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Exploring the nexus of education finance, governance, and sustainability in Somalia's post-conflict education sector: a structural equation modeling analysis

Mohamed Ibrahim Nor*

Institute of Climate and Environment (ICE), Mogadishu, Somalia

This study examines the nexus between education finance, governance, and system sustainability in Somalia's post-conflict education sector using structural equation modeling (SEM). The analysis identifies significant positive relationships between governance and education finance, finance and performance, and equitable access to education and system sustainability. The findings underscore the vital role of governance in managing financial resources to enhance educational outcomes and ensure long-term sustainability. The study offers actionable insights for policymakers and practitioners, highlighting the need to strengthen governance frameworks and financial management in post-conflict education systems. By employing SEM, the study provides a novel and comprehensive analysis of these complex relationships, contributing to the limited research on education finance and governance in post-conflict settings. This research offers empirical evidence from Somalia, adding new insights into the interplay between governance, finance, and education, and informing future policy and practice.

KEYWORDS

education finance, governance, system sustainability, post-conflict, structural equation modeling (SEM)

Introduction

Somalia's education system has endured decades of disruption due to protracted conflict, political instability, and systemic underinvestment. The collapse of central governance in the early 1990s left public infrastructure, including schools, in a state of neglect. Since then, efforts to rebuild have been fragmented, with most education services being supported by international donors, non-governmental organizations, and local communities (Hassan and Ahmed, 2024). In this fragile environment, education finance has emerged as a crucial factor in rebuilding infrastructure, hiring teachers, and ensuring access to learning materials.

However, education in Somalia is shaped by both the scarcity of resources and the weakness of governance institutions. Somalia's decentralized governance structure delegates education responsibilities to federal member states, which operate with vastly different levels of institutional capacity (Greany, 2022). This has resulted in policy inconsistency, unequal access to resources, and limited oversight, especially in rural and conflict-affected areas. Governance and financial constraints therefore intersect to determine the reach, quality, and sustainability of educational outcomes across the country.

Despite recognition of education as a fundamental pillar of recovery and development, Somalia continues to face systemic barriers in delivering equitable and quality education. The problem is not merely a lack of funds but the ineffective governance of available resources, leading to misallocation, inefficiency, and underutilization (Nor and Raheem, 2025b). Financial mismanagement and limited policy enforcement hinder the ability of the education system to function effectively, particularly in disadvantaged communities (Dwangu and Mahlangu, 2021; Munastiwi and Puryono, 2021).

Moreover, entrenched political challenges, such as corruption and weak accountability structures, exacerbate the problem. There are stark regional disparities in resource distribution and educational opportunities, especially for girls, internally displaced persons (IDPs), and rural populations (Klugman and Ortiz, 2022; Yang and Kong, 2025). The governance deficit, combined with inadequate financial planning and poor monitoring mechanisms, critically undermines education system sustainability. This multifaceted issue demands a more integrated and evidence-based approach to understanding the drivers of poor education outcomes in Somalia.

Given the central role of education in nation-building, there is a compelling need to explore how education finance and governance systems can be strengthened to support sustainable development in Somalia. Current interventions often focus on either expanding access or improving curriculum, but they overlook the structural relationships between financing, governance, and system performance. Understanding these interlinkages is critical for designing policies that are both effective and contextually relevant.

Furthermore, post-conflict settings like Somalia require tailored policy solutions that recognize the constraints of fragmented governance and resource scarcity. Without empirical data on how education finance and governance impact access and sustainability, reforms risk being reactive and uncoordinated. This study is motivated by the desire to provide actionable insights that are grounded in Somalia's realities, thus equipping policymakers with the tools to implement more coherent and targeted educational reforms.

The urgency of this research lies in Somalia's transitional state—where rebuilding public institutions and expanding education access are critical to national recovery. If governance and financial inefficiencies persist, they risk undermining the entire education sector, leading to further marginalization and long-term economic stagnation. Addressing these issues is not just a technical exercise but a matter of social justice, equity, and sustainable development.

The theoretical foundation of this study is grounded in Education Production Function (EPF) theory and the Theory of Educational Governance. EPF theory posits that educational outcomes are influenced by the quality and quantity of inputs—such as funding, teachers, and materials (Hanushek, 1979). Meanwhile, governance theory emphasizes the role of policy, decision-making, and accountability structures in managing these inputs (Elmore, 2000). Together, these frameworks enable a comprehensive understanding of how education systems function and why certain interventions succeed or fail in fragile contexts like Somalia.

What distinguishes this study is its integrated approach, which examines governance, finance, equitable access, system performance, and sustainability within a single structural framework. Rather than treating these variables in isolation, the study uses Structural Equation Modeling (SEM) to analyze their interrelationships in the Somali context. This methodological rigor offers a more nuanced view of how

systemic factors interact and influence educational outcomes, a perspective that is particularly lacking in studies on fragile states.

The study is also significant for its context-specific focus. Somalia remains one of the least studied countries in educational policy research, particularly using advanced statistical techniques like SEM. By focusing on Somalia, this study fills an important gap in the global literature and offers insights that may be transferable to other post-conflict countries with similar institutional challenges. The findings are intended not only to advance academic understanding but also to inform practical, locally grounded policy interventions.

Despite increasing attention to education reform in fragile and conflict-affected settings, there remains a notable lack of research that examines the integrated effects of governance, finance, and system sustainability in Somalia. Most existing studies focus on single issues such as access or quality, with limited attention to how governance and financial structures shape system performance holistically (see for instance, Nor and Raheem, 2025a; Abdi et al., 2025; Mohamud, 2023). Additionally, few studies employ rigorous quantitative models like SEM to analyze these relationships, leaving a methodological and empirical gap in the literature.

This study aims to address these research gaps by offering a holistic, empirically grounded analysis of how education finance, governance, equitable access, and performance interact to affect system sustainability in Somalia. By using structural equation modeling, the research provides both theoretical and practical contributions to the body of knowledge on education in fragile contexts. Hence, the main purpose of this study is to investigate the nexus among education governance, education finance, equitable access to education opportunities, education performance and delivery, and education system sustainability in Somalia's post-conflict education sector.

In a nutshell, this paper argues that education system sustainability in Somalia cannot be achieved without addressing the interrelated challenges of finance, governance, and equitable access. It responds to a significant research gap by integrating these variables into a single analytical model grounded in established education theories. The study's aim is to uncover how these factors jointly shape education outcomes and to provide evidence-based recommendations that reflect the realities of Somalia's decentralized and resource-constrained context. By doing so, the paper contributes new empirical insights and practical strategies to the fields of education policy, post-conflict reconstruction, and public administration in fragile states.

Literature review

Global context

Globally, adequate and equity funding for education has been the focus of much attention in relation to education finance, governance, and performance. Patrinos et al. (2021) claimed that there is a positive effect of increased investment in education on human capital development, which in turn fuels economic growth and reduces social inequity. Nevertheless, the success of such funding highly depends on how educational systems are managed. Thus, countries that have strong governance frameworks for their education systems always perform relatively better than those that do not because they tend to deliver more desirable learning outcomes and thus have sustainable

systems of education as well (Carnoy, 2024; Hanushek and Woessmann, 2020). The integration of governance mechanisms into the discourse concerning education finance is important, as it ensures the efficient utilization of resources.

Furthermore, the literature underlines that equitable access to education opportunities is a vital aspect of education system durability. Unicef (2021) reports that ensuring equal access is essential because social justice and sustainable development are intertwined. Many parts of the globe encounter considerable difficulties in accessing quality education by marginalized groups such as girls, rural dwellers and children with disabilities (Taneja-Johansson et al., 2023). These problems often result from a lack of funding and governance problems, leading to inequalities in the provision of educational services and outcomes. Hence, an understanding of the global dynamics of education financing and governance is necessary if these disparities are to be addressed toward inclusive and sustainable education systems (Mundy and Verger, 2016).

In addition to governance and finance, global studies have explored the impact of education performance and delivery on system sustainability. A study by OECD (2019) revealed that countries with well-developed education systems that prioritize performance and continuous improvement are more likely to sustain high levels of educational quality over time. These systems often employ data-driven approaches to monitor and enhance education delivery, ensuring that all students have access to high-quality learning experiences (Teng et al., 2023). The global literature, therefore, provides valuable insights into the interconnectedness of finance, governance, performance, and equitable access, which are critical for understanding the challenges and opportunities in Somalia's post-conflict education system.

A growing body of research highlights the unique challenges faced by girls in accessing education in conflict-affected contexts, where gender-based disparities are often exacerbated by instability, poverty, and socio-cultural barriers. According to UNESCO's Her Atlas: Girls' Education in Crisis Settings (2021), girls in fragile and conflict-affected regions are 2.5 times more likely to be out of school than boys, particularly at the secondary level (Guglielmi et al., 2021). These disparities are further intensified by early marriage, lack of menstrual hygiene facilities, and security risks during transit to school (Psaki et al., 2021). In Somalia, such barriers persist, particularly in rural and internally displaced communities. Therefore, any effort to ensure equitable access to education must include a gender-responsive approach, one that accounts for the intersection of conflict, poverty, and cultural norms. Gender-focused education policies and targeted financial support—such as scholarships and community-led safety measures—have proven effective in comparable contexts, and offer promising avenues for advancing inclusive education in Somalia (Manzoor et al., 2023).

Regional studies

In Africa, many studies have been conducted regarding education finance and governance in different contexts, including post-conflict and fragile states. For example, Turrent and Oketch (2009) and Milton (2021) explored the connection between education finance and its governance in post-conflict and fragile countries and revealed wide disparities that exist within educational budgeting systems as well as accessibility to education across the region. Researchers argue that such disparities are further fueled by weak governance structures, which result in inefficiencies in resource allocation and use (Muzaffar et al., 2023). These studies suggest better mechanisms of governance to see education finance contribute to advancing a fair and sustainable regional schooling system.

Furthermore, decentralization is another important factor that can enhance educational outcomes in conflict-affected areas. Some researchers have examined how decentralized approaches to governing education can improve student performance in both Kenya and Uganda; these studies confirmed that such models work where they are backed by resources at local levels and capacity-building initiatives (Twinomujuni et al., 2023). Nevertheless, this move has the potential to increase gaps in inequality but only if it is not administered, especially when limited resources and institutional capacities remain weak (Kameshwara et al., 2020). Therefore, context-based strategies must be employed for good governance because these challenges are unique to Africa's post-conflict environment.

Moreover, regional research has focused on equitable access to education opportunities, particularly in conflict-affected areas. According to a report released by the AfricanUnion (2021), many African countries still have very uneven access rates to schools, with rural areas being most affected since most disadvantaged populations reside there. This exclusion arises from inadequate financial resources committed toward learning needs, thereby causing implementation barriers to equity-related policies, thus hindering marginalized children from attending school like others do. Therefore, interventions targeting these issues, such as increased investment in education, training programs for local government units and policy formulation prioritizing equity in all pupils, regardless of their economic background, are needed.

While Somalia presents a unique set of challenges due to prolonged conflict and fragmented governance, valuable insights can be drawn from other post-conflict regions to contextualize the education governance and finance nexus. For instance, in Rwanda, post-genocide reforms prioritized centralized governance and strong accountability frameworks, which significantly improved education access and equity (see for example, Williams, 2017; Goodwin, 2022; Russell, 2015). Rwanda's success underscores the importance of political will and donor alignment in rebuilding education systems.

Similarly, South Sudan has struggled to develop a cohesive education policy due to persistent instability and conflict. Despite these challenges, certain strategies have shown promise. One key approach has been the involvement of local stakeholders in shaping education delivery, ensuring that policies and practices are responsive to on-the-ground realities. In addition, adaptive governance models—those that allow flexibility in response to shifting conditions—have proven effective in addressing disparities in educational access, especially in conflict-affected regions. These strategies suggest that even in fragile contexts, education systems can make progress through inclusive and context-sensitive approaches (see Novelli et al., 2016; Tsoni et al., 2024; Ginsburg et al., 2017).

In Liberia, decentralization and community-based education models were implemented after the conflict to improve access for marginalized groups. These approaches initially showed promise, helping to expand educational opportunities in underserved areas. However, their long-term sustainability was hindered by systemic issues, including weak financial management and heavy reliance on

external donors, which limited the models' ability to endure without continued external support (see Nyei, 2014; Barrios-Tao et al., 2017).

These cases highlight the interplay of governance structures, financial mechanisms, and equity considerations, offering comparative benchmarks for Somalia. The inclusion of diverse post-conflict experiences provides a more holistic view of how education systems evolve under constrained and transitional conditions.

Somalia-specific research

Somalia's education system has been severely impacted by decades of conflict. This has led to significant problems in terms of financing, governance and delivery of education. Research on Somalia-specific contexts underscores the importance of education financing as a key element for rebuilding the national schooling system (Abdullahi, 2023). Consequently, one of the major barriers to reinstating and developing the education sector in Somalia is the insufficient provision of funds, as noted by Bank (2019). Weak political institutions in Somalia that normally lead to resource mismanagement, thus hindering the effective delivery of educational services, further compound this problem.

Governance issues are also a central concern in Somalia's education system. Eno et al. (2022) examined the challenges of education governance in Somalia, focusing on the decentralized nature of the education system. They reported that while decentralization has the potential to improve education delivery by bringing decision-making closer to local communities, it has also led to inconsistencies in policy implementation and disparities in education quality across different regions. The study suggests that strengthening governance frameworks and enhancing the capacity of local education authorities are crucial for improving education outcomes and ensuring the sustainability of the education system in Somalia.

However, equitable access to education is still a great challenge in Somalia, especially among girls, rural residents, and internally displaced persons (IDPs). These groups face numerous difficulties while striving for quality educational services, such as sociocultural practices, security concerns and a lack of infrastructure or resources within their communities (Aden et al., 2023). The literature suggests actions such as gender-based educational policies, building safe learning environments and grant schemes, as well as other monetary backings for marginalized students. By doing so, Somalia will be able to obtain an inclusive and sustainable education system that offers equal opportunities to all children in its territory.

Theoretical foundation

Education production function theory

The Education Production Function (EPF) theory is an economic model that elucidates the process by which various inputs within the education system—such as financial resources, governance quality, and institutional support—are converted into educational outcomes, including student achievement, equitable access, and system sustainability (Hanushek, 1979; Rolle, 2024). According to this theory, the quality and quantity of these inputs critically influence the

efficiency and effectiveness of educational delivery, thereby shaping the overall success of educational institutions.

This theory posits that the quality and quantity of inputs directly affect the efficiency and effectiveness of education delivery (Carnoy, 2024; Cervantes-Gómez et al., 2023). In Somalia's post-conflict setting, where resources are scarce and governance structures are often weak, EPF theory is particularly relevant. It allows for the analysis of how different factors—such as the adequacy of education finance, the effectiveness of governance mechanisms, and the provision of educational resources—combine to influence the overall performance of the education system. By applying this theory, policymakers and researchers can better understand the relationships between input variables and educational outcomes, leading to more targeted interventions that enhance system performance and sustainability.

Theory of educational governance

The theory of educational governance emphasizes the role of governance structures and processes in shaping the quality and equity of education systems (Asaduzzaman and Virtanen, 2023; Elmore, 2000; Hood, 1995). This theory posits that effective governance is essential for ensuring that education policies are implemented effectively, that resources are allocated equitably, and that education systems are accountable to stakeholders. In the context of Somalia's post-conflict setting, where governance challenges are pervasive, this theory provides a framework for understanding how governance practices can either facilitate or hinder the delivery of quality education. The theory suggests that strong governance structures, characterized by transparency, accountability, and stakeholder participation, are critical for addressing issues such as corruption, mismanagement of resources, and inequitable access to education.

This theory can help identify the governance gaps that have led to disparities in education access and performance, particularly in rural and conflict-affected regions. For example, how decentralized governance structures affect the implementation of education policies and the distribution of resources across different regions can be explored. Additionally, the theory underscores the importance of building institutional capacity and fostering collaboration among various stakeholders, including government agencies, local communities, and international organizations, to enhance governance and ensure that education systems are resilient and sustainable (Filgueiras, 2023; Nadeem, 2024).

Research framework and hypothesis development

Framework

The research framework for this study is designed to examine the dynamic interactions among education finance, education governance, education performance and delivery, equitable access to education opportunities, and education system sustainability in Somalia's post-conflict education sector. The framework is based on the assumption that these building blocks are mutually dependent and collectively determine the efficiency and resilience of a system of education. This framework integrates ideas from educational production function and educational governance theories and offers a holistic means by which financial resources, governance practices and access to educational

opportunities influence both the performance and sustainability of an education system. This framework allows us to not only identify direct relationships between these variables but also account for the mediating effects of governance and access on education outcomes.

The conceptual model

The conceptual model underlying this study illustrates the hypothesized relationships among the key variables: education finance, governance, performance and delivery, equitable access, and system sustainability. As exhibited in Figure 1, this is a model in which good governance leads to both educational finance and access to education, which in turn affects the performance of the education system as well as its sustainability. Education financing is seen as a crucial input that directly influences the quality of teaching and learning processes and overall system efficiency. Equitable access is treated as both an outcome of good governance and an essential contributor to the sustainability of the education system. The model thus captures the cyclical and interrelated nature of these variables, reflecting the dynamic challenges faced by Somalia's post-conflict education system.

Hypothesis development

Good governance is widely recognized as a fundamental determinant of effective education finance management. In the context of Somalia, where institutional capacity and governance structures have been weakened by years of conflict, the ability of the government to mobilize, allocate, and utilize financial resources efficiently is heavily dependent on the quality of governance. Good governance practices, such as transparency, accountability, and stakeholder participation, ensure that education funds are managed in a way that maximizes their impact on the education system (Codd, 2023). When governance structures are robust, they can prevent the misallocation and mismanagement of resources, thereby enhancing the overall effectiveness of education financing (Wang et al., 2020).

Moreover, good governance can influence the mobilization of additional financial resources for education. In countries with strong governance frameworks, there is often greater trust and confidence among donors and investors, leading to increased financial support for the education sector (Francioni et al., 2021). This is particularly important in Somalia, where external aid plays a significant role in funding education. By improving governance practices, Somalia can attract more funding and ensure that these resources are used to address critical gaps in the education system. As a result, this study proposed the following hypotheses:

> *Hypothesis 1*: Good governance influences education finance.

Education financing is a critical input that directly affects the performance and delivery of education services. Adequate funding is necessary for the recruitment and retention of qualified teachers, the development of educational infrastructure, and the provision of learning materials. In Somalia, where the education system has been severely disrupted by conflict, the availability of financial resources is crucial for rebuilding the system and ensuring that it can deliver quality education to all students. Research shows that increased education spending is associated with improved student outcomes, including higher achievement levels and better access to education (Patrinos et al., 2021).

However, the effectiveness of education financing in improving system performance is contingent on how these resources are allocated and utilized. If education funds are not managed efficiently or if they are disproportionately allocated to certain regions or groups, the overall impact on education delivery may be limited. This is particularly relevant in the Somali context, where disparities in education access and quality are significant. Therefore, the second hypothesis suggests that the adequacy and equitable distribution of education finance are key determinants of the performance and delivery of the education system in Somalia. Accordingly, this study proposes the following hypotheses:

> *Hypothesis 2*: Education finance affects the performance and delivery of the education system.
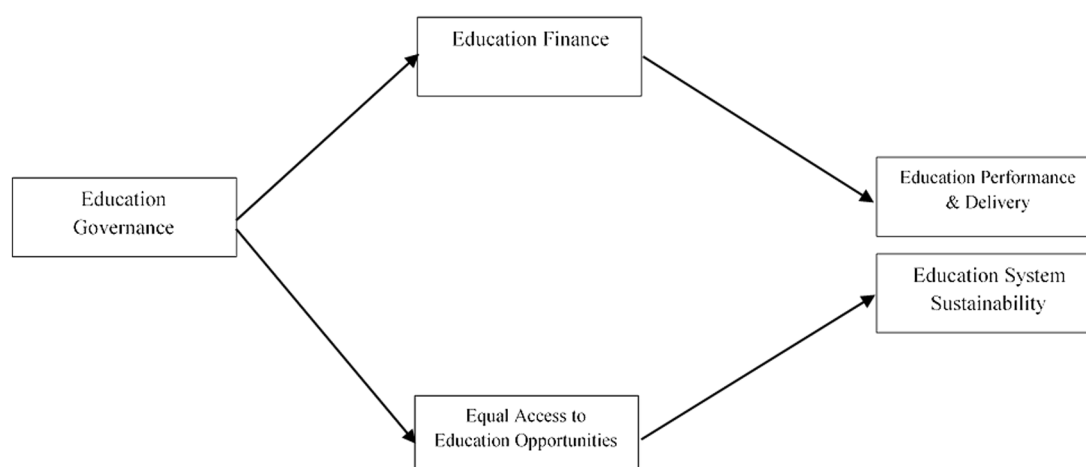

FIGURE 1
Conceptual model.

Good governance plays a crucial role in promoting equitable access to education, particularly in post-conflict settings such as Somalia. Governance structures that emphasize transparency, accountability, and inclusivity are more likely to implement policies that ensure that all children, regardless of their socioeconomic background, have access to quality education. In Somalia, where access to education is uneven across different regions and population groups, good governance can help address these disparities by prioritizing resource allocation to marginalized communities and ensuring that education policies are inclusive (Eno et al., 2022).

Moreover, governance practices that involve community participation and engagement can enhance the responsiveness of the education system to the needs of diverse populations. By involving local stakeholders in decision-making processes, governments can better understand the barriers to education that different groups face and develop targeted interventions to overcome these challenges. In this way, good governance not only improves access to education but also ensures that the education system is more equitable and responsive to the needs of all students (Theoharis, 2024). Thus, this study posited the following hypotheses:

> *Hypothesis 3*: Good governance affects equal access to education.

Equal access to education is a foundational element of a sustainable education system. When all children, regardless of their background, have the opportunity to receive quality education, the benefits extend beyond individual achievement to broader societal impacts. In Somalia, where conflict and instability have created significant inequalities in education access, ensuring that all children can attend school and receive high-quality education is crucial for long-term peace and development. Equitable access helps build social cohesion, reduce disparities, and promote economic stability, all of which are essential for the sustainability of the education system (Lewis et al., 2021).

Furthermore, equitable access to education is closely linked to the resilience of the education system. In post-conflict settings, where resources are often limited and challenges are numerous, an inclusive education system that serves all segments of the population is better positioned to withstand external shocks and disruptions. By providing equal opportunities for education, the system can develop a more diverse and skilled workforce, which is critical for the country's economic recovery and sustainable development (Hue, 2022). As a result, this study formulated the following hypotheses:

> *Hypothesis 4*: Equal access to education contributes to the sustainability of the education system.

Methodology

Research design

This research employs a quantitative approach to analyze the relationships between education finance, performance, access, governance, and system sustainability in Somalia. Structural equation modeling (SEM), a statistical technique that tests complex causal models with latent variables, is central to the methodology. SEM allows for more accurate estimates by accounting for measurement error, unlike traditional regression analysis, which examines only simple associations among observed variables (Hair et al., 2014). This makes SEM ideal for detecting statistically significant relationships and handling interdependent variables and feedback loops, allowing for a deeper understanding of educational outcomes across different levels of government performance. While Structural Equation Modeling (SEM) allows for the testing of hypothesized relationships among latent constructs, it does not imply causation. Given the cross-sectional nature of the data, the results should be interpreted as associations rather than causal effects. Future longitudinal or experimental studies would be necessary to establish the directionality and causal nature of these relationships.

While this study employed Structural Equation Modeling (SEM) using a Partial Least Squares (PLS-SEM) approach via ADANCO, it is important to note that certain model fit indices commonly reported in covariance-based SEM—such as the Comparative Fit Index (CFI) and Root Mean Square Error of Approximation (RMSEA)—are not applicable in this context. These indices require assumptions of multivariate normality and are computed based on covariance matrices, which are not used in PLS-SEM. Instead, model fit was assessed using the Standardized Root Mean Square Residual (SRMR), which is a widely accepted goodness-of-fit measure for PLS-based models. While the absence of CFI and RMSEA may limit comparability with covariance-based studies, the use of SRMR and path-level assessments provides a robust basis for evaluating the model's structural integrity.

Data collection and sampling methods

This study collected primary data through a structured survey conducted in 2023, targeting a broad range of stakeholders across Somali society. Respondents were drawn from government entities, educational institutions, non-governmental organizations (NGOs), and the private education sector, ensuring that diverse perspectives on education governance in post-conflict settings were captured. The use of a purposive stratified sampling strategy was central to the study's design, aimed at achieving diversity in both institutional affiliation and geographic representation.

To reflect Somalia's complex educational and governance landscape, particular attention was given to achieving broad regional coverage. Respondents were selected from six key regions: Banadir Region, Puntland State, Southwest State, Jubaland State, Galmudug State, and Hirshabelle State. These areas represent a cross-section of Somalia's federal member states and vary significantly in terms of educational infrastructure, governance capacity, and levels of conflict exposure. This approach was designed to mitigate the risk of overrepresentation from more accessible or urbanized regions and to ensure that the findings reflect the diverse and decentralized realities of the Somali education sector.

A total of 150 questionnaires were distributed, of which 112 were validated and retained for analysis after data cleaning procedures. The robust sample provides a solid foundation for examining key issues in education governance, finance, and access. The sampling strategy ensured a balanced distribution of participants across key stakeholder categories, including both policy-making bodies and frontline

implementers. To enhance transparency and illustrate the breadth of the dataset, a summary table (Table 1) has been included, detailing respondent characteristics by sector affiliation, regional location, and gender. This inclusive and methodologically rigorous approach strengthens the generalizability of the findings and reinforces the study's relevance to diverse education governance contexts within Somalia.

Construct development and variable measurements

This study investigates the dynamic relationships between education finance, performance, access, governance, and sustainability in Somalia's education sector. By constructing and operationalizing robust variables, the research aims to provide a nuanced understanding of how these factors influence education effectiveness in a post-conflict setting. Variables were developed based on key theoretical dimensions and measured using reliable scales validated in previous research. Education finance was assessed through resource allocation and management indicators, while educational performance and delivery focused on effectiveness and efficiency. Equal access was measured by fairness in access to materials and facilities, and governance by policy structures, decision-making, and accountability mechanisms. Table 2 offers academic definitions for each construct.

TABLE 1 Breakdown of respondents by region, stakeholder type, and gender.

Region	Stakeholder type	Male	Female	Total
Banadir Region	Government	13	5	18
	Private Sector	36	3	39
	NGO	7	2	9
Puntland State	Government	3	1	4
	Private Sector	6	1	7
	NGO	4	1	5
Southwest State	Government	4	1	5
	Private Sector	4	1	5
	NGO	4	0	4
Jubaland State	Government	2	0	2
	Private Sector	4	1	5
	NGO	3	1	4
Galmudug State	Government	1	1	2
	Private Sector	2	1	3
	NGO	3	0	3
Hirshabelle State	Government	2	1	3
	Private Sector	2	0	2
	NGO	2	1	3
Total		112		112

TABLE 2 Variable measurements.

No.	Construct	Definition	Survey item
1	Education Finance	The allocation, management, and utilization of financial resources dedicated to the education sector to ensure adequate funding and support for educational programs and institutions.	EDFIN01 EDFIN02 EDFIN03
2	Education Performance and Delivery	The effectiveness and efficiency of educational institutions in delivering quality education and achieving desired learning outcomes for students.	EDP&D01 EDP&D02 EDP&D03
3	Equal Access to Education Opportunities	All individuals, regardless of socioeconomic background, gender, or location, have fair and equitable access to educational resources and opportunities.	EACES01 EACES02
4	Education Governance	The policies, structures, and processes that guide the management, decision-making, and accountability mechanisms within the education system.	EDGOV01 EDGOV02
5	Education System Sustainability	The ability of the education system to maintain and improve its functions, services, and quality over time, ensuring long-term resilience and adaptability to changes.	EDSUS01 EDSUS02 EDSUS03

Model specification

In designing the model, five distinct constructs—Education Finance, Education Governance, Education Performance and Delivery, Equal Access to Education Opportunities, and Education System Sustainability—were specified to reflect the conceptual independence of these domains as informed by the Education Production Function and Educational Governance theories. This distinction was necessary to capture the multifaceted and context-specific dynamics within Somalia's post-conflict education sector, where governance and financial mechanisms operate through distinct pathways. While hierarchical modeling was considered, separating these constructs allowed for more precise estimation of their individual and collective effects and provided clearer policy-relevant insights. Empirical validation through SEM confirmed that each construct demonstrated strong discriminant and convergent validity, supporting the robustness of the five-factor specification.

Results

In the initial phase of our research methodology, we utilized SPSS to address and mitigate missing values within our dataset, applying linear interpolation techniques to ensure the completeness and integrity of the data. Following this, we conducted a thorough examination of common method bias, an essential aspect of research design, particularly highlighted by Podsakoff et al. (2003). To detect the presence of common method variance (CMV), we employed Harman's single-factor test, which involves integrating all key constructs into a principal component factor analysis, following the approach outlined by Podsakoff and Organ (1986). This meticulous adherence to established methodological practices not only serves to meet procedural standards but also plays a critical role in bolstering the reliability and validity of our study's outcomes, thereby maintaining the overall integrity of our research findings.

The analysis revealed that the first four factors together accounted for 74.76% of the variance, a result that not only exceeds the conventional threshold for mitigating concerns about common method bias but also highlights the comprehensive representation of the dataset's complexity. This broad variance distribution suggests that our findings are rooted in a diverse set of constructs rather than being overly influenced by the singular dimensionality that can be a pitfall in single-source data analyses. Consequently, this thorough analytical approach strengthens our confidence that common method bias has been effectively minimized, affirming both the empirical soundness of our study and the reliability of its conclusions. This outcome aligns with the broader research literature, which emphasizes the critical role of methodological rigor in ensuring the validity and credibility of research findings (Podsakoff et al., 2003; Richardson et al., 2009).

In this study, we employed ADANCO-SEM as the primary tool for analyzing our data, following the methodologies recommended by Lin et al. (2024) and Luo et al. (2024). ADANCO, a software package specifically designed for composite-based structural equation modeling (SEM), allows us to explore the complex relationships between our measured variables and underlying latent constructs. Drawing on the frameworks established by Conway and Lance (2010) and Podsakoff and Organ (1986), we conducted a thorough evaluation of both the measurement model's validity and reliability, alongside an assessment of the structural model to examine the interactions among the variables. To enhance the rigor of our analysis, we applied the bootstrapping method suggested by Sarstedt et al. (2021), which provided a robust means of testing the hypothesized relationships within our conceptual framework. This comprehensive approach ensured that our findings were both reliable and grounded in well-established analytical practices.

Measurement model

We carefully evaluated the measurement model by considering both convergent and discriminant validity in line with Sarstedt et al. (2021) guidelines. To achieve convergent validity, we examined factor loading, average variance extracted (AVE), and composite reliability (CR) using established criteria. The results of this study revealed that all the items met the required standards: the loading of each factor exceeded 0.7 (with few exceptions), the AVE values consistently exceeded 0.5, and the CR values were above 0.7, as shown in Table 3. These findings affirm the high degree of convergent validity for our scale measurements, implying that the model is indeed capable of precisely capturing what it intended to represent. This rigorous process of validation adds to the general dependability and credibility of the measurement model used, thus ensuring that our findings hinge on the strong methodological basis from which they were obtained.

One item within the Education Performance and Delivery construct (EDP&D03) reported a factor loading of 0.5839, which falls below the conventional threshold of 0.70. Despite this, the item was retained due to its theoretical significance in capturing a unique dimension of performance relevant to post-conflict education systems. Its inclusion supports construct coverage and helps reflect the operational realities of education delivery in fragile state contexts like Somalia.

To assess the discriminant validity of the measurement model, we employed the heterotrait–monotrait (HTMT) ratio of correlations on the basis of a methodology established by Henseler et al. (2015) within the multitrait–multimethod matrix framework. The

TABLE 3 Convergent validity.

Construct	Item	Loading	CR	AVE
Education Finance	EDFIN01	0.725	0.804	0.508
	EDFIN02	0.716		
	EDFIN03	0.739		
Education Performance and Delivery	EDP&D01	0.757	0.757	0.513
	EDP&D02	0.791		
	EDP&D03	0.583		
Equal Access to Education Opportunities	EACES01	0.792	0.782	0.642
	EACES02	0.810		
Education Governance	EDGOV01	0.821	0.752	0.607
	EDGOV02	0.734		
Education System Sustainability	EDSUS01	0.802	0.762	0.523
	EDSUS02	0.669		
	EDSUS03	0.691		

TABLE 4 HTMT ratios.

Construct	1	2	3	4	5
Education Finance	1				
Education Performance and Delivery	0.973	1			
Equal Access to Education Opportunities	0.787	0.920	1		
Education Governance	0.929	1.001	0.958	1	
Education System Sustainability	1.023	0.841	0.724	0.760	1

methodology is based on an important benchmark: the HTMT value must not be greater than 0.90, which is recommended by Gold et al. (2001) to establish convergent and discriminant validity; thus, any value greater than this threshold implies that there are some indications of a lack of discrimination between the scales or factors in question. The findings reveal that most HTMT values are lower than 0.90, with only a few exceptions, as shown in Table 4. This finding reveals that, for many parts, the distinctiveness among them is retained, which maintains good discriminant validity among these variables. Thus, this supports the analysis and interpretation that follows, which makes it more sound and reliable as well as adds to the structural integrity of our model, showing that it captures different aspects without overlapping much to make any sense at all about what can be concluded from results obtained through this particular approach.

Although most HTMT values fell below the 0.90 threshold, the HTMT between Education Governance and Education Finance slightly exceeded this cutoff (HTMT = 0.929), indicating a high degree of correlation. This result aligns with the theoretical and contextual premise that in post-conflict environments such as Somalia, financial mechanisms are closely tied to governance frameworks. While this proximity suggests interdependence, our assessment of the measurement items confirmed distinct constructs with no overlap in content or operational scope. Therefore, we retained both constructs, interpreting their high correlation as a meaningful reflection of the context rather than a methodological concern.

Structural model

The model's overall fit was assessed using the Standardized Root Mean Square Residual (SRMR), which yielded a value of 0.1119. Although this slightly exceeds the conventional threshold of 0.10, it remains within an acceptable range for exploratory PLS-SEM models in complex settings. The study's rigorous evaluation of the structural model, employing a bootstrapping procedure with 5,000 resamples as recommended by Sarstedt et al. (2021), underscores the empirical robustness of the proposed theoretical framework through an in-depth examination of R^2 values, standardized beta coefficients (β), t values, and effect sizes (f^2). As shown in Table 5 and Figure 2, the analysis provides unequivocal support for all four hypothesized relationships. Notably, there is a significant positive relationship between Finance Education and Performance and Delivery ($\beta = 0.973$, $p < 0.01$), Education Governance and Education Finance ($\beta = 0.929$, $p < 0.01$), and Education Governance and Equal Access to Education ($\beta = 0.958$, $p < 0.01$). Additionally, equal access to education is shown to have a substantial influence on education system sustainability ($\beta = 0.724$, $p < 0.01$). These findings collectively highlight the complex

interplay between educational governance, finance, and access in shaping the performance and sustainability of education systems, thereby reinforcing the model's theoretical propositions and practical implications for educational policy and management.

In investigating the relationships among education governance, finance education, and education system sustainability, our study demonstrates compelling findings, with R^2 values of 0.863 for Education Finance, 0.918 for Equal Access to Education, 0.946 for Performance and Delivery, and 0.525 for Education System Sustainability, indicating that the model explains a substantial proportion of the variance in these constructs.

As shown in Figure 2, Good Governance plays a central role in shaping the performance of Somalia's education system through its influence on both Education Finance and Equal Access to Education Opportunities. The path coefficients demonstrate strong, statistically significant relationships, particularly from governance to finance ($\beta = 0.929^{***}$) and to access ($\beta = 0.958^{***}$), highlighting governance as a foundational enabler of equitable resource distribution.

As illustrated in Figure 2, Education Finance significantly predicts Education Performance and Delivery ($\beta = 0.973^{***}$), emphasizing the critical role of financial inputs in improving system outputs. Similarly, Equal Access to Education is shown to be a key predictor of Education System Sustainability ($\beta = 0.724^{***}$), suggesting that ensuring equitable access is not only a moral imperative but also a strategic condition for long-term resilience. The high R^2 values (ranging from 0.525 to 0.946) indicate that the model explains a substantial proportion of variance in the endogenous variables, reinforcing the strength of these relationships.

Following the methodological guidance of Sarstedt et al. (2021), we assessed the effect sizes (f^2) to understand the magnitude of the relationships postulated in our hypotheses. According to Cohen's benchmarks for interpreting effect sizes—0.02, 0.15, and 0.35 denoting weak, moderate, and strong effects, respectively—our analysis revealed that all supported hypotheses manifested significant effect sizes, thereby affirming the practical relevance and significance of our findings (see Table 5). Moreover, an examination for multicollinearity was conducted, adhering to the variance inflation factor (VIF) threshold of 10.00 (Cheng et al., 2022; Thompson et al., 2017), ensuring that multicollinearity does not pose a threat to the reliability of the model's estimates. While all VIF values remain below the critical threshold of 10, the value for the path between governance and equal access (VIF = 9.776) approaches this limit. This suggests a degree of multicollinearity, likely due to conceptual overlap between governance mechanisms and access-enabling policies. Although within an acceptable range, this value indicates a need for caution and highlights an area for refinement in future iterations of the survey instrument. This detailed analysis underscores the critical role of education governance, education finance, and equal access to education in

TABLE 5 Structural model.

Hypothesis	Path relationship	Std. Beta	SE	t-value	Decision	f²	VIF
H1	Finance Education → Performance and Delivery	0.973	0.051	18.983	Supported	17.459	5.250
H2	Equal Access to Education → Education System Sustainability	0.724	0.109	6.648	Supported	1.104	4.808
H3	Education Governance → Education Finance	0.929	0.058	16.061	Supported	6.314	5.933
H4	Education Governance → Equal Access to Education	0.958	0.062	15.443	Supported	11.157	9.776

SE, standard error; VIF, variance inflation factor; std. beta, standardized beta coefficient.

FIGURE 2
SEM model.
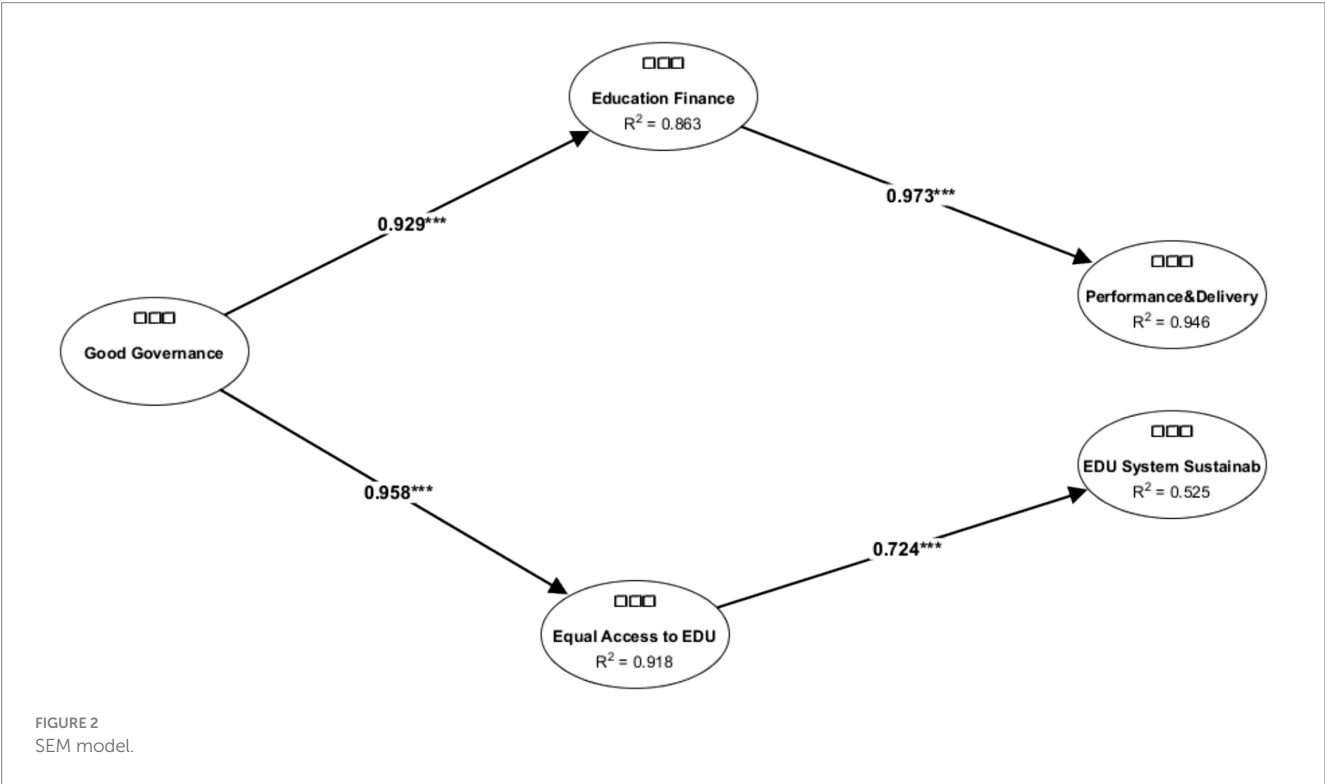
fostering sustainable and high-performing education systems, offering valuable insights for policymakers and educators alike.

Discussion

The primary objective of this study was to investigate the nexus among education governance, education finance, equal access to education opportunities, education performance and delivery, and education system sustainability in Somalia's post-conflict education sector using structural equation modeling (SEM). Key findings revealed significant positive links between education finance and performance, governance and financial management, and equal access and system sustainability. The results suggest that robust governance and effective financial management are essential for improving educational outcomes. Additionally, equitable access to education enhances system resilience and sustainability, which is critical in

post-conflict environments like Somalia. Adequate funding and transparent governance are crucial to achieving these objectives.

The findings of this study are deeply embedded in the context of Somalia's post-conflict recovery, where governance structures are still being rebuilt and financial resources are often limited. The unique challenges faced by the education sector, such as inadequate infrastructure, political instability, and social inequalities, play a significant role in shaping the relationships observed in the study. These contextual factors highlight the need for tailored policy interventions that address the specific challenges of post-conflict societies, where the rebuilding of educational systems must go hand in hand with broader efforts to stabilize governance and economic structures.

Decentralization in Somalia presents a complex dynamic for education governance and finance. While the federal system is designed to enable localized decision-making and improve responsiveness to community needs, the reality in post-conflict

Somalia is more fragmented. Regional disparities in administrative capacity, budgeting skills, and oversight mechanisms often result in unequal education finance allocation and inconsistent governance standards across federal member states. Some regions demonstrate strong local education management, while others struggle with coordination, leading to inefficiencies and accountability gaps. This uneven decentralization exacerbates regional inequalities and weakens the coherence of national education policies. Therefore, any governance reform or financial intervention must be context-sensitive, recognizing the asymmetric capacity and political dynamics of Somalia's federal system.

Comparing Somalia's experience with that of other post-conflict nations reveals both similarities and differences in how education finance and governance interact. For example, countries such as Rwanda have also emphasized the importance of strong governance in rebuilding their education sectors, with positive outcomes similar to those observed in Somalia (see, for instance, McLean Hilker, 2011; Hodgkin, 2006; Buckland, 2005; Ansoms et al., 2022; Taka, 2023). However, Somalia's prolonged conflict and the resulting extensive damage to its educational infrastructure present unique challenges, making the role of governance even more critical. Unlike other post-conflict settings, where education systems might have been less affected, Somalia requires a more focused approach to rebuild both governance and education simultaneously.

The findings of this study have significant implications for policymakers and practitioners. Strengthening governance frameworks and ensuring efficient financial management should be prioritized to improve educational outcomes and system sustainability in Somalia. Policymakers should focus on creating transparent, accountable, and inclusive governance structures that can effectively manage and allocate financial resources. Additionally, expanding access to education, particularly in underserved regions, is crucial for building a resilient education system that can sustain itself over time. Practitioners should also focus on innovative solutions to address the unique challenges of Somalia's post-conflict context, such as the use of technology to improve access to and the quality of education.

To complement the statistical findings, stakeholder perspectives were incorporated to contextualize the quantitative results. Dr. Nageeye, a senior advisor at the Ministry of Education of the Federal Government of Somalia, emphasized the critical role of governance in financial outcomes:

> *"Strengthening accountability and financial oversight at regional levels is essential to ensure that education funds in Somalia reach schools and are used efficiently. Without this, there is a risk of misallocation or underutilization of resources."*

This viewpoint aligns with the study's finding of a strong association between education governance and financial adequacy. Similarly, Hani Mohamed, who leads the Restore Somalia Foundation (RSF) and works closely with local communities, highlighted the intersection of finance, access, and planning:

> *"Girls in rural areas still walk hours to reach the nearest school—finance alone does not fix this without community-level planning."*

These insights underscore the practical challenges that reinforce the observed statistical relationships, particularly the pathways linking governance and finance to equitable access and system sustainability. Supporting this, the UNICEF (2021) also reports persistent regional disparities and stakeholder frustrations over fragmented policy execution and limited resource flow, reinforcing the need for coordinated, accountable governance structures at all levels.

This study's results align with the literature on the critical role of governance and financial management in education. Research by Cull et al. (2018) and Emara and El Said (2021) highlights the importance of governance in enabling financial systems to function effectively, which echoes the positive relationship between governance and education finance found in this study. Additionally, the link between education finance and improved educational outcomes supports the findings of Patrinos et al. (2021), who emphasize that adequate funding is essential for achieving educational quality in developing countries. The positive relationship between equal access to education and system sustainability also resonates with studies that stress the importance of equity in education for long-term system resilience (Borazon and Chuang, 2023; Reyes et al., 2013).

This study contributes to the theoretical understanding of how governance, financial management, and access to education interact in a post-conflict environment. By applying SEM, the research provides a nuanced analysis of these relationships, offering insights into the mechanisms through which governance influences educational outcomes. The findings suggest that governance and finance are not isolated factors but are deeply intertwined, with governance playing a crucial role in shaping the effectiveness of financial management and access to education. This challenges traditional views that treat governance and finance as separate domains and underscores the need for integrated approaches to education policy and management.

The novelty of this study lies in its use of structural equation modeling (SEM) to explore the complex relationships between education finance, governance, and system sustainability in a post-conflict setting. By focusing on Somalia, a largely under-researched country in education, and integrating diverse societal perspectives, the study offers unique insights into rebuilding its education system. Key contributions include empirical evidence on education in post-conflict Somalia, a deeper understanding of how governance impacts financial management and outcomes, and a demonstration of SEM's effectiveness in capturing complex variable interactions in education research.

While this study employs a quantitative structural equation modeling (SEM) approach, insights from qualitative and mixed-methods research can offer rich contextual understanding of the nuanced challenges in post-conflict education systems. For instance, in Ethiopia, Jones et al. (2016) used focus groups and interviews to explore how traditional gender norms influence educational access for adolescent girls in rural areas. In Rwanda, Williams (2010) conducted qualitative case studies of school communities to assess how governance reforms influenced equity and school rebuilding efforts post-genocide. Similarly, Sommers (2013) utilized ethnographic methods in South Sudan to reveal localized education delivery challenges, such as community distrust and teacher shortages. These studies underscore the value

of stakeholder voices—teachers, students, parents, and local officials—in shaping education policy. Incorporating such findings into broader education finance and governance frameworks allows for a more holistic analysis that goes beyond structural relationships and captures the lived realities within post-conflict societies.

Conclusion

This study investigates the dynamic relationships among education finance, governance, and system sustainability in Somalia's post-conflict education sector. Key findings revealed that governance plays a pivotal role in managing education financing, which in turn significantly affects the performance and delivery of education. Additionally, equitable access to education is found to be a critical factor in ensuring the sustainability of the education system. These results highlight the interdependence of governance, finance, and access in shaping educational outcomes and sustaining educational improvements over time.

The study contributes to the theoretical discourse on the interconnectedness of governance, financial management, and educational outcomes, particularly in post-conflict settings. By applying structural equation modeling, this research offers a detailed analysis of these complex relationships, challenging traditional approaches that view governance and finance as separate entities. The findings underscore the need for integrated frameworks that consider the interplay between governance structures and financial management in achieving sustainable educational development.

These findings have key policy implications for post-conflict nations like Somalia. Policymakers should focus on strengthening governance frameworks to ensure efficient and equitable management of financial resources, which directly impact educational performance and sustainability. Expanding access to education, especially in underserved areas, is essential for building a resilient system. Practitioners can use these insights to design interventions that improve governance, transparency, and financial management, ultimately leading to better educational outcomes and a more sustainable education system in post-conflict settings.

Based on the empirical findings, several actionable policy recommendations emerge. First, the government should implement earmarked education financing at regional and district levels to ensure consistent resource flow and reduce risks of misallocation. Second, community-led monitoring systems can enhance transparency and build local accountability, particularly in rural areas where oversight is often weak. Third, investing in capacity-building for regional education offices would address disparities in governance and financial management across federal member states. Finally, integrating performance-based budgeting can help link financial inputs more directly to educational outcomes, incentivizing efficiency and equity in education delivery.

The study's significance lies in its ability to provide empirical evidence from a post-conflict setting, offering valuable insights into the complex relationships among governance, finance, and education. The findings have the potential to inform both policy and practice, contributing to broader efforts to rebuild and develop education systems in post-conflict societies such as Somalia. By highlighting the importance of integrated governance and financial management, this study offers a pathway for achieving sustainable educational outcomes in challenging environments.

While the study offers important insights, it also has limitations that should be acknowledged. This study is based on a cross-sectional design, which limits the ability to establish definitive causal relationships between variables, such as the influence of governance on education finance. While SEM allows for the testing of theoretically informed directional paths, the findings should be interpreted with caution. Future research using longitudinal designs is recommended to better understand how these relationships evolve over time. Additionally, the focus on Somalia may limit the generalizability of the findings to other post-conflict settings. Future research should consider longitudinal studies and comparative analyses across different contexts to validate and extend the findings.

Future research could build on this study by employing longitudinal designs to explore the long-term impacts of governance and financial management on educational outcomes. Comparative studies across different post-conflict settings could provide a broader understanding of how these variables interact in diverse contexts. Additionally, qualitative research could complement the quantitative findings by exploring the lived experiences of stakeholders in the education sector, offering deeper insights into the challenges and opportunities of rebuilding education systems in post-conflict environments.

In conclusion, this study provides a comprehensive analysis of the relationships among education finance, governance, and system sustainability in Somalia's post-conflict setting. The findings underscore the critical role of governance and financial management in shaping educational outcomes and sustaining educational improvements. By offering insights that are both theoretically and practically significant, this study contributes to ongoing efforts to rebuild and strengthen education systems in post-conflict societies, ultimately supporting the broader goal of achieving sustainable development.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by Ethics committee, Centre for Research and Development, SIMAD University. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

MN: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing.

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Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

The author declares that no Gen AI was used in the creation of this manuscript.

Publisher's note

Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/feduc.2025.1552668/full#supplementary-material

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