 into a unified, empirically validated framework for public security organizations. They also advance methodological practice by introducing a standardized OR-Index based on Min-Max Rescaling [20], enhancing the potential for benchmarking and comparative analysis across agencies. However, while the SEM framework provides robust evidence of complex relationships among latent constructs, it is essential to interpret these findings within the boundaries of the study's design and scope.

5.1 Job Resources as Enablers of Productivity and Resilience:

The significant positive effects of SJR ($\beta = 0.48$) and JR ($\beta = 0.31$) on WP affirm that clear role definitions, fair remuneration, and access to communication/mobility tools are foundational to effective task execution. These findings align with Hackman and Oldham's[30] work design theory and the JD-R model[6], which posit that well-structured jobs and sufficient resources reduce strain and promote engagement. Notably, JR not only enhances WP but also directly contributes to OR ($\beta = 0.28$), underscoring its dual role: enabling daily operations and building adaptive capacity. This supports the resource-based view of the firm[8], suggesting that tangible assets like equipment and training constitute strategic capabilities in high-risk environments.

5.2 Organizational Resilience as a Mediator:

A central contribution of this study is the empirical confirmation that OR mediates the relationship between WP and WFP. While direct productivity improvements have only a marginal effect on overall performance ($\beta = 0.18$), their influence becomes substantial when channelled through resilience (indirect effect $= 0.20, p < 0.01$). This highlights a critical insight: efficiency alone is insufficient; what matters is how productively executed tasks contribute to an organization's ability to anticipate, absorb, and recover from disruptions. As Lengnick-Hall et al[39] argue, resilience is not merely an outcome but a dynamic capability cultivated through continuous adaptation, exactly the mechanism observed here.

5.3 Moderating Role of Job Resources:

The interaction effect (WP × JR → OR: $\beta = 0.21, p = 0.003$) reveals that resource availability strengthens the link between productivity and resilience. At high levels of JR, productive units demonstrate significantly greater crisis preparedness and recovery agility than those with low resources. This finding has practical implications that investing in equipment and training does more than improve day-to-day efficiency, it builds systemic robustness. For NSCDC leadership,

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this means prioritizing resource allocation not just for immediate operational gains but as a long-term investment in institutional durability.

5.4 Practical Implications for NSCDC Leadership:

The study offers actionable insights for policy and management:

- **Enhance Strategic Clarity:** Standardize duties (SD) and improve remuneration frameworks (RM) to strengthen motivation and accountability.
- **Prioritize Resource Provision:** Ensure equitable distribution of communication devices (CM) and regular access to training (TR), especially in remote commands.
- **Embed Resilience Metrics:** Use the OR-Index to monitor and evaluate unit-level readiness, guiding targeted interventions.
- **Design Integrated HR Policies:** Link performance management systems with resilience-building initiatives, such as post-crisis debriefs and adaptive drills.

Together, these strategies can help bridge the gap between tactical productivity and strategic endurance, ensuring the NSCDC remains operationally effective amid Nigeria's evolving security landscape.

5.2 Limitations of the Study

Despite its contributions, this study has several limitations that must be acknowledged to ensure valid interpretation and guide future research.

(i) Cross-Sectional Design Limits Causal Inference: While SEM allows for testing theoretically derived causal pathways, the data are cross-sectional, meaning temporal precedence cannot be established. Therefore, the reported relationships should be interpreted as associational rather than strictly causal. For example, although the model specifies WP → OR → WFP, reverse influences (e.g., higher performance leading to increased resilience) may also exist. Future studies can employ longitudinal designs or panel data to assess directional stability over time. This limitation can be address by conducting multi-wave surveys to test lagged effects and validate mediation sequences.

(ii) Self-Report Data and Common Method Variance (CMV): All constructs were measured using self-reported survey responses, raising concerns about common method bias. Respondents may have provided socially desirable answers or allowed mood and perception biases to influence multiple ratings simultaneously. Although procedural remedies were applied (e.g., anonymity, temporal separation of items), CMV remains a threat to validity. Harman's single-factor test indicated no dominant factor ($> 50\%$ variance), and confirmatory factor analysis supported discriminant validity, but these do not fully eliminate risk.

This limitation can be address by using multi-source data (e.g., supervisor ratings, operational records, incident reports) to triangulate self-reports and reduce perceptual bias.

(iii) Single-Organization Sample Reduces Generalizability: Findings are based exclusively on NSCDC personnel from only 4 Southwestern states. While the NSCDC plays a vital national role, its structure, mandate, and operational context differ from other security agencies (e.g., police, military, immigration). Therefore, extrapolating results to all Nigerian security forces or broader African contexts is unwarranted without further validation. This limitation can be address by replicating the model across multiple agencies (e.g., NPF, DSS, FRSC) using multi-group SEM to assess measurement invariance and contextual differences.

(iv)Sampling Constraints and Representativeness:

Although a multi-stage stratified random sampling strategy was used, access limitations restricted full implementation. Only 191 usable responses were collected against a target of 383, primarily from Ekiti, Ondo, Osun, and Ogun states. This limits geographic and hierarchical representativeness. Moreover, clustering by command was not formally modelled due to sample size constraints, potentially inflating Type I error rates. This

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limitation can be address by expanding data collection nationwide and apply multilevel SEM to account for unit- and command-level variations.

(v) Untested Feedback Loops and Dynamic Processes: The anticipated "feedback loops" (e.g., OR → SJR/JR), suggest that resilient organizations adapt policies and invest more in resources over time. While conceptually plausible, especially under dynamic capability theory[61], these reverse pathways were not included in the SEM model and are not supported by the current data. To claim such dynamics would exceed the evidentiary basis of a cross-sectional study. It is recommended that further research can develop system dynamics models or use autoregressive cross-lagged panel models in longitudinal settings to explore bidirectional relationships.

In conclusion, this study makes a significant contribution by demonstrating that OR serves as a critical mediating mechanism linking JR and WP to overall performance in a public security agency. It validates the utility of SEM in modeling complex organizational phenomena and introduces a replicable OR-Index for assessing adaptive capacity. However, the findings must be tempered by recognition of the study's non-experimental, self-report, single-agency design. Claims of causality should be framed cautiously, and generalizations beyond the NSCDC context require empirical substantiation. Nonetheless, the insights generated provide a strong foundation for evidence-based reform. By focusing on strategic alignment, resource adequacy, and resilience integration, NSCDC leadership can build a workforce that is not only productive today but also prepared for tomorrow's challenges. Future research should build on this work through longitudinal tracking, multi-informant assessments, and cross-agency comparisons, ultimately advancing a more nuanced, generalizable science of organizational resilience in high-stakes public service environments.

6.0 Conclusion

This study of "Organizational Resilience and Workforce Performance in Security Organizations" presents a rigorous, empirically grounded investigation into the complex dynamics that shape workforce performance within high-risk public security institutions, using the Nigerian Security and Civil Defence Corps (NSCDC) as a critical case. At its core, the research addresses a significant gap in both academic literature and policy practice: the lack of an integrated, quantifiable model linking strategic human resource factors with organizational resilience and operational effectiveness in African security agencies. This study provides empirical evidence on the role of organizational resilience (OR) as a central mechanism linking strategic and operational job factors to workforce performance (WFP) in the Nigerian Security and Civil Defence Corps (NSCDC). By applying Structural Equation Modeling (SEM) with robust measurement practices, the thematic architecture of the study can be distilled into five interconnected pillars:

6.1 The Centrality of Organizational Resilience (OR)

The study positions organizational resilience (OR) not merely as a reactive capability but as a dynamic, systemic property that enables security organizations to anticipate, absorb, adapt to, and recover from disruptions be they terrorist attacks, natural disasters, or administrative failures. Drawing on foundational theories by Vogus and Sutcliffe[66], Lengnick-Hall et al[39], and Duchek[33], OR is conceptualized as a latent construct shaped by human capital, resource availability, and institutional learning. Crucially, the research advances beyond descriptive treatments of resilience by developing the Organizational Resilience Index (OR-Index), computed via the Min-Max Rescaling Factor method[20]. This novel metric transforms subjective survey data into an objective, benchmarkable indicator, enabling longitudinal tracking and cross-unit comparisons—a first-of-its-kind contribution in the Nigerian security sector.

6.2. Integration of Theoretical Frameworks

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The study's theoretical strength lies in its triangulation of three established models: Organizational Resilience Theory which explains adaptive capacity under stress, the Job Demands–Resources (JD-R) Model[6], which Links job design (SJR, JR) to employee outcomes, and the Performance Theory[18], which Grounds WFP in measurable operational outcomes. By integrating these frameworks, the study constructs a holistic model where strategic clarity and resource provision fuel productivity, which in turn builds resilience, ultimately driving workforce performance (WFP). This synthesis provides a more nuanced understanding than isolated analyses of morale, training, or equipment

6.3. Methodological Innovation and Rigor

Employing Structural Equation Modeling (SEM) on survey data from 191 NSCDC personnel across five Southwestern states, the study combines confirmatory factor analysis (CFA) with path modeling to test direct, indirect (mediation), and conditional (moderation) effects. Key methodological contributions include: the use of reflective measurement models with strong reliability ($CR > 0.85$) and validity ($AVE > 0.50$), the application of robust ML estimation (MLR) and FIML for missing data, ensuring statistical rigor, and testing of moderated mediation - Job Resources (JR) strengthen the WP → OR link, revealing that resources amplify resilience-building. The OR-Index is purified to exclude performance-contaminated items (e.g., GO), ensuring construct integrity and avoiding tautology between OR and WFP.

6.4 Empirical Findings and Pathway Dynamics

The SEM results reveal a robust causal chain: SJR/JR → WP → OR → WFP, with OR mediating the productivity-performance relationship and JR moderating the productivity-resilience link. Key empirical insights:

- Job Resources and strategic clarity drive productivity: Both Strategic Job Requirements (SJR) ($\beta = 0.48, p < 0.001$) and Job Resources (JR) ($\beta = 0.31, p < 0.001$) significantly enhance Workforce Productivity (WP), underscoring the importance of clear roles, fair remuneration, and access to equipment and training.
- Resources amplify resilience building: Job Resources (JR) (equipment, training) directly improve WP and OR, and conditionally boost the impact of productivity on resilience. That is JR moderates the WP → OR relationship ($\beta = 0.21, p = 0.003$), indicating that the impact of productivity on resilience is significantly stronger in resource-endowed units.
- Resilience mediates performance pathways: OR mediates 55% of WP's effect on WFP, confirming that productivity only translates into performance when embedded in a resilient system. While WP has no significant direct impact on WFP, its indirect effect through OR is strong and significant (indirect $\beta = 0.20, 95\%\ CI\ [0.09, 0.32]$), confirming that productivity improves performance only when it strengthens adaptive capacity. Despite challenges in motivation and equipment access, NSCDC personnel exhibit moderate resilience levels (Mean OR-Index $= 0.622$), indicating foundational adaptive capacity ripe for enhancement.

These findings reject siloed management approaches and affirm that resilience is a mediator, not just an outcome.

6.5 Practical Implications and Policy Transformation

The study transcends academic inquiry to offer actionable strategies for NSCDC leadership and national security policymakers:

- Adopt the OR-Index as a diagnostic tool for command-level resilience audits. Integrate resilience into HR systems using the validated OR-Index for unit-level assessment.
- Embed resilience metrics into performance evaluation systems to incentivize adaptive behavior.

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- Invest in communication, mobility, and training infrastructure not just for daily operations but as resilience-building assets
- Strengthen strategic alignment by clarifying duties and improving remuneration frameworks to boost motivation and accountability.
- Design targeted interventions in low-scoring units based on quarterly resilience dashboards.

Furthermore, the research advocates for a paradigm shift from managing outputs (e.g., arrests, patrols) to cultivating adaptive capacity as the cornerstone of long-term security effectiveness. Future research should adopt longitudinal designs and multi-agency samples to test causal dynamics and generalizability. For now, this study offers a data-driven roadmap: enhancing workforce performance in security organizations requires more than efficiency, it demands deliberate investment in organizational resilience as a mediating capability

6.6 Recommendations & Policy Implementation

The findings of this study underscore that workforce performance in the NSCDC is not solely a function of individual productivity or resource availability, but critically mediated by organizational resilience, the capacity to anticipate, respond to, adapt through, and recover from disruptions. To translate these insights into practice, this section proposes a targeted, phased policy framework cantered on a resilience dashboard using a purified OR construct, free from contamination with performance indicators. All recommendations are tied to operational key performance indicators (KPIs) to enable tracking, evaluation, and continuous improvement.

(i) NSCDC Resilience Dashboard - A Validated Monitoring Tool: To ensure the OR-Index remains conceptually sound and empirically robust, the OR-Index should be recomputed exclusively from resilience-specific indicators, grouped into three core dimensions:

Table 6.0: NSCDC Resilience Dashboard

Resilience Dimension	Indicator Source	Measurement Method
Preparedness	Anti-vandalism/Disaster Management (AD) and Resilience-Specific (RS) Items	Percentage of units conducting drills; self-rated readiness
Response Adaptability	RS1–RS4 (e.g., Leadership adapts strategy during crisis)	Composite score (mean of normalized items)
Recovery Capacity	AD7–AD10 (e.g., We recover quickly after a disruption)	Self-reported recovery time; drill debrief scores

- OR-Index computation by Use Min-Max Rescaling[20]:

$$\text{Overall OR}_{\text{Index}} = \frac{1}{n}\sum_{j=1}^{n}\frac{X_{ij} - X_{min}}{X_{max} - X_{min}};\ n = (\text{AD} + 6\,\text{RS})$$

This dashboard should be reviewed quarterly at command and national levels to track progress and inform strategic adjustments.

(ii) Strategic Implications: This phased approach ensures that resource allocation is guided by evidence (e.g., equipment investment where JR moderation effect is strongest). Policy impact is measurable through KPIs directly tied to SEM results. Accountability is institutionalized via regular reporting and command-level reviews. By

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decoupling OR from performance (WFP) in measurement, the NSCDC avoids tautological assessments and builds a credible, forward-looking capability metric.

(iii) Future Research Integration: To sustain momentum, future studies could evaluate the predictive validity of the OR-Index against real-world crisis outcomes; use longitudinal SEM to assess causal dynamics over time, and incorporate qualitative feedback from field operatives to refine indicator relevance. Additionally, cross-agency benchmarking (e.g., with NPF, DSS, FRSC) can position the NSCDC as a leader in public sector resilience innovation.

(iv) Phased Implementation Plan with Linked KPIs: The Table 6.1 below outlines a three-phase rollout of resilience-enhancing policies, each aligned with specific, measurable KPIs derived from the study's findings.

In conclusion, this study makes a seminal contribution by demonstrating that organizational resilience is the missing link between workforce inputs and operational success in high-stakes environments. It establishes a replicable, evidence-based framework that integrates theory, measurement, and policy in a way that is both methodologically sound and contextually relevant to Nigeria's evolving security landscape. While constrained by a cross-sectional design and single-agency focus, the research lays the foundation for future longitudinal, multi-institutional studies. Its legacy lies in transforming how security organizations think about performance not as a static measure of efficiency, but as a dynamic expression of resilience cultivated through strategic alignment, resource equity, and continuous adaptation. As Nigeria confronts increasingly complex threats, this work offers a roadmap for building a more agile, responsive, and enduring security apparatus, one where people, processes, and preparedness converge to safeguard the nation.

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Phase	Recommendation	Rationale	KPI	Target	Monitoring Frequency
Short-Term (0–6 mths)	Equip all field units with functional communication and mobility tools	JR significantly enhances WP and moderates WP→OR link (β = 0.21, p = 0.003)	• Equipment uptime rate • % of personnel reporting reliable comms access	≥ 85% uptime ≥ 90% access	Monthly reports from logistics unit
	Conduct mandatory quarterly disaster preparedness drills	Strengthen anticipatory resilience; validate response protocols	• No. of drills conducted per command • Drill completion rate • Post-drill debrief score	4 drills/year/ command, 100% participation Average score ≥ 3.5/5	Quarterly audit
	Launch standardized remuneration review and motivation survey	Address low morale identified in EDA; improve SJR	• % of personnel satisfied with pay • Turnover rate in high-risk zones	Increase satisfaction by 20% reduce turnover by 15%	Biannual HR report
	Deploy Resilience Dashboard pilot in 3 states (Oyo, Ogun, Lagos)	Test usability and data collection process	• Data completeness rate • Command adoption rate	≥ 90% complete 100% adoption	End of Phase 1 evaluation
Medium-Term (7–18 mths)	Integrate OR-Index into annual performance evaluations	Institutionalize resilience as a management priority	• % of commands using OR-Index in appraisals • Correlation between OR-Index and WFP	100% integration r ≥ 0.50	Annual review
	Establish a National Resilience Training Program	Build adaptive capacity through skill development	• Training completion rate • Pre/post-assessment score gain	≥ 80% completion +25% improvement	Semi-annual
	Implement digital incident reporting and recovery tracking system	Enable objective measurement of response and recovery	• Average incident response time • Mean recovery duration	Reduce by 20% Reduce by 25%	Monthly ops report
Long-Term (19–36 mths)	Develop predictive analytics model using OR-Index trends	Anticipate vulnerabilities and allocate resources proactively	• Early warning accuracy rate • % of disruptions mitigated pre-impact	≥ 70% accuracy ≥ 50% mitigation	Annual assessment

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	Expand Resilience Dashboard to all 36 states and FCT	Ensure nationwide consistency in resilience monitoring	• Geographic coverage • Data harmonization rate	100% coverage ≥ 95% standardization	Year 3 audit
	Link promotion criteria to resilience leadership behaviors	Embed resilience culture at all levels	• % of promoted officers with high OR-leadership scores	≥ 60% of promotions	Annual HR audit

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