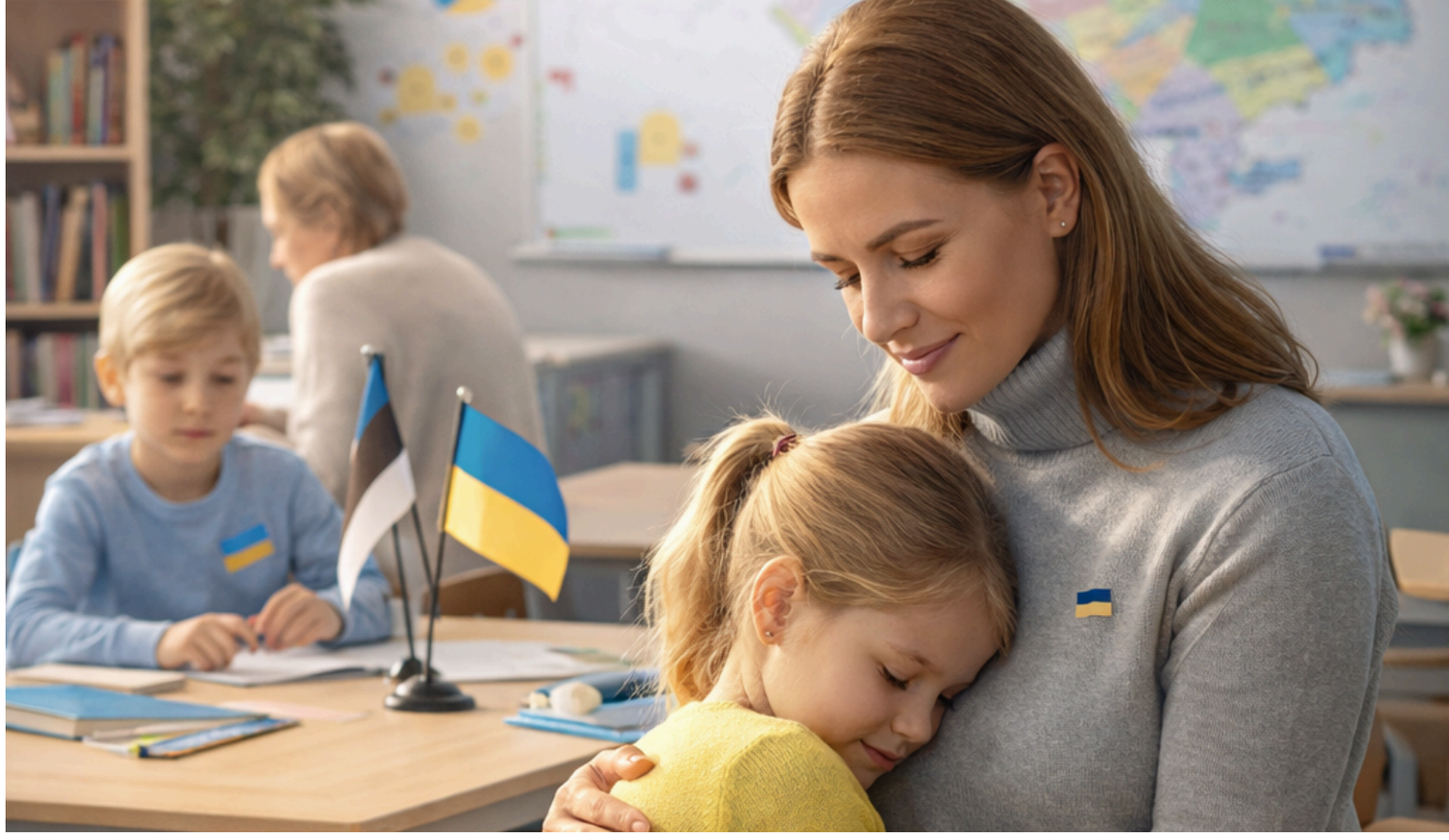


NORTHRISE UNIVERSITY
BEING EXCELLENT AT WHAT IS GOOD

SOLI DEO GLORIA
1898
DBU
DALLAS BAPTIST UNIVERSITY

JoRIE

Journal of Research for International Educators

Today's Compelling Educational Challenges & Finding Global Benefits

CGE
CONSORTIUM FOR GLOBAL EDUCATION

Journal Vol 5 2026

CHRIST
(DEEMED TO BE UNIVERSITY)
BANGALORE | DELHI NCR | PUNE
EXCELLENCE SERVICE CHRIST

ANDERSON UNIVERSITY

UNIVERSITY OF MARY HARDIN-BAYLOR 1845

www.jorie.org

JoRIE Journal of Research for International Educators

Jeffrey Moore Vol 5:1 2026

Anderson University

Author Note

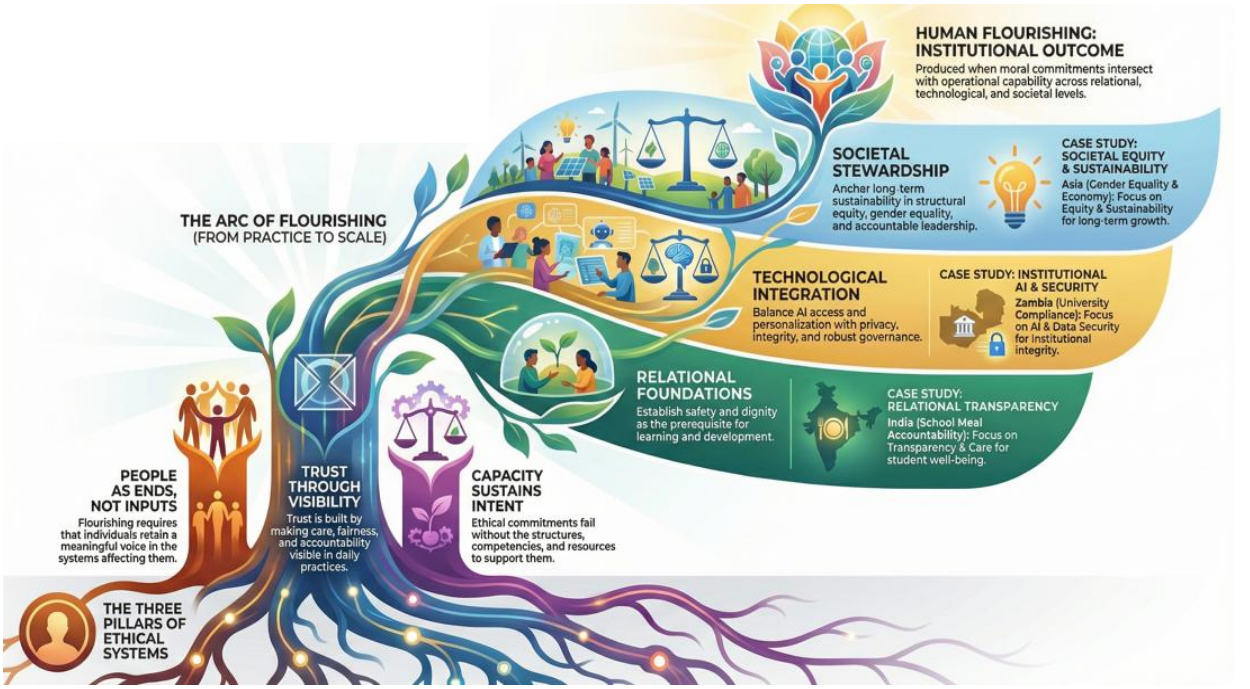
ORCID Number: 0000-0002-2508-2896; jmoore@andersonuniversity.edu

What does it take for people to flourish inside the institutions that shape daily life? Schools, workplaces, and public systems aim to promote development, yet under strain they can also produce exclusion, mistrust, and harm. The eight articles in this special issue approach a shared question from different settings: how can institutions design practices and tools that support learning, well-being, dignity, and sustainable outcomes while remaining ethically grounded?

Across the issue, three through-lines surface in every context. **First, dignity and agency**: flourishing requires that people are treated as ends, not inputs, and that they retain meaningful voice in systems that affect them. **Second, trust**: whether in classrooms, digital platforms, or public institutions, trust is not assumed; it is built through practices that make care, fairness, and accountability visible. **Third, governance capacity**: ethical intent is insufficient without structures, competencies, and resources that sustain ethical practice over time. In other words, flourishing is not a private achievement. It is an institutional outcome produced at the intersection of moral commitments and operational capability.

Figure 1

Designing Institutions for Human Flourishing



The articles also converge on a shared warning: when ethics is reduced to compliance, when inclusion becomes optional, or when responsibility is pushed onto individuals without institutional support, flourishing becomes fragile. Yet the issue does not present ethics as a simple checklist. Instead, it reveals productive tensions that leaders must navigate. Transparency can strengthen dignity and trust, but it can also conflict with privacy. AI can expand access and personalization, but it can also erode integrity and learner agency if assessment and accountability do not evolve. Compliance can formalize expectations, but character and judgment matter when real decisions are ambiguous, pressured, or poorly supervised. These tensions are not side notes; they are the practical terrain where ethical commitments are tested. The issue is organized as a coherent thread from the relational foundations of flourishing to the governance structures that sustain it at scale. It begins in educational settings where dignity and care must be made concrete. *Dignity in Every Meal* examines a transparency-based initiative in a

statewide network of fully residential schools in India. By sharing daily photographs of meals and dining environments, the intervention strengthens accountability and participation and reframes trust as a relational practice. *Trauma-Informed Education During Crisis* focuses on teachers supporting refugee students in Estonia amid displacement linked to the war in Ukraine. It argues that learning cannot be separated from safety and regulation when trauma is present. Here, ethical responsibility is inseparable from institutional capacity: trauma-informed education requires systems that support teachers, not only appeals to compassion.

From those relational foundations, the issue turns to the challenges of technology-mediated learning, where access, agency, and integrity must be held together. *EduGenius AI* presents an adaptive, inclusive AI learning assistant designed to provide personalized support at scale through multimodal access and responsive guidance, insisting that inclusion is a design constraint rather than an optional feature. Two Zambia-based higher education studies sharpen the ethical stakes of AI adoption. *Exploring Effective Methods of Assessing University Students Amidst AI Usage* highlights how traditional assessments can become misaligned with learning outcomes when students rely on chatbots to generate responses, pressing institutions toward more authentic demonstrations of learning. *Data Security Compliance in Zambian Universities* adds a critical counterweight: the same digital transformation that enables scale also increases privacy risk, and compliance maturity depends on leadership commitment translated into training, implementation, and resourcing. Taken together, these papers illuminate a central tension: expanding technological capability without strengthening governance can undermine the very trust and dignity technology is meant to support.

The issue then broadens from campus systems to public institutions and societal outcomes, where stewardship, accountability, and equity shape flourishing at scale. *Financial*

Management in State-Owned Enterprises: Leveraging Machine Learning for Bankruptcy Prevention in Zambia examines bankruptcy risk in SOEs and the promise of predictive tools, while underscoring governance realities that affect autonomy and accountability. The ethical question is not only whether prediction is accurate, but whether institutions are structured to act responsibly on insight, protect stakeholders, and prevent avoidable harm. Finally, *Sustainability in the Economy through the Achievement of Gender Equality* expands the lens to societies, linking sustainability outcomes to gender equality and broader social priorities. The contribution reinforces a capstone insight of the issue: flourishing is structural. When systems normalize inequity and restrict opportunity, sustainability weakens; when equality is treated as foundational, development becomes more durable and more widely shared.

The issue is sequenced to show how human flourishing is built and sustained in complex systems. It starts with education, where safety, care, dignity, and trust must be enacted in daily practice, then moves to AI-enabled learning and the ethical tensions it raises around integrity, privacy, and governance. The impact then widens to public institutions and societal outcomes, emphasizing stewardship in state-owned enterprises and concluding with sustainability through gender equality. Across contexts, the message is consistent: ethical commitments matter most when they are operationalized, supported by governance capacity, and scaled toward durable, equitable outcomes.

© 2026 CGE – Consortium for Global Education

Table of Contents

Brenda Morton Vol 5:2 2026

University of Mary Hardin-Baylor

Author Note

ORCID Number: 0000-0002-1065-7677; bmorton@umhb.edu

Abstract

The Russian invasion of Ukraine triggered large-scale displacement and placed refugee children at elevated risk for trauma exposure, disrupted schooling, and long-term psychosocial distress. Estonian schools received Ukrainian students amid acute national anxiety and limited prior experience hosting large numbers of war refugees. This mixed-methods study examines Estonian teachers' attitudes toward trauma-informed care and their planned classroom responses for welcoming Ukrainian refugee students. Participants (N = 63) were teachers and education students enrolled in a trauma-focused course delivered through Fulbright support in spring 2022. Pretest and posttest results from the Attitudes Related to Trauma-Informed Care Scale for Education (ARTIC-35) showed statistically significant gains across five domains, with medium-to-large effect sizes. Qualitative analysis of end-of-course writing assignments emphasized emotional and physical safety, trauma literacy and neurobiology, modeling of regulation, and concrete classroom tools to support belonging and learning. Findings support embedding trauma-

informed preparation in educator training and ongoing professional development, especially in crisis-driven migration contexts.

Keywords: trauma-informed education, refugee students, Ukraine, Estonia, teacher training, ARTIC-35

Introduction

The Russian invasion of Ukraine has triggered one of the most significant refugee crises in recent history, with "one in four Ukrainians have been displaced and nearly four million have left their country" (Javanbakht, 2022, p. 1). In 2022, Estonia received 121,464 Ukrainian refugees with children, representing 23.2% of the 28,235 individuals granted temporary protection (European Commission, 2022). By early 2023, 66,142 individuals had stayed, while 55,322 had moved on to other destinations.

While refugee experiences are heterogeneous, they share many psychological impacts (Hodes, 2023). Refugees are " (a) civilians without self-protection resources, exposed to military and war trauma, (b) have repeated cumulative exposure to such trauma, (c) endure immense personal, material, psychosocial, literal and symbolic losses, including of family members and loved ones, homes, socioeconomic standing, and memories among others, (d) sustain cumulative psychosocial stress, economic headship, and lack of resources during the flight, and years after displacement. War-related stress continues through exposure to news and worries about family members remaining in conflict areas, all contributing to "high levels of psychological impact" (Javanbakht, 2022, p. 2).

These cumulative experiences place refugees at high risk for long-term psychological distress, including mental health disorders, including PTSD, anxiety, and depression (Javanbakht, 2022), creating unique challenges in adjusting to new environments (Barrett & Berger, 2021). To

mitigate these impacts, immediate and culturally sensitive interventions, such as mental health first aid, psychoeducation, and assistance with navigating host-country healthcare systems, are crucial (Javanbakht, 2022).

Children and war

War disproportionately affects children, leaving enduring psychological and developmental consequences that extend far beyond other disasters. Unlike natural catastrophes, war destabilizes entire communities for generations, through prolonged conflict that subjects children to violence, threats to physical safety, forced relocation, and limited access to necessities (Shelashska, 2025). The scale of displacement is staggering. Over two million Ukrainian children crossed into neighboring countries, while an additional 2.5 million were internally displaced within Ukraine (Kruszewska & Lavrenova, 2022).

Children face the most severe mental health consequences of war, often losing access to education, safety, and stability, factors critical to healthy development (Kruszewska & Lavrenova, 2022). Nearly 44% of children in Ukraine show signs of potential PTSD, characterized by difficulty concentrating, increased emotional reactivity, isolation, and difficulty sleeping (President of Ukraine, 2024). These symptoms result from direct and indirect stressors such as bombings, displacement, and family separation, which contribute to chronic stress (Shelashska, 2025). The complex trauma experience follows what researchers term the "Triple Trauma Paradigm" (Switchboard, p2), defined as pre-flight, flight, and displacement, and resettlement.

The impact extends beyond individual children to family systems, as children frequently share adverse experiences with their parents and remain deeply perceptive of adult distress (Javanbakht, 2022, p. 2). Research indicates that up to half of refugee children may exhibit elevated levels of PTSD and anxiety (Javanbakht, 2022). Exposure to multiple traumas increases the

likelihood of mental health issues and cognitive impairments, including learning delays (Sullivan & Simonson, 2016), with effects persisting into adulthood (Slone & Peer, 2021).

Educational settings reveal the practical manifestations of these trauma responses. Educators have observed trauma symptoms among refugee children, including hoarding, aggression, and social withdrawal (Szente et al., 2006). A systematic review by Perfect et al. (2016) of 83 studies confirmed that students exposed to severe or cumulative trauma face heightened risk for cognitive dysfunction, behavioral challenges, and academic failure. These patterns were found to be true for Ukrainian children in Estonia.

Ukrainian children in Estonia

In a recent study, Toros et al. (2024) conducted interviews with Ukrainian refugee children living in Estonia. The findings revealed significant psychosocial challenges. For example, more than half of the children reported worse living conditions in Estonia compared to Ukraine. They described overcrowded and inadequate housing, the discomfort of sharing space with strangers, and anxiety due to unfamiliar environments and language barriers. Language barriers contributed to social isolation, limiting children's ability to connect with Estonian peers and confining them to relationships with only other Ukrainian speakers.

Participants also reported negative attitudes from Russian-speaking locals and expressed fears of bullying, further exacerbating their sense of alienation (Toros et al., 2024). In addition, homesickness emerged as a central theme, with children missing their physical homes, personal belongings, friends, and family members left behind. These feelings of loss contributed to sadness and anxiety, complicating their adjustment to daily life in a new country (Toros et al., 2024, p. 4). Lastly, the children participants expressed a desire for psychological support and interest in learning emotional regulation and communication strategies (Toros et al., 2024).

Attending Estonian schools

Children who enrolled in Estonian schools encountered many difficulties. These included "unfamiliarity with the language, lack of comfortable communication, changes in the times that school is on, and age and class mismatches compared to the Ukrainian educational system (Kravchenko & Strömpl, 2024, p. 224). Despite these trying circumstances, Ukrainian children reported a high satisfaction with Estonian schools. Kravchenko and Strömpl (2024) explored the experiences of Ukrainian children in Estonian schools. While exploring school satisfaction, students reported a 3.7 out of 5 rating for their school, higher than their Estonian peers, who rated it 3.3 out of 5. Students also noted caring teachers. A total of 70% of Ukrainian students reported having caring teachers, compared to only 51% of their Estonian peers (Kravchenko & Strömpl, 2024).

Schools and community-based care

Hodes (2023) highlighted the importance of a safe, supportive environment and advocated for a socio-ecological perspective to meet these multiple needs, including contextual, community-based care. One such community is schools. Schools are uniquely positioned to serve as hubs for refugee adjustment and healing. Educators play a pivotal role in supporting the resettlement and academic success of refugee students and their families (Nagasa, 2014; Szente et al., 2006). Chafouleas et al. (2016) argue that schools are ideal environments for fostering recovery in students affected by trauma. However, despite this potential, many educators report feeling ill-equipped to meet the complex needs of refugee students. In the UK, for example, only 40% of teachers reported feeling prepared to support children with mental health needs, including those coping with trauma and grief (Lowry et al., 2022). Cwirynkalo et al. (2024) studied 684 Polish teachers and found critical deficits in their readiness to work with Ukrainian refugee students. They

concluded that psychological and pedagogical knowledge is "crucial for recognizing students' difficulties and emotional needs and developing their socio-emotional competencies, including coping skills" (p. 3). Without proper training, teachers cannot adequately "address their safety needs, and recognize and cope with their emotions, including fear, loneliness, and a sense of loss" (p. 2).

Teachers and Secondary Trauma

The consequences extend beyond individual students. Educators can become profoundly impacted when students share experiences of daily hardships and traumatic events. The DSM-5 clarifies that "indirect exposure to trauma can lead to the development of impairing symptoms" (American Psychiatric Association, 2013). While teachers typically demonstrate significant compassion for their students, they may also feel overwhelmed and helpless when addressing student suffering. These feelings can result in emotional withdrawal, compassion fatigue, and secondary traumatic stress stemming from exposure to firsthand trauma accounts (Hodgkins, 2019; NCTSN, 2022; Thomas, 2013; Yang, 2021), which can lead to depression, feelings of professional incompetence, and burnout, thereby increasing teacher attrition rates (Fearson & Duncan, 2024). Training should be included at the beginning and throughout their career to develop the skills and competencies needed to support traumatized children (Frearson & Duncan, 2024).

Trauma-Informed Practices

The effects of traumatic situations and events can be mitigated through protective factors. "Studies indicate that war-affected families can repair, grow, and pass down their adaptive capacities to the next generation, which makes psychosocial support especially crucial for war-affected children to strengthen their resilience" (Denov et al., 2019). One way to mitigate is through trauma-informed practices implemented in schools.

Trauma-informed practices are methods that apply understanding of trauma's effects to establish safe, supportive environments that foster recovery and avoid causing additional harm (Ko et al., 2008). Trauma-informed teaching practices take into account how trauma affects students' learning, development, and overall well-being, and include preparing educators and school staff with the skills needed to effectively support these students (Record-Lemon & Buchanan, 2017).

Trauma-informed practices in schools are increasingly validated by empirical research. Berger et al. (2021) found that trauma-informed interventions lead to greater staff awareness, increased student engagement, higher referral rates for students in need, reductions in disruptive behavior and suspensions, and lower levels of post-traumatic stress and depression among youth In response to such findings, this study implemented the Trauma-Informed Schools Project (TISP) model, drawing on the collective recommendations of educators, theorists, and experts in traumatology and attachment.

While the effects of trauma can be profound and enduring, they are not irreversible. With appropriate psychosocial support, war-affected children and families demonstrate a strong capacity for resilience and recovery. Trauma-informed school practices offer a powerful means of supporting refugee children by fostering emotionally safe learning environments. These interventions not only enhance academic achievement but also promote resilience by addressing students' psychological and developmental needs. As Denov et al. (2019) emphasize, families can adapt and even flourish when they have access to resources that support emotional well-being and relational stability.

The term trauma-informed refers to a multidisciplinary, evolving framework that draws on the fields of traumatology, neurobiology, and developmental theory, particularly attachment and cognitive development (Berardi & Morton, 2017, 2019). It is grounded in an understanding of how

adverse experiences affect brain development, behavior, and learning, and it incorporates evidence-based strategies that support healing and growth. This approach invites educators and caregivers to examine the intersection of attachment theory and neurobiology in understanding how trauma shapes a child's experience (Morton & Berardi, 2017). Central to this framework is the process of forming secure attachments through attunement and mentoring, which lays the foundation for the development of self-regulation skills. These skills are critical for self-stabilization, a prerequisite for accessing higher-order executive brain functions (Berardi & Morton, 2019).

As children acquire these capacities, they become better able to navigate developmental tasks and continue their recovery. This progression bolsters their sense of competence and self-efficacy, both of which are essential components of resilience. By fostering secure relationships and equipping individuals with emotional regulation strategies, trauma-informed practices help lay the groundwork for long-term healing, adaptive functioning, and overall well-being (Berardi & Morton, 2019).

Trauma-Informed School Practices Framework

The Trauma-Informed School Practices (TISP) model (Berardi & Morton, 2019) guided this study. The TISP model outlines the essential knowledge, abilities, and attitudes aligned with trauma-informed teaching expertise. It draws upon trauma-informed research, incorporating recent advances in understanding the neurobiology of stress and trauma, developmental theories, and proven methods for facilitating recovery and resuming normal development. This model is designed to be both sequential and cyclical, with each stage building upon the previous one to enhance a student's capacity to engage in various tasks (Berardi & Morton, 2019). Figure 1

presents the TISP model, and Figure 2 shows the research and conceptual elements contributing to it.

Figure 1

TISP Model

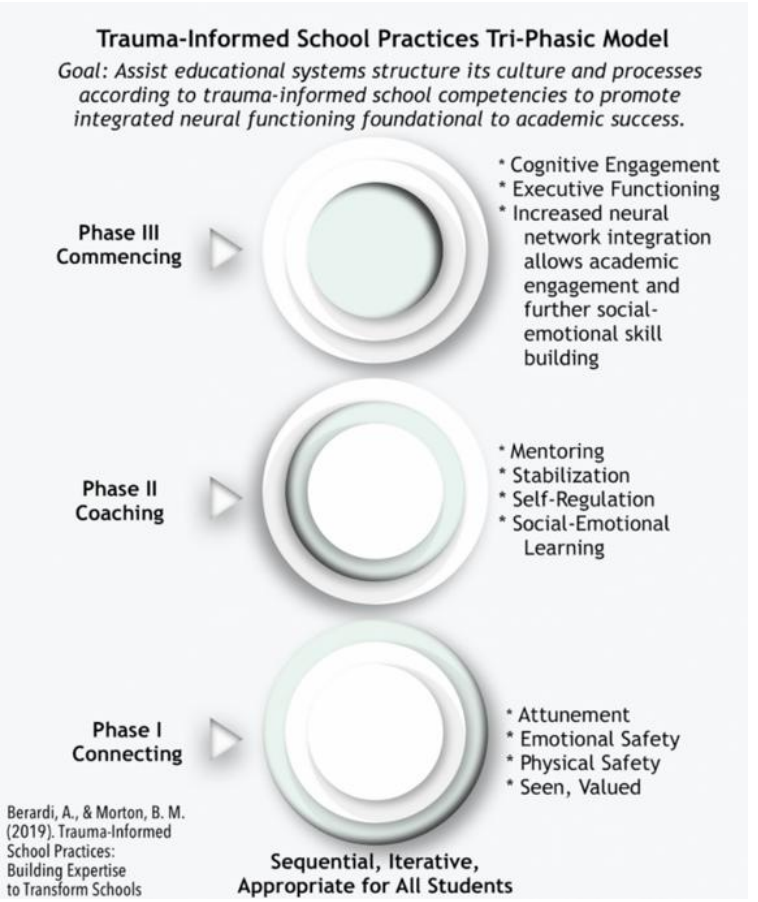
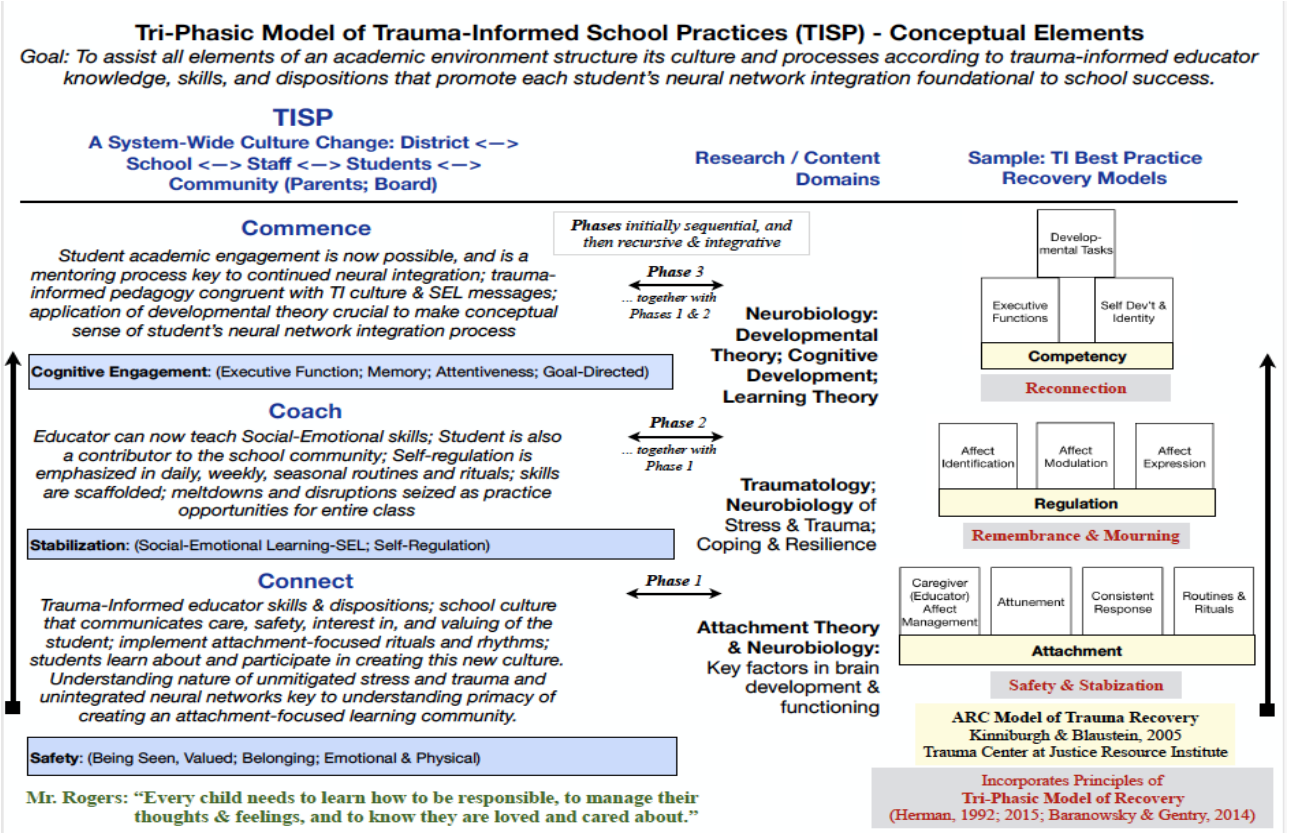


Figure 2

Tri-Phasic Model of Trauma-Informed School Practices (TISP)



Course readings, activities, and assignments were designed to facilitate student / participant ability to connect, coach, and commence with all students, but with particular focus on Ukrainian refugee students.

Methods

The context and timing of this course are critical to understanding the full context of the course, the research, and the students/participants' underlying emotional mindset.

To begin, this course was supported by the U.S. Department of State Fulbright Specialist Program in collaboration with the Estonian Fulbright Commission. The course was taught both online and in person. The face-to-face seminars began on February 28, 2022, four days after the war in Ukraine started, marking the most significant conflict in Europe since World War II.

Estonia, a border country with Russia, and a country with a similar, shared history with the Ukrainian people due to occupation by the Soviet Union until 1991, meant that many Estonians saw themselves in the eyes of the Ukrainian women and children who fled to Estonia.

Ukrainians came in large numbers to Estonia. Estonians, with "no previous experience of hosting unexpected large numbers of war refugees" (Kravchenko & Strömpl, 2024, p.218), sprang into action, welcoming Ukrainians into their homes, donating clothing and household goods, and volunteering in various capacities. Many Estonians had friends and family in Ukraine or knew people who did. They met the need with generosity and kindness.

Estonians were also anxious about the possibility of a similar invasion from Russia. It is estimated that more than 80,000 Russian citizens were living in Estonia when Russia invaded Ukraine. This, along with a shared eastern border, adds to the fear that Russia would invade Estonia. Several colleagues shared they were instantly transported back to memories of rationing under the Soviet Union. Estonian citizens began gathering grocery staples and non-perishable goods, including hand-cranked radios and candles, to prepare for potential widespread power outages. Two of my students shared that they had joined the Women's Voluntary Defence Organisation, Estonia's state-run paramilitary defense, where they received basic military skills, firearms training, and other tactical training. Students also shared that they had created emergency plans with friends and family members, should the emergency siren system go off. Needless to say, emotional tensions were high and at times spilled over into tears during this course. However, they came to learn how to welcome Ukrainian refugee students into their classrooms with a trauma-informed approach.

Training

Over the course of the semester, the students read three books on trauma and trauma-informed care in schools. These included: *The Body Keeps The Score* by Bessel van der Kolk (2015), *The Boy Who Was Raised As A Dog*, by Bruce Perry (2017), and *Trauma-Informed School Practices: Building Expertise to Transform Schools* by Berardi and Morton (2019). In addition to the readings, the students participated in multiple activities focused on social-emotional learning and trauma-informed strategies for use in the classroom. They also earned their Psychological First Aid certification through the National Child Traumatic Stress Network. At the end of the course, the students completed two writing assignments designed to explore their understanding of trauma-informed practices: a long-term and a short-term implementation plan, and a specific plan to welcome Ukrainian refugee students using trauma-informed practices immediately. These assignments are explained below.

Participants

The participants were students enrolled in a trauma class at Tallinn University and the University of Tartu in the Spring semester of 2022. Participants were teachers, school assistants, or students pursuing a degree in education. A total of n=63 participated in this study. Their participation was voluntary.

Data collection

Data were collected at two specific points during the semester: the first day of class and the end of the semester. The data that was collected included:

- ARTIC - 35 survey for educators
- Writing assignments

This study utilized a mixed-methods approach to gain a rich understanding of Estonian teachers' attitudes and dispositions toward the inclusion of trauma-informed practices in their classrooms. The study used survey design, course assignments, and in-class activities to collect data.

Survey

The Attitudes Related to Trauma-Informed Care measure, referred to as the ARTIC Scale, was specifically chosen to capture attitudes toward trauma-informed care. The ARTIC scale captures professional attitudes toward trauma-informed care. Validated tool to measure trauma-informed care. Co-developed by Dr. Courtney Baker, Tulane University, and the Traumatic Stress Network. There are multiple versions for different environments: Schools, Human Service organizations, State agencies, etc.

I chose to administer the ARTIC 35 for Education. This tool measured professional attitudes among people working with children in school settings and in settings where trauma-informed practices have not yet been implemented.

- The ARTIC-35 tool was selected.
- End-of-course assignments.
- Writing assignments

Two writing assignments were completed at the end of the course. These two included a summative assessment in which students created a plan to implement what they learned in class, and the second focused on how they would support Ukrainian refugee children enrolled in Estonian schools. Both are described in detail.

Assignment #1: The trauma-informed Estonian teacher

Develop a plan to become a trauma-informed educator. Include a discussion about what has influenced your thinking about children/youth impacted by trauma and the needs they have. Consider the following:

- What steps will you need to take to create a trauma-informed environment?
- What materials/resources will you need, and how will you use these?
- What practices will you implement?
- What do you need to do to prepare yourself to be trauma-competent?

These questions are not exhaustive but should guide your thinking. Write a four to five-page paper, plus an additional page for the reference list. All sources should be cited in the reference list and in the body of the paper. The paper is to follow a reflective paper model, not a research report.

Assignment #2: Response to Ukrainian Refugee Students

If tomorrow you learned you would have Ukrainian refugee students in your classroom, what would you do to prepare? What would you want to keep in mind when you enter your classroom?

Ethical considerations

Before the study was conducted, Institutional Review Board approval was received from the University of Mary Hardin-Baylor. Once approved, the application was submitted to the Tallinn University Ethics Committee, which also approved it. In addition to these approvals, the emotional well-being of my participants was also at the forefront of this research. Even before the course began, I received a few emails from participants/students asking whether they could bring infant-aged children to class with them, as they were afraid to be away from their children due to the war and the threat of a Russian invasion of Estonia. To meet this need, during each class

session, participants, including me, took turns holding the babies during in-class activities so everyone could participate. I also began and ended each class session intentionally to promote emotional well-being by acknowledging the war, providing space for verbal processing, and leading exercises designed to calm the mind and body. As a group, we agreed to take frequent breaks and to honor the voices and experiences of all in the room, including comforting students when emotions came through tears. I was available before and after class for further discussion, and I provided contact information for on-campus mental health services.

Research questions

The following research questions guided this mixed-methods study:

RQ 1: What are Estonian teachers' attitudes and dispositions toward implementing trauma-informed practices, as measured by the ARTIC-35 survey?

RQ 2: How do Estonian teachers articulate their responses to having Ukrainian refugee students in their classrooms?

RQ 3: How do they plan to implement trauma-informed practices to support these students?

Research Question 1 Hypothesis

It is hypothesized that the teachers will have an average ARTIC-35 score of 5.00/7.00 or higher, thereby indicating support for trauma-informed care. This hypothesis is based on several factors. First, Baker et al.'s (2020) follow-up ARTIC validity study had a mean ARTIC-35 score of M = 5.32. Second, Schafer's (2019) study found that 80% of participants began the professional development seminar with a positive attitude towards trauma-informed care. This hypothesis was further informed by participants' decision to enroll in the course, and given Estonia's similar history to Ukraine and their shared historical trauma, it was hypothesized that they might have supportive attitudes toward supporting children impacted by trauma.

Findings

Quantitative Findings

Paired-samples t-tests were conducted to examine the effect of the intervention on participants' scores across five domains: Cause, Response, On-the-job behavior, Self-efficacy at work, and Reactions to the work. Results are shown in Table 1.

Table 1

Paired Samples t Test for the Difference Between Pretest and Posttest Scores

Domain	Pretest M	Pretest SD	Posttest M	Posttest SD	t	p	d
Cause	5.4105	.70097	5.9321	.62653	< .001	< .001	-.958
Response	5.7056	.79160	6.1811	.69652	< .001	< .001	-.731
On-the-job behavior	5.3678	.74224	5.9141	.71830	< .001	< .001	-.994
Self-efficacy at work	5.3157	.80111	5.8478	.70965	< .001	< .001	-.693
Reactions to the work	5.5714	.73220	6.0113	.60960	< .001	< .001	-.752

N=63. d represents Cohen's d.

The results for the first subscale, Cause, showed an increase from a pretest mean (M) of 5.41 (SD = 0.70) to a posttest mean of 5.93 (SD = 0.63), t(62) <.001, p < .001 with a large effect size (Cohen's d = -0.958). On the Response scale, scores rose from M=5.71 (SD = 0.79) to M = 6.18 (SD = .70), t (62) <.001, p <.001, also reflecting a large effect size (d = -0.731). For On-the-job behavior, the pretest mean was 5.37 (SD = 0.74), increasing to 5.91 (SD = 0.72), t (62) <.001, p <.001, with a substantial effect (d = -0.994). An increase was also observed in Self-efficacy at work, where mean scores increased from 5.32 (SD = 0,80) to 5.58 (SD = 0.71), t (62) <.001, p <.001, with a moderate to large effect size (d = -0.693), t (62) <.001, p <.001, with a large effect

size (d = -0.752). Last, Reactions to the work increased from M=5.57 (SD = 0.73) to M = 6.01 (SD = 0.61), t (62) <.001, p <.001, with a large effect size (d = -0.752).

These findings indicate that the intervention was associated with statistically and practically significant improvements across all measured constructs. The observed effect sizes, all in the medium to extensive range, suggest that the changes were not only statistically reliable but also of meaningful magnitude.

Qualitative Findings

Writing Assignment #1: The trauma-informed Estonian teacher

Four themes emerged from the first writing assignment: safety (both emotional and physical), neurobiology, modeling, and tools.

Safety

The responses showed that Estonian teachers are committed to providing a safe classroom where all students feel welcome. One student said, “I would have to make sure that every child in my classroom feels safe. That every child feels that they are at peace, feels loved by their peers and teacher.” Another wanted to keep their own expectations in mind, given what the child may have gone through. They said, “I have to control myself to create trust. I have to think about what I say or how I act if a child is not behaving or following our classroom rules.” Another wanted to remember the importance of not giving up on any child. They shared,

> Some might be very resistant to your help, but you cannot give up. Probably everyone before you has, so you must not do it. Because the kid is perhaps so sure that you are going to quit anyway, as the others did. So they might be sitting there thinking, “I dare you to motivate me.”

Neurobiology

The students also mentioned the impact of learning about the neurobiology of trauma and how this will influence their classroom practices. One said,

> This course allowed me to reflect and understand the biology of trauma. I took time to read again the books and reflect my own traumatic experiences in the childhood. I also thought about my students and parents, with whom I or my mom (who is working at the police with foster kids and family violence) have worked with."

Another shared, "In this course I became aware of the essence of trauma, how and what parts of the human brain it affects the most, how trauma survivors may react in different situations and what I can do to help as a person and as a teacher." One student reflected on the importance of listening to and believing the child. They said,

As an adult, it is so common to minimize the meaning of a child's brief, horrific trauma experiences, and when these actions take place, not to realize that in the future they could lead to severe problems at home, in kindergarten, at school, and in public places. The belief in children's resilience is widespread (Perry & Szalavitz, 2016), and that is why every education system needs trauma-informed educators."

One student commented that "becoming a trauma-informed educator requires from the teacher ability to see forest behind the trees (the saying in Estonia, in English it is different). You cannot think that a child's behavior is a child's nature.

Modeling

Last, several shared activities or how to model social-emotional strategies to support student self-regulation. One student said,

> Doing short physical activity with the students, like Starfish jumps, will help my students. Students in my class are young and very energetic. Many of them have ADHD symptoms. Short, physically challenging activities in between lessons can really help them regulate their focus and release steam."

Modeling behavior, including how to manage big emotions, was the focus of another student's submission. They shared,

> Practicing modeling calm behavior as a class teacher is important. This is a challenge I need to practice every day and probably for the rest of my teaching career. It is so important for a teacher to stay calm and collected. Children who have trouble controlling their emotions NEED an adult by their side who can control their feelings."

Tools

Another student planned to create a sensory station in their classroom or in a shared space at the school. They said, "Having kinetic sand or sensory rice stations somewhere in our school will support the social-emotional needs of our students. This station needs to either have its own room (maybe the calm down room)."

Writing assignment #2 end of course - Response to Ukrainian Refugee Students

This assignment yielded two themes: physical and emotional safety and connection. One student shared,

> For the refugee students my first plan would be to make them feel welcomed and create a safe classroom atmosphere for them. I would choose two or three Estonian students from the class who could be the little helpers for the refugee students. They would try to answer the refugee's student's questions and help them around in the building. I sincerely hope

that the Estonian students and their parents would be able to help to gather some school supplies and clothes for the new kids.

Three additional students shared their thoughts for connection and inclusion. One said, “It is very important to try to build with them a healthy relationship and safe environment. They must feel that they are not outsiders and are welcome into this society.” Another, “Positive interaction, acceptance, unconditional regard and kind words are very important. They must feel that they can talk with me every time if they have some concern or any information or experience that they want to share. And, “Maybe it would be good to reorganize the classroom to get more integrated with other students. And also there has to be a private place, where to be alone if it is needed for refugees.”

The last student shared a unique situation in which they were able to provide support. They shared,

> I have been working in a school for children with special needs and there I had one boy who came from Ukraine due to the war. He is really young, not even old enough to attend school yet, but the school still accepted him. We as the educators involved him in all of the school work that was possible. For example, when others did math or Estonian language exercises, he was asked to put some puzzles together. We tried to involve him in all of the activities so he wouldn’t feel left out. As a person who doesn’t speak Russian at all I had to talk to him only in Estonian and it was such a joy to one day hear him answering to me in Estonian.

Discussion

Overall, the students scored high on the ARTIC Scale, indicating they had positive professional attitudes toward trauma-informed care for students. This could explain why the

majority of Ukrainian students felt welcome and cared for by their teachers. This is also a rationale for why trauma-informed education is critical for all school personnel. However, it is nonexistent in the majority of teacher and administrator preparation programs worldwide. As a result, “trauma management within classrooms tends to be instinctive, reactive, and based on human instinct such as compassion, empathy, and understanding” (Frearson & Duncan, 2024, p. 564). A lack of formal training in trauma and cultural competence can lead to unintentional insensitivity and inadequate support (Nagasa, 2014; Pines, 2002). Prior research has called for teacher training that included “a mix of theory and a range of strategies and techniques they could draw upon to adapt to tailor their approach to each child” (Frearson & Duncan, 2024, p. 564). While there are multiple approaches to trauma-informed training, what is important is that trauma-informed education is included in teacher and administrator preparation programs and offered as professional development throughout these professionals' careers.

Limitations

The results from this study reveal positive growth in attitudes to trauma-informed practices. However, there are a few important limitations to note. First, given the Estonian shared history of Soviet occupation with Ukraine and their actions immediately following the invasion of Russia into Ukraine to meet refugee needs, the findings are not surprising. The data were collected during the early stages of the war, over a single semester. Given these limitations, a longitudinal research study to explore the long-term implementation practices and effectiveness would be warranted. Additionally, a study exploring student outcomes would help provide a more complete picture of how trauma-informed practices may contribute to academic outcomes. Lastly, implementing this same model in a country with a similar population of Ukrainian students would help determine whether it is independent of location.

Conclusion

Meeting the needs of children who have suffered unimaginable hardships is a moral imperative. These children did not choose displacement, trauma, or loss. They are innocent victims of geopolitical conflict who deserve compassionate, practical support. Providing trauma-informed practices supports teachers, administrators, children, and families as they work together to help children transition and grow academically and socially in a new environment. Educational institutions can no longer afford to wait for the next crisis to implement these evidence-based practices. Every day without trauma-informed approaches represents a missed opportunity to transform not just individual lives, but entire communities.

References

Barrett, B. J., & Berger, E. (2021). Refugee children and mental health: A review of recent literature. *Child and Adolescent Social Work Journal, 38*(6), 1259–1272. https://doi.org/10.1007/s10560-021-00761-9

Berardi, A., & Morton, B. (2017). Trauma-informed practices and resilience in education. *Journal of Social, Behavioral, and Health Sciences, 11*(1), 1–14.

Berardi, A., & Morton, B. (2019). Trauma-informed educational practices: Building resilience in students and schools. *Journal of Educational Research and Practice, 9*(1), 22–37.

Berger, E., Barrett, B. J., & Luthra, R. (2021). Implementing trauma-informed practices in schools: A research synthesis. *Children and Youth Services Review, 128*, 104200. https://doi.org/10.1016/j.childyouth.2021.104200

Berger, E., Bearsley, A., & Lever, M. (2021). Qualitative evaluation of teacher trauma knowledge and response in schools. *Journal of Aggression, Maltreatment & Trauma, vol 30*(8), 1041–1057. https://doi.org/10.1080/10926771.2020.1806976

Chafouleas, S. M., Johnson, A. H., Overstreet, S., & Santos, N. M. (2016). Toward a blueprint for trauma-informed service delivery in schools. *School Mental Health, 8*(1), 144–162. https://doi.org/10.1007/s12310-015-9166-8

Denov, M., Akesson, B., Khan, F., & Pierre, J. (2019). Family resilience in the context of war and displacement: An exploratory study of Syrian refugees. *Journal of Refugee Studies, 32*(1), 35–52. https://doi.org/10.1093/jrs/fey019

European Commission. (2022). Temporary protected Ukrainians and other Ukrainians in Estonia 2022. https://migrant-integration.ec.europa.eu/library-document/temporary-protected-ukrainians-and-other-ukrainians-estonia-2022_en

Frearson, L., & Duncan, M. (2024). Exploring trauma-informed approaches in the classroom: Perspectives from educators. *Pastoral Care in Education, 42*(4), 562–575. https://doi.org/10.1080/02643944.2023.2184823

Hodes, M. (2023). Mental health care for asylum seekers and refugees: Moving forward. *International Journal of Social Psychiatry, 69*(1), 6–12. https://doi.org/10.1177/00207640221098010

Javanbakht, A. (2022). The psychological toll of the war in Ukraine. The Conversation. https://theconversation.com/the-psychological-toll-of-the-war-in-ukraine-179069

Ko, S. J., Ford, J. D., Kassam-Adams, N., Berkowitz, S. J., Wilson, C., Wong, M., ... & Layne, C. M. (2008). Creating trauma-informed systems: Child welfare, education, first responders, health care, juvenile justice. *Professional psychology: Research and practice, 39*(4), 396.

Kruszewska, D., & Lavrenova, O. (2022). *Children and war: The mental health impact of the conflict in Ukraine*. UNICEF Office of Research-Innocenti. https://www.unicef-irc.org/article/2281-children-and-war-the-mental-health-impact-of-the-conflict-in-ukraine.html

Lowry, S., Hayton, S., & Bradbury, A. (2022). Teachers' preparedness to support mental health needs: A UK perspective. *Educational Psychology in Practice, 38*(2), 153–169. https://doi.org/10.1080/02667363.2021.1973150

Morton, B. M. & Berardi, A. (2017). Trauma-informed school programming: Applications for Mental Health professionals and Educator partnerships. *Journal of Child and Adolescent Trauma.* https://doi.org/10.1007/s40653-017-0160-1

Nagasa, K. A. (2014). Refugee students in Canadian schools: The role of teachers and educators. *Canadian Journal of Education, 37*(2), 1–26.

Kravchenko, Y., & Strömpl, J. (2024). *Ukrainian Refugee Children in the Estonian Education System During the Russian Invasion of Ukraine: Vulnerable, Traumatised and Displaced.* In Child Vulnerability and Vulnerable Subjectivity: Interdisciplinary and Comparative Perspectives (pp. 215–232). Springer Nature Switzerland.

Perfect, M. M., Turley, M. R., Carlson, J. S., Yohanna, J., & Gillespie, R. (2016). School-related outcomes of traumatic event exposure and traumatic stress symptoms in students: A systematic review of research from 1990 to 2015. *School Mental Health, 8*(1), 7–43. https://doi.org/10.1007/s12310-016-9175-2

Perry, B. D., & Szalavitz, M. (2017). *The boy who was raised as a dog: And other stories from a child psychiatrist's notebook* (3rd ed.). Basic Books.

Pines, M. (2002). Supporting refugee children in the classroom: The teacher's role. *Multicultural Education, 9*(4), 16–20.

President of Ukraine. (2024, March 7). How the war has changed Ukrainian children and the challenges they face. https://www.president.gov.ua/news/yak-vijna-zminila-ukrayinskih-ditej-ta-yaki-vikliki-na-nih-c-89341

Record-Lemon, R. M., & Buchanan, M. J. (2017). Trauma-informed practices in schools: A narrative literature review. *Canadian Journal of Counselling and Psychotherapy, 51*(4).

Shelashska, R. (2025). Mental Health and Parenting Among War-Affected Ukrainian Families: A Multi-Context Study (Doctoral dissertation, Texas Christian University).

Slone, M., & Peer, A. (2021). Children's Reactions to War, Armed Conflict and Displacement: Resilience in a Social Climate of Support. *Current Psychiatry Reports 23*(11). https://doi.org/10.1007/s11920-021-01283-3

Sullivan, A. L., & Simonson, G. R. (2016). A review of the research on school-aged refugees: Implications for best practices. *Psychology in the Schools, 53*(7), 694–708. https://doi.org/10.1002/pits.21914

Switchboard. (2020). *Trauma-informed care: A primer for refugee service providers*. https://www.switchboardta.org/wp-content/uploads/2020/01/Trauma-informed-Care-A-Primer-for-Refugee-Service-Providers.pdf

Szente, J., Hoot, J., & Taylor, D. (2006). Responding to the special needs of refugee children: Practical ideas for teachers. *Early Childhood Education Journal, 34*(1), 15–20. https://doi.org/10.1007/s10643-006-0082-2

Toros, K., Kozmenko, O., & Falch-Eriksen, A. (2024). 'I just want to go home, is what I need'– Voices of Ukrainian refugee children living in Estonia after fleeing the war. *Children and Youth Services Review*, *158*, 107461.

van der Kolk, B. (2015). *The body keeps the score: Brain, mind, and body in the healing of trauma*. Penguin Books.

© 2026 CGE – Consortium for Global Education

Justin Joy, Shibu K Mani & Helen Josephine VL

Christ University, India

Vol 5:3 2026

First Author Note

ORCID Number: 0000-0002-6482-1057; justin.joy@christuniversity.in

Abstract

This paper examines a transparency and community engagement initiative implemented within a statewide network of fully residential schools in Karnataka, India, designed to deliver equitable education to children from marginalized backgrounds. While these schools consistently met basic service standards, their operations were largely inaccessible to the public, which contributed to a sense of isolation and limited trust between institutions and communities. Recognizing this gap, administrators introduced a low-cost, participatory practice that required each school to share daily photographs of four elements: the day's menu, plated meals, children during mealtimes, and kitchen spaces.

Keywords: Social justice, Community engagement, Transparency, Visibility, Education reform

Introduction

In India, the intersection of education and social justice remains a critical domain for policy and practice, particularly concerning children from historically marginalized communities such as Scheduled Castes (SCs) and Scheduled Tribes (STs). While access to schools has expanded through constitutional mandates and large-scale programs like the Sarva Shiksha Abhiyan and the Mid-Day Meal Scheme, disparities in the quality of education and the lived school experience persist (Govinda, 2022; Oxford Human Rights Hub, 2025).

The 2020 National Education Policy (NEP) aspires toward a more inclusive, equitable, and learner-centered educational system. However, systemic inequalities, deeply rooted in India's

socio-economic structure, continue to shape educational outcomes (Moore, 2017; Swift, 2001). Within this context, there is growing recognition that dignity, visibility, and community participation are foundational elements of effective reform, particularly in residential school systems serving marginalized children (Kwon et al., 2020; Daly & Chrispeels, 2008).

Legal and Institutional Framework

The Government of India's Mid-Day Meal (MDM) Scheme, governed by the 2015 Mid-Day Meal Rules, mandates nutritional benchmarks for children aged 6–14 during school hours (Assan et al., 2020; Irani et al., 2021). These regulations are designed not only to improve attendance and nutritional status but also to reinforce the constitutional value of equality in educational access (Govinda, 2022).

Addressing Nutritional Needs

The need for adequate nutrition in schools is underscored by national reports highlighting stagnant funding for midday meal programs and the impact of rising food inflation on food quality in government schools. Proper nutrition is foundational for cognitive engagement, as evidenced by improvements in children's focus and participation during lessons when meals are provided (Assan et al., 2020; Irani et al., 2021; Economics of Education Review, 2021).

Holistic Learning Experience

Meals serve as a catalyst for enhanced educational engagement. When children are nourished, they exhibit greater curiosity and enthusiasm for learning (Chakraborty et al., 2019). This holistic approach to education recognizes that emotional and physical well-being are crucial for academic success. For instance, students' concentration levels significantly improve when they have access to nutritious meals, highlighting the integral relationship between nutrition and learning outcomes (Assan et al., 2020; Irani et al., 2021).

However, critiques of the MDM program reveal stagnation in funding, inconsistent food quality, and administrative opacity, which can alienate the very communities the program

intends to support (Govinda, 2022). The implementation of such schemes, particularly in residential institutions like those under the Karnataka Residential Educational Institutions Society (KRIES), requires not only compliance but also innovation in transparency and community trust-building (Kaur, 2021).

Transparency and community trust building are essential components of effective governance and social cohesion. Transparency involves open communication, accessible information, and clear decision-making processes, allowing community members to understand and participate in matters that affect them positively. By fostering transparency, organizations and institutions can demonstrate accountability and integrity, which are crucial for building trust. Trust building, in turn, requires consistent, honest interactions and a willingness to address concerns and feedback from community members. When leaders and organizations prioritize transparency and actively engage in trust-building efforts, they create an environment of mutual respect and collaboration. This approach can lead to increased civic participation, improved community relations, and more effective problem-solving, ultimately strengthening the social fabric and enhancing the overall well-being of the community (Afiyah, 2024; Kwon et al., 2020).

Transparency means being open, sharing information, and taking responsibility for decisions. When organizations and leaders are clear and honest about what they are doing and why, people in the community are more likely to trust them. Building trust requires time and effort. It involves talking to people, listening to their concerns, and demonstrating that you can be relied upon. Transparency and trust-building create a positive cycle. More openness leads to more trust, which encourages even more openness and teamwork (Daly & Chrispeels, 2008; Moore, 2017).

This process can strengthen communities by improving relationships between people and leaders, enabling more effective problem-solving, and increasing participation in local projects.

Ultimately, focusing on transparency and building trust can create communities where people work together better, are more involved, and get along well with each other.

Transparency in educational administration is essential for fostering trust among parents seeking the best outcomes for their children. Clear and consistent communication and visible accountability practices reassure families that institutions prioritize student welfare, thereby strengthening community engagement and promoting a more inclusive and responsive educational environment (Swift, 2001).

The following practice situation demonstrates how strategic transparency, combined with the innovative yet low-tech use of digital tools, contributed to enhancing the delivery of mid-day meals in government residential schools.

By mandating the daily sharing of photographs depicting meals, menu charts, dining areas, and kitchen environments, the initiative significantly enhanced public visibility and institutional accountability within government residential schools. This transparent and low-cost practice not only led to measurable improvements in the consistency, hygiene, and presentation of mid-day meals but also cultivated a renewed sense of pride and ownership among school staff. Framed as a participatory process rather than a top-down compliance mechanism, the intervention demonstrated how visibility can serve as a catalyst for service enhancement and community trust-building. The following case narrative explores this transformation in greater detail.

The KRIES Context: A Closed System

KRIES (Karnataka Residential Educational Institutions Society) operates over 900 fully residential schools in Karnataka, India primarily catering to SC/ST students. Despite functioning efficiently on paper,with meals, lodging, and education provided,the schools operated in relative isolation. Community members, including parents, rarely entered the premises; reporting was hierarchical and limited to internal audits. While basic standards were

met, the absence of public visibility or participatory oversight fostered detachment and muted accountability.

During visits, school administrators often reported "no issues," yet observations revealed children eating in silence, kitchens marked by routine rather than care, and a lack of joyful engagement. It was a system that worked,but it was invisible, bureaucratic, and emotionally sterile.

Methodology

This study employs a qualitative, practice-based research design grounded in digital ethnography and visual content analysis to examine the role of low-tech transparency in reshaping institutional behavior within government residential schools. The data corpus is composed primarily of publicly available Twitter posts shared by over 800 Karnataka Residential Educational Institutions Society (KRIES) schools, as part of an administrative intervention aimed at improving mid-day meal delivery, institutional pride, and community trust.

Data Sources and Collection

The primary dataset comprises social media content generated between January 2024 and June 2024, during the early months of the intervention. Each participating school was encouraged to share images daily on Twitter that conveyed the daily menu chart, pictures of meal close-ups with children eating meals, along with the kitchen or serving areas. In addition to images, captions accompanying these posts,often written by school staff,were also analysed for tone, intent, and engagement.

A total of 420 posts were systematically archived for analysis. These were captured manually from official school Twitter handles, most of which were created or activated specifically for this initiative. The visual and textual data were organized chronologically and geographically by district, allowing for comparisons across time and place.

Supplementary data included:

Internal implementation memos from KRIES (to understand institutional framing), Informal WhatsApp communications from school groups (to assess internal peer feedback), and Observational notes from administrative field visits.

No student-identifying information was collected or analyzed, and all data remained within the bounds of publicly available or officially sanctioned communication channels.

Analytical Framework

The methodology integrates two primary approaches:

Visual Content Analysis:

- Each image was coded for the presence of specific visual elements related to:
- Food hygiene and plating (e.g., clean steel plates, variety, garnishing),
- Kitchen environment (e.g., cleanliness, organization, safety),
- Student engagement (e.g., body language, expressions, posture),
- Inclusion of value-added elements (e.g., nutrition posters, educational displays, community involvement).
- Trends in image quality, composition, and creativity were also noted, particularly in schools that moved beyond the basic compliance of photo-posting and began innovating with presentation.

Textual and Behavioral Analysis of Tweets:

Captions were reviewed to extract sentiments, tone, and evolving vocabulary. Tags such as #PrideInService or #DignityInEveryMeal emerged organically, signaling the cultural shift around the initiative. Texts were thematically coded to identify recurring motifs such as ownership, participation, compliance, and innovation.

Engagement metrics (likes, retweets, comments) were also considered to gauge public response, although not analyzed quantitatively. Select cases where tweets triggered feedback

loops (e.g., corrections, recognitions, or administrative visits) were documented to highlight the role of visibility in governance responsiveness.

Observational Component

Field visits by administrative staff,including the Principal Secretary of KRIES,were recorded as informal observational notes. These observations focused on:

- Reactions of school staff to the posting routine,
- Behavioral shifts in meal preparation and service,
- Differences between photographed meals and actual practices.

These notes served to triangulate the digital data and provided ground-level context to support or complicate conclusions drawn from online materials.

Ethical Considerations

As the study relied on publicly available institutional social media content and did not involve direct interaction with students or personal data, formal ethical clearance was not required. However, care was taken to anonymize school names in the analysis unless public recognition was central to the case being discussed.

Ethical considerations form an integral part of the methodology. Given the involvement of schools and potentially vulnerable populations, the study adheres to strict ethical guidelines. This includes ensuring informed consent, maintaining confidentiality, and protecting the privacy of individuals involved in the study. The research also considers the potential impact of the study on ongoing educational processes and aims to minimize any disruptions to school operations.

This methodology is designed to provide a comprehensive and nuanced understanding of the KRIES intervention. By combining various methods and drawing from a robust theoretical framework, the study aims to contribute valuable insights into the implementation and impact of educational reforms in the State of Karnataka, India. The findings from this research have

the potential to inform future policy decisions and contribute to the broader discourse on educational interventions, public accountability, and social justice in education.

The Initiative: From Surveillance to Visibility

The practical application of this methodology unfolded as follows: A pivotal moment of this initiative came when a tweet posted by a former teacher showed two different breakfasts,idlis and rice,served in the same school. While the issue was logistical (the batter had run out), the image raised questions about equity and consistency. Recognizing the power of a single photo to communicate truth beyond formal reporting, the Principal Secretary proposed a radical idea: use photos, not files, to let the system speak for itself.

The initiative asked each school to share via low-tech platforms like WhatsApp or Twitter/X:

- The day's menu chart
- A close-up of the food plate
- A photo of children eating
- The kitchen workspace

No new app, no budget outlay, no extra staff. Just light, decentralized visibility. Figures 1 and 2 show photographs posted on Twitter depicting students during mealtimes.

Figure 1

Karnataka Chief Minister with Students During Meals

Figure 2

Lunch Time in a KRIES School

Findings and Observations

Visibility Fosters Dignity

The daily act of photographing meals began to change behavior. Cooks cleaned more carefully. Children smiled at the camera. Menus became neater. Visual documentation promoted a sense of pride and accountability, and more importantly, restored a sense of dignity in a routine that had become mechanical (Moore, 2017; Swift, 2001).

Low-Tech Tools, High Impact

Within weeks, over 800 schools participated. Teachers, cooks, and principals began to internalize the practice—not as surveillance, but as celebration. Some schools added flower borders to menus. Others included health tips or even nutritional facts. These acts of self-expression affirmed ownership over the process and allowed school culture to become visible (Irani et al., 2021).

Community Trust and External Engagement

As images spread on social media, parents, community leaders, and even elected officials began engaging with the posts. Retweets by MLAs became common. For families unable to visit campuses, the photos offered daily reassurance: their children were seen, fed, and valued (Kwon et al., 2020; Afiyah, 2024).

Unintended but Valuable Feedback Loops

One photo showed a boy standing behind a seated girl while others ate. It raised concerns about seating arrangements. The moment was innocent, but it reflected how public attention invites accountability, even for unintentional details (Daly & Chrispeels, 2008).

Sustainability Without Infrastructure

The model's greatest strength was its sustainability. It required no contractors, no procurement, no tech rollouts. It leveraged human motivation—dignity, recognition, and shared responsibility—to drive improvement (Govinda, 2022; Assan et al., 2020).

Discussion: A Model of Grassroots Reform

The KRIES initiative illustrates a replicable model for education systems—particularly in low-resource settings—where visibility, rather than surveillance, becomes a vehicle for transformation. Instead of relying on complex, top-down dashboards or compliance mechanisms, the practice demonstrated that representation, when localized and meaningful, generates better outcomes. This framework aligns with broader discourses on social accountability and participatory monitoring and reflects the core National Education Policy 2020 goal of creating a learning environment that respects the dignity of every child (Moore, 2017; Swift, 2001).

Conclusion

What began as a reaction to a tweet evolved into a movement of cultural reform. By inviting schools to document their meals, KRIES enabled a shift in perspective: from institutions of care-as-duty to communities of pride and shared humanity.

The initiative represents a low-cost, high-impact approach that prioritizes dignity, fosters public engagement, and cultivates internal accountability. For policymakers and educators aiming to bridge the gap between institutions and communities,particularly in under-resourced or marginalized contexts,this model offers a compelling, scalable pathway.

Future Scope

This article has demonstrated how transparency, when implemented thoughtfully, can lead to constructive changes in public service delivery,particularly in educational institutions. The use of simple, low-cost communication tools such as social media has shown potential in improving accountability and encouraging pride among service providers.

Future research could investigate the design and implementation of customizable digital dashboards that summarize key indicators across government-run services. These dashboards should aim to enhance local-level monitoring in a way that supports rather than polices institutions,emphasizing contextual relevance, accessibility, and user ownership. For example, dashboards could visually represent patterns in school meal delivery, infrastructure use, or community engagement, based on real-time updates from decentralized sources.

Another promising area of study is the replication of visibility-driven interventions in other sectors, such as early childhood care centers, primary health clinics, or nutrition programs. Research could examine how publicly shared data or images influence service quality, user satisfaction, and staff motivation in different institutional contexts.

Moreover, future work could assess the long-term impacts of such practices on institutional culture. Questions worth exploring include whether repeated acts of visual reporting change how staff perceive their roles, whether families develop stronger trust in public services, and how communities interpret and respond to the visibility of everyday service delivery.

Finally, integrating community feedback mechanisms,such as WhatsApp responses or voice-based surveys,could enhance two-way communication between institutions and citizens, offering new models of participatory governance. This line of inquiry opens up a broader discussion on how simple, inclusive digital tools can support equity, dignity, and responsiveness in public systems, particularly in resource-constrained environments.

References

Assan, J. K., Simon, L., Kharisma, D. D., Adaboh, A. A., Assan, N., & Al Mamun, A. (2020, October 31). *Assessing the impact of public-private funded midday meal programs on the educational attainment and well-being of school children in Uttar Pradesh, India. CASTE: A Global Journal on Social Exclusion, 1*(2), 193–214. https://doi.org/10.26812/caste.v1i2.143

Chakraborty, T., & Jayaraman, R. (2019). *School feeding and learning achievement: Evidence from India's Midday Meal Program. Journal of Development Economics, 139*, 249–265. https://doi.org/10.1016/j.jdeveco.2019.04.005

Daly, A. J., & Chrispeels, J. (2008). *A question of trust: Predictive conditions for adaptive and technical leadership in educational contexts. Leadership and Policy in Schools.*

Food and Agriculture Organization of the United Nations (FAO). (2025, August). *4. Conclusions.* Retrieved August 31, 2025, from https://www.fao.org/4/ag119e/AG119E06.htm

Govinda, R. (2022, February 21). *India: Learning in the margin.* In *Learning, marginalization, and improving the quality of education in low-income countries* (pp. 277–292). Open Book Publishers. https://doi.org/10.11647/OBP.0256.09

Irani, L., Schooley, J., Verma, S., & Chaudhuri, I. (2021). *Layering of a health, nutrition and sanitation programme onto microfinance-oriented self-help groups in rural India: Results from a process evaluation. BMC Public Health, 21*, 2131. https://doi.org/10.1186/s12889-021-12049-0

Kaur, R. (2021). *Estimating the impact of school feeding programs: Evidence from the mid-day meal scheme of India. Economics of Education Review, 84*, Article 102171. https://doi.org/10.1016/j.econedurev.2021.102171

Kwon, K. H., Shao, C., & Nah, S. (2020). *Localized social media and civic life: Motivations, trust, and civic participation in local community contexts. Journal of Information Technology & Politics.*

Moore, S. (2017). *Towards a sociology of institutional transparency: Openness, deception and the problem of public trust. Sociology.*

Oxford Human Rights Hub. (2025, August 17). *The sorry state of education in India.* Retrieved August 31, 2025, from https://ohrh.law.ox.ac.uk/the-sorry-state-of-education-in-india/

Swift, T. (2001). *Trust, reputation and corporate accountability to stakeholders. Business Ethics: A European Review.*

© 2026 CGE – Consortium for Global Education

Helen Josephine V L, Manohar Sivvala, Daparthi Dedeepya Divya

Vol 5:4 2026

School of Business and Management, Christ University, Bangalore, India

Author Note

ORCID Number: 0000-0003-2896-7005; helen.josephine@christuniversity.in

Abstract

The integration of artificial intelligence (AI) into education is transforming teaching and learning processes around the world. According to recent surveys, more than 70% of educational institutions have already implemented AI-driven solutions to increase learning results, accessibility, and engagement. Despite this progress, existing digital platforms mostly focus on content delivery and assignment management, with inadequate assistance for adaptive, interactive learning experiences. Students sometimes have difficulties in connecting their everyday study practices with planned course objectives, resulting in unequal information acquisition and decreased motivation. The research introduces EduGenius AI, an intelligent learning assistant developed to fill these gaps. The system provides interactive explanations, real-time academic support, personalized study plans, and engaging tools to promote self-directed learning. It additionally features multimodal elements that make interaction more accessible and inclusive to a diverse learners. EduGenius AI encourages continual academic progress by combining conversational AI and individualized educational support. The evaluation demonstrates its ability to work as an adaptive and interactive digital tutor, providing a scalable, ethical, and inclusive approach to AI adoption in global educational settings.

***Keywords**:* Artificial Intelligence in Education, Adaptive Learning, Personalized Study Plans, Conversational AI, Inclusive Digital Tutor

Introduction

The integration of digital technologies into education has increased at an unparalleled rate during the past decade. According to UNESCO, more than 90% of students worldwide engaged in some sort of digital learning during the COVID-19 epidemic, which drove the spread of online platforms and virtual classrooms. While Learning management Systems (LMS) like Google Classroom and Moodle have become common tools for disseminating assignments and resources, they are generally used for administrative purposes rather than providing adaptive, interactive learning opportunities. The disparity between organized course outlines and actual student development is a major difficulty in higher education and self-paced learning. Students frequently rely on fragmented study tools, generic recommendations, and delayed instructor response, resulting in inconsistent understanding of courses.

Approximately 60% of students are overwhelmed by managing multiple online resources and fail to fit their daily study habits with course objectives[1]. This discrepancy frequently leads to disengagement, missing deadlines, and shallow learning outcomes. Artificial intelligence (AI) has significant prospects for addressing these difficulties. AI-powered tutoring systems, for example, can assess learning behaviour, tailor explanations to the learner's level, and provide immediate feedback. According to the global AI-in-education industry will approach $25 billion by 2030, owing to increased need for personalization, intelligent evaluation, and accessibility technologies [2]. Beyond personalization, multimodal AI,which includes voice, text, and interactive chat,has been found to promote inclusion for students with diverse learning styles and accessibility requirements.

The present research presents EduGenius AI, a learning assistant powered by Google Gemini that aims to fill these gaps. Unlike typical LMS platforms, this one integrates many features into a single ecosystem, including topic explanations, chatbot queries, automated quizzes, study plan generation, Python code assistance, and multimodal engagement via speech recognition and text-to-speech. By combining these capabilities, the system aims to deliver ongoing, personalized, and interactive academic support.

The objectives of this study are:

1. To design and implement an AI-powered learning assistant that integrates multiple academic support features, such as topic explanations, interactive chatbot queries, automated quiz generation, structured study plan creation, code assistance, note summarization, and flashcard generation, within a unified platform.
2. To enhance accessibility and personalization in education by incorporating multimodal interaction (speech-to-text and text-to-speech) and delivering tailored, course-aligned recommendations that adapt to individual learning needs.
3. To evaluate the effectiveness and scalability of EduGenius AI in improving student engagement, alignment with academic objectives, and ethical AI adoption within diverse educational contexts.

Literature Review

Accurately building an interactive AI tutor that combines LLM-driven explanations, automated question generation, and voice I/O to improve accessibility and engagement remains central to AI-in-education research.

Kurdi et al. produced a systematic review of automatic question generation (AQG) techniques for educational use, showing that template-based and neural methods can reliably produce MCQs and short-answer items; when paired with tuning for curricular language, AQG systems substantially reduce teacher authoring time while maintaining acceptable item quality,

supporting EduGenius's automated quiz module as an efficient content generator[3]. Dennis et.al evaluated AI-powered speech recognition programs in EFL settings and found measurable improvements in pronunciation and speaking when ASR tools provide immediate, automated feedback, this supports integrating ASR-driven practice sessions as part of EduGenius's voice-enabled features, while flagging the need to log confidence scores and offer re-record prompts for low-confidence transcriptions [4].

Dai et al. reported that high-quality text-to-speech (TTS) improves reading comprehension and accessibility[5] specially for students with dyslexia or attention differences,but TTS effectiveness depends on voice naturalness and pacing; this endorses EduGenius's use of gTTS but suggests upgrading to higher-quality neural TTS (or offering adjustable speed/voice) for production-grade accessibility. Another research article demonstrated that pre-trained generative models can serve as core dialog/feedback engines while a separate pedagogical policy module controls hints and scaffolding, this architecture mirrors EduGenius's separation between LLM prompt outputs and UI-driven interactions (explanations vs. quizzes) and suggests implementing a thin pedagogical policy layer to moderate hints or stepwise solutions [6].

Recent applied studies of LLMs for content generation and code assistance show that transformer models can rapidly produce useful example code, summaries, and study plans, but that human editing greatly improves reliability; practical guidance for EduGenius includes (1) constrain generation length, (2) include "verify" or "regenerate" affordances in the UI, and (3) log model responses for audit and iterative prompt refinement,matching best practices in current LLM-assisted educational tools.

Method

a. Early Digital Platforms: LMS and MOOCs

The implementation of Artificial Intelligence (AI) in education began with digital learning platforms such as Learning Management Systems (LMS) and Massive Open Online Courses. These systems enabled students to access instructional content remotely, organize schoolwork, and track progress. Popular portals such as Moodle, Coursera, edX, and Khan Academy democratized learning by providing affordable and flexible access to high-quality resources. Despite these advancements, such platforms still had significant limits. They were mostly content-driven rather than learner-centred, providing the same curriculum to all users regardless of their individual pace, background, or interests. Passive learning experiences arose from a lack of tailored instruction, minimal interactivity, and low levels of human-like involvement. This constraint demanded the next step of advancement in AI-driven education.

Table 1

Comparison of LMS/MOOCs

Platform Type	Examples (Global/India)	Advantages	Disadvantages
Learning Management Systems (LMS)	Moodle, Blackboard	Centralized learning management, structured content delivery	Not personalized, rigid structure, one-size-fits-all learning
MOOCs	Coursera, edX, Swayam	Free/affordable, global access, scalability	Low completion rates, lack of personal feedback, limited adaptability
Video Lecture Portals	Khan Academy, NPTEL	Easy access to recorded sessions, self-paced	Passive learning, no interaction, no adaptive pathways
Assessment Platforms	Testbook, Byju's, Unacademy	Practice-based, analytics for performance	Feedback is generic, not individualized, cannot adapt to unique learning needs
Hybrid Portals	Udemy, UpGrad, Simplilearn	Combines video, projects, and peer interaction	Limited real-time personalization, focus remains on broad audience

b. Emergence of Humanoid Robots

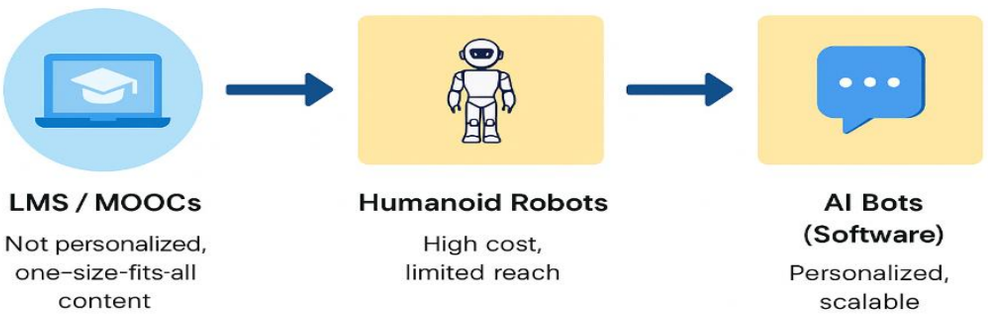
To address the lack of engagement and personalization in LMS/MOOCs, humanoid robots were integrated into the classroom. These robots aimed to imitate human-like interaction by providing real-time instructions, adaptive responses, and emotional engagement. Examples from India include the Mitra Robot in Bengaluru (designed by Invento Robotics), robotics-based helpers in Mumbai schools, and robots deployed in Chennai for interactive education[7]. While humanoid robots provided a more engaging and dynamic learning environment, they encountered challenges such as high initial costs, extensive maintenance, and restricted scalability[8]. This limited their accessibility to certain institutions rather than the larger learner community.

c. Evolution to AI-powered Software Bots

The next stage of evolution shifted from cost-intensive hardware-based robots to AI-powered bots and virtual assistants that operate solely as software. These AI bots integrate seamlessly with mobile devices, web portals, and learning applications, providing personalized tutoring, real-time Q&A, adaptive content recommendation, and predictive analytics without demanding physical infrastructure. Unlike humanoid robots, software-based AI tutors (e.g., ChatGPT-integrated classroom aides, Google's Socratic, or Indian AI-powered EdTech bots) are scalable, cost-effective, and available to millions of learners at once. They represent the most recent stage in AI's educational growth, shifting the learning experience from one-size-fits-all content to highly personalized, interactive, and data-driven education.

Figure 1

Evolution of Artificial Intelligence in Education



d. EduGenius AI: Advancing the Era of AI-Powered Educational Bots

Building on the foundation of AI-powered software bots, EduGenius AI delivers the next stage in educational revolution by solving the limits of existing AI tutors and including advanced personalization methods. Unlike former LMS or MOOC systems, which largely provided static, non-personalized content, and unlike humanoid robots, which had expensive upfront infrastructure costs, EduGenius AI emerges as a cost-efficient, scalable, and learner-centered solution.

Table 2

Features of EduGenuius AI

Dimension	EduGenius AI
Personalization at Scale	Adapts dynamically to each learner's pace, learning style, and progress using NLP and predictive analytics, creating individualized learning paths.
Integration & Accessibility	Software-only solution accessible through mobile, web, and cloud platforms, ensuring global reach including resource-constrained institutions.
Interactivity & Engagement	Enables interactive Q&A, intelligent doubt resolution, adaptive quizzes, and assignment support, while providing educators with analytics-driven insights.
Cost & Scalability	Cloud-native model minimizes costs and ensures scalability to millions of learners with minimal incremental investment.

e. Technology

Artificial intelligence (AI) is a diverse topic that focuses on developing machines capable of imitating human-like intelligence, such as problem solving, reasoning, and decision

making [7]. Machine Learning (ML) is a subsection of artificial intelligence that allows systems to learn patterns from data and improve their performance over time without being explicitly programmed. ML models are trained on historical datasets and used to perform tasks like classification, prediction, and grouping. Deep Learning (DL), a subset of ML, uses artificial neural networks with multiple layers of learning to capture complex relationships in huge datasets. DL's capacity to represent high-dimensional and nonlinear data has fuelled advances in speech comprehension, image recognition, and natural language processing [8].

Generative AI (GenAI) is a distinct paradigm within AI that extends beyond analysis and prediction to creation. Unlike typical ML models that categorize or forecast, Generative AI algorithms learn data distributions and then generate new data instances that are similar to the original [9]. GenAI can generate human-like writing, realistic graphics, synthetic music, and even computer code. GenAI models include GPT, which is a huge language model, and Stable Diffusion or DALL·E, which generate images.

EduGenius AI ARCHITECTURE

a. Input Processing and Model Interaction

The EduGenius AI interaction begins with module selection, during which learners specify their goals, such as concept learning, assignment support, or exam preparation. This modular entry ensures that queries get routed to the right processing channel, aligning system functionality with user goals. When a query is received, the system begins preprocessing, which converts raw natural language input into tokens, the smallest meaningful units of text. These tokens constitute the input sequence for the underlying transformer architecture. At the core of EduGenius AI's operation is the transformer-based model, which uses attention mechanisms to analyse contextual links across the entire token sequence at the same time. Unlike sequential models, transformers compute attention weights to find the most relevant contextual dependencies, capturing semantic meaning and long-term relationships within the

learner's query. The model creates tokens one by one using autoregressive prediction until it has created a cohesive and contextually relevant answer.

b. Deployment, Personalization, and Feedback Integration

In deployment, EduGenius AI interacts with the large language model via secure API calls that require authentication with API keys. The learner's processed query gets sent to an external LLM (such as OpenAI or Gemini), which does inference. The response that is generated is then fed back into EduGenius AI in real time. Once received, the system integrates a personalization layer that tailors responses to individual learner profiles, previous interactions, and chosen learning modes, resulting in higher pedagogical relevance. EduGenius AI combines feedback absorption and engagement statistics into its design. Learner activity, such as follow-up questions or quiz results, is continuously recorded and analysed. These data streams improve recommendation systems and help to iterate on system accuracy, personalization, and general learning support. Through this integrated cycle, EduGenius AI maintains adaptability and scalability in tailored education delivery.

Figure 3

Response Generation Workflow In EDUGENIUS AI

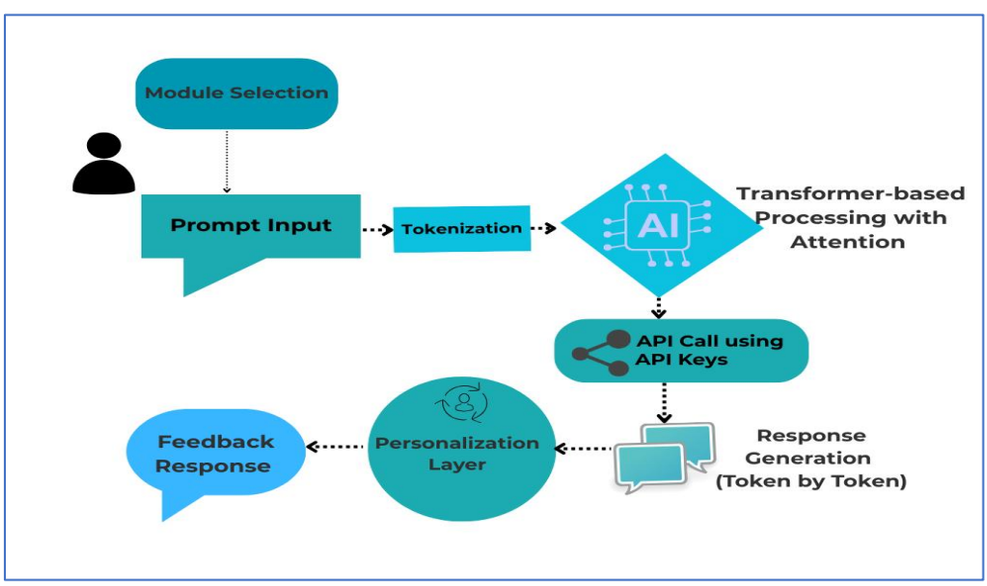
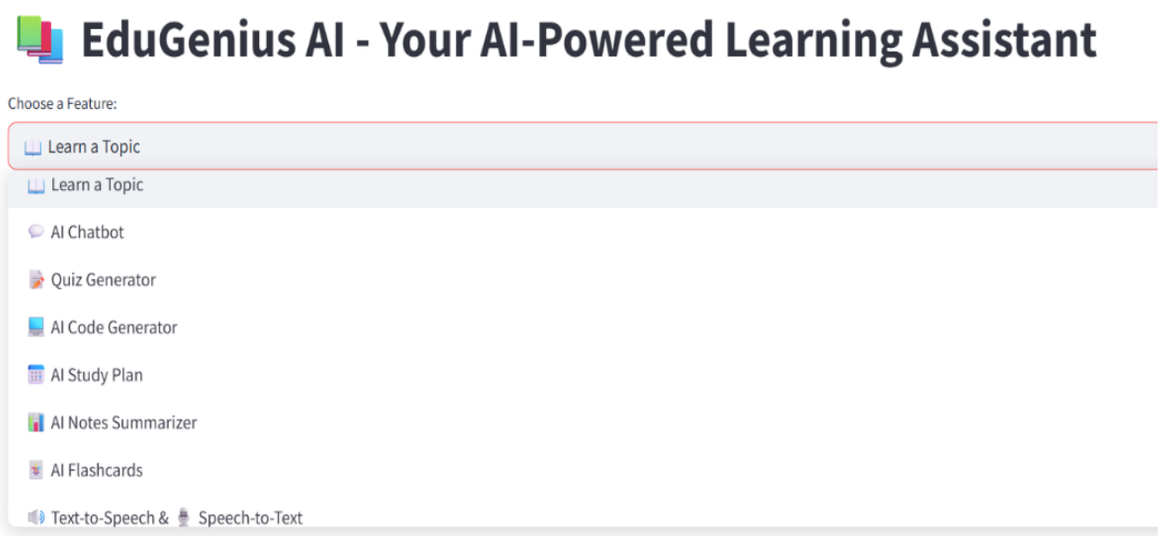


Figure 4

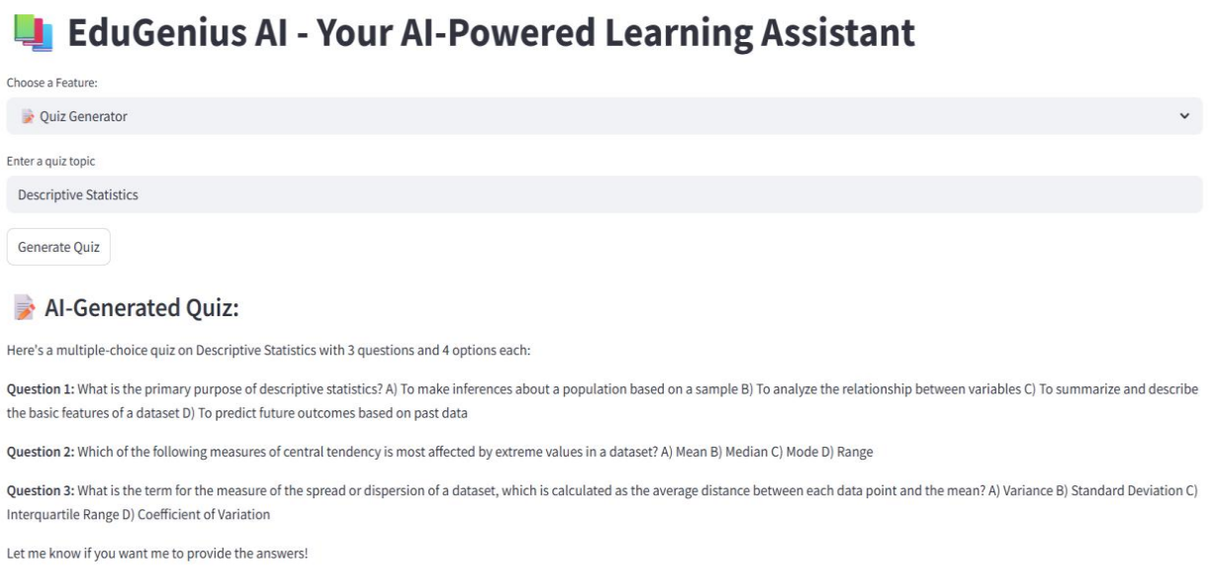
AI-powered learning assistant interface



This image shows an AI-powered learning assistant interface with a dropdown menu that offers a variety of educational capabilities. There are alternatives for studying a topic, an AI chatbot for questioning, a quiz generator, an AI code generator, a study plan builder, a notes summarizer, flashcards, and text-to-speech and speech-to-text capabilities. This structured menu demonstrates the platform's versatility in aiding users with a variety of learning demands, ranging from conceptual comprehension to interactive evaluations and coding support. The intuitive design improves accessibility, allowing users to easily select and interact with the desired feature.

Figure 5

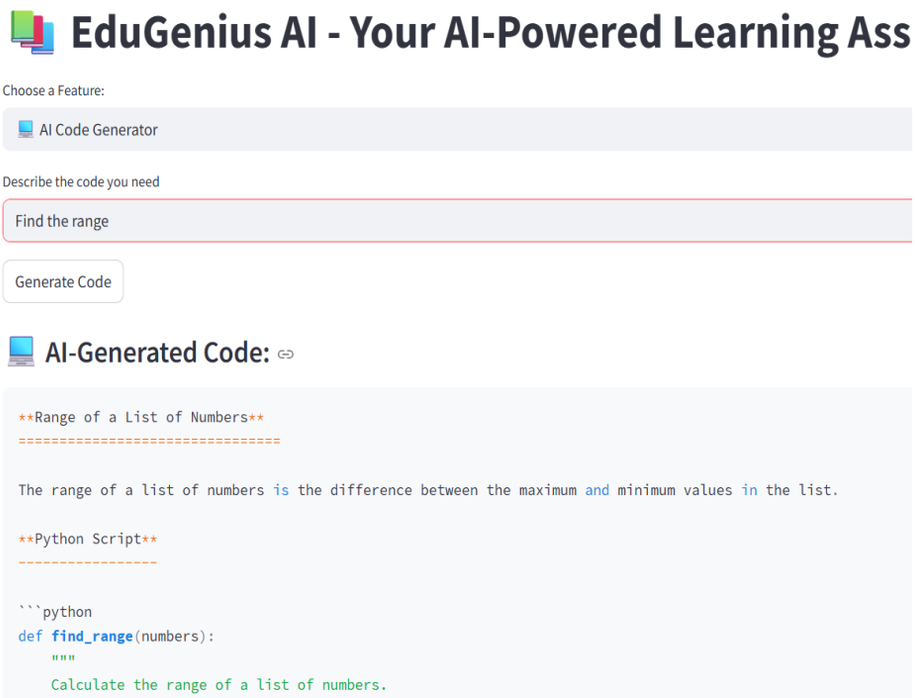
AI-powered learning assistant - quiz



The graphic shows an AI-powered learning assistant interface, notably the "Quiz Generator" feature. Users can create a quiz by entering a topic in the supplied text box and clicking the button below. This feature allows learners to create automatic quizzes to test their knowledge on a variety of topics. The reduced design improves usability, making it simple to create personalized tests for education or self-assessment reasons.

Figure 6

AI-powered learning assistant - code



The image shows an AI-driven learning platform with the "AI Code Generator" feature enabled. Users can offer a description of the code they require, and the system will generate appropriate code depending on the prompt. This tool is intended to help students, developers, and professionals by automating code creation, making it easy to obtain usable snippets for a variety of programming jobs. The interface is simple and easy to use, making it more accessible for coding-related queries.

Figure 7

AI-powered learning assistant – study plan

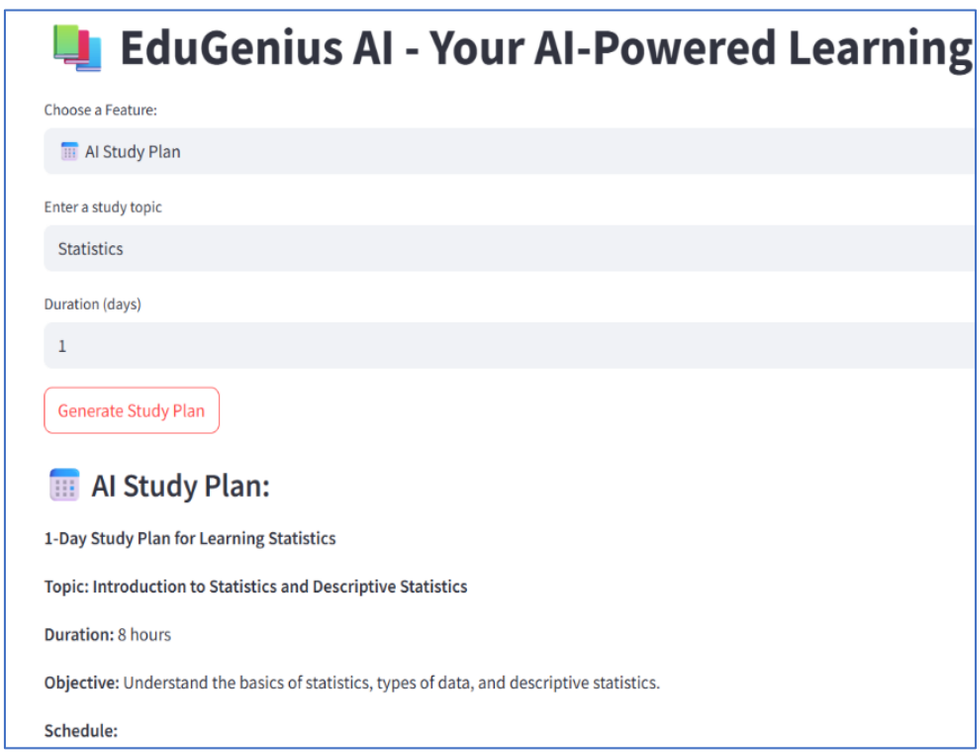
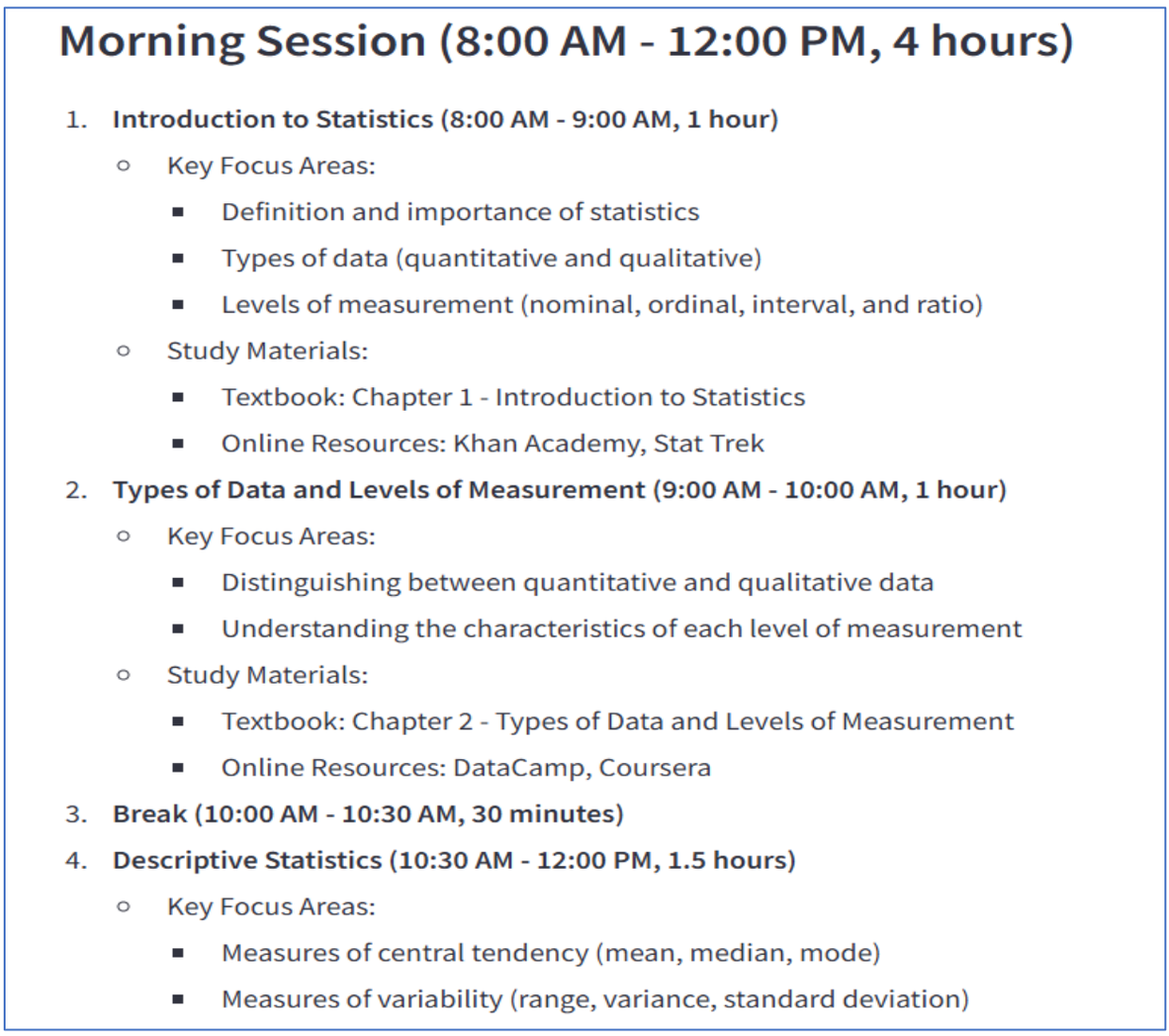


Figure 8

AI-powered learning assistant – study plan output



The picture depicts an AI-powered learning assistant with the "AI Study Plan" feature enabled. Users can enter a study topic and a time frame in days, and the system will generate a customized study plan. This tool allows students to easily create their study schedules, assuring a well-organized approach to learning new subjects within a set timeframe. The user-friendly interface makes it simple to enter information and receive an automated study guidance.

Conclusion

EduGenius AI, as illustrated in the featured learning assistant interface, demonstrates the transformative potential of AI in education by offering diverse tools such as chat-based tutoring, quiz generation, study planning, note summarization, flashcards, and speech technologies. Unlike traditional platforms that emphasize content delivery, EduGenius AI fosters adaptive, interactive, and self-directed learning. Its multimodal design ensures accessibility and inclusivity, supporting learners with varied needs and preferences. By integrating real-time academic support with personalized study pathways, EduGenius AI functions as a scalable and ethical digital tutor, empowering institutions to enhance engagement, comprehension, and equitable learning outcomes globally.

References

EDUCAUSE. (2022). *2022 Students and Technology Report: Rebalancing the student experience* (Jenay Robert, Ed.). EDUCAUSE. https://www.educause.edu/ecar/research-publications/2022/students-and-technology-report-rebalancing-the-student-experience.

PS Market Research. (2025). *AI in education market size to reach $25,772 million in 2030* [Press release]. https://www.psmarketresearch.com/press-release/ai-in-education-marke

Kurdi, G., Leo, J., Parsia, B., Sattler, U., Al-Emari, S., & Stevens, R. (2020). A systematic review of automatic question generation for educational purposes. *International Journal of Artificial Intelligence in Education, 30*(1), 121–204. https://doi.org/10.1007/s40593-019-00186-y

Dennis, N. K. (2024). Using AI-powered speech recognition technology to improve English pronunciation and speaking skills. *IAFOR Journal of Education, 12*(2), 107–126.

Bonifacci, P., Colombini, E., Marzocchi, M., Tobia, V., & Desideri, L. (2022). Text-to-speech applications to reduce mind wandering in students with dyslexia. *Journal of Computer Assisted Learning, 38*(2), 440–454.

Lee, J., Scarlatos, A., Woodhead, S., & Lan, A. (2026). *Letting tutor personas "speak up" for LLMs: Learning steering vectors from dialogue via preference optimization. arXiv*. https://doi.org/10.48550/arXiv.2602.07639

Russell, S. J., & Norvig, P. (2021). *Artificial intelligence: A modern approach* (4th ed.). Pearson.

Malayil, J. (2024, November 25). India's first sari-donning AI humanoid robot teacher starts teaching. *Interesting Engineering*. https://interestingengineering.com/innovation-news/indias-first-sari-donning-ai-humanoid-robot-teacher-starts-teaching

Patel, D. K. (2022, August 2). Teacher from Mumbai invents the first humanoid robot from waste material. *The Hans India*. https://www.thehansindia.com/offbeat/teacher-from-mumbai-invented-the-first-humanoid-robot-from-waste-material-756134

Zhang, D., et al. (2024) is: Zhang, D., Lin, J., Wang, Z., & Chen, J. (2024). *Generative AI and Its Impact on Personalized Intelligent Tutoring Systems*. arXiv. https://arxiv.org/abs/2410.10650.

Parnin, C., Prather, J., & Bird, C. (2024). Using large language models to support student programming: Opportunities and risks. *ACM Transactions on Computing Education, 24*(3), 1–29. https://doi.org/10.1145/3625269

© 2026 CGE – Consortium for Global Education

Kaunda Salimu, Grey Chibawe & Bester Ngulube

Northrise University

Vol 5:5 2026

Abstract

The research explored the effective methods that lecturers and educators can employ to assess university students, in the context of artificial intelligence (AI) chatbots. The field of artificial intelligence has been rapidly growing. The rapid growth has wrought interactive tools such as ChatGPT, a text based interactive tool that generates human like responses based on user text input. ChatGPT was launched not so long ago, in November 2022 but has attracted millions of users, world over. Chatbots like ChatGPT are able to give responses to complex essay questions, programming problems and even business ideas in a way that mimics the student writing the response on their own. Lecturers and educators now have to rethink and restructure the type of assessments that they assign to students. The traditional methods of assessing university students might not produce the intended results according to set university pedagogical goals. Students' use of AI chatbots to write answers to assessments given by educators has the greatest potential to negatively impact key academic areas such as critical thinking, development of research skills, and becoming a lifelong learner. Hence the need for an exploration of approaches, strategies, techniques and methods to assess students amidst the usage of artificial intelligence tools. The research involved an extensive literature review on the subject followed by collection of qualitative data on the views of both educators and learners from universities in Ndola, Zambia. The study population comprised two universities in Ndola, from which a sample size of 25 participants was drawn, based on attaining saturation point. The research findings could benefit university faculty as they will have a guide on what type of assessments to assign students and how to evaluate student responses. In addition, other non-academic institutions that create assessments could also find the findings useful in that

they may be assessing individuals who might be versed with artificial intelligence tools. Higher education policies can be formulated based on the findings of this research.

Keywords: Artificial intelligence, ChatGPT, Chatbot, assessment, generative AI

Exploring Effective Methods Of Assessing University Students Amidst AI Usage

Computer technology has been revolutionizing how industry professionals perform their tasks and duties in respective fields ranging from manufacturing, service, health and education. One branch of computer technology that has been rapidly growing and transforming how companies operate in their day to day activities is Artificial Intelligence (AI). On November 30th 2022, the company OpenAI released a version of generative AI called ChatGPT. This AI tool for the first time in the history of computer technology had the capability of producing human-like responses in a conversational format. The tool can also remember previous responses and inputs and be able to provide more meaningful responses such as admitting to incorrect responses, challenging incorrect viewpoints, and being able to reject inappropriate input (OpenAI, 2022).

The release of ChatGPT was followed with numerous reviews from individuals and corporate entities worldwide. It did not take long for people to realize that the new AI tool can be utilized to write project plans, business ideas, and cover letters for jobs and summarize stories and essays. As people interacted with ChatGPT in the first few weeks after the release, they identified a few pitfalls in the new AI tool. It was identified that ChatGPT had a tendency of creating false responses due to the unavailability of requested data (Mollick, 2022).

In addition to the pitfalls such as false responses, ChatGPT was also identified to have biases based on the data that it was trained on. These biases range from racially or ethnically inclined statements, gender inclined statements, and religious based stereotypical statements. ChatGPT based on GPT-3.5 seemed to have been enhanced on the predecessor's GPT version, which was GPT-2 (Lau & Guo, 2023; Liang, Morency, & Salakhutdinov, 2021). Microsoft

(2023) in their report on governing AI - a blueprint for the future, they present some guidelines on AI usage as AI progresses in this era. Microsoft (2023) states that the corporate entities in countries should be considering questions such as how can we harness this new technology to solve complex problems? How can new problems created by the new technology be avoided or managed? How can companies remain in control of the ever growing powerful technology? One of the guardrails among the five points for governing AI is "promoting transparency and ensuring academic and nonprofit access to AI" in which it is stated that universities need access to critical technology infrastructure such as AI to advance in scientific and technological research (Microsoft, 2023). In the report by Microsoft it can be clearly observed that AI will be in existence even in the coming decades.

Background

The year 2023 started on a very high note for a number of universities across the globe due to the fact that students caught up with the generative artificial intelligence tool - ChatGPT. Just like how working professionals caught up with the tool on speeding up their work and delivering task outputs with efficiency, students noticed that they could query the tool to write assignments for them in a very short time period. Students started querying ChatGPT to write essay type assignments, and some went to the extent of querying ChatGPT during their online exams. This caused a lot of panic in a number of universities around the world because they did not know how to manage the rapid increase in ChatGPT usage among the students. The concerns were that students would not learn imperative skills of critical thinking and problem solving and also mitigating academic dishonesty. The concerns led to a lot of universities and education districts to block school computer networks from accessing ChatGPT and other related generative artificial intelligence chatbots (Johnson, 2023; Korn & Kelly, 2023; Nolan, 2023).

While that can look like a solution, it was argued by Roose (2023) that instead of blocking it, teachers can utilize ChatGPT as a teaching aid. Roose (2023) argued that ChatGPT can unlock student creativity potentials that teachers are not aware of by blocking it. In addition to that he argued that regardless of blocking accessibility to ChatGPT on the school computer networks, students still have access to ChatGPT on their smartphones and laptops. Therefore, blocking ChatGPT on school computer networks is not the solution (Johnson, 2023; Roose, 2023).

According to pedagogical teaching principles, students have to be engaged and motivated in the learning process, and the teachers should ensure that students are assessed based on their level of understanding. Consequently, when students have interacted with the course material and they have acquainted themselves with the course textbooks and adequately covered the course objectives, then they can be assessed according to the bloom's taxonomy levels. (Heny & Pennock, 2023) However, if students can easily query a generative artificial intelligence tool when answering assessment questions, it defeats the purpose of pedagogical goals and bloom's taxonomy levels of assessing students.

Problem Statement

The current assessment methods in higher education institutions are becoming ineffective amidst the usage of generative AI tools such as ChatGPT (Todeschini et al, 2023). Computer technologies such as Artificial Intelligence (AI) have revolutionized how people complete their tasks. ChatGPT, a generative version of AI, has the capability of producing human-like responses in a conversational format. This has led to students having their assignment/assessment responses generated by ChatGPT which they in turn submit as their own. The objectives for student assessments include assessment of knowledge, critical thinking skills, research skills and problem solving skills amongst others. Student assessments therefore aim to bridge the gap between theory and practice by assessing how

students are able to apply the concepts learnt. However, the usage of AI tools such as ChatGPT counteracts these intended objectives because ChatGPT is able to generate responses and solutions for the students without them putting in any effort. This research therefore aims to explore effective assessment methods that can be realized in order to ensure that the intended objectives are still met.

Research Objectives

1. To investigate and assess the knowledge and usage of AI among faculty and students in the context of higher education institutions.
2. To critically assess the effectiveness of current assessment methods employed by higher education institutions in Ndola amidst AI usage.
3. To explore effective assessment methods for students in higher education institutions amidst AI usage in Ndola.

Research Questions

1. How do faculty and students perceive and utilize AI within the context of higher education institutions?
2. How effective are current student assessment methods employed in higher education institutions amidst AI usage?
3. What assessment methods for students in higher education institutions would be effective amidst AI usage?

Research Significance

This research can benefit university faculty as it provides methods and approaches on what type of assessments to assign students and how to evaluate their responses. It can also serve as a guide for other non-academic institutions that create assessments. Higher education policies can also be formulated based on the findings of this research.

Literature Review and Conceptual Framework

Literature Review

Effectiveness of current assessment methods

The higher education has been transformed by generative AI. According to Heny and Pencook (2023), since its introduction in 2023, faculty and students have been impacted in the way they teach and learn respectively. Heny and Peancook (2023) further state that as the abilities of AI continue to improve, so has the usage among students and faculty reporting that 42% of students who were surveyed admitted to using AI for their course work in one way or another. The objectives of assessments include application of knowledge, developing critical thinking, problem solving and research skills, self-directed learning and enhancing communication skills. With the capabilities that AI possesses, students are able to ask the AI tools such as ChatGPT to respond to a question exactly as needed thereby hampering the objectives set for assignments. Heny and Peancook (2023) emphasizes that if AI is not used correctly, students will end up learning less than they currently do. Cardona et al, (2023) states that there has been an increasing interest in the usage of AI in the education sector suggesting that educators must seek technologically enhanced approaches to enhance their teaching methodologies. Cardona et al, (2023) further emphasizes that educators should not shun generative AI tools but rather continue to explore how AI tools can improve learning outcomes by harnessing the good out of AI tools. To effectively do so is to understand the challenges with current assessment methods and protect the learners against the dangers that may arise with the abuse of AI generative tools usage. Bridgeman et al, (2023) in their report mention that one of the challenges with current assessment methods with AI generative tools is that there is fear that this new technology that is able to produce human-like responses will encourage cheating and undermine academic integrity. The major concern is the tool's ability to produce a complete finished essay when given a topic and asked to do (Bridgeman et al,

2023). In an article in the Guardian newspaper, DanGillmor who is a Journalism professor tested an assignment he gives to his students on ChatGPT and he said he would have given a very good grade of the response. According to Swiecki et al (2022), it is important for educators to create well designed assessments in order to determine whether students have learnt. Sweicki et al (2022) argues that current traditional assessment methods have several issues such as inauthenticity and inability to provide nuanced views of learning thus suggesting that several applications of AI tools have come in handy to partially address these challenges. Swiecki et al (2022) however cautiously noted that traditional assessment tools were created for a reason and have been successful in evaluating and improving student learning and thus should not be rendered obsolete. Mislevy and colleagues as cited by Swiecki et al (2022) state that educational assessments are mostly set within the standard assessment paradigm and the commonly used assessments include multiple choice questions, essays and short answer questions. Swiecki et al (2022) further state that as much as these methods are commonly and currently used, they do have several potential problems. In summary, the several potential problems being discussed are that current assessment methods are discrete, uniform, isolated and antiquated (Swiecki et al, 2022).

It is a given that AI tools such as ChatGPT have triggered debates on plagiarism and cheating in academia with others suggesting that it is indeed plagiarism and others suggesting it is not. Lee (2023) discusses that AI models for detecting plagiarism are being developed and until then, the workload rests with faculty for them to deal with challenges in detecting whether the students have presented AI generated work or not. Lee (2023) further suggests that lecturers need to be trained on new assessment practices in response to the challenges that were being experienced with student's usage of AI tools like ChatGPT. Owan et al (2023) states that there is an increased concern that AI tools are able to generate responses

that cannot be detected by a plagiarism checker and there are currently no methods to differentiate between content generated by AI and content generated by humans.

Effective assessment methods for students in higher education institutions

Despite the continued growth of AI and its usage in schools, learning and assessment objectives set by the universities must still be attained. Technological advancements are meant to enhance teaching efforts and not replace the teaching efforts. According to Heny and Pencook (2023), for universities to continue to excel at its core mission of teaching, it must respond to the challenges posed by AI and must work towards training faculty to manage these challenges as opposed to shunning it. “The bulk of these efforts inevitably fall on the shoulders of faculty members who must rapidly understand this unique technology, grapple with its implications for their course goals, teaching strategies, and evaluation techniques and develop methods for seizing gains and mitigating losses in the midst of continuing AI" (Heny & Pencook, 2023, Pg. 1). According to Lydia Lu as cited by Cardona et al (2023), there is a strong need for all stakeholders involved in the education sector to critically understand the effects of AI and education. AI tools may enhance teaching methods and learning outcomes but at a cheaper cost (Cardona et al, 2023). Assessment methods may be developed in a way that makes them responsive to the knowledge and experiences that the students possess (Cardona et al, 2023). Therefore when creating assessments, consideration should be given to aligning the assessment methods with the existing knowledge and experience of the learners. This suggests a learner centered approach that takes into account diverse backgrounds and prior learning of the learners (Cardona et al, 2023). Embracing AI tools such as ChatGPT means thoroughly understanding that there is a cheaper way to enhance teaching, improve learning while at the same time, saving time. One of the objectives of the creation of AI tools was ease of use (Bridgeman et al, 2023). It could help students learn by creating new opportunities for them to learn. As established earlier, current

assessment methods have several potential problems and the usage of AI tools such as ChatGPT may potentially offer new learning opportunities to address these problems. One useful way faculty can employ AI tools to effectively assess students is by modifying the current mode of assessment while maintaining the objectives of assessment. Swiecki et al (2022) suggests practical assignments using an AI environment such as games and simulations can support authentic assessment of students' skills but cautiously advises that educators should be careful to not let AI restrict the pedagogical role of assessment. As suggested by Heny and Pencook (2022), AI tools should only be used as instructional design aides. As AI tools continue to gain popularity, the role of teachers is still a fundamental and critical element in a student's learning process and as such should not be undermined (Owan et al., 2023). Lee (2023) states that there is a need to accept the presence of ChatGPT and lecturers should critically understand how the tool works and take advantage of its weaknesses. As such, lecturers should consider using authentic and personalized assessment methods such as using real life examples and contextually specific assignment or discussion question assessments (Lee, 2023). Lee (2023) further suggests adding personal experiences to questions which can allow students to draw specific conclusions, placing emphasis on assessing the learning process rather than the outcome. Assessments designed to critique papers, creating concept maps enables students to gain a deep understanding of the topic beyond what ChatGPT is able to provide for them in its responses (Lee, 2023). Mohamed et al. (2022) warned that AI was here to stay and there was an urgent need for universities and lecturers to accept its existence and find ways of training and guiding students to use AI ethically.

Theoretical Framework

The theoretical framework on which this research was based is Chickering and Reisser's seven vectors of development (Corey, 2011; Leticia & Bonita, 2000; Norhasni &

Affero, 2012). The seven vectors of Chickering's theory are 1) developing competence, 2) managing emotions, 3) moving through autonomy toward interdependence, 4) developing mature interpersonal relationships, 5) establishing identity, 6) developing purpose and 7) developing integrity. The Chickering theory was a revision of a growing number of student development theories of his time (Chickering, 1969).

For this research, the focus was on vectors number 1 and 7. How would instructors assess students in this era of AI chatbots to develop a set of useful competences while upholding integrity as a learner? The first vector of Chickering's theory of developing competence included intellectual, physical or manual and interpersonal qualities that would be gained through assessments given by educators to learners. In the wake of the AI chatbots, was it possible anymore to have learners develop these qualities if the learners could easily seek the help of AI chatbots to respond to assessments given by their teachers? Intellectual development meant growth in the ability to think and reason. Is this possible anymore? Is the ability of learners to communicate and interact with others (interpersonal skills) still possible? One of the objectives in teaching is to develop learners who are honest and principled. This is where the seventh vector of Chickering's theory comes in. In this era of AI chatbots, would teachers still be able to train students with integrity, students who would not cheat their way to graduation? The genesis of AI chatbots set the two vectors on the balance, with doubt whether higher education institutions would still be able to develop competence and integrity in students. This research, therefore, sought to explore methods that would be used to assess higher education students amidst the existence of AI chatbots.

Research Methodology

This study aimed at exploring and understanding the perception of educators and students, of the contribution and effect of AI chatbots to the assessment methods used by instructors to assess students in universities and colleges. The study examined whether the current methods of assessing students were still effective amidst the usage of AI chatbots by students to help give responses to questions in assessments. With an in-depth probe into the experiences of both instructors and students the study took a phenomenological qualitative approach to research in order to dig into hidden thoughts of respondents to make deductive conclusions.

The study used the phenomenological research design because the researchers sought to understand lived experiences of the respondents (instructors and students) and how the respondents subjectively interpreted their lived experiences (Juma, 2023). Through the phenomenological approach, the research aimed at exploring the lived experiences and perceptions of instructors of how the use of AI chatbots by students influenced effective assessment of students using the existing assessment methods in the universities and colleges which were sampled. The researchers also aimed at learning the perceptions of students on the effectiveness of the assessments they received amidst their usage of AI chatbots when attempting to respond to questions or tasks given in the assessments.

Participants

This research utilized a purposeful sample to recruit instructors and students from two higher education institutions in Ndola, Zambia. The researchers needed to have participants who had an idea of or interacted with AI chatbots like ChatGPT, Bing, Bard and so on. AI chatbots were only introduced in November 2022, so not so many instructors and students may have known or interacted with them. One of the two higher education institutions chosen

had IT and Computer Science students while both utilized e-resources in managing student assessments.

Permission to recruit respondents and collect data from the two institutions was sought through their employees designated to give such permissions. This was either the Human Resource Manager or Academic Head of the institution. Letters were written to them by the Research Board of the University where the researchers worked.

Research Instruments

Semi-structured interview guides were developed by the researchers in order to provide guidance on areas of interest that marched the objectives and theoretical framework of the research. One interview guide for the instructors (Appendix A) and one interview guide for students (Appendix B) were developed. The interviewers were able to probe for deeper responses even with the presence of the interview guide. This probe was meant to dig in the nuances of the experiences and perceptions of the respondents.

Data Analysis and Findings

Lecturer Responses

Knowledge of existence of AI Chatbots

The key aspects of the findings were that most respondents had little to limited information about AI tools and the specificity of them. The information known of them had been acquired through adverts as mentioned by one the respondents. Two respondents mentioned to know more about them and have used them several times.

Benefits of using AI Chatbots

There were several key findings that emerged from the perspectives of university lecturers regarding the benefits that emerged with the use of AI chatbots. The respondents overwhelmingly highlighted the positive impacts of these tools on their teaching practices. They noted that AI chatbots significantly improved their preparation and delivery of lectures by providing quick access to relevant information and assisting in the creation of interactive content. Moreover, the ability of chatbots to summarize resources was deemed invaluable, saving lecturers considerable time by condensing lengthy materials into concise summaries. Furthermore, lecturers appreciated the time-saving aspect of AI chatbots, as these tools automated repetitive tasks and provided instant access to information. This efficiency allowed lecturers to allocate more time and energy towards complex tasks ultimately enhancing the quality of their teaching. However, despite the evident benefits, lecturers also voiced concerns about the widespread encouragement of AI chatbot usage. They cautioned against excessive reliance on technology, fearing it could lead to a decline in critical thinking skills and independence among students**.**

Knowledge of objectives for student assessment

The research explored the main objectives of assessing university students and several key findings emerged, shedding light on the multifaceted nature of student assessment in higher education. One respondent identified the need to gauge students' understanding of materials covered in their courses as a critical objective for university student assessment. Feedback also emerged as a critical component of the assessment process, serving as a catalyst for enhancing learning strategies. By soliciting feedback from assessments, educators gained valuable insights into students' learning experiences and challenges. This feedback informed the formulation of personalized strategies to address areas of weakness and optimize learning outcomes. Furthermore, assessments played a pivotal role in determining

whether learning had indeed taken place. By evaluating students' performance against predefined learning objectives, educators were able to assess the extent to which students had absorbed and retained knowledge. This aspect of assessment was crucial in providing feedback on the effectiveness of instructional methods and guiding instructional decisions. The findings also highlighted the importance of assessing students' exposure to technology in today's digitized educational landscape. Evaluating students' proficiency with technological tools and platforms provided insights into their readiness to navigate digital learning environments. Skill development emerged as another key objective of student assessment. Assessments went beyond testing knowledge acquisition to evaluate students' development of essential skills such as critical thinking, communication, and problem-solving. Assessments were found to have the potential to influence behavioral changes in students. Problem-solving skills were also identified as a key focus of student assessment. Assessments provided opportunities for students to demonstrate their ability to solve complex problems across various contexts. Ultimately, the primary objective of assessing university students was to ensure the attainment of predefined learning outcomes.

How has AI affected student objectives

From the perspective of the lecturer, the research findings indicate a discernible negative impact of Artificial Intelligence (AI) on student assessment. Respondents highlighted several aspects where AI has adversely affected learning outcomes, notably by diminishing students' engagement with their own perspectives in responses. The findings also suggest a concerning trend of decreased effort among students in conducting research, gathering information, and synthesizing data due to the reliance on AI. Moreover, it is evident from the findings that AI tools tend to discourage proactive learning behaviors among students, as they often submit responses generated by AI tools without significant input or critical thinking. Some respondents expressed concerns that AI tools have compromised the

alignment of learning objectives with traditional assessment methods, necessitating a revision of student assessment objectives. Consequently, the overarching conclusion drawn from the research is that AI tools do not inherently enhance the learning process. However, it is acknowledged that these tools could potentially contribute to the quality of assignment submissions provided students possess adequate knowledge of how to effectively utilize them and interpret the information provided.

Proposed assessment methods amidst AI usage

The findings in some responses suggested that current traditional assessment methods such as generic assignment have now become inefficient and ineffective amidst the usage of AI. As opposed to applying themselves, students submit AI generated information with no input from themselves. To counter this, the respondents suggested case studies, oral presentations, one on one discussions and analytical assessments to be used instead of the traditional mode assessments of assignment questions and discussion questions. However, a percentage of respondents suggested integrating AI usage into the education system rather than shunning it. Furthermore, it was important for AI usage to be encouraged among students except they should be advised and trained on correct usage of AI. Rather than eliminating the mode of assessments, lecturers should be trained on how to effectively set assessments in consideration of AI usage so that they were still able to meet the set learning objectives. Some respondents suggested one way of integrating AI into school curriculum was for verification of information fed into AI tools such as chatbots by higher education institutions and possible collaboration between academicians and AI developers.

Proposed legal framework for AI usage in Higher Learning Institutions

The majority of the respondents affirmed that AI was here to stay and it was imperative for universities to adapt to this changing technology as opposed to shunning it. One respondent mentioned that in developed countries, they were more advanced in

technology and had already taken into consideration ways in which AI can be used effectively. Developing countries like Zambia are only playing catch up and they therefore needed to establish ground on which AI tools could be used effectively without distorting the objectives of current assessment methods. One of the ways mentioned was that the usage of AI needed to be governed by relevant institutions or the government. Another way was to establish hefty penalties for students who were guilty of AI cheating and these penalties could come from higher education institutions governing bodies. One respondent stated that "there was a need for a legal framework to be formulated to handle penalties on AI cheating, however way that framework would look like". In addition, another respondent stated that there was a need for AI cheating to be categorized as high level cheating. Some respondents mentioned that there was a need for more research to be done on AI so that it could be properly understood and its capabilities and inefficiencies well defined. This way, AI tools could then be well implemented in higher learning institutions with adequate restrictions on its usage. This also included investment in adequate IT infrastructure by all universities to ensure that AI tools and alike could be well implemented and monitored. Some of the findings suggested that there was now need for universities to consider open book exams which have a time limit on how long a student can take to complete an exam. Traditional ways of assessing students, so far, has remained to be the best therefore there was a need to study how AI could be used to assess students effectively without deviating much from traditional methods of assessment. Some respondents mentioned that one way in which this could be done is by increasing the number of tests and reducing the number of assignments than the other way round. This ensured that the objectives of assessing students in how to write, how to research, and how to critically analyze information could still be retained in that one assignment given to students. The rest of the time, student's assimilation of knowledge learnt should be assessed through tests and exams. In addition, the grading system should be

changed in universities where universities increased the weight on practical assessments and reduced on theoretical assessments. Theoretical courses should have more practical aspects and assessments on them as well.

Student Responses

Quick responses and learning assistance

Respondents noted that AI tools, particularly ChatGPT, provided quick analyses and concise answers to queries. AI tools were praised for their ability to generate summarized responses, which was seen as advantageous, especially for efficiency in information retrieval. One of the challenges highlighted was the brevity of information provided, often necessitating further expansion or clarification. Respondents appreciated that AI tools listed all relevant information at once, saving time compared to searching across multiple websites. AI tools were commended for their ease of use and time-saving capabilities, particularly beneficial for students and those with overdue assignments.

While AI tools were considered helpful for learning and explaining complex tasks in simpler formats, the respondents noted a lack of passion compared to traditional teaching methods. While generally rated highly for accuracy, respondents acknowledged occasional inconsistencies in responses, especially when compared to their prior knowledge or research. Clear articulation of queries was highlighted as essential to receive accurate responses from AI tools, with language barriers posing a challenge. The respondents also expressed concerns about overreliance on AI tools leading to laziness, emphasizing the importance of independent fact-checking.

Accessibility and critical thinking

The respondents expressed concerns about the ease of access to information provided by AI tools, particularly ChatGPT, without proper citation or critical thinking. They noted instances where information was submitted without thorough consideration. There were

mixed perspectives on the impact of AI tools on critical thinking skills. While some participants believed AI could aid in critical thinking by breaking down topics and providing context, others felt it encouraged laziness and reduced critical thinking engagement. Several respondents highlighted negative impacts on learning, intelligence, and critical thinking skills. They noted a decrease in critical thinking skills and expressed concerns about overreliance on AI tools, which could undermine students' confidence in their own abilities.

Balancing dependency and autonomy

Respondents emphasized the importance of not becoming overly reliant on AI tools and stressed the need for students to develop paraphrasing skills. They suggested using AI tools as guides rather than substitutes for independent learning and critical thinking. Concerns were raised regarding the accuracy of information provided by AI tools, with some participants rating their reliability around 80%. However, participants acknowledged the usefulness of AI tools in providing concise summaries and short notes for better understanding

Dependency and autonomy

Participants expressed concerns about becoming overly dependent on AI tools, leading to a lack of personal initiative and critical thinking in learning processes. While AI tools were acknowledged for their role in aiding research when lecturers were unavailable, participants highlighted the importance of not relying on them for personal decision-making or abdicating responsibility for learning. Participants emphasized the need to understand that AI tools are algorithms and should not be solely relied upon for accurate or comprehensive information. However, some participants noted that AI tools had not significantly impacted them.

There were concerns raised about AI tools hindering learning independence and responsibility, particularly when individuals relied too heavily on them for answers without

engaging in critical thinking or personal research. Participants shared mixed experiences with AI tools, noting instances where they had not yielded impressive results in assignments. However, some participants felt that AI tools had helped them take responsibility for their learning, while others believed they hindered it. Participants emphasized the importance of mentors guiding individuals to avoid seeking easy solutions and to take responsibility for their learning journey. They stressed that AI tools should be used as aids rather than replacements for personal learning efforts.

Honesty and citation

Respondents expressed concerns about the lack of honesty associated with using AI tools, citing issues such as the tools not citing sources and the temptation for students to maintain their grades through dishonest means. Strategies for ensuring honesty included using AI tools for verification and then conducting further research on the topic to enhance understanding and integrity. Participants had mixed feelings regarding the honesty of using AI tools, with some feeling guilty about not acknowledging sources or doing their own work, while others justified their usage by counter-checking responses or using plagiarism checkers. While some participants admitted to using ChatGPT extensively for assignments, others emphasized the importance of not depending entirely on AI tools and using them only to assist in certain areas, not for entire assignments. Participants highlighted the compromise of integrity when using AI tools and stressed the importance of self-discipline, learning, and maintaining academic integrity. Respondent's suggestions included implementing restrictions on AI tool usage, providing more time for assignments, and ensuring flexibility in assessment structures to prevent overreliance on AI tools and encourage independent learning.

Improving accuracy and integration

Respondents emphasized the need for AI tools to be more accurate, ideally achieving 100% accuracy. Suggestions included integrating AI tools into learning management systems

and providing developer packages for students similar to Google's developer programs**.** Respondents suggested universities should normalize the use of AI tools for learning and provide more honest ways for students to utilize them. They also proposed improvements such as adding citations and references to the information generated by AI tools to enhance academic integrity.

Support for learning and teaching

AI tools were seen as beneficial for summarizing information, assisting struggling students, and aiding lecturers in understanding complex topics. Suggestions included using AI tools for presentations, integrating them into course modules, and assisting lecturers in explaining certain subject matter. Respondents suggested universities should continue using assignments to promote deeper learning and implement plagiarism software to detect improper usage of AI tools in assignments. They also recommended more interactive assessment methods such as oral presentations and practical tests. Respondents highlighted the importance of providing opportunities for students to engage with real business environments and professionals to enhance practical learning experiences.

Conclusion and Recommendations

Conclusion

The research findings reveal a nuanced landscape regarding AI chatbots' impact in higher education, as perceived by both students and lecturers. Student responses showcased a mixed sentiment towards AI tools, appreciating their efficiency and assistance in learning tasks while expressing concerns about over-dependency, diminishing critical thinking, and

integrity issues. Despite the convenience AI tools offer, students emphasized the importance of maintaining personal initiative, critical thinking skills, and academic integrity, suggesting a cautious and balanced approach to AI integration in education. This feedback underscores the need for educators to guide students in responsibly leveraging AI tools as aids rather than replacements for independent learning efforts, fostering a culture of self-discipline and academic integrity.

Conversely, lecturers identified numerous benefits of AI chatbots, including improved lecture preparation, delivery, and time-saving aspects, enhancing teaching practices. However, concerns regarding over-reliance on technology, potential impacts on critical thinking among students, and the need for a revised assessment framework were also highlighted. Lecturers advocated for a legal framework to govern AI usage, emphasizing the importance of collaboration between academia and AI developers to ensure responsible integration and adherence to ethical standards. The conclusions drawn from both student and lecturer perspectives underscore the complexity of AI's role in education, highlighting the necessity of informed guidance, continuous research, and thoughtful integration strategies to maximize the benefits while mitigating potential drawbacks in higher learning institutions.

Recommendations

The research findings on AI chatbots in higher education suggest several recommendations for future exploration and implementation. Further studies should be conducted to track the lasting impact of AI chatbots on student learning outcomes, critical thinking skills, and academic integrity over multiple semesters or academic years. This would provide insights into evolving trends and changes in student behavior and performance. Supplementing quantitative data with qualitative analysis, such as interviews or focus groups, can offer a deeper understanding of students' and lecturers' perceptions, experiences, and challenges related to AI chatbots.

Additionally, exploring ethical considerations surrounding AI chatbot usage is crucial. This includes addressing privacy concerns and biases in AI algorithms. Establishing guidelines and protocols for ethical AI integration in higher education can ensure transparency, fairness, and accountability. Comprehensive training and support programs should be provided for students and lecturers on the effective use of AI chatbots in education. This training should cover critical thinking, information evaluation, citation practices, and responsible AI usage to mitigate risks and maximize benefits. Fostering collaborative partnerships between higher education institutions, AI developers, and regulatory bodies can establish industry standards, best practices, and a legal framework for AI usage in higher learning environments. Dialogue and collaboration are essential to address challenges and leverage AI technology effectively. Exploring innovative assessment strategies that integrate AI chatbots while preserving assessment integrity is vital. This includes investigating alternative assessment methods, adaptive learning technologies, and personalized feedback mechanisms to enhance learning outcomes and engagement. Implementing a system for continuous evaluation and feedback gathering on AI chatbot usage in education is necessary. Addressing these recommendations can contribute to a more informed, ethical, and effective integration of AI chatbots in higher education, ultimately improving teaching and learning experiences for students and lecturers.

References

Cardona, M. A., Rodríguez, R. J., & Ishmael, K. (2023). *Artificial Intelligence and the Future of Teaching and Learning: Insights and Recommendations.* Office of Educational Technology, U.S Department of Education, Washington DC. Retrieved September 21, 2023, from https://www2.ed.gov/documents/ai-report/ai-report.pdf

Chickering, W. A. (1969). Education and Identity. Jossey-Bass.

Corey, F. (2011). Chickering and Reisser's Seven Vectors of Development: Using the Theory to Assess Three Students. Retrieved from https://friendportfolio.weebly.com/uploads/1/4/0/6/14065890/friend_formal_theory_paper.pdf

Gokhale, A. A. (2016). The importance of assessment and evaluation in teaching and learning. *Journal of Education and Practice, 7*(27), 36-43. doi: https://doi.org/10.7176/JEP/7-27-05

Heny, N., & Pennock, A. (2023, June). Generative AI has Arrived. What Does this Mean for Teaching and Learning at UVA? *Report of the Generative AI in Teaching and Learning Task Force*. Retrieved September 21, 2023, from https://provost.virginia.edu/sites/provost/files/gen-aI-in-teaching-learning-final_508.pdf

Johnson, A. (2023, January 18). *ChatGPT In Schools: Here's Where It's Banned—And How It Could Potentially Help Students*. Retrieved September 20, 2023, from Forbes: https://www.forbes.com/sites/ariannajohnson/2023/01/18/chatgpt-in-schools-heres-where-its-banned-and-how-it-could-potentially-help-students/?sh=37cb39656e2c

Korn, J., & Kelly, S. (2023, January 6). *New York City public schools ban access to AI tool that could help students cheat*. Retrieved September 20, 2023, from CNN Business: https://edition.cnn.com/2023/01/05/tech/chatgpt-nyc-school-ban/index.html

Lau, S., & Guo, P. (2023, September 10). From "Ban It Till We Understand It" to "Resistance is Futile": How University Programming Instructors Plan to Adapt as More Students Use AI Code Generation and Explanation Tools such as ChatGPT and GitHub Copilot. *ICER '23: Proceedings of the 2023 ACM Conference on International Computing Education Research, I*, 106-121. Retrieved September 18, 2023, from https://doi.org/10.1145/3568813.3600138

Lee, J. (2023). *Effective assessment practices for a ChatGPT-enabled world.* Times Higher Education. Retrieved from https://www.timeshighereducation.com/campus/effective-assessment-practices-chatgptenabled-world

Leticia, L. L., & Bonita, B. (2000). Chickering's Seven Vectors of Student Development Explained. Retrieved from http://kvccdocs.com/KVCC/2013-Spring/FY125-OLA/content/L-17/Chickering-Vectors-Explained.pdf

Liang, P. P., Morency, L.-P., & Salakhutdinov, R. (2021). Towards Understanding and Mitigating Social Biases in Language Models. *International Conference on Machine Learning*. Retrieved from https://arxiv.org/pdf/2106.13219.pdf

McCabe, D. L. (2005). Cheating among college and university students: A North American perspective. *International Journal for Educational Integrity, 1*(1), 1-11. doi: https://doi.org/10.21913/IJEI.v1i1.10

Microsoft. (2023, May 25). Governing AI: A Blueprint for the Future. Retrieved September 18, 2023, from https://query.prod.cms.rt.microsoft.com/cms/api/am/binary/RW14Gtw

Mollick, E. (2022, December 14). *ChatGPT Is a Tipping Point for AI*. Retrieved September 18, 2023, from Harvard Business Review: https://hbr.org/2022/12/chatgpt-is-a-tipping-point-for-ai

Nolan, B. (2023, January 30). *Here are the schools and colleges that have banned the use of ChatGPT over plagiarism and misinformation fears*. Retrieved September 20, 2023, from Business Insider: Africa: https://africa.businessinsider.com/news/here-are-the-schools-and-colleges-that-have-banned-the-use-of-chatgpt-over-plagiarism/q9mykkh

Norhasni, A. Z., & Affero, I. (2012, January). Exploring Student Development Theory in Enhancing Learning through Supervision. *International Journal of Academic Research in Progressive Education and Development, 1*(1), 213-223. Retrieved from https://www.researchgate.net/publication/313567028_Exploring_Student_Development_Theory_in_Enhancing_Learning_through_Supervision

OpenAI. (2022, November 30). *Introducing ChatGPT*. Retrieved September 19, 2023, from OpenAI: https://openai.com/blog/chatgpt

Owan, V. J., Abang, K. B., Idika, D. O., Etta, E. O., & Bassey, B. A. (2023). Exploring the potential of artificial intelligence tools in educational measurement and assessment. *EURASIA Journal of Mathematics, Science and Technology Education*. Retrieved 2023, from https://www.researchgate.net/publication/371733134_Exploring_the_potential_of_artificial_intelligence_tools_in_educational_measurement_and_assessment

Roose, K. (2023, January 12). *Don't Ban ChatGPT in Schools. Teach With It.* Retrieved September 20, 2023, from The New York Times: https://www.nytimes.com/2023/01/12/technology/chatgpt-schools-teachers.html

Spaulding, D. T., Rockinson-Szapkiw, A. J., & & Donnelly, C. (2018). Proctoring online exams: Strategies for assuring academic integrity. *Journal of Online Learning Research, 4*(3), 229-255. doi: https://doi.org/10.1080/24748668.2018.1473228

Thomas, S. L., & Johnson, S. M. (2008). Successful strategies for recruiting, training, and utilizing proctors for high-stakes testing. *International Journal of Testing, 8*(1), 17-29. doi: https://doi.org/10.1080/15305050701807715

© 2026 CGE – Consortium for Global Education

Cornelius Chipasha, Ranjan Arulanandham & Simon Tembo

Vol 5:6 2026

Northrise University, Ndola Zambia

Abstract

This study assessed data security compliance in Zambian universities following the enactment of the Data Protection Act No. 3 of 2021, which established a legal framework for safeguarding personal information. Despite universities managing highly sensitive data, such as student records, biometrics, and academic credentials, there is limited empirical evidence on their institutional compliance with this legislation. This study aimed to evaluate the extent of data protection implementation, identify barriers to compliance, and propose evidence-based strategies for improvement.

A qualitative multiple-case study design was employed, involving two private and one Government universities. Data collection included 21 semi-structured interviews with key stakeholders, document analysis, and observational field notes. Thematic analysis was conducted following Braun and Clarke's six-phase approach.

Findings revealed distinct disparities in compliance maturity. University B exhibited high compliance, characterized by robust policy frameworks, technical safeguards, and effective incident response protocols. University A showed moderate compliance, with general awareness but inconsistent implementation. University C demonstrated low compliance, lacking foundational governance structures and awareness of the Act. Three key patterns emerged: (1) a leadership-awareness versus operational-implementation gap, (2) a policy-practice disconnect due to poor communication and training, and (3) systemic resource constraints.

The study concludes that legal mandates alone are insufficient to ensure data security compliance. A shift towards a data protection culture, supported by adequate resources, capacity building, implementation guidelines, and regulatory oversight, is essential. The findings have

implications for university governance, national policy, and the development of sustainable data protection frameworks in Zambia's higher education sector.

Keywords: data security compliance, Data Protection Act (2021), Zambian universities, cybersecurity, data governance, regulatory compliance

Introduction

The digital transformation of higher education has fundamentally altered how institutions manage sensitive personal data. Universities today serve as custodians of vast datasets, including student academic records, financial information, biometric data, and research involving human subjects, making them high-value targets for cyber threats (Langmuir, Buchanan, & Keats, 2020). In Zambia, this shift toward digitization has been accompanied by growing concerns over data privacy and security, particularly in light of increasing cyberattacks on educational institutions globally.

To address these risks, the Government of Zambia enacted the Data Protection Act (2021) (Act No. 3 of 2021), establishing a comprehensive legal framework for the protection of personal data. The Act aligns Zambia with international data protection standards such as the EU's General Data Protection Regulation (GDPR), mandating that all data controllers, including universities, implement appropriate technical and organizational measures to safeguard personal data against unauthorized access, loss, or disclosure (Government of Zambia, 2021). It also requires institutions to ensure accountability, conduct data protection impact assessments, and report data breaches within 72 hours.

Despite the legal mandate, there is limited empirical evidence on the extent to which Zambian universities have implemented the requirements of the Act. This study addresses this critical gap by assessing the state of data security compliance in three private higher education institutions: A, B, and C.

Using a qualitative case study approach, this research evaluates institutional policies, cybersecurity infrastructure, incident reporting mechanisms, and stakeholder awareness in relation

to the Data Protection Act (2021). Findings reveal significant deficiencies, particularly in policy communication and incident management, underscoring the urgent need for targeted interventions.

The study contributes to an emerging body of literature on data governance in African higher education and provides actionable recommendations for university administrators, policymakers, and the Office of the Data Protection Commissioner (ODPC). By benchmarking current practices against statutory requirements, this research supports the development of a robust, compliant, and resilient data protection culture within Zambia's evolving digital education landscape.

Background to the Study

The integration of information and communication technologies (ICTs) into Zambian universities has revolutionized teaching, learning, and administrative operations. Institutions now rely heavily on digital platforms such as student information systems, e-learning portals, and cloud-based financial management tools, resulting in the accumulation of large volumes of personal and sensitive data (Cheng & Wang, 2022). While these advancements enhance efficiency and accessibility, they also expose universities to escalating cybersecurity threats, including phishing, ransomware, insider breaches, and distributed denial-of-service (DDoS) attacks.

Globally, the education sector has become a prime target for cybercriminals. According to the IBM Cost of a Data Breach Report (2023), the average cost of a data breach in the education sector reached USD 3.8 million in 2023, with incidents often stemming from inadequate access controls and poor incident response planning. In Africa, the situation is exacerbated by limited cybersecurity budgets, insufficient technical expertise, and fragmented governance structures (PwC, 2022).

Recognizing these vulnerabilities, the Zambian government enacted the Data Protection Act (2021) to establish a national framework for data privacy and security. The Act defines key principles such as lawfulness, fairness, transparency, data minimization, accuracy, storage limitation, integrity, and confidentiality. It designates universities as data controllers, requiring them to implement security safeguards, appoint data protection officers (where applicable), register with the ODPC, and report data breaches promptly (Government of Zambia, 2021).

However, the implementation of such legislation in resource-constrained environments presents significant challenges. Many Zambian universities, especially private institutions, operate with limited IT infrastructure, outdated software, and minimal cybersecurity training for staff and students (Maranga & Nelson, 2019). A 2022 PwC report on digital maturity in Africa found that only 34% of Zambian organizations had fully mapped their data processing activities, a foundational step for compliance.

Moreover, while global research has explored data protection in higher education, such as Aliyu et al.'s (2020) Holistic Cybersecurity Maturity Assessment Framework (HCYMAF) in the UK or Taborda et al.'s (2021) ISO-based model in Colombia, there remains a notable absence of empirical studies on compliance with the Data Protection Act (2021) in Zambian universities. Existing literature discusses the importance of cybersecurity but lacks localized, evidence-based assessments of institutional readiness.

This study fills that gap by conducting a qualitative case study of A, B, and C three institutions of higher learning with varying levels of technological maturity. Grounded in Compliance and Regulatory Theory, which emphasizes continuous monitoring, policy alignment, and adaptive governance (Chukwurah, 2024), the research evaluates institutional practices against the legal requirements of the Act.

By identifying key compliance gaps, such as lack of formal policies, ineffective communication, and absence of incident reporting mechanisms, this study provides critical insights for strengthening data governance in Zambian higher education. The findings are essential for shaping institutional strategies, guiding policy enforcement, and fostering a culture of accountability and digital responsibility in an era of rapid technological change.

Problem Statement

The enactment of the Data Protection Act (2021) in Zambia represents a pivotal step toward safeguarding personal data across public and private institutions, including higher education. The law mandates that all data controllers, such as universities, implement robust technical, organizational, and procedural safeguards to protect sensitive information, ensure accountability, and report data breaches within 72 hours of discovery (Government of Zambia, 2021). As custodians of vast amounts of personal data, including student records, financial details, biometric

information, and research data, Zambian universities bear a significant legal and ethical responsibility to comply with these provisions.

Globally, higher education institutions are increasingly recognized as high-risk targets for cyber threats. Studies have shown that inadequate cybersecurity policies, poor incident response mechanisms, and low staff awareness contribute to frequent data breaches in universities (Langmuir et al., 2020; IBM, 2023). In response, many countries have developed comprehensive compliance frameworks, supported by institutional governance, regular audits, and cybersecurity training programs (Aliyu et al., 2020; Taborda et al., 2021).

However, despite the legal mandate and global best practices, there is a critical lack of empirical evidence on the extent to which Zambian universities are complying with the Data Protection Act (2021). While the legislation has been in force since 2021, anecdotal reports and preliminary assessments suggest that many institutions, particularly private universities, lack formal data protection policies, designated data protection officers, or structured incident reporting systems. Furthermore, awareness of the Act among key stakeholders remains inconsistent, and existing cybersecurity infrastructure is often outdated or poorly maintained (Maranga & Nelson, 2019).

This study identifies a significant gap between regulatory requirements and institutional realities in Zambian higher education. Specifically, there is insufficient understanding of:

- How universities interpret and implement the Act's data security provisions,
- Whether they have established compliant policies and communication strategies,
- If mechanisms for incident detection, reporting, and response are in place,
- And what institutional, financial, and technical barriers hinder full compliance.

Without such an assessment, universities remain vulnerable to data breaches, legal penalties, reputational damage, and loss of stakeholder trust. This problem is further exacerbated by the rapid digitization of academic and administrative systems, which increases exposure to cyber threats without a corresponding investment in security readiness.

Therefore, this research is necessary to empirically evaluate the state of data security compliance in Zambian universities, using University A, B, and C as case studies. By diagnosing compliance gaps and identifying systemic challenges, the study provides actionable insights for

strengthening institutional data governance and ensuring adherence to national law. In doing so, it addresses a critical void in the literature and supports the development of a secure, accountable, and resilient higher education sector in Zambia.

Research Objectives

This study aims to assess the state of data security compliance in selected Zambian private universities in light of the Data Protection Act (2021). The specific objectives are to:

1. Evaluate the extent to which University A, B, and C comply with the data security and privacy requirements stipulated in the Data Protection Act (2021), with a focus on policy implementation, technical safeguards, and institutional accountability.
2. Identify the key institutional, technical, and human resource challenges that hinder effective implementation and sustained compliance with the Act in the selected universities.
3. Assess the effectiveness of current mechanisms for incident reporting, stakeholder awareness, and cybersecurity training in promoting a culture of data protection within the institutions.
4. Propose context-specific, evidence-based recommendations to strengthen data security governance and ensure full alignment with national data protection regulations.

Research Questions

To achieve the stated objectives, this study sought to answer the following research questions:

1. To what extent are University A, B, and C aligned with the data security and privacy provisions of the Data Protection Act (2021), and what are the key areas of non-compliance?
2. What institutional, financial, and technical barriers limit the full implementation of data protection policies and practices in these universities?
3. How effective are current strategies for communicating cybersecurity policies, managing data breaches, and building stakeholder capacity in ensuring regulatory compliance?
4. What actionable strategies can be adopted to improve data security compliance and institutional resilience in Zambian private universities?

Significance of the Study

This study holds significant academic, practical, and policy relevance in the context of Zambia's evolving digital and regulatory landscape. As one of the first empirical assessments of data security compliance in Zambian private universities under the Data Protection Act (2021), it provides critical insights into the current state of institutional preparedness, identifies systemic gaps, and offers actionable recommendations for improvement.

1. Contribution to Institutional Data Governance

The findings of this study are directly beneficial to university administrators, IT departments, and data protection officers for higher education institutions in Zambia. By evaluating the extent of compliance with the Data Protection Act (2021), the research highlights weaknesses in policy communication, incident reporting mechanisms, and staff awareness, key areas that, if addressed, can significantly enhance institutional data governance. The study empowers these institutions to strengthen their cybersecurity frameworks, align with legal requirements, and foster a culture of accountability and data responsibility.

2. Support for National Regulatory Implementation

The Office of the Data Protection Commissioner (ODPC) is tasked with enforcing the Data Protection Act (2021) across all sectors, including education. However, effective enforcement requires evidence-based understanding of compliance levels and institutional challenges. This study provides empirical data on the real-world implementation of the Act in higher education, offering the ODPC valuable intelligence on common barriers—such as lack of training, inadequate infrastructure, and poor policy dissemination. These insights can inform targeted regulatory guidance, capacity-building programs, and compliance monitoring strategies tailored to the higher education sector.

3. Enhancement of Student and Stakeholder Trust

Universities are custodians of vast amounts of sensitive personal data, including academic records, financial information, biometric data, and health details. Non-compliance with data protection laws not only exposes individuals to privacy violations but also erodes public trust. This

study underscores the importance of transparency, accountability, and proactive security measures in safeguarding stakeholder interests. By advocating for improved compliance, the research supports efforts to protect student privacy and uphold institutional integrity, thereby strengthening confidence among students, parents, staff, and funding partners.

4. Informing Policy and Strategic Planning

The results of this research provide a foundation for evidence-based policymaking in Zambia's education and digital transformation agendas. Ministry of Technology and Science officials, educational planners, and cybersecurity task forces can use the findings to develop national guidelines for data protection in higher education, allocate resources for cybersecurity capacity building, and integrate data governance into broader digital education strategies. Furthermore, the study supports the alignment of Zambian institutions with international best practices, such as the EU's GDPR and ISO/IEC 27001 standards, enhancing global interoperability and collaboration.

5. Advancing Academic Research in African Cybersecurity Contexts

There is a notable scarcity of localized, qualitative research on data protection compliance in African higher education institutions. This study fills a critical gap in the literature by offering a context-specific, in-depth case study analysis grounded in Zambian realities. It contributes to the growing body of knowledge on cybersecurity governance in resource-constrained environments and serves as a model for similar assessments in other African countries undergoing digital transformation. Future researchers can build upon this work to conduct comparative studies, longitudinal analyses, or sector-wide evaluations.

6. Promotion of Cybersecurity Awareness and Capacity Building

By identifying low levels of policy communication and inconsistent training programs, the study highlights the urgent need for cybersecurity awareness initiatives within universities. The recommendations derived from this research can guide the development of staff training modules, student education campaigns, and continuous professional development programs focused on data protection. This promotes a whole-institution approach to cybersecurity, where every stakeholder understands their role in protecting sensitive information.

In summary, this study is not merely an academic exercise but a strategic intervention in Zambia's journey toward responsible data stewardship. It bridges the gap between legal mandate and institutional practice, providing a roadmap for Zambian universities to achieve meaningful compliance with the Data Protection Act (2021). In doing so, it enhances data security, supports regulatory enforcement, protects individual rights, and strengthens the resilience of the nation's higher education system in an increasingly digital world.

Literature Review

The rapid digitization of higher education institutions has transformed academic and administrative operations, increasing reliance on digital systems for managing sensitive personal data. As custodians of vast datasets, including student records, financial information, biometric data, and research involving human subjects, universities face growing cybersecurity threats and regulatory obligations. This literature review examines the global and regional landscape of data security compliance in higher education, with a focus on the implications of national data protection legislation, particularly Zambia's Data Protection Act (2021). It explores existing frameworks, sector-specific insights, and challenges in implementation, culminating in a critical assessment of the research gap this study addresses.

Global Perspective on Data Security Compliance

In an era of digital transformation, data security compliance has become a strategic imperative across sectors. Organizations are increasingly required to align their data handling practices with evolving legal and regulatory frameworks to protect individual privacy and avoid penalties for non-compliance (Chukwurah, 2024). The European Union's General Data Protection Regulation (GDPR) and similar laws worldwide have set a precedent for robust data governance, emphasizing principles such as lawfulness, accountability, data minimization, and breach notification (Government of Zambia, 2021).

Compliance is not merely a legal obligation but a critical component of organizational resilience. Luo et al. (2023) note that regulatory misalignment can lead to significant operational costs, reputational damage, and commercial risks. In the United States, Chukwurah (2024) highlights how technology companies must harmonize internal teams and policies to

meet data protection standards, underscoring the need for a culture of compliance. Similarly, Alqahtani and Braun (2021) found that in e-government organizations, employee behavior and accountability significantly influence the effectiveness of cybersecurity compliance, suggesting that technical controls alone are insufficient without human and organizational alignment.

Cybersecurity in the Higher Education Sector

Higher education institutions are particularly vulnerable to cyber threats due to their open network environments, decentralized IT systems, and large volumes of sensitive data. Langmuir, Buchanan, and Keats (2020) describe a "data security crisis" in universities, identifying factors such as weak access controls, outdated software, and lack of incident response planning as key contributors to data breaches. These breaches can compromise academic integrity, expose personal information, and result in financial and reputational losses.

Globally, the education sector has seen a surge in cyberattacks. According to IBM (2023), the average cost of a data breach in education reached USD 3.8 million in 2023, with ransomware and phishing among the most common attack vectors. Oliveira et al. (2022) emphasize that the interconnected nature of university systems, linking students, faculty, research labs, and third-party vendors, creates multiple entry points for cybercriminals, necessitating a holistic security approach.

Sector-Specific Compliance Frameworks

Various sectors have developed models to enhance compliance and cybersecurity maturity. In banking, Mohan (2023) assessed information security governance in Indian public sector banks, advocating for robust frameworks that integrate risk management, regulatory alignment, and stakeholder trust. In insurance, Talesh (2018) explored how insurers act as "compliance managers," using policy incentives to encourage data protection among businesses, suggesting that external accountability mechanisms can drive internal compliance.

In technology, Chukwurah (2024) investigated the use of machine learning to optimize compliance in cloud computing, demonstrating how automation can improve monitoring and reduce human error. Cheng, Villamarin, Cu, and Lim-Cheng (2018) proposed a model for continuous compliance monitoring across multiple regulations, emphasizing real-time assessment and adaptive governance—principles equally applicable to higher education institutions navigating complex legal landscapes.

Cybersecurity Strategies in Higher Education

Recognizing the unique challenges faced by universities, researchers have proposed targeted strategies to strengthen data security. Cheng and Wang (2022) recommend that institutional leaders enhance cybersecurity governance by revisiting key performance indicators (KPIs), clarifying policies, and conducting regular training. They also stress the need to address emerging threats from artificial intelligence and mobile device usage.

Maranga and Nelson (2019) emphasize the importance of investing in cybersecurity technologies, hiring dedicated security professionals, and fostering stakeholder awareness in Kenyan higher education institutions. Back and LaPrade (2019) apply Situational Crime Prevention (SCP) theory to cybersecurity, conceptualizing technical controls (e.g., firewalls, access logs) as preventive measures that reduce opportunities for cybercrime. Their findings suggest that proactive, layered defenses are more effective than reactive responses.

To operationalize these strategies, Aliyu et al. (2020) developed the Holistic Cybersecurity Maturity Assessment Framework (HCYMAF) for UK higher education institutions. This lightweight, self-assessment tool integrates multiple security standards and regulations, enabling institutions to evaluate their maturity level and identify areas for improvement. Similarly, Taborda, Collazos, Marulanda, and Villalba (2021) designed a dynamic cybersecurity model based on ISO/IEC 27001 for Colombian universities, offering a customizable framework aligned with international best practices.

Data Security Compliance in Zambian Universities

In Zambia, the enactment of the Data Protection Act (2021) marks a significant step toward safeguarding personal data. The Act designates universities as data controllers, requiring them to implement technical and organizational measures to protect data, appoint data protection officers where necessary, register with the Office of the Data Protection Commissioner (ODPC), and report breaches within 72 hours (Government of Zambia, 2021).

Despite this legal mandate, empirical evidence on compliance levels in Zambian universities remains scarce. While Bayewu (2022) discusses the interplay between cybersecurity, legal frameworks, and risk management, the study lacks a sector-specific focus on higher education. PwC (2022) notes that only 34% of Zambian organizations have fully mapped their data processing activities, a foundational step for compliance, suggesting systemic gaps in implementation.

Furthermore, Alibeigi, Asgari, and Rezaei (2022) highlight widespread non-compliance with data protection regulations in various sectors, attributing it to weak enforcement, limited awareness, and resource constraints. In the Zambian context, where many institutions operate with limited IT budgets and technical expertise, these challenges are likely amplified.

Identified Research Gaps

While the literature provides valuable insights into global best practices and theoretical frameworks, several critical gaps remain, particularly in the Zambian higher education context:

Lack of Zambian-Specific Studies: Most research on data security compliance in higher education focuses on Western or Asian contexts, with minimal empirical investigation into Zambian institutions.

Limited Analysis of the Data Protection Act (2021): Although the Act is referenced in policy discussions, there is a dearth of in-depth studies on how universities interpret and implement its provisions.

Absence of Empirical Compliance Data: Existing literature discusses the importance of compliance but lacks concrete, evidence-based assessments of actual compliance levels in Zambian universities.

Underexplored Institutional Challenges: The unique barriers faced by Zambian universities, such as financial constraints, inadequate infrastructure, low staff capacity, and poor policy communication, have not been systematically studied.

This study directly addresses these gaps by conducting a qualitative case study of University A, B, and C. By evaluating their data security practices against the requirements of the Data Protection Act (2021), the research provides much-needed empirical insights into compliance levels, institutional challenges, and pathways to improvement.

Theoretical Framework

This study is grounded in Compliance and Regulatory Theory, which emphasizes the need for organizations to align their practices with legal and regulatory requirements through continuous monitoring, auditing, and adaptation (Chukwurah, 2024). The theory posits that compliance is not a one-time achievement but an ongoing process requiring institutional commitment, stakeholder engagement, and responsive governance.

Key components of the theory include:

Regulatory Compliance: Ensuring alignment with the Data Protection Act (2021).

Audit and Review: Conducting regular assessments to identify gaps.

Continuous Improvement: Updating policies and practices in response to emerging threats.

This framework guides the analysis of data security practices in the three case study institutions, enabling a systematic evaluation of compliance and the development of actionable recommendations.

Conclusion

The literature confirms that data security compliance is a critical challenge for higher education institutions globally, particularly in resource-constrained environments. While frameworks like HCYMAF and ISO-based models offer valuable guidance, their applicability

in the Zambian context requires empirical validation. The Data Protection Act (2021) provides a legal foundation, but its implementation remains uneven and poorly documented.

This study fills a vital research void by assessing real-world compliance in Zambian private universities. By identifying gaps in policy communication, incident reporting, and technical safeguards, it contributes to the development of a robust, context-sensitive data protection culture in Zambian higher education.

Research Methodology

This study employed a qualitative case study design to conduct an in-depth assessment of data security compliance in three Zambian universities, **A, B** and **C,** in relation to the Data Protection Act (2021). The methodology was carefully selected to explore complex institutional practices, identify compliance gaps, and understand the contextual challenges influencing data protection implementation in higher education.

The research design, data collection methods, sampling strategy, data analysis procedures, and ethical considerations are detailed below, ensuring transparency, credibility, and scholarly rigor.

This research adheres to the highest standards of cybersecurity research ethics. Following the Belmont Report principle of 'do no harm,' we have implemented institutional anonymization through consistent pseudonymization. In cybersecurity compliance assessments, public identification of institutions with documented non-compliance could expose them to regulatory penalties, reputational damage, and potentially increase their risk profile with threat actors. This approach maintains research integrity while fulfilling our ethical obligation to protect participating institutions from potential negative consequences of disclosure.

Research Philosophy and Approach

This study is grounded in the interpretivist paradigm, which emphasizes understanding social phenomena through the meanings individuals and institutions ascribe to their experiences (Creswell & Poth, 2018). Given that data security compliance involves organizational culture, policy interpretation, and stakeholder behavior, an interpretive

approach allows for a nuanced exploration of how institutions perceive and implement the Data Protection Act (2021).

A qualitative approach was adopted to generate rich, descriptive data that captures the complexity of cybersecurity governance beyond mere technical metrics. This aligns with the study's objective of assessing how and why institutions comply, or fail to comply, with legal requirements, rather than simply measuring how much compliance exists.

Research Design: Qualitative Case Study

The research utilized a multiple-case embedded case study design, as defined by Yin (2018), where each university represents a distinct case, and multiple units of analysis (e.g., policies, staff interviews, incident reports) are examined within each case. This design is particularly suitable for answering "how" and "why" questions in real-life contexts, especially when the boundaries between phenomenon and context are not clearly evident.

Rationale for Case Study Design

- Allows for in-depth, contextual analysis of data security practices within real-world institutional settings.
- Enables cross-case comparison across three universities with varying sizes, IT maturity, and governance models.
- Supports triangulation of data sources (interviews, documents, and observations), enhancing validity and reliability.
- Facilitates the identification of patterns, discrepancies, and best practices in compliance implementation.

The three institutions were purposively selected based on:

1. Their status as universities operating in urban centers.
2. Variability in technological infrastructure and administrative capacity.
3. Accessibility for research engagement and willingness to participate.
4. Representation of diverse institutional models within the Zambian higher education sector.

Research Setting and Participants

Research Setting

The study was conducted in Lusaka and Ndola, Zambia, focusing on three higher education institutions:

- University A: A faith-based institution with a growing digital infrastructure.
- University B: A technology-focused college with an emphasis on IT training.
- University C: A smaller institution with limited IT resources.

These settings were chosen because they reflect a range of technological readiness and institutional capacity, offering valuable comparative insights into compliance challenges.

Participants

A purposive sampling strategy was employed to select participants who possess direct knowledge of or responsibility for data security and compliance. The sample included:

ROLE	Number	Rationale
IT Managers / Directors	3	Responsible for technical infrastructure and cybersecurity
Registrars / Academic Officers	3	Handle student data and institutional records
Data Protection Officers (or equivalent)	2	Key actors in compliance implementation
Faculty Members	6	End-users of institutional data systems
Administrative Staff	4	Involved in daily data handling processes
Senior Management (e.g., Vice Chancellors, Deans)	3	Decision-makers in policy adoption and resource allocation

Total Participants: 21

Data collection continued until thematic saturation was achieved—i.e., no new themes emerged from additional interviews.

Data Collection Methods

To ensure comprehensive and triangulated data, the study employed three primary methods:

Semi-Structured Interviews

Face-to-face and virtual semi-structured interviews were conducted using an interview guide aligned with the research questions and thematic framework. Each interview lasted between 45 and 60 minutes with participant consent.

Key Interview Themes:

- Awareness and understanding of the Data Protection Act (2021)
- Institutional policies on data security and privacy
- Technical safeguards (e.g., encryption, firewalls, access controls)
- Incident reporting and response mechanisms
- Staff training and awareness programs
- Challenges to compliance (financial, technical, human resource)

The use of open-ended questions allowed participants to express their perspectives freely while maintaining focus on core research areas.

Document Analysis

Relevant institutional documents were reviewed to assess formal compliance with the Act. These included:

- Data protection or cybersecurity policies
- IT security manuals and procedures
- Incident response plans
- Training materials and workshop reports
- Evidence of registration with the Office of the Data Protection Commissioner (ODPC)

Documents were analyzed for completeness, alignment with the Act's requirements, and dissemination to stakeholders.

Observational Notes (Non-Participant)

During site visits and IT infrastructure walkthroughs, the researchers made systematic observational notes on:

- Physical security of server rooms
- Use of authentication mechanisms (e.g., multi-factor login)
- Visibility of data protection notices
- Staff behavior in handling sensitive data

These observations supplemented interview and document data, providing contextual depth.

Data Analysis Method

The study employed thematic analysis, a widely used qualitative method for identifying, analyzing, and reporting patterns (themes) within data (Braun & Clarke, 2006). The analysis followed a six-phase approach:

Phase 1: Data Familiarization

Transcripts and documents were read multiple times to gain a deep understanding of the content.

Phase 2: Initial Coding

Meaningful segments of text were coded using NVivo 14 software. Codes were descriptive (e.g., “lack of breach reporting,” “staff unaware of DPA”).

Phase 3: Theme Development

Codes were grouped into broader themes based on conceptual similarity and relevance to the research questions.

Phase 4: Reviewing Themes

Themes were reviewed against the dataset to ensure they accurately represented the data and were distinct from one another.

Phase 5: Defining and Naming Themes

Each theme was clearly defined and named to reflect its essence (see Table below).

Phase 6: Writing the Report

Findings were presented with illustrative quotes, contextual explanations, and linkages to the theoretical framework.

Table 3.1

THEME	DESCRIPTION
Awareness of the Data Protection Act (2021)	Level of knowledge among staff and leadership about the Act's requirements and implications.
Policy Development and Communication	Existence, quality, and dissemination of formal data security policies.
Cybersecurity Infrastructure	Technical measures in place (e.g., firewalls, encryption, access controls).
Incident Management and Reporting	Presence of response plans and mechanisms for reporting breaches.
Training and Capacity Building	Availability and effectiveness of staff and student training programs.
Compliance Monitoring and Auditing	Internal audits, accountability mechanisms, and continuous improvement processes.
Challenges to Compliance	Financial, technical, and institutional barriers hindering implementation.

Validity and Reliability (Trustworthiness)

To ensure the credibility, transferability, dependability, and confirmability of the findings (Lincoln & Guba, 1985), the following strategies were employed:

CRITERION	STRATEGY
Credibility	Triangulation of data sources (interviews, documents, observations); member checking by sharing summaries with participants for validation.
Transferability	Thick description of context, participants, and findings to allow judgment of applicability to other settings.
Dependability	Audit trail maintained with raw data, coding decisions, and analytical memos; peer debriefing with co-researchers.
Confirmability	Reflexivity practiced, researchers documented their assumptions and biases; findings grounded in data, not preconceptions.

Additionally:

- Inter-rater reliability was ensured by having two researchers independently code a subset of transcripts and compare results (high agreement achieved).
- Pilot testing of the interview guide was conducted with one non-participant IT officer to refine questions and ensure clarity.

Ethical Considerations

The study adhered to strict ethical standards in line with the Zambian National Health Research Authority (NHRA) and university research ethics guidelines.

Key ethical measures included:

- **Informed Consent:** All participants signed written consent forms after receiving a detailed explanation of the study's purpose, risks, and benefits.
- **Voluntary Participation:** Participants were informed of their right to withdraw at any time without penalty.
- **Confidentiality:** All data were anonymized using pseudonyms (e.g., P1, P2); identifying details removed from transcripts.
- **Data Security:** Audio recordings and transcripts were stored on encrypted drives with password protection, accessible only to the research team.
- **Beneficence and Non-Maleficence:** The study was designed to benefit institutions without exposing them to legal or reputational harm.

Ethical approval was obtained from the Institutional Review Board (IRB) i.e. NUREC of the

Research Limitations

While rigorous, the study has several limitations that are acknowledged transparently:

- Limited Generalizability: As a qualitative case study of three private universities, findings may not be generalizable to public institutions or other African countries.
- Response Bias: Participants may have provided socially desirable responses due to concerns about institutional reputation or job security.

- Access Constraints: Some institutions were reluctant to share sensitive documents (e.g., incident logs), limiting the depth of document analysis.
- Temporal Dynamics: The Data Protection Act (2021) is relatively new; compliance practices are still evolving, meaning findings represent a snapshot in time.
- Researcher Subjectivity: Despite reflexivity, the researchers' backgrounds in IT and cybersecurity may have influenced data interpretation.

These limitations are mitigated through methodological transparency, triangulation, and acknowledgment in the discussion.

Delimitations

The study was intentionally bounded by the following delimitations to ensure focus and feasibility:

1. Geographic Scope: Limited to Lusaka and Ndola based universities.
2. Legal Focus: Exclusively assesses compliance with the Zambian Data Protection Act (2021), no other frameworks like GDPR or ISO 27001 (though used for benchmarking).
3. Institutional Type: Focused on higher education institutions, excluding secondary schools or colleges.
4. Time Frame: Examines compliance practices post-2021 enactment of the Act.
5. Methodology: Uses qualitative methods only; no quantitative surveys or statistical analysis were conducted.

Conclusion

This methodological approach provides a robust, systematic, and ethically sound foundation for assessing data security compliance in Zambian universities. By combining case study design, thematic analysis, and multi-source data collection, the research generates deep, contextually rich insights into how institutions interpret and implement the Data Protection

Act (2021). The findings are not only academically rigorous but also practically valuable for enhancing data governance in Zambian higher education.

Findings and Discussion

Ethical Approach to Institutional Identification

Before presenting the findings, it is important to clarify our methodological approach to institutional identification. For ethical and confidentiality reasons, the three participating institutions are referred to using pseudonyms (University A, University B, and University C) throughout this chapter. This decision aligns with international research ethics standards, including the Belmont Report principle of "beneficence" (do no harm), and addresses specific concerns relevant to cybersecurity compliance research:

> "In cybersecurity compliance assessments, public identification of institutions with documented non-compliance could expose them to regulatory penalties, reputational damage, and potentially increase their risk profile with threat actors. To maintain research integrity while fulfilling our ethical obligation to 'do no harm,' we have implemented institutional anonymization through consistent pseudonymization. This approach allows for rigorous academic analysis while protecting participating institutions from potential negative consequences of disclosure."

Each pseudonym represents a distinct institutional profile within the Zambian higher education sector:

University A: A faith-based institution with moderate technological infrastructure

University B: A technology-focused institution with specialized IT programs

University C: A smaller institution with limited IT resources

This anonymization practice is consistent with responsible disclosure principles in cybersecurity research and has been approved by our Institutional Review Board (IRB). The findings remain valid and valuable for understanding compliance challenges in Zambian higher

education, while respecting the vulnerability of institutions still adapting to the Data Protection Act (2021).

This chapter presents the findings of the qualitative case study assessing data security compliance in three Zambian private universities, A, B and C in light of the Data Protection Act (2021). The analysis is structured around the core themes derived from thematic coding of interview transcripts, document reviews, and observational data:

1. Awareness and Understanding of the Data Protection Act (2021)
2. Policy Development and Communication
3. Cybersecurity Infrastructure and Technical Safeguards
4. Incident Management and Reporting Mechanisms
5. Training and Capacity Building
6. Institutional Challenges to Compliance

Each theme is presented with empirical findings followed by a critical discussion that situates the results within existing literature, regulatory expectations, and institutional realities.

4.1 Awareness and Understanding of the Data Protection Act (2021)

Findings

Awareness of the Data Protection Act (2021) varied significantly across institutions and roles. While senior administrators and IT managers generally acknowledged the existence of the law, their understanding of its specific requirements was often superficial.

At University A, the Chief Technology Officer confirmed awareness of the Act but admitted:

“We know there’s a new law on data protection, but we haven’t had formal training or a detailed breakdown of what it means for our daily operations.” (P5, IT specialist A)

In contrast, University B, being an ICT-focused institution, demonstrated higher awareness. The IT Director stated:

We've reviewed the Act and mapped our current systems against its principles. We're working toward registration with the ODPC." (P2, IT Director, University B)

However, at University C, awareness was minimal. A faculty member noted:

"I've never heard of the Data Protection Act. Are we supposed to be doing something different with student records?" (P12, Lecturer, University C)

Only two institutions, University A and University B, had initiated internal discussions about compliance. University C had no documented engagement with the Act.

Discussion

The findings reveal a critical gap between legal enactment and institutional awareness, a challenge echoed in global studies on regulatory adoption in higher education (Langmuir et al., 2020). While the Act mandates accountability from data controllers, compliance cannot be achieved without widespread understanding across administrative and academic staff.

This aligns with Alqahtani and Braun's (2021) assertion that employee awareness and accountability are central to effective cybersecurity compliance. The lack of formal training or dissemination mechanisms, particularly at University C, undermines the principle of organizational accountability enshrined in the Act (Government of Zambia, 2021, Section 27).

Furthermore, the variation in awareness reflects institutional maturity in digital governance. University B's proactive stance is consistent with its technical mission, whereas University C's unawareness suggests a need for top-down policy leadership. As Cheng and Wang (2022) emphasize, institutional leaders must prioritize data protection literacy to foster a culture of compliance.

4.2 Policy Development and Communication

Findings

All three institutions had some form of IT or data handling policy, but only University B had a formal, standalone Data Protection and Cybersecurity Policy aligned with the Act.

At University A, the IT department relied on an outdated IT usage policy last revised in 2018. When asked about updates post-2021, the IT Officer responded:

"We added a clause about data privacy, but we haven't done a full review. It's on our agenda." (P4, IT Officer, University A)

University C had no formal data protection policy. Instead, data handling was governed by informal practices:

"We tell staff not to share passwords and to lock computers, but there's no written rule." (P9, Administrative Staff, University C)

Even where policies existed, communication was weak. At University A, only 30% of interviewed faculty reported having seen the IT policy. One academic remarked:

"If there's a policy, I don't know where it is. We just do what we've always done." (P6, Faculty Member, University A)

None of the institutions had conducted policy awareness campaigns or distributed summaries to non-IT staff.

Discussion

The absence of formal, updated, and communicated policies constitutes a major compliance gap under the Data Protection Act (2021), which requires data controllers to establish and disseminate data protection measures (Section 24).

This finding supports Maranga and Nelson's (2019) observation that Kenyan universities often lack structured cybersecurity governance, relying instead on ad hoc practices. Without clear, accessible policies, staff cannot be expected to comply, increasing the risk of inadvertent breaches.

The situation also reflects a failure in institutional leadership and governance. As Cheng and Wang (2022) argue, revisiting cybersecurity KPIs and explicating policies are essential leadership responsibilities. The lack of policy communication at University C and University A suggests a top-down disconnect between administrative intent and operational reality.

University B's formal policy represents a best practice, but even there, implementation monitoring was limited. This underscores the need for continuous policy review and enforcement mechanisms, as emphasized in Compliance and Regulatory Theory (Chukwurah, 2024).

4.3 Cybersecurity Infrastructure and Technical Safeguards

Findings

Technical safeguards varied widely across the institutions:

University B employed firewalls, endpoint protection, encrypted databases, and multi-factor authentication (MFA) for administrative systems. Server rooms were physically secured, and backups were conducted weekly.

University A used antivirus software and basic firewalls but lacked encryption for stored data. MFA was not implemented, and password policies were weak (e.g., no mandatory rotation).

University C relied on outdated antivirus software and shared login credentials for administrative systems. No encryption was used, and backups were irregular.

During site visits, researchers observed unattended logged-in computers in administrative offices at both University A and University C. At University C, a staff member admitted:

"We use one password for the whole department. It's easier that way." (P10, Admin Staff, University C)

Only University B conducted regular system audits. University A performed audits only after incidents, and University C had never conducted one.

Discussion

The disparities in technical infrastructure highlight a digital divide within the private university sector, influenced by institutional priorities and resource allocation.

University B's robust technical measures align with best practices recommended by ISO/IEC 27001 (2013) and the Holistic Cybersecurity Maturity Assessment Framework (HCYMAF) (Aliyu et al., 2020). Its use of encryption and MFA directly supports the Act's requirement for "appropriate security measures" (Section 25).

In contrast, University A and University C exhibit technical immaturity, making them vulnerable to common threats like phishing and insider breaches. The use of shared credentials at University C violates fundamental cybersecurity principles and increases accountability risks.

These findings support Back and LaPrade's (2019) application of Situational Crime Prevention (SCP) theory, which posits that technical controls reduce opportunities for cybercrime. The absence of such controls in weaker institutions creates a permissive environment for data compromise.

Moreover, the lack of regular audits at two institutions indicates a reactive rather than proactive security posture, undermining the Act's emphasis on continuous compliance monitoring.

4.4 Incident Management and Reporting Mechanisms

Findings

Only University B had a formal Incident Response Plan (IRP). The IT Director explained:

"We have a step-by-step guide for reporting breaches, including internal escalation and notification to the ODPC within 72 hours." (P2, IT Director, University B)

At University A, incident response was informal:

"If something happens, we call the IT guy. We don't have a written plan." (P5, Registrar, University A).

University C had no mechanism for reporting breaches. When asked about a recent ransomware attack on a faculty laptop, the response was:

"We formatted the laptop and reinstalled the software. No one was told." (P8, IT Assistant, University C).

None of the institutions maintained a breach log or conducted post-incident reviews. Only University B had ever reported an incident (a phishing attempt) to the ODPC.

Discussion

The absence of formal incident management processes in two out of three institutions represents a critical non-compliance issue under the Data Protection Act (2021), which mandates timely reporting of data breaches (Section 32).

This failure exposes institutions to legal liability, reputational damage, and repeated attacks. IBM (2023) reports that organizations with formal IRPs save an average of USD 1.2 million per breach.

The informal handling of incidents at University A and University C reflects a culture of silence around cybersecurity failures, a phenomenon noted in PwC's (2022) Digital IQ Report. Without transparency and accountability, lessons cannot be learned, and systemic vulnerabilities persist.

University B's structured approach offers a model for others, but even there, staff training on the IRP was limited. As Taborda et al. (2021) emphasize, incident response models must be dynamic, tested, and widely understood to be effective.

4.5 Training and Capacity Building

Findings

Cybersecurity training was inconsistent across institutions:

University B conducted annual cybersecurity workshops for staff and included data protection in IT curricula.

University A held one training session in 2022 but none since.

University C had never conducted any formal training.

When asked about training frequency, a participant at University A said:

"We had a talk once. It was about email safety. Nothing since." (P7, Faculty Member, University A)

Only University B evaluated training effectiveness through post-session quizzes. None of the institutions provided training for students on data privacy rights.

Discussion

The lack of continuous, institution-wide training undermines the human element of cybersecurity, which is often the weakest link (Oliveira et al., 2022). As Maranga and Nelson (2019) stress, capacity building is essential for sustainable compliance

The findings confirm that one-off training is insufficient. Effective cybersecurity cultures require ongoing education, reinforcement, and evaluation—principles embedded in Compliance and Regulatory Theory's "continuous improvement" component (Chukwurah, 2024).

The absence of student training is particularly concerning, as students are both data subjects and data handlers (e.g., in research projects). Their lack of awareness of rights under the Act (e.g., access, rectification) limits the law's effectiveness.

University B's integration of data protection into its academic programs demonstrates a proactive, embedded approach that other institutions should emulate.

4.6 Institutional Challenges to Compliance

Findings

Participants identified several barriers to compliance:

Table 4.1

CHALLENGE	INSTITUTION AFFECTED	EXAMPLES
Limited Funding	All three	"We can't afford encryption tools or a dedicated security officer." (P4, B)
Lack of Expertise	University A, and C	"We don't have a data protection officer. The IT guy does everything." (P9, C)
Low Priority	University A, and C	"Data security is important, but we're focused on accreditation." (P5, C)

Only University B had appointed a Data Protection Officer (DPO), as recommended under the Act (Section 28). The other institutions cited cost and workload as barriers.

Discussion

These challenges reflect the realities of resource-constrained environments, where cybersecurity competes with other institutional priorities. PwC (2022) notes that only 34% of Zambian organizations have mapped their data processing activities—a foundational step for compliance.

The lack of DPOs in two institutions violates a key governance requirement of the Act. As Bayewu (2022) argues, legal frameworks must be supported by human and financial investment to be effective.

The findings also highlight a silos problem in institutional governance. Without collaboration between IT, academic, and administrative units, data flows remain unmonitored and unsecured.

To overcome these barriers, institutions need strategic prioritization, external support, and phased implementation plans, a point reinforced by Aliyu et al.'s (2020) call for lightweight, self-assessment tools like HCYMAF to guide incremental improvement.

Table 4.3

THEME	B	A	C
Awareness of DPA (2021)	Moderate (leadership only)	High	Low
Formal Data Protection Policy	Partial (outdated)	Yes	No
Technical Safeguards	Basic	Strong	Weak
Incident Reporting Mechanism	Informal	Formal	None
Staff Training	One-time	Annual	None
Data Protection Officer	No	Yes	No
ODPC Registration	Pending	In progress	Not started

Overall Compliance Level:

- University B: High
- University A: Medium
- University C: Low

4.8 Synthesis and Theoretical Reflection

When analyzed through the lens of Compliance and Regulatory Theory (Chukwurah, 2024), the findings reveal a spectrum of institutional maturity:

- University B demonstrates regulatory alignment, audit readiness, and continuous improvement, core tenets of the theory.
- University A shows partial compliance, with awareness and intent but insufficient implementation.
- University C exhibits systemic non-compliance, lacking even basic governance structures.

The study confirms that compliance is not merely a technical or legal issue but a socio-technical challenge requiring leadership, resources, culture, and continuous adaptation.

The Data Protection Act (2021) provides a strong legal foundation, but its effectiveness depends on institutional will, capacity, and accountability. As the findings show, the gap between law and practice remains wide, especially in under-resourced institutions.

Conclusion and Recommendations

5.1 Summary of Key Findings

This research set out to assess the state of data security compliance in Zambian private universities in light of the Data Protection Act (2021), with a specific focus on three institutions referred to as University A, University B, and University C (for ethical reasons, as explained in Chapter 4). Through a qualitative case study approach involving interviews, document analysis, and observational methods, the research identified significant variations in compliance levels and uncovered critical gaps in data protection practices across the sector.

The findings revealed a spectrum of compliance maturity:

- **University B** demonstrated high compliance with the Act, showing strong policy frameworks, technical safeguards, and incident management procedures
- **University A** exhibited medium compliance, with awareness of requirements but inconsistent implementation
- **University C** showed low compliance, lacking even basic governance structures and awareness of the Act

Three critical patterns emerged across all institutions:

1. **Awareness-Implementation Gap:** While leadership at most institutions was aware of the Data Protection Act (2021), this awareness did not consistently translate into operational compliance. As University A's IT Manager noted, "We know there's a new law on data protection, but we haven't had formal training or a detailed breakdown of what it means for our daily operations."
2. **Policy-Practice Disconnect: Formal** policies existed at two institutions (University A and University B), but communication to end-users was poor. At University A, only 30% of faculty reported having seen the IT policy, with one academic remarking, "If there's a policy, I don't know where it is. We just do what we've always done."
3. **Resource Constraints as Systemic Barrier**: All institutions cited limited funding and expertise as major challenges, but University C's situation was particularly concerning, with staff admitting, "We don’t change passwords at all, as per password policy. It's easier that way."

These findings confirm that compliance with the Data Protection Act (2021) is not merely a technical or legal issue but a socio-technical challenge requiring institutional commitment, resource allocation, and cultural change.

5.2 Conclusions

5.2.1 Addressing the Research Questions

This study set out to answer three specific research questions. The conclusions to each are as follows:

Research Question 1: What are the existing data security measures and levels of compliance with data protection regulations within Zambian universities?

The research reveals a stark disparity in compliance levels across Zambian private universities. University B has established a robust compliance framework with formal policies, technical safeguards, and incident management procedures. University A shows partial compliance with awareness but inconsistent implementation. University C exhibits systemic non-compliance, lacking even basic data protection structures.

Crucially, no institution had achieved full compliance with the Data Protection Act (2021). All showed significant gaps in policy communication, staff training, and incident reporting mechanisms, key requirements under gaps in policy communication Sections 44, 64 and ,57, Gaps in staff training section 50, 48 and 46. Gaps in incident reporting mechanism, section, 49, (1, 2, 3)

Research Question 2: What specific factors hinder Zambian universities from fully achieving data security compliance?

Four interrelated barriers emerged as primary obstacles:

1. **Resource constraints:** Limited funding for cybersecurity infrastructure and personnel
2. **Capacity gaps:** Insufficient expertise, particularly the absence of Data Protection Officers
3. **Organizational silos:** Poor coordination between IT departments and academic/administrative units
4. **Cultural factors:** Low prioritization of data protection compared to other institutional concerns

These barriers create a compliance paradox: institutions recognize the importance of data protection but lack the resources, expertise, and institutional will to implement comprehensive measures.

Research Question 3: What are the most effective strategies for enhancing data security practices within Zambian universities to ensure compliance with the provisions outlined in the Data Protection Act (2021)?

The research identified several effective strategies, with University B serving as a model:

1. **Integrated policy development:** Creating formal, standalone data protection policies rather than ad hoc additions to existing IT policies
2. **Continuous training:** Moving beyond one-time workshops to ongoing, mandatory cybersecurity education
3. **Technical investment:** Implementing basic but essential safeguards like encryption and multi-factor authentication
4. **Incident management systems:** Establishing formal reporting mechanisms and response protocols
5. **Leadership commitment:** Visible support from senior administration for data protection initiatives

University B's success demonstrates that even resource-constrained institutions can make meaningful progress through strategic prioritization and phased implementation.

5.2.2 Theoretical and Practical Implications

From a theoretical perspective, this research validates Compliance and Regulatory Theory (Chukwurah, 2024) in the Zambian higher education context. The findings confirm that compliance is not a binary state but a continuum of maturity requiring ongoing monitoring, adaptation, and institutional commitment.

Practically, the study reveals that the Data Protection Act (2021), while providing a strong legal foundation, cannot achieve its intended outcomes without:

- Adequate institutional resources
- Clear implementation guidance
- Capacity building support
- Effective enforcement mechanisms

The research underscores a critical insight: legal enactment alone is insufficient for compliance. As demonstrated by University C's complete unawareness of the Act, legislation must be accompanied by robust implementation support and monitoring frameworks.

5.3 Recommendations

Based on the findings and conclusions, this section presents specific, actionable recommendations for key stakeholders in the Zambian higher education ecosystem.

5.3.1 Recommendations for Universities

For All Institutions:

- **Conduct a Data Protection Gap Analysis:** Systematically assess current practices against the Act's requirements using frameworks like HCYMAF (Aliyu et al., 2020)
- **Develop a Phased Implementation Plan:** Prioritize critical compliance areas (e.g., breach reporting, consent mechanisms) rather than attempting comprehensive change at once
- **Establish Cross-Functional Data Governance Committees:** Include representatives from IT, academic, administrative, and legal units to break down silos
- **Implement Basic Technical Safeguards:** At minimum, deploy encryption for stored data, multi-factor authentication, and regular backups

For University A (Medium Compliance):

- Revise and Communicate Policies: Update the outdated IT policy to specifically address data protection requirements and develop a communication strategy to ensure all staff understand their obligations
- Strengthen Incident Reporting: Formalize the informal incident response process with documented procedures and staff training
- Appoint an Interim Data Protection Officer: Even part-time designation would demonstrate commitment and provide focal point for compliance efforts

For University C (Low Compliance):

- Begin with Awareness Campaigns: Prioritize basic education about the Data Protection Act for all staff before implementing technical measures
- Implement Password Management Policies: Immediately address the shared password practice and establish individual accountability
- Seek External Support: Partner with the ODPC or industry associations for initial compliance guidance and capacity building
- Start Small: Focus first on high-risk areas like student records before expanding to broader compliance efforts

5.3.2 Recommendations for the Office of the Data Protection Commissioner (ODPC)

1. Develop Sector-Specific Guidance: Create a Higher Education Data Protection Implementation Guide that translates the Act's requirements into practical steps for universities, addressing common challenges like student data handling and research ethics.
2. Establish a Compliance Support Program: Offer workshops, templates, and consultation services specifically for higher education institutions, recognizing their unique resource constraints.
3. Implement a Phased Enforcement Approach: For the first 18-24 months, focus on technical assistance rather than penalties, with clear milestones for compliance progression.

4. Create a Higher Education Compliance Network: Facilitate peer learning through a forum where universities can share best practices and challenges.
5. Develop a Self-Assessment Tool: Adapt frameworks like HCYMAF (Aliyu et al., 2020) to the Zambian context, allowing institutions to benchmark their compliance levels.

As PwC (2022) notes, only 34% of Zambian organizations have fully mapped their data processing activities, a foundational step for compliance. The ODPC could significantly accelerate progress by providing sector-specific mapping templates and support.

5.3.3 Recommendations for Policy Makers

1. Integrate Data Protection into University Accreditation Criteria: Require evidence of data protection compliance as part of institutional accreditation processes.
2. Create a Cybersecurity Capacity Fund: Establish a dedicated funding stream to support universities in implementing essential data protection measures, particularly for institutions serving vulnerable populations.
3. Develop National Cybersecurity Curriculum Standards: Work with the Ministry of Education to incorporate data protection principles into IT and computer science programs nationwide.
4. Strengthen Interagency Collaboration: Facilitate coordination between the ODPC, Ministry of Technology, and Ministry of Higher Education to ensure cohesive policy implementation.
5. Support Research on Compliance Barriers: Fund studies examining the specific challenges faced by Zambian institutions in implementing data protection requirements.

5.3.4 Recommendations for Future Research

1. Expanded Sector Assessment: Conduct a larger-scale study across both public and private Zambian universities to develop a comprehensive national compliance profile.

2. Public-Private Comparative Analysis: Investigate the differences in compliance approaches and challenges between public and private institutions in the Zambian context.
3. Longitudinal Compliance Tracking: Establish a multi-year study to monitor compliance progression and identify effective intervention strategies.
4. Cost-Benefit Analysis of Compliance: Research the financial implications of compliance for Zambian universities, including both implementation costs and potential savings from breach prevention.
5. Student Data Rights Awareness Study: Examine students' understanding of their data rights under the Act and how this impacts institutional compliance.
6. Implementation Science Approach: Study the specific factors that enable or hinder successful implementation of data protection measures in resource-constrained academic settings.

5.4 Study Limitations and Ethical Considerations

This study, while providing valuable insights, has several limitations that warrant acknowledgment:

1. Sample Size and Scope: The research focused on three private universities in Lusaka, and Copperbelt limiting generalizability to public institutions or rural campuses. However, the purposive selection of diverse institutional profiles enhances the depth of insights within the private sector.
2. Methodological Constraints: As a qualitative study, it does not provide quantitative metrics of compliance. Future research could incorporate mixed methods to measure compliance levels more precisely.
3. Temporal Limitations: The Data Protection Act (2021) is relatively new, meaning compliance practices are still evolving. These findings represent a snapshot in time rather than a mature compliance landscape.

4. Access Restrictions: Some institutions were reluctant to share sensitive security documentation, potentially limiting the depth of technical assessment.
5. Ethical Anonymization: As discussed in Chapter 4, the use of pseudonyms while protecting institutional confidentiality may limit the specificity of certain findings, though it aligns with responsible research practices in cybersecurity compliance assessment.

Despite these limitations, the study makes a significant contribution to understanding data protection compliance in Zambian higher education—a previously under-researched area. The ethical decision to anonymize participating institutions reflects responsible research practices that prioritize "doing no harm" while still generating valuable insights for the sector.

5.5 Final Reflection

This research confirms that the Data Protection Act (2021) represents more than just legal compliance, it embodies a fundamental shift in how Zambian universities must approach data stewardship. The findings reveal that while technical measures are important, true compliance requires a cultural transformation where data protection becomes embedded in institutional values and daily practices.

The journey toward full compliance will not be easy, particularly for resource-constrained institutions. However, as University B's example demonstrates, meaningful progress is possible through strategic prioritization, phased implementation, and institutional commitment.

The ultimate goal of data protection is not merely regulatory adherence but the preservation of trust, between universities and their students, between institutions and regulatory bodies, and between Zambian higher education and the global academic community. By embracing the Data Protection Act (2021) not as a burden but as an opportunity to strengthen institutional integrity, Zambian universities can position themselves as leaders in responsible data stewardship within the African higher education landscape.

As the digital transformation of higher education continues to accelerate, the imperative for robust data protection practices will only grow. This research provides a foundation upon which Zambian universities, the ODPC, and policymakers can build a more secure, trustworthy, and compliant higher education sector—one that not only meets legal requirements but also upholds the highest standards of data responsibility in the digital age.

References

Alibeigi, N., Asgari, N., & Rezaei, P. (2022). A systematic literature review on data protection compliance: Challenges and solutions. *Journal of Information Security and Applications, 67*, 103188. https://doi.org/10.1016/j.jisa.2022.103188

Alqahtani, M., & Braun, R. (2021). Examining the impact of technical controls, accountability and monitoring towards cyber security compliance in e-government organizations. *ResearchSquare*. https://doi.org/10.21203/rs.3.rs-196216/v1

Back, K. J., & LaPrade, J. G. (2019). Cyber situational crime prevention: An empirical assessment of cybersecurity measures in academic institutions. *Crime & Delinquency, 65*(6), 759–786. https://doi.org/10.1177/0011128718823989

Bayewu, O. (2022). Cybersecurity, legal frameworks, and risk factors: A review of organizational best practices. *International Journal of Cybersecurity and Digital Forensics, 11*(2), 45–52.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Cheng, D., Villamarin, J., Cu, G., & Lim-Cheng, N. (2018). Towards end-to-end continuous monitoring of compliance status across multiple requirements. *International Journal of Advanced Computer Science and Applications, 9*(12), 456–463. https://doi.org/10.14569/IJACSA.2018.091264

Cheng, E. C. K., & Wang, T. (2022). Institutional strategies for cybersecurity in higher education institutions. *Information, 13*(4), 192. https://doi.org/10.3390/info13040192

Chukwurah, E. (2024). Harmonizing teams and regulations: Strategies for data protection compliance in U.S. technology companies. *Computer Science & IT Research Journal, 5*(4), 824–838. https://doi.org/10.51594/csitrj.v5i4.1044

Creswell, J. W. (2013). *Qualitative inquiry and research design: Choosing among five approaches* (3rd ed.). Sage.

Government of Zambia. (2021). *Data Protection Act, 2021 (Act No. 3 of 2021)*. Lusaka: Government Printers.

IBM. (2023, June 7). *Cost of a data breach report 2023*. IBM Security. https://www.ibm.com/reports/data-breach

ISO/IEC 27001. (2013). *Information technology — Security techniques — Information security management systems — Requirements*. International Organization for Standardization.

Langmuir, M., Buchanan, M., & Keats, D. (2020). Data security crisis in universities: Identification of key factors affecting data breach incidents. *Nature Journal of Computer Science and Systems Biology, 8*, 175–183.

Maranga, M. J., & Nelson, M. (2019). Emerging issues in cyber security for institutions of higher education. *International Journal of Computer Science and Network, 8*(4), 371–379.

Mohan, K. (2023). Assessing information security governance in public sector banks of India. *International Journal of Engineering Technology and Management Sciences, 7*(5), 103–116. https://doi.org/10.46647/ijetms.2023.v07i05.012

Oliveira, A. D., Funchal, G., Queiroz, J., Loureiro, J., Pedrosa, T., Parra, J., & Leitão, P. (2022). Learning cybersecurity in IoT-based applications through a capture the flag competition. *2022 IEEE 20th International Conference on Industrial Informatics (INDIN)*. https://doi.org/10.1109/INDIN51773.2022.9976079

PwC. (2022, June). *Global Digital IQ Survey 2022*. PricewaterhouseCoopers. https://www.pwc.com/us/en/tech-effect/cloud/digital-iq.html

Taborda, M. A. V., Collazos, F. A. M., Marulanda, C. A. E., & Villalba, K. M. (2021). Dynamic cybersecurity model based on ISO standards for higher education institutions in Colombia. *Ingeniería Solidaria, 17*(3), 1–21. https://doi.org/10.16925/2357-6014.2021.03.05

Talesh, S. (2018). Data breach, privacy, and cyber insurance: How insurance companies act as "compliance managers" for businesses. *Law & Social Inquiry, 43*(2), 417–440. https://doi.org/10.1111/lsi.12303

Whitman, M. E., & Mattord, H. J. (2012). *Principles of information security* (4th ed.). Cengage Learning.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). Sage.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Sage.

Yin, R. K. (2018). *Case study research and applications: Design and methods* (6th ed.). Sage.

© 2026 CGE – Consortium for Global Education

David Wohlers

Vol 5:7 2026

Gordon–Conwell Theological Seminary

Author Note

ORCID Number: 0000-0003-2946-2332

Abstract

It is a common experience for faith and ethics to be disconnected from the "real world" of science, technology, engineering, math and construction trades (STEM&CT). To address such challenges, I developed and facilitated a short course—known as "*The Builders Guild"*—as one component of my Doctor of Ministry thesis-project. The Builders Guild explored the integration of Biblical theology and ethical decision-making, emphasizing a Biblically transformed virtue ethic as a preferred alternative to the more commonly emphasized ethical frameworks of deontology or utilitarianism. This article surveys some of the most insightful aspects of my thesis-project. Findings suggest that integration of theology into ethics education is not only viable but deeply meaningful for practitioners who seek to resolve theological and ethical complexities inherent to vocations in STEM&CT.

Introduction and the Context of the Thesis-Project

My thesis-project explored the need and opportunity to facilitate a faith-based ethics course at a Christian ministry called "Anselm House" located at the University of Minnesota in Minneapolis. Early in the doctoral program, I intended to limit the scope of my project to practicing engineers and students enrolled in engineering programs at the University of Minnesota. While developing the thesis-project, however, I met several construction workers and technicians who expressed interest in joining a STEM-focused community of Christians. Based on my experiences as a professional engineer who is directly involved with construction projects, I am aware that engineers work closely with technicians, tradespeople, and people in various other STEM disciplines. Thus, the project scope expanded to include university students, career professionals in STEM, and practitioners representing several construction trades.

Problem Statement

It is a common experience for faith and ethics to be disconnected from the "real world" of STEM and construction trades (STEM&CT). Neil Postman uses the term "technopolies" to describe societies that are dismissive of religion and tradition and instead submit culture to the "sovereignty of technique and technology," usually for the sake of power and progress (Postman, 1993, p. 59 & 26). Despite assumptions made by "technopolies", customs and belief systems serve essential functions in helping people to know their history, form identity, and navigate ethical challenges. As argued by Foltz and Foltz, "To destroy belief systems is to lose the very resources needed for a meaningful democratic society" (Foltz & Foltz, 2018, p. 4). STEM education does

not escape technopoly's grip and, reflecting its very ethos, modern STEM curriculum generally exalts "technical" subjects while discounting "soft" subjects such as religion and ethics.

It is likewise not uncommon for STEM educators at Christian higher-education institutions to isolate faith from technical disciplines. After collecting and modeling surveys from 2,074 faculty representing 55 institutions from within the Council of Christian Colleges & Universities (CCCU), Kaul et al. found that: "The results of the Discipline model suggest that, on average, faculty from the field of religion and philosophy are more likely to integrate faith and learning, whereas faculty from both the hard or applied sciences and humanities are less likely to integrate their faith into the classroom" (Kaul, Hardin, & Beaujean, 2017, pp. 172–187 & 183). Jon Schmidt similarly discusses the related tendency for technical knowledge to be pursued and applied apart from ethical and social considerations: "The common perception—even among engineers—is that engineering is primarily a matter of technical problem-solving and design by solitary individuals, and that the chief function of an engineer is to devise the most efficient means to achieve an end that is specified by someone else" (Schmidt, 2013, p. 993). To isolate ethics and religious faith from daily life in STEM and the trades, however, is to grossly misunderstand the very nature of the persons and communities we claim to serve. Consequently, while practitioners in STEM and construction trades may become proficient in delivering efficient and technologically complex solutions, they are often ill-equipped to resolve theological and ethical dilemmas inherent to their work. This phenomenon is not unique to the modern classroom, however. Even seasoned professionals tend to focus narrowly on strictly technical issues while remaining unaware of—or unconcerned about—the "soft" social factors that are purportedly beyond the rigid boundaries of their profession. Whether or not people appreciate the intertwined relationship between "hard" technical topics (e.g., topics that stereotypically involve equations and schematic diagrams) and

"soft" topics (e.g., religion and ethics), such "hard" and "soft" topics are interrelated constituents that compose larger social systems and should be considered in unison rather than compartmentalized into separate spheres.

Research Questions

As an intervention to address such challenges facing STEM&CT practitioners, I designed a short course that was referred to as the "Builder's Guild". This course explored three common ethical frameworks (deontology, utilitarianism, and virtue ethics), with an emphasis on virtue ethics, and considered the relevance of Biblical theology in resolving complex ethical challenges within our technologically advanced and religiously diverse world. With this purpose in mind, I sought to answer the following research questions:

1. Can a properly designed course that bridges the gap between industry's treatment of ethics and a Biblically transformed understanding of ethics lead to a robust understanding and integration of faith and ethics among people who minister in STEM and construction trades?
2. To what extent can the Builders course change perceptions regarding the role and relevance of faith and ethics in STEM and construction trades?

Introduction to Virtue Ethics

Virtue Ethics

To appreciate the emphasis on virtue ethics, it is beneficial to consider the tendency of ethics courses to focus on questions of moral permissibility (e.g., codes of conduct). Whether it be university courses or professional development modules, for example, ethics training is commonly structured to help people definitively answer legalistic questions such as "Is it ever

acceptable to take surplus materials from a construction site?" or "Can I allow people to perform tasks that they are not trained or qualified for?" or "What maximum value of '*gift*' am I allowed to accept from a contractor?" Virtue ethics regards such questions as flawed because they focus on the moral permissibility of external actions rather than getting to the heart of who a person truly is (Mattison III, 2008, p. 13). The core framework of virtue ethics, rather, is for people to consider their own habits of character and introspectively consider questions such as "What kind of person ought I to *be*?" rather than focusing on legalistic questions of permissibility. Character is the core of virtue, and ethicist Alasdair MacIntyre defines virtues as "dispositions which issue in the types of action which manifest human excellence" (MacIntyre, 1998, p. 52). In *Summa theologica,* Thomas Aquinas likewise defines virtue as "a good quality of the mind, by which we live righteously, of which no one can make bad use, which God forms in us, without us" (Thomas Aquinas, n.d., p. q.55 a.4 obj. 1). NT Wright defines virtue as follows:

> [Virtue] is what happens when someone has made a thousand small choices, requiring effort and concentration, to do something which is good and right but which doesn't '*come naturally'*—and then, on the thousand and first time, when it really matters, they find that they do what's required '*automatically*,' as we say. (Wright, 2010, p. 20)

In synthesizing wisdom contained in each of these definitions, I suggest that virtues are habituated dispositions that equip a person to act with excellence and without painstaking conscious deliberation amidst both ordinary and ethically ambiguous circumstances.

The framework of virtue ethics is outlined in Aristotle's compiled work titled *The Nicomachean Ethics*. According to Aristotle, a virtue is a character quality that, when possessed, enables a person to fulfill their function (Greek word *ergon*) with *excellence* (Greek word *arête*).

When not possessed, an absence of virtue prevents a person from functioning with excellence. Aristotle concludes that excellence is attributed to human effort and requires that people know what the human good is and actually exercise virtues that guide the pursuit of good ends (Lovin, 2011, p. 188). MacIntyre similarly explains how Aristotle determined whether or not a person was genuinely virtuous: "For Aristotle one sign of a virtuous man is that he *gets pleasure* from virtuous activity, and another is that he knows how to choose among pleasures and pains" (MacIntyre, 1998, p. 42). Thus, virtue ethics focuses on what we should *be* rather than what we should *do* and emphasizes the development of dispositions that condition habitual, stable, and predictable behaviors. Aristotle also concludes that virtues do not come naturally to anyone. Instead, virtues must be intentionally pursued and habitually exercised for a person to attain them—a person has not truly inculcated a virtue if a seemingly virtuous behavior is infrequent and "out-of-character." In other words, virtues are *predictable* and *repeated* habits that define our character (Lovin, 2011, p. 189).

The Greek word *eudaimonia* is commonly, yet imprecisely, translated into the English word "happiness." In *The Nicomachean Ethics*, Aristotle taught that happiness is an activity of the soul that requires complete goodness throughout a lifetime (Aristotle, 1934, p. 61 & 47 in Logos Bible Software). In contrast to modern use of the word "happiness," Aristotle argues that happiness is not found in simple amusements and pleasantries (Aristotle, 1934, pp. 609-611 in Logos Bible Software). Nor is happiness found in wealth, fame, or power (Robinson, 2004, p. 39). Rather, Greek philosophy concludes that *eudaimonia* is about human flourishing and people fulfilling their potential through the cultivation and acquisition of virtue.

It is important to note that Aristotle was concerned with both the individual and corporate exercise of virtues. Indeed, community is the training ground—the realm where moral struggles

occur—for developing virtue. Virtues must therefore be understood in terms of how they influence dispositions and actions of individual people as well as communities. Writing from a Christian perspective, NT Wright similarly explains that Christian virtue is intended to build up the Church, so virtues must also be developed and practiced corporately within the body of Christ:

> the vocation to be a royal priesthood, the challenge to develop the Christian virtues which constitute us as genuine, God-reflecting human beings, is a vocation and challenge that we receive not merely as individuals but as communities. Aristotle saw the person of virtue as taking a key role within the *polis*, the city, the basic political unit of his day. Christian virtue, though it generates great leaders, does so in order that the whole body of Christ may function with the same learned, habitual virtue. (Wright, 2010, p. 272)

Regarding how virtues are developed, Aristotle taught that a person cannot attain virtues through mere intellectual exercise. Rather, Aristotle asserts that the development of virtue requires intentionality and persistence as a person develops virtue through the process of habituation. Aristotle also believes that friendship and community are essential components of virtue development (Aristotle, 1934, pp. 461-463 in Logos Bible Software).

Analysis. Virtue ethics is holistically concerned with excellence in motivation, action (including excellence in the acquisition and application of technical knowledge!) and *actual* attainment of good ends. However, it is necessary to clarify that virtue ethics does not deem rules and consequences as irrelevant. Rules and consequences are indeed valid concerns in the broader exercise of virtue, yet rules and consequences are not themselves the penultimate consideration in virtue ethics. NT Wright similarly discusses how character development (the inculcation of

virtue) does not negate the need to either adhere to rules and/or intentionally pursue desirable ends. To the contrary, Wright explains,

> Character—the transforming, shaping, and marking of a life and its habits—will generate the sort of behavior that rules might have pointed toward but which a '*rule-keeping'* mentality can never achieve. And it will produce the sort of life which will in fact be true to itself—though the '*self*' to which it will at last be true is the redeemed self, the transformed self, not the merely '*discovered*' self of popular thought. (Wright, 2010, p. 7)

A Biblically-transformed virtue ethic complements the Christian life because of its capacity to sustain Christ-centered motivations, inform right actions, and guide a person in the pursuit of truly good ends.

Distinct Features of a Biblically Transformed Virtue Ethic

The holistic nature of virtue ethics, with its consideration of such issues as habituation, character, proper role of rules, and *telos,* renders it an appropriate framework, yet it is still lacking and in need of transformation from Biblical theology. Given the overarching argument that a Biblically transformed virtue ethic is appropriate for the ambiguous and complex nature of STEM&CT, I now highlight distinct features and applications of such a transformed framework.

Transformed Nature

One important nuance of a Biblically transformed virtue ethic concerns how we understand a person's transformed nature. In terms of Biblical theology, Romans 6:1-11 articulates how a Christian is baptized into Christ's death and resurrection and thereby gains a

new life in Christ. This new life in Jesus Christ involves "the Spirit's synergistic involvement in putting to death the habits and passions of the body and progressing toward the good" (Miller & Hauerwas, 2014, p. 130). In other words, Christians live on the basis of *be*ing in Christ and having our sinful nature increasingly transformed into the likeness of Christ through the work of the Holy Spirit (aka "sanctification"). Expressed in various ways throughout his letters to the Church, the Apostle Paul teaches that following Jesus Christ necessarily involves exchanging sinful habits and act-based legalism for a new life in Christ. In his letter to the church in Philippi, Paul writes that the aim of life is to share in the power of the resurrection and be raised from the dead: "I want to know Christ—yes, to know the power of his resurrection and participation in his sufferings, becoming like him in his death, and so, somehow, attaining to the resurrection from the dead."[1] Paul sought an ever-increasing knowledge of Christ, and this increasing knowledge impacted the *way* he lived. This pursuit is not unique to the Apostle Paul; no, it ought to be true of all Christians. Furthermore, Paul is not interested in moral formation for its own sake. His concern, rather, is for how Christians can best express *in action* what they have already become through faith and baptism (Harrington, SJ & Keenan, SJ, 2010, p. 110).

Actions Regulated by Our Identify

Another distinct feature of a Biblically transformed virtue ethic centers on the reality that Jesus did not come to give us a list of "do's and don'ts" but to "confer identity upon us, and to allow us to think and act from this identity" (Brown, 2017, p. Introduction in Logos Bible Software). As stated in *Virtue Ethics*, Brad Kallenberg suggests that Aristotelian virtue ethics complements Biblical theology in that both frameworks establish an identity that informs and

[1] See Phil. 3:10-11.

regulates actions: “Christian virtue ethics analyzes moral situations relative to the *fit* of its action as measured against the character of Christ revealed in the Gospel narratives. For virtue ethics the metric is not so much effectiveness as *faithfulness to the gospel*” (Kallenberg, 2017, p. 31). In other words, God-glorifying virtues are fruit, not the cause, of our identity in Christ.

Corporate Exercise of Virtue

A third distinction centers on the corporate exercise of virtues. Similar to how Aristotle believed that virtues ought to be inculcated at both the individual and community levels, the Church itself can be considered a corporate manifestation of a virtue ethic. In Philippians 1:27, for example, Paul exhorts Christians to “conduct yourselves in a manner worthy of the gospel of Christ.” Here the English phrase “conduct yourselves” comes from translating the original Greek word *politeuomai,* which is primarily concerned with the formation of right community (*polis*) rather than being limited to the character of an individual person. In this passage, Paul exhorts Christians to emulate Christlikeness *as a community*, and this exhortation is similar in concept to Aristotle’s concern for the corporate exercise of virtues.

Biblical Paradigm of Happiness (*eudaimonia*)

Generally speaking, contemporary society often assumes that a person’s happiness is a function of accomplishments, financial wealth, and/or social status. Popular myths in STEM&CT careers likewise suggest that, for example, happiness will increase after a person finally reaches such milestones as professional licensure, secures yet another abbreviation after their last name, or manages a prestigious construction project. By implication, a person who experiences career stagnation, vocational tragedy, or even just plain “*ordinariness*” is destined to experience limited

happiness. Such myths are not unique to contemporary society, and even Aristotle argued that an otherwise virtuous person who finds himself "fallen into the direst misfortune" cannot possibly be happy amidst unfortunate circumstances (Aristotle, 1934, p. 441 in Logos Bible Software). This conditional view of happiness is poignantly refuted in a book titled *The cross before me: reimagining the way to the good life*, in which the authors explore the "cruciform way" of life. The overarching thesis of this book is that "Happiness is communion with God. And the way to communion with God is the *way of the cross*" (Wilbourne & Gregor, 2019, p. Ch. 9 in Logos Bible Software). By implication, humans—who are, in fact, image-bearers of God—cannot experience true happiness apart from a restored relationship with their Creator. The "cruciform way," as discussed by Wilbourne and Gregor, centers on how Jesus' suffering and death on the cross brings salvation and establishes the *ordinary* way of life for Christians.[2] During Christ's incarnate life, death, and resurrection, Jesus fully and perfectly demonstrated what it means to live as a true image-bearer of God.[3] Jesus's life therefore exemplifies the nature of a truly "good life," which involves such virtues as humility and sacrificial love and rejection of the world's empty promises and notions of happiness apart from God. From a Biblical perspective, contemporary society's misconceptions about happiness ought to be of comparatively little concern to a Christian. Indeed, our inattention to Kingdom realities is the primary barrier that inhibits true happiness. Furthermore, a Christian who is overly concerned with his or her own temporal fortune or worldly pleasures functionally glorifies self above God—this is idolatry. We find life and true happiness, rather, when we commune with Christ.[4]

[2] See Matt 16:24-28.
[3] See Gen 1:27 and Col 1:15.
[4] See Matt 10:32-39.

Christ-centered *telos*

Another noteworthy difference between Greek philosophy and Biblical theology centers on what each paradigm considers the penultimate purpose of individual people and communities. The Greek word *telos* refers to ultimate purpose or function, and it is readily observed that questions of *telos* are at the forefront of peoples' minds. For example, we commonly encounter questions to the tone of, "What is the purpose of life?" or "What job best aligns with my goals?". As just one reflection of such concerns, a journal article titled "*A thematic analysis of Tweets about purpose in life*," concludes that people often believe it is possible to discover their purpose in life, but the burden of searching for life purpose is itself a source of much anxiety (Bronk, Cheung, Mehoke, & Pham, 2023, pp. 674-687). Conveniently—but rarely in a person's genuine best interest—our cultural liturgies are quick to provide self-serving (and sometimes obscure!) answers to questions of *telos*.

From a Biblical perspective, the *telos* of God's image-bearers is demonstrated in the incarnate life of Jesus Christ. As God's image-bearers, our primary *telos* is to repent, love and submit to the lordship of Jesus Christ, and seek to bring glory to God. Reinforcing this *telos*, Augustine began his *Confessions* by emphasizing that humans are made for the purpose of knowing and worshiping God. In the English translation of the *Confessions* we read of the human *telos*: "To praise Thee is the wish of man who is but a part of Thy creation. Thou dost bestir him so that he takes delight in praising Thee: *for Thou hast made us for Thee and our heart is unquiet till it finds its rest in Thee*" (Augustine of Hippo, 1953, p. 1.1.1). In another commonly recited text, Question #1 of the Westminster Shorter Catechism famously communicates a God-oriented *telos* in the statement that "the chief end of man is to glorify God and enjoy Him forever" (The Westminster shorter catechism: with Scripture proofs, 1996).

Needless to say, the Biblical *telos* is quite different from propositions of *telos* as prescribed by contemporary society. In fact, the Biblical *telos* perhaps even contradicts much of mainstream Christianity, which often teaches—implicitly if not explicitly—that a person's penultimate *telos* is simply a matter of escaping hell. The foremost concern of Biblical theology, rather, is *the glory of God*, and our individual salvation is a participatory history in that glory.

In addition to considering the *telos* of the individual person, we must also consider the *telos* of community and the *polis*. The *telos* of community is pertinent because people are, of course, significantly shaped by the communities in which they live. From the vantagepoint of Biblical theology, the *telos* of the community of Believers is to fulfill our calling as the body of Christ. The body of Christ, to be clear, is an eschatological community of people who have been reconciled with God and embody "their experience of God's salvation in their relations with each other" (Wall, 1992, p. 1103). Such relationships, as well as corporate stewardship of God-given gifts, edify people within and outside the community and provide tangible witness to all. Similar to how a person's individual salvation is a participatory history of God's glory, the Church (*ekklesia*) is a participatory corporate manifestation of the Kingdom of God.

Humility and Virtuous Suffering

Two unique features of a Biblically transformed virtue ethic are the interrelated virtues of humility and virtuous suffering. Humility and virtuous suffering are certainly not regarded as virtues according to Greek philosophy, and contemporary ethics textbooks heavily reflect the Greek view by remaining silent on these topics. In fact, none of the ethics textbooks I acquired when preparing for the *Builders* course contained discussion on suffering, and humility was only scarcely mentioned. I speculate that the notable quietness on suffering and humility is likely

attributed to the fact that suffering and humility are taboo topics within high-modernist technopolies wherein each individual person carries the burden of creating themselves and building their own success. In such a worldview, the experience of suffering is functionally regarded as a well-deserved consequence of weakness and/or an accurate reflection of a person's own inadequacies and failures. Needless to say, this paradigm leaves many casualties mercilessly strewn along the wayside. Given our current cultural moment, it is timely and beneficial to contemplate a Biblical understanding of humility and virtuous suffering.

Humility. The virtue of humility is a prominent attribute of Jesus Christ, and Jesus explicitly exhorted his followers to learn humility from him.[5] Jesus demonstrated humility through such things as washing his disciples' feet, eating with sinners, and ultimately humbling himself to death on a cross. The prescribed and exemplified virtue of humility starkly contradicts Greek philosophy's exaltation of *megalopsychia*, which asserts that a virtuous person ought to know their own purported greatness and pursue great things for their own honor. Contrasting the Greek and contemporary worldviews, humility is a uniquely Biblical disposition that shifts focus *away* from self (Robinson, 2004, p. 47). Pertaining to the relevance of humility in STEM&CT vocations, we do our work as unto the Lord and thereby *not* primarily for financial gain, career advancement, or numerous other forms of praise and personal benefit. Wilbourne and Gregor write that "humility aspires to do excellent work, that it might be a blessing to others, that it might be life-giving. And in those times when our work turns out as somewhat less than we'd hoped, humility accepts that with joy as well" (Wilbourne & Gregor, 2019, p. Ch. 4 in Logos Bible Software).

[5] See Matt 11:29.

Virtuous suffering. Closely related to humility is the concept of virtuous suffering. Regardless of any reasons why humility and suffering are largely absent from ethics textbooks, suffering is an inevitable experience and therefore remains an incredibly relevant discussion topic. For example, STEM&CT practitioners who steward their vocations well will hopefully reduce suffering through such contributions as providing water and wastewater treatment, developing medicines, designing and constructing structurally sound buildings, or developing technologies that enhance food security. As one incredibly complex example from our current cultural moment, attempts are being made to develop Artificial Intelligence and transhumanism for the purpose of eliminating human work and physical suffering altogether—this presents a slew of ethical and theological questions for which we must prepare to respond.

As we lessen the sufferings of other people, STEM&CT practitioners may also suffer themselves while toiling within a dishonest and otherwise sinful world. As just a few representative examples, people may suffer termination or demotion if they are honest about design errors or fraud, publish unpopular research findings, or pursue accountability for shoddy work. Such consequences may rightly be categorized as "virtuous suffering." In societies that idolize comfort and pleasure, however, virtuous suffering is counter-cultural and perhaps even absurd. Whether our sufferings are significant or small, however, the Bible exhorts us to "rejoice in our sufferings, knowing that suffering produces endurance, and endurance produces character, and character produces hope, and hope does not put us to shame, because God's love has been poured into our hearts through the Holy Spirit who has been given to us."[6] Since suffering is an inevitable experience for every person, it remains an incredibly relevant topic for *Builders* to contemplate from the vantagepoint of Biblical theology.

[6] See Rom 5:3-5.

Developing Virtue Through Intentional Habituation and Submission to the Holy Spirit

Another distinguishing feature of a Biblically transformed virtue ethic is recognition that virtues are developed both by the Holy Spirit and through the countless and seemingly trivial decisions that form our everyday habits. Concerning the Christian life, the Holy Spirit does not usually free us from sinful habits in a single moment. Rather, it seems that the *modus operandi* of the Holy Spirit is to convict a person of sin, lead them to repentance, and cause the person to yield to the Holy Spirit throughout the lifelong process of sanctification. For example, in 2 Peter 1:5-11 we see the development of Christian virtue as a *process* rather than an instantaneous work of the Holy Spirit. Christians who exhibit little concern for putting off the old self and renewing their minds, assuming that God will simply refine their character as He sees fit,[7] functionally replicate the logic of the wicked servant who hid his master's money rather than exert reasonable effort to invest it.[8] In other words, there is a mysterious and legitimate role for people to take practical actions, make decisions, and cooperate with the Holy Spirit as we follow Christ.

[7] See Eph 4:17-24.
[8] See Matt 25:14-30.

Thesis-Project Design

The previous discussion presented some of the core concepts that I discussions in module #3 of the *Builders Guild*, which was the highlight of the course. The *Builders Guild* was hosted at Anselm House, which is a Christian ministry located on the University of Minnesota campus. Anselm House offers lectures, fellowships, and short courses designed to integrate faith and life, making it an ideal setting for this study. The following discussion highlights the design and findings from the course.

Population and Sample Size

The course cohort consisted of participants from engineering, construction, and other STEM-related fields. These individuals represented diverse technical and vocational backgrounds, enabling rich dialogue and comparative analysis. Eight active participants attended all three modules. Five active participants attended two modules, and one active participant attended only one module. Some participants either registered but didn't attend the course or attended without registering; these participants were not regarded as "active participants" and their data was not included in the study.

Table 1 summarizes active participants' vocation and perceived level of knowledge about ethics before the *Builders* course commenced. In the pre-course survey, eight active participants had "no" to "some" knowledge, and six participants believed they had "moderate" to "expert" knowledge of ethics.

Table 1

Active participant vocations and pre-course knowledge of ethics

Participant #	STEM or a Trade	Declared academic and/or career discipline	PRE-COURSE SURVEY QUESTION#6: What is your existing (pre-course) level of knowledge about common ethical frameworks?
Participant #001	STEM	Physics degree, finance career	Moderate knowledgeable
Participant #002	STEM	Mechanical Engineering	Some knowledge
Participant #003	TRADE	Fabrication	Some knowledge
Participant #004	TRADE	Construction	Moderate knowledgeable
Participant #005	STEM	Biomedical Engineering	Moderate knowledgeable
Participant #006	STEM	Organization Development and Quality/Process Improvement (including applied statistics)	Expert knowledge
Participant #007	STEM	Sr Engineer (M.E.)	No knowledge
Participant #009	STEM	Project Manager	Moderate knowledgeable
Participant #010	STEM	Civil Engineering	Some knowledge
Participant #011	STEM	Philology and technology	Slight knowledge
Participant #012	OTHER	Ed Psychology-Special Education and Applied Behavior Analysis	Slight knowledge
Participant #013	STEM	Information and operational technology	Some knowledge
Participant #015	STEM	Engineering	Slight knowledge
Participant #016	TRADE	Inventor	Moderate knowledgeable

The course consisted of three modules. The first module explored the merits and deficiencies of deontology and utilitarianism, and ways that Biblical theology may transform these frameworks. The second module explored the merits and deficiencies of strict Aristotelean virtue ethics, and ways that Biblical theology may transform the Greek cardinal virtues of courage, temperance, justice, prudence. The third module, which is the focus of this article, explored the merits and deficiencies of a Biblically transformed virtue ethic with emphasis on the theological virtues of faith, hope, and love.

Procedures of Data Collection and Analysis

My thesis-project utilized an exploratory mixed-methods methodology. Data collection instruments included pre- and post-course surveys, transcripts of in-class meeting discussions, and written data from one-minute papers. These data collection instruments were mostly qualitative in nature, and I evaluated data to determine the extent to which course outcomes and objectives were achieved. Data analysis involved identifying recurring themes, shifts in perception, and qualitative reflections from participants that evidenced increased understanding and integration of theological ethics.

Validity, Reliability, Generalizability, Transferability, and Replicability

Triangulation of surveys, recorded transcripts of the in-class discussions, and written reflections helped ensure internal validity. Reliability was strengthened through consistent facilitation of the course, consistency in questions in the pre- and post-course surveys, and structured writing exercises. While the study's faith-based context limits its generalizability to secular audiences, its transferability to other Christian ministries is strong. The course curriculum, methodology, and findings may be replicated in other faith-based vocational and international education contexts with appropriate adaptation.

Project Findings

I used recorded transcripts of the in-class meeting, pre- and post- course surveys to assess how effective the course was in terms of changing participants' attitudes about ethics, increasing the level of confidence that participants have in terms of integrating faith and ethics in their vocations, evaluating whether course participants gained an appreciation for the sacred nature of their vocation, and determining potential shifts in how participants understand and appreciate the

relevance of ethics and theology to their vocations. Data suggests that participants valued the course's introduction to ethical frameworks and especially appreciated the theological depth and personal relevance of the Biblically transformed virtue ethic.

Recorded Transcripts from Module #3

A thematic analysis was conducted of each recorded transcript. Results of Module #3, which focused on a Biblically transformed virtue ethic, is discussed in the following section.

Thematic Analysis of Course Discussions

In Module #3, participants explored the theological virtues of faith, hope and love.

Faith. Participants #001, #003, #004, #006, #007, #010, and #011 engaged in a discussion on faith. These participants largely concluded that faith, depending upon context, is characterized by trusting in your own beliefs, the beliefs of others, and ultimately in God. It was also suggested that faith relates to courage, faith involves an element of curiosity and truth-seeking, and faith requires humility. Regarding courage, participants felt that the practical application of faith in the real world requires courage to ask questions. Ultimately faith was characterized by trust, courage, humility, and strength. The following quote from Participant #011 reflects the broader discussion:

> When it came to faith, it was a question of—do you trust your methodology and your experience and all the observations that you have made, such as the age of the house? The way [the house] was built and so forth, versus blindly trusting technology and a procedure that may have been designed for a more recent way of building things. Do you just trust whatever the paper says, or do you go through and have the faith to be able to

> say, '*No, I see it differently. Here's how I'm going to mark it"*? Even though your boss said, '*No, the first three [people] marked it right*.'

There was consensus that faith permeates STEM and construction trades, and this is exemplified by the necessity to trust the integrity of technical reports, co-workers, and quality of the materials we use and produce. Participant #006 shared the following anecdote from his own life:

> I recently had some remodeling done and worked with an electrician. When it came time for the inspection, the inspector looked around a little bit, saw the electrician's name on the box, and he said, '*It's all good*.' Why? '*Because I know his [the contractor's] work*.' The benefit of being a faithful person senses of the word…I may have nuanced it a bit. He looked around first and then he looked *who* did the work, and knew that he wouldn't have to check further, because in this case the appearances aligned with the things he couldn't see, because of the people he knew who did it. Back to your point [to participant #011], you don't have to check everything yourself. At some point you've got to trust, and I can tell you other stories where I wish I could tear the wall apart because I'm sure they didn't do it right.

Hope. The next theological virtue of discussion was hope. Hope received less discussion than either faith or love. However, participants shared insightful thoughts regarding the application of hope as a theological virtue in everyday life. Participants found hope to be less clearly defined than faith, with more divergent views on the definition of hope and its application to STEM and the trades. Hope was considered by some participants to present the risk of naive or manufactured hope. Some participants found hope in the workplace to be multifaceted, meaning

there might be divergent applications of hope across professional disciplines. For example, hope was felt to be absent in certain professions (e.g., lawyers), and this type of hope was juxtaposed to uniquely Christian hope. Participant #003 stated:

> There's different kind of bounds in which hope operates where you can have hope in your coworkers, you can have hope in the goals of your company or the goals of your team, or frankly, the goals of your profession. We [the participant's breakout group] talked about law and being a lawyer that there are bounds in which you can have this real sense of hope in a legal system, let's say. Then we also touched on how this ultimate hope is a uniquely Christian ultimate hope that is not shaken by the reality that the things that we hope in often fail. There's a uniquely Christian element of this ultimate hope that is an odd thing to the rest of the world.

Love. As the third virtue of consideration, participants engaged in discussions on love. When considering love as a theological virtue that applies to everyday life, participants suggested that STEM disciplines are prone to desensitizing or otherwise dehumanizing people. It was perceived that people are often treated as "resources" rather than with dignity as true *imago Dei* beings. In many situations, there is little concern or demonstrable love for people. One notable statement from Participant #005 included:

> Because the example given, the case study was treating people as '*resources*'. The kind of language that we use when we say people are '*resources,*' specifically it talks about on the other side of the world, there's a family, when I see the leadership in my company getting the wrong picture about this developer group and then treating them like trash or treat the employees like commodities and even the language we use. What I was saying is

> people are our greatest resource anywhere that you go, but people don't stop there. They're more than '*resources.*'

On a positive note, however, it was suggested that love may be a growing force in STEM. Participants suggested that love is demonstrated through a growing emphasis on the social and environmental impacts of things we produce. This was also considered the case given that the virtue of love can be a catalyst to improve the quality of our work. Participant #009 explained:

> It's just interesting to see how the World Bank is asking for environmental and social impact assessments to be done and safeguards to be put in place on different projects. I've seen projects being stopped because their worker got injured or there's a fatality on the construction site. Whereas in previous years, environmental impact assessments were not really an in-thing. It's only in recent years, globally. I thought to your last point, that it's interesting how it's coming in, in the name of the environment and social impact. I think probably the driving force behind it could be love.

Overall, participants seemed more comfortable and confident exploring the theological virtues of faith and hope compared to discussing the virtue of love. There was common agreement about what faith means as a theological virtue. Participants had less agreement about love, perhaps indicating less knowledge, comfort, or understanding of how love relates to vocations in STEM and the trades.

Analysis of Pre-Course and Post-Course Surveys

Participants were asked in the pre- and post-course surveys to identify whether the *Builders Guild* would increase their desire to integrate their faith into their work. Pre- and post-

course survey data indicate an overall increase in participants' desire to integrate faith and work after the course, but I am reluctant to draw firm conclusions about whether these results can be attributed to the *Builders* course itself. Afterall, course participants likely already had a desire to integrate faith and work before registering for the course.

When asked whether their expectations about the course were met, participants had varying responses. A common theme among participants was that they expected the *Builders* course to more deeply explore specific issues in their specific contexts. A related theme was that participants were grateful for the broad focus and introduction to virtue ethics. Aside from these themes, survey data indicates that participants may not have had clear expectations about the course or they had trouble articulating these expectations when completing the survey.

When asked whether participation in the course increased their knowledge of ethical frameworks, responses were largely united in the pre- and post-course surveys. Of pre-course survey responses, 93% (N=13) expressed some form of agreement in the expectation that the course would increase participants' knowledge of ethical frameworks. Post-course surveys confirmed that this objective was accomplished, with 100% of participants agreeing to the following statement: "*The 'Builders' course increased my knowledge of ethical frameworks*." While post-course survey responses were unanimous on this question, three participants had a slight decrease in their level of agreement with this question when compared to their pre-course answers. Participant #006 downgraded from "Agree" in the pre-course survey to "Somewhat agree" in the post-course survey, writing "good to see Dave's approach (the written materials), hear him talk about it (your examples are great), and listen to how others understand and apply the concepts and models." Participant #006's comment is not negative, however, and this person still agreed that the course increased their knowledge.

Participants were largely united in their responses when asked if they felt the *Builders* course increased their confidence and ability to integrate faith into ethical decision-making. In the post-course survey, thirteen participants expressed some level of agreement, and one participant disagreed with the statement that "*this course increased my confidence and ability to integrate faith as I resolve ethical challenges at work*." Participant #011 disagreed with this survey question and commented, "what I'm missing is how my religious faith impacts my interaction with all ethical frameworks and how I can translate my religious beliefs about the world and my duty toward others into language that can be understood by others not sharing my religious beliefs." This concern could be resolved in the future by providing additional course Modules that invite practitioners in STEM and construction trades to explore such issues in another student-centered class.

In terms of how the content of the *Builders* course might apply to daily life, one theme that emerged in the survey data is that participants believed the course would help them interact and communicate with other people. Some participants also indicated that the course made them more aware of specific virtues they could focus on at work. When asked about the highlight of the course, participants expressed appreciation for group discussions and opportunities to meet and talk with each other. Indicative of this appreciation, participant #005 wrote, "meeting people and exchanging their work stories."

One value of the course is that it exposed participants to the types of ethical issues they may encounter in the future. For example, participant #003 wrote, "I realized that as I advance in my career, the moral/ethical weight of my decisions will increase," and participant #012 wrote, "I learnt about the virtues of prudence, love and hope. I work with people with disabilities and their families. [This] course will be relevant to how I relate and work with my clients or students

and their families." Other participants expressed similar sentiments. Overall, participants enjoyed the fledgling friendships and hearing stories from each other's lives.

Recommendations for Future Research

Future research should explore long-term behavioral outcomes for *Builders Guild* alumni, potentially comparing faith-integrated approaches to secular ethics training. Replication at other Christian colleges, trade schools, workplace settings, and in cross-cultural contexts would provide additional insights regarding impact and scalability.

Future courses should also invite participants to share ethical dilemmas they face in their respective vocations. During the Builders course, I facilitated a fictional, though representative, case study in Module #1. In Modules #2 and #3, I invited course participants to consider the ethical challenges described during my pre-thesis interviews. To make future courses even more relevant, before the course it may be beneficial for me to invite course participants to partake in an interview or write a short narrative regarding an ethical challenge they have personally experienced or witnessed in their workplace. These scenarios could then be explored in-depth during class discussions. Research is needed to determine the impacts of such an approach in making courses even more relevant and impactful to participants.

Finally, I intend to adapt the course to facilitate interfaith dialogue and explore virtues of other religions and worldviews, hopefully in international contexts. Revisiting the original ambition of developing an ethics curriculum for technological universities in Myanmar, for example, this thesis-project advanced knowledge that may help me to develop future courses that enhance religious literacy, foster interfaith dialogue, and explore ethical decision-making in cross-cultural contexts. While this thesis-project focused primarily on how virtue ethics and

Biblical theology inform ethical decision-making, I am interested in designing future trainings that have an interreligious dialogue component.

Conclusion

The *Builders Guild* fostered ethical reflections rooted in Biblical theology. Theologically grounded virtue ethics proved not only intellectually robust but also practical and spiritually formative among practitioners in STEM and construction trades. Findings from this project also suggest that faith-integrated ethics education can prepare professionals in technical fields to navigate ethical challenges with theological integrity. Participants developed deeper commitments to Biblical virtues and gained practical perspectives to be faithfully present in their vocations, reinforcing that engineering and technical education needs to engage moral formation and not simply rule compliance. This project also affirms that faithful presence requires a reimagining of how ethics education is delivered—one where people take an integrated approach in surveying Biblical theology and ethical frameworks while having honest conversations about the messiness of real life.

References

Aristotle. (1934). *The Nicomachean Ethics* (Revised edition ed., Vol. XIX). (J. Henderson, Ed., & H. Rackham, Trans.) Cambridge, MA: Harvard University Press.

Augustine of Hippo. (1953). *Confessions.* (R. J. Deferrari, Ed., & V. J. Bourke, Ph.D., Trans.) Washington, DC: The Catholic University of America Press.

Bronk, K. C., Cheung, R. C., Mehoke, S. A., & Pham, P. K. (2023). A thematic analysis of Tweets about purpose in life. *The Journal of Positive Psychology, 18*(5), 674-687.

Brown, K. J. (2017). *Designed for good: recovering the idea, language, and practice of virtue.* Peabody, MA: Hendrickson Publishers.

Fink, L. D. (2003). *Creating Significant Learning Experiences.* San Francisco: Jossey-Bass.

Foltz, F. A., & Foltz, F. A. (2018). *Faith, Hope, and Love in the Technological Society.* Eugene, OR: Cascade Books.

Harrington, SJ, D. J., & Keenan, SJ, J. F. (2010). *Paul and Virtue Ethics- Building Bridges Between New Testament Studies and Moral Theology.* New York: Rowmand & Littlefield Publishers, Inc.

Hauerwas, S., & Pinches, C. (1997). *Christians Among the Virtues: Theological Conversations with Ancient and Modern Ethics.* Notre Dame, IN: University of Notre Dame Press.

Kallenberg, B. J. (2017). Virtue Ethics. In S. Wilkens (Ed.), *Christian Ethics: Four Views.* Downers Grove, Illinois: IVP Academic: An Imprint of InterVarsity Press.

Kaul, C. R., Hardin, K. A., & Beaujean, A. (2017). Predicting Faculty Integration of Faith and Learning. *Christian Higher Education, 16*(3), 172–187.

Lovin, R. W. (2011). *An Introduction to Christian Ethics: Goals, Duties, and Virtues.* Nashville: Abingdon Press. Retrieved from ps://ebookcentral.proquest.com/lib/dtl/detail.action?docID=889638

MacIntyre, A. C. (1998). *A Short History of Ethics: a History of Moral Philosophy from the Homeric Age to the 20th Century.* Place of publication not identified: Routledge Imprint.

Mattison III, W. C. (2008). *Introducing Moral Theology: True Happiness and the Virtues.* Grand Rapids, MI: Brazos Press.

Miller, C. D., & Hauerwas, S. (2014). *The Practice of the Body of Christ: an Agency in Pauline Theology after MacIntyre.* Cambridge: The Lutterworth Press, James Clarke & Co Ltd.

Postman, N. (1993). *Technopoly: The Surrender of Culture to Technology.* New York: Vintage Books.

Robinson, E. A. (2004). *These Three: The Theological Virtues of Faith, Hope, and Love.* Eugene, OR: Wipf & Stock.

Schmidt, J. A. (2013). Changing the Paradigm for Engineering Ethics. *Science and Engineering Ethics, 20*(4), 985-1010.

The Westminster shorter catechism: with Scripture proofs (Vol. 3). (1996). Bellingham, WA: Logos Research Systems, Inc.

Thomas Aquinas. (n.d.). *Summa theologica. (Fathers of the English Dominican Province, Trans.).* London: Burns Oates & Washbourne.

Wall, R. W. (1992). Community: New Testament. In D. N. Freedman (Ed.), *The Anchor Bible Dictionary* (p. 1103). New York: Doubleday.

Wilbourne, J., & Gregor, B. (2019). *The cross before me: reimagining the way to the good life.* (D. C. Cook, Ed.) Colorado Springs, CO: David C Cook.

Wright, N. (2010). *After You Believe: Why Christian Character Matters.* New York: HarperCollins Publishers Inc. Kindle Edition.

© 2026 CGE – Consortium for Global Education

Linda Hamulumbu, Peter Chiko Bwalya, Jessy Mwewa, Hedson Malata, Mwansa Malama, Lillian Muleya, Charles Chomba, Bester Ngulube

Vol 5:8 2026

Northrise University in Zambia

Author Note

ORCID Number: 0009-0005-5743-5296; linda.kimoni@northrise.net

Abstract

This study investigates early warning indicators of bankruptcy risk in State-Owned Enterprises (SOEs) in Zambia, with an emphasis on the predictive importance of liquidity ratios. Using a quantitative approach, the research analyses financial data from a sample of SOEs to examine the relationship between key financial ratios and bankruptcy outcomes. The analysis employed descriptive statistics, correlation analysis, and visual comparisons to identify significant patterns. The findings reveal that lower liquidity ratios are significantly associated with higher bankruptcy risk, highlighting liquidity as a critical early warning indicator. Other ratios, including solvency, profitability, and acid-test ratios, showed weaker and less consistent associations with bankruptcy. These results underscore the importance of monitoring liquidity in SOEs as part of effective financial management and risk mitigation strategies. The study contributes to understanding financial distress in SOEs and offers practical insights for policymakers and managers seeking to improve financial sustainability.

Research Background

Historical Context and Challenges

State-owned enterprises (SOEs) play a crucial role in Zambia's economic development by generating public revenue and providing essential goods and services. Efficient management of these enterprises is vital for contributing to citizens' well-being, reducing unemployment, and fostering economic growth (Nhete, 2021). However, many SOEs in Zambia have historically faced significant challenges, resulting in financial distress and bankruptcy, which have adversely impacted national resources and economic stability.

The concept of SOEs in Zambia dates back to the economic reforms of the late 1960s and early 1970s during the Kenneth Kaunda era, when the Zambia Industrial and Mining Corporation (ZIMCO) was established to manage key private sector companies, including mining firms, under the nationalization program (Policy Monitoring and Research Centre, 2019). Despite government efforts, by 1980, many SOEs had become unprofitable due to poor management, changing economic conditions, and governance failures. Issues such as poor financial management, non-remittance of taxes, and irregular payments contributed to corporate failures, leading to bankruptcy and subsequent privatization under the Privatization Act of 1992 (Policy Monitoring and Research Center, 2015). In recent years, the Industrial Development Corporation (IDC), incorporated in 2014, has overseen SOEs with the mandate to strengthen the industrial base, create jobs, and maximize long-term shareholder value.

Legislative and Regulatory Framework

Bankruptcy, a key aspect of the market economy, has significant impacts on stakeholders including creditors, employees, suppliers, consumers, and local communities (Brown, Smith, & Jones, 2022). Zambia's insolvency legislation, initially part of the Companies Act, was enhanced with the enactment of the Corporate Insolvency Act in 2017 to provide a standalone framework for handling corporate insolvencies.

Financial Management and Governance Issues

Corporate audits, particularly those reported in the Parastatal Auditor General's reports from 2010 to 2022, have consistently highlighted concerns such as poor financial management, uncollected funds, non-remittance of taxes, poor record-keeping, and irregular payments. These governance issues have played a significant role in the financial distress and corporate failures of many SOEs in Zambia (Policy Monitoring and Research Center, 2015).

Statement of the Problem

State-owned enterprises (SOEs) in Zambia have historically faced significant challenges, including financial distress and bankruptcy, despite their critical role in national economic development (Voda, et al., 2021). Some SOEs in Zambia have gone bankrupt multiple times, while others have required government bailouts repeatedly (Bellovary, et.al. 2017). Despite legislative efforts to address these issues, the sustainability of SOEs remains a pressing concern. Of critical importance is the fact that management of these SOEs struggles to identify effective tools for predicting bankruptcy using conventional financial data (Voda, et al., 2021), and as

such, there is a critical need to develop or leverage tools that can accurately predict bankruptcy, aiding proactive management strategies and enhancing the financial stability of SOEs in Zambia.

Despite an extensive literature on the challenges faced by SOEs globally and in Zambia specifically, there remains a gap in the use and application of predictive tools for bankruptcy risk tailored to the context of SOEs. Existing studies often focus on general corporate bankruptcies or private enterprises, neglecting the early warning signs and challenges of SOEs. Moreover, while some studies discuss financial distress and the role of governance in SOEs, few provide actionable insights into predictive analytics that can guide preemptive measures to prevent bankruptcy (Rahman et al., 2021).

The literature also highlights a scarcity of studies that systematically evaluate the effectiveness of governmental interventions, such as bailouts, in mitigating bankruptcy risks in SOEs (Bellovary et al., 2017). Understanding these dynamics is crucial for policymakers and stakeholders to implement targeted strategies that improve SOE resilience and sustainability.

In Zambia, previous studies on this topic have predominantly been qualitative or quantitative (Simeon, et.al 2023; Kalabo, 2022). In contrast, this study proposes a mixed methods approach, aiming to provide a comprehensive understanding of SOE financial management challenges and the effectiveness of interventions. This holistic approach will integrate qualitative insights with quantitative data, offering a nuanced perspective that addresses the gap in the current literature.

Significance of the Study

The significance of the study is that it will help to provide a predictive tool for bankruptcy risk tailored to the context of SOEs for stakeholders to use, enabling timely action and evidence-based decision-making.

Research Objectives

a) To determine whether there are significant differences in solvency ratios between bankrupt and non-bankrupt companies.
b) To determine whether there are significant differences in liquidity ratios between bankrupt and non-bankrupt companies.

Hypotheses

H_{0_1}: There is no significant difference in solvency ratios between bankrupt and non-bankrupt firms.

H_{0_2}: There is no significant difference in liquidity ratios between bankrupt and non-bankrupt firms.

Alternative Hypotheses:

H_{a_1}: There is a significant difference in solvency ratios between bankrupt and non-bankrupt firms.

H_{a_2}: There is a significant difference in liquidity ratios between bankrupt and non-bankrupt firms.

Definitions

State-Owned Enterprises (SOEs): State-owned enterprises are business entities or organizations in which the government holds a significant ownership stake, typically more than 50% (Wang, Heng-Ruei, Shiu 2017).

Bankruptcy: Bankruptcy is a legal status that an organization or individual enters when they are unable to repay their debts or meet their financial obligations (Miller, 2019).

Literature Review

Bankruptcy is a legal process for organizations unable to meet debt obligations, involving asset reorganization or liquidation (Altman, 2018). For state-owned enterprises (SOEs), bankruptcy can be particularly complex due to their essential service roles and government ties (Shirley & Walsh, 2020).

Bankruptcy in SOEs impacts public services, employment, and economic stability. SOEs are created and owned by governments to manage crucial resources and services (Shirley & Walsh, 2020). When SOEs face financial distress, it reflects broader systemic issues like poor governance, inefficiencies, and corruption (Megginson & Netter, 2019). Examples of such complexities include disruptions in public services and economic instability.

Understanding SOE bankruptcy is crucial for policymakers to implement reforms and prevent financial crises. Given their significant role in national economies, especially in developing countries, the financial distress of SOEs can indicate broader systemic issues within the economy. This context sets the stage for exploring SOEs' roles and challenges in Zambia's

economic landscape, emphasizing the need for effective financial management to ensure their sustainability.

Overview of the Economic Landscape in Zambia and the Role of SOEs

Zambia's mixed economy, dominated by mining, faces debt, poverty, and unemployment challenges (World Bank, 2023). SOEs are crucial in key sectors but often struggle with inefficiencies. The economic landscape of Zambia is characterized by periods of rapid growth and significant challenges. SOEs operate in vital sectors like energy, transport, telecommunications, and natural resources, playing a critical role in infrastructure development and service delivery. However, they are often face with financial distress due to mismanagement, lack of accountability, and political interference. For example, some companies have experienced recurring financial difficulties, requiring substantial government support to maintain its operations (IMF, 2022; Lungu & Mulenga, 2021).

The financial health of SOEs in Zambia is vital for national economic stability and growth. Addressing the causes of bankruptcy and financial distress in these enterprises is essential for ensuring their sustainability and contributing to the overall economic stability and growth of the country. This underscores the importance of addressing financial management practices leading to SOE bankruptcy.

Financial Management Practices Leading to Bankruptcy in State-Owned Enterprises

Financial mismanagement is a key factor in SOE bankruptcy (Kader & Khan, 2019; Otoo, 2024). Studies show poor financial controls, cash flow issues, and cost management failures lead to bankruptcy (Muguchia, 2018; An et al., 2020). Effective financial management

practices are crucial for organizational success. For instance, Singh et al. (2019) assert that financial management practices guarantee the effective utilization of resources and enhance business profitability. Aldubhani et al. (2022) emphasize that working capital management regulates a firm's financial performance, liquidity risk, and value. Poor financial performance among organizations is often attributed to poor financial management practices (Muguchila, 2018).

Effective financial management practices are essential for profitability and sustainability. Mismanaged financial practices can lead to bankruptcy by causing liquidity problems, eroding profitability, and failing to hedge against financial risks (Boichenko et al., 2019; Chen & Wang, 2020). This highlights the need for robust financial practices to prevent SOE bankruptcy and maintain financial health.

Financial Sustainability in SOEs

Financial sustainability means operating without government support (Putra et al., 2021). Global studies cite inefficiencies, corruption, and political interference as common causes of SOE financial distress (OECD, 2021; Megginson & Netter, 2019). Improving governance, transparency, and adopting private-sector practices can enhance SOE performance (Chen & Lin, 2020). In the African context, SOEs face challenges like dependency on government subsidies, mismanagement, and corruption. For instance, Nigerian SOEs struggle due to poor management and reliance on government funding (Adewale, 2020). In Kenya, political patronage and lack of professional management are key factors contributing to SOE financial distress (Kanyinga & Okello, 2021).

Improving governance, transparency, and adopting private-sector practices can enhance SOE performance. Strengthening the legal and regulatory framework, reducing political interference, and fostering public-private partnerships can help improve accountability and performance. This framework guides the evaluation of SOEs in Zambia and their financial sustainability.

Role of Government in Bankruptcy Prevention

State-Owned Enterprises (SOEs) are drivers of national economic development but are typically faced with severe financial mismanagement and inefficiency. Zambian SOEs are no exception, as most of them exhibit chronic financial instability and dependence on government bailouts. Best practices in financial management, corporate governance enhancement, transparency, and private sector practice implementation are the solution to enhancing the performance of SOEs and making them viable in the long term.

Identifying early warning indicators of financial distress is central to mitigating bankruptcy risk in SOEs. Prior studies have demonstrated the utility of financial ratios, such as liquidity measures, solvency ratios, and profitability indicators, in predicting bankruptcy risk (Prabowo, 2019; Muzanni & Yuliana, 2021). Models like Altman's Z-Score and Zmijewski's X-Score have been widely applied in this context, providing timely insights that help stakeholders anticipate and address financial risks. For example, Muzanni and Yuliana (2021) identified the Zmijewski model as being more predictive of bankruptcy for retail companies in Indonesia, while Altman's model was more predictive for firms in Singapore. These findings point to the possible applicability of prediction models in informing financial decision-making.

There is a need to strike a balance between government intervention and financial independence to ensure SOE sustainability. The empirical evidence shows that private companies are more

profitable compared to SOEs, an indicator that financial independence and sound management are needed. This serves as the foundation for examining SOEs' financial health and stability in Zambia.

Theoretical Framework

This study reviewed five theories: Resource Dependency, Institutional, Stewardship, Financial Distress, Public Choice, and Agency theory. However, the study was anchored on the Agency theory

Resource Dependence Theory

Organizations rely on external resources for survival, affecting strategic options and adaptability. For Zambian SOEs, heavy reliance on government subsidies can lead to financial instability when support is reduced (Pfeffer & Salancik, 1978; Hillman et al., 2009).

Institutional Theory

Organizational behavior is influenced by the broader institutional environment. Zambian SOEs are shaped by regulatory frameworks, political influences, and cultural expectations, which can lead to inefficiencies and financial crises (DiMaggio & Powell, 1983; Scott, 2001).

Stewardship Theory

Managers act in the best interests of owners due to intrinsic motivations. Effective stewardship can enhance SOE sustainability, but external pressures and inadequate governance may undermine this, leading to financial distress (Davis et al., 1997).

Financial Distress Theory

Financial instability can result from internal inefficiencies and external economic factors. Managing distress through restructuring and seeking support is crucial for preventing bankruptcy in Zambian SOEs (Altman, 1968; Whitaker, 1999).

Public Choice Theory

Economic principles applied to political science highlight how political motivations and bureaucratic inefficiencies affect SOE performance. In Zambia, political interference can lead to suboptimal decisions and financial distress (Buchanan & Tullock, 1962).

Relevance to SOEs

Agency problems in SOEs are exacerbated by political interference and weak accountability, leading to financial challenges (Boubakri et al., 2013; Musili, 2018).

Agency Theory

Agency theory addresses conflicts between principals (government) and agents (managers). In Zambian SOEs, misalignment of interests can lead to poor financial management and corruption, increasing the risk of bankruptcy (Jensen & Meckling, 1976; Villalonga & Amit, 2006).

Methodology

Study Design

This study adopted a mixed-method research design with a quantitative, cross-sectional research design in examining early warning signs of bankruptcy risk in Zambian SOEs, particularly the predictive value of liquidity ratios. This quantitative component of the design was appropriate as it enabled the researcher to systematically uncover and quantify relationships between chosen financial ratios and actual bankruptcy outcomes using archival financial data over a predetermined time frame. This approach allowed statistical analysis of the extent to which liquidity and other financial ratio changes were associated with bankruptcy risk at a given point in time, thus providing clear, empirical findings on financial distress predictors. Data was analyzed using Python programming language.

In addition to the quantitative strand, the study incorporated a qualitative strand to offer context and supplement the statistical findings. Senior SOE decision-makers were interviewed using semi-structured interviews to explore managerial practices, decision-making, and organizational factors that may cause financial vulnerability. The mixed-methods approach enhanced both the validity and richness of the findings by triangulating quantitative data with subjective managerial opinions, thereby yielding a more complete picture of bankruptcy risk drivers.

Study Population

The population of interest was all SOEs listed in the Industrial Development Corporation (IDC) database in Zambia. The population included companies involved in various strategic

sectors such as transport, hospitality, broadcasting, microfinance, social security, water transport, education, and utilities. These institutions impact the economy of Zambia but are famous for facing chronic financial challenges, making them an appropriate topic to use in a study on financial distress.

For the quantitative study, the unit of analysis was one financial performance record of an SOE for a specific year, which allowed the study to ascertain how financial ratios related to bankruptcy status for time periods. For the qualitative study, the unit of analysis was the finance manager or senior officer of an SOE who was directly responsible for financial decision-making and was hence in a position to make informed observations about institutional practices and constraints.

Sample Size and Sampling Technique

The total sample was composed of 33 SOEs, which was a high percentage of the total population. This was further divided into 28 SOEs taken for the quantitative study and a purposive subsample of 5 SOEs taken for the qualitative interviews. For the quantitative study, simple random sampling was employed so that the findings would be generalizable to the wider population of SOEs.

$$n = \frac{N}{1 + N \cdot e^2} = \frac{36}{(1 + 36 \cdot 0.05^2)} = 33$$

$N =$ Number of companies registered in the IDC database

$n =$ Sample size

$e =$ margin of error

This method minimized selection bias and allowed for robust statistical inferences. For comparison, the qualitative sample was selected using purposive sampling that targeted the

inclusion of participants with the requisite expertise, seniority, and relevance to provide insightful inputs into organizational and managerial processes behind financial distress.
The quantitative data consisted of 101 firm-year observations, spanning from 2013 to 2022, providing a longitudinal view of financial performance and bankruptcy risk.

Data Collection

For the quantitative data, the study relied on secondary data, analyzing audited financial statements and annual reports published by the SOEs. These reports facilitated the computation of certain key financial ratios, including the Liquidity Ratio (as a percentage of current assets to current liabilities), Solvency Ratio, Profitability Ratio, and the Acid-Test Ratio. Each SOE's bankruptcy position in every year was determined from official documents and coded as a binary variable, where 1 indicated bankruptcy and 0 indicated solvency.

Qualitative data were collected through semi-structured interviews with government officials, directors, and finance managers. The interviews sought to obtain a more in-depth insight into financial management practices, organizational culture issues, and decision-making challenges that may explain patterns in quantitative analysis. Interviews were tape-recorded with participants' consent, transcribed, and subjected to thematic analysis to determine key recurring themes.

Ethical Considerations

Ethical approval for the study was obtained prior to data collection to determine compliance with institutional and professional standards. Qualitative interview participants were sufficiently informed of the study aim and scope and provided informed consent before taking part. Confidentiality of sensitive financial data was ensured at all times during the study, and anonymity of respondents who took part in interviews was assured to prevent any potential

injury or retribution. Principles of beneficence, non-maleficence, and transparency were adhered to in all stages of the research process.

Data Analysis Cycle

The quantitative analysis of data followed a well-structured and systematic cycle to ensure accuracy and reliability of findings. The data cleaning and pre-processing was done, where the financial data was thoroughly examined for completeness, and the missing values and outliers were accordingly treated. The missing data points were imputed with mean and median imputation techniques to preserve the integrity of the dataset without introducing significant bias. Following that, descriptive statistical analysis was conducted to summarize the central tendency and dispersion of the key financial ratios. Measures such as mean, median, and standard deviation were computed to describe the overall financial health of the SOEs in the sample. This was followed by exploratory data visualization, wherein boxplots and violin plots were generated to visually contrast the distributions of financial ratios for bankrupt and solvent firms. These visualizations provided intuitive and accessible representations of financial ratio differences by bankruptcy status.

For assessing the direction and strength of the associations between financial measures and bankruptcy risk, point-biserial correlation analysis was employed. This type of statistical analysis was appropriate because of the continuous nature of the financial ratios and the dichotomous nature of the bankruptcy outcome measure. Statistical significance was tested at the conventional alpha level of $\alpha=0.05$, providing evidence regarding whether observed correlations were likely or unlikely to have occurred by chance.

Additional visual and numerical analyses reaffirmed the key result that lower liquidity ratios were significantly associated with higher bankruptcy risk, reinforcing the conclusion that

liquidity serves as a critical early warning indicator of financial distress in SOEs.

Data Presentation and Analysis

This chapter presents and discusses findings from 33 Zambian State-Owned Enterprises (SOEs) across the transport, hospitality, broadcasting, microfinance, social security, water transport, education, and utilities sectors. The discussion interprets financial ratios as early warning indicators of bankruptcy risk with an emphasis on liquidity as a predictor. Organizational matters, government interventions, and management practices were also examined to contextualize the quantitative findings.

Quantitative Analysis

Descriptive Statistics and Risk Distribution

The financial information contained 101 firm-year observations over 28 SOEs for the period 2013–2022. Bankruptcy risk was allocated as a dichotomous measure, where 0 = companies not bankrupt (no risk) and 1 = at risk of bankruptcy. Approximately 11% of observations were allocated high risk (1), while 89% of the observations were solvent status (0). These proportions indicate that while the majority of the SOEs had comparative financial stability, there were some significant minorities exposed to enhanced risk of financial distress.

Correlation Analysis and Early Warning Indicators

Table 1

Correlational Analysis

```
Solvency: Correlation = 0.246, p-value = 0.013
Liquidity_Ratio: Correlation = -0.226, p-value = 0.024
Profitability_Ratio: Correlation = -0.092, p-value = 0.361
Acid_ratio: Correlation = -0.149, p-value = 0.138
                    Correlation   p-value
Variable
Solvency               0.246395  0.013466
Liquidity_Ratio       -0.225557  0.024047
Profitability_Ratio   -0.092253  0.361304
Acid_ratio            -0.149281  0.138243
```

The results of the point-biserial correlation between the financial ratios and bankruptcy risk are presented in Table 1. There was a statistically significant negative relationship between bankruptcy risk and liquidity ratio ($r = –0.226$, $p = 0.024$) as established by the analysis. This proves that firms with lower liquidity ratios were at greater risk of bankruptcy, validating the hypothesis that weak short-term liquidity is a significant measure of financial distress.

Conversely, solvency ratio was statistically significantly associated with bankruptcy risk ($r = 0.246$, $p = 0.013$). The opposite finding would mean that higher solvency defined in this manner could be a consequence of increased usage of debt financing rather than improved financial health, leaving companies facing higher financial risk.

The acid-test ratio was negatively correlated with the risk of bankruptcy ($r = –0.149$), and the profitability ratio was also negatively correlated ($r = –0.092$); nonetheless, these were not statistically significant ($p = 0.138$ and $p = 0.361$, respectively). This reveals that while both ratios would intuitively be associated with financial well-being, they were not strongly predictive of the risk of bankruptcy in this population.

These findings are why the liquidity ratio is such an important initial warning indicator of risk of bankruptcy for SOEs, but also why solvency indicators need to be treated with caution in the light of their unexpected positive correlation with risk.

Feature Importance

To more explain the contribution of each financial ratio, feature importance analysis (Table 2) found that solvency accounted for approximately 36% of the predictive weight, followed by liquidity ratio at approximately 27%, then acid-test ratio at 21% and profitability ratio at 16%. Although solvency is the most critical in terms of characteristics, its negative association with

risk means that it might actually capture abusive debt usage, whereas liquidity's negative association with risk conforms to theory as an effective warning signal.

Table 2

Feature Importance in Predicting Bankruptcy Risk

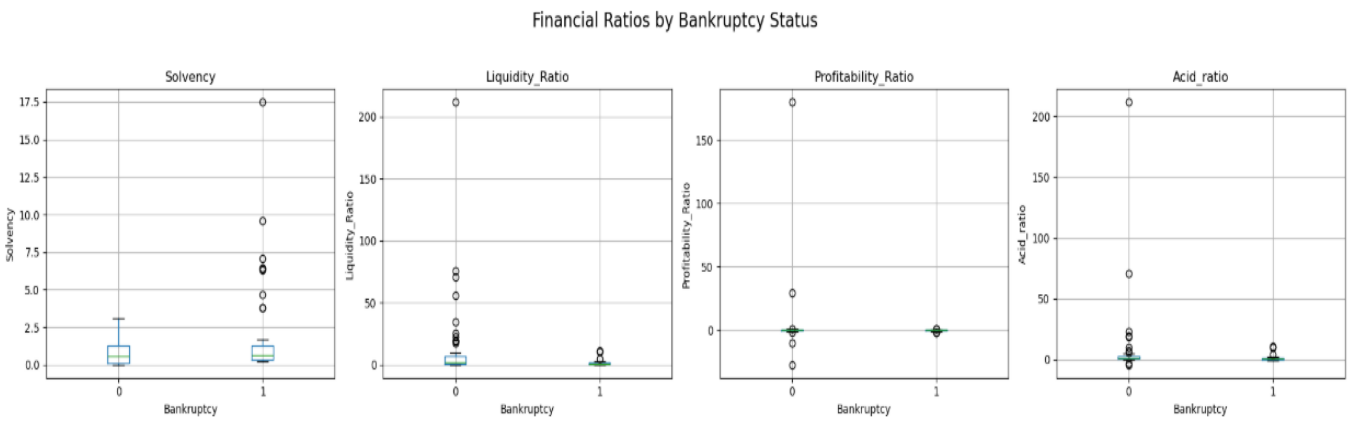
	Feature	Importance
0	Solvency	0.356110
1	Liquidity_Ratio	0.268910
3	Acid_ratio	0.210549
2	Profitability_Ratio	0.164431

Box plots

The boxplot is a graphical tool used to summarize and compare distributions of quantitative variables. It visually displays the median, spread, and potential outliers of a dataset, enabling rapid identification of central tendencies and variability. Boxplots were used in this study to compare financial ratios of solvent and bankrupt firms and highlight significant differences in their financial profiles.

Figure 1

Financial Ratios by Bankruptcy Status



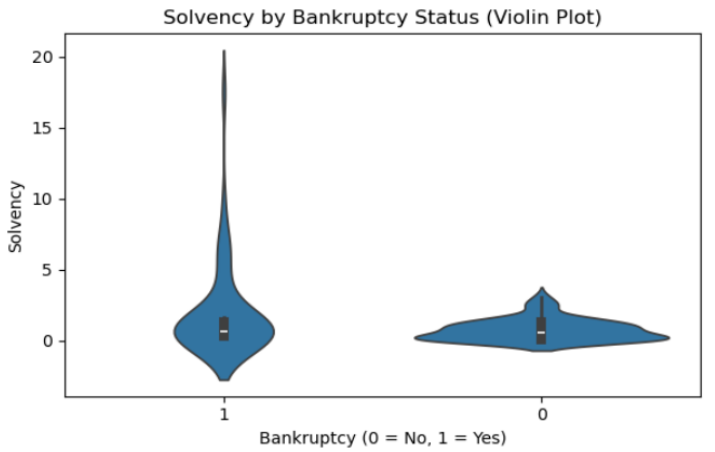
The boxplots are rich with information about the interaction between solvency ratio and bankruptcy status. The median for the solvency ratio among the bankrupt firms is higher than it is among the non-bankrupt firms, as was the case with the prior positive correlation ($r = +0.25$). This unexpected finding implies that, in this data set, a greater solvency ratio does not always indicate health; it may rather reflect over-leverage, or variation in the way the ratio is calculated. Liquidity ratio indicates a lower median for failing companies as theory would suggest and the negative correlation ($r = –0.23$) observed. It also reinforces the assumption that inadequate liquidity, reflecting difficulty in maintaining compliance with short-run commitments, is a significant indicator of bankruptcy risk. The profitability ratio is lower in failed firms, yet the difference is slight and statistically non-significant ($p > 0.05$), suggesting that profitability does not make a strong discriminating measure of failure in this population. Similarly, the acid-test ratio is slightly lower in failed firms, following the path of liquidity, yet the difference is statistically non-significant. In general, these findings pinpoint liquidity as the most consistent early warning sign of risk of bankruptcy among the four financial ratios.

Violin Plots

Violin plots represent the distribution and density of values for every group (bankrupt = 1, non-bankrupt = 0), blending a boxplot with a kernel density plot.

Figure 2:

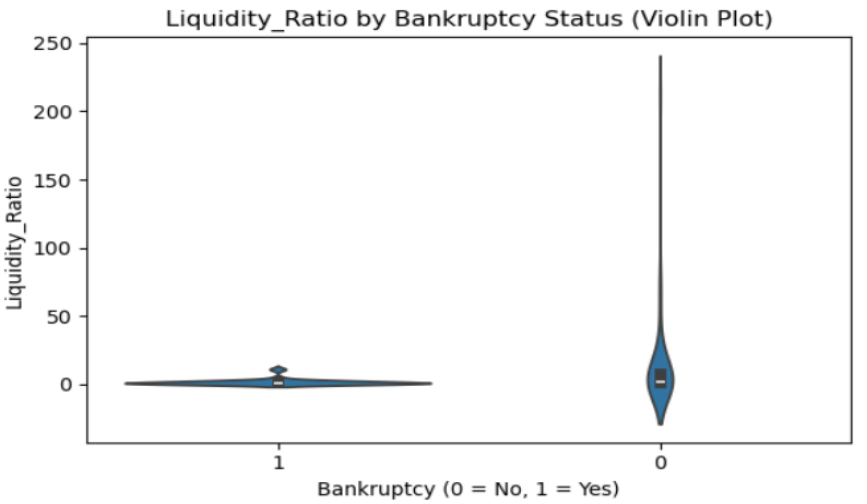
Solvency by bankruptcy status



Both the solvent and the bankrupt companies' solvency ratios are right-skewed with a heavy upper tail of greater solvency values. Bankrupt companies have a slightly higher median than solvent companies. This suggests that the bankrupt companies have extremely high solvency ratios, which may be an artifact of the definition of solvency used in the dataset or over-leverage and debt reliance instead of actual financial health.

Figure 3

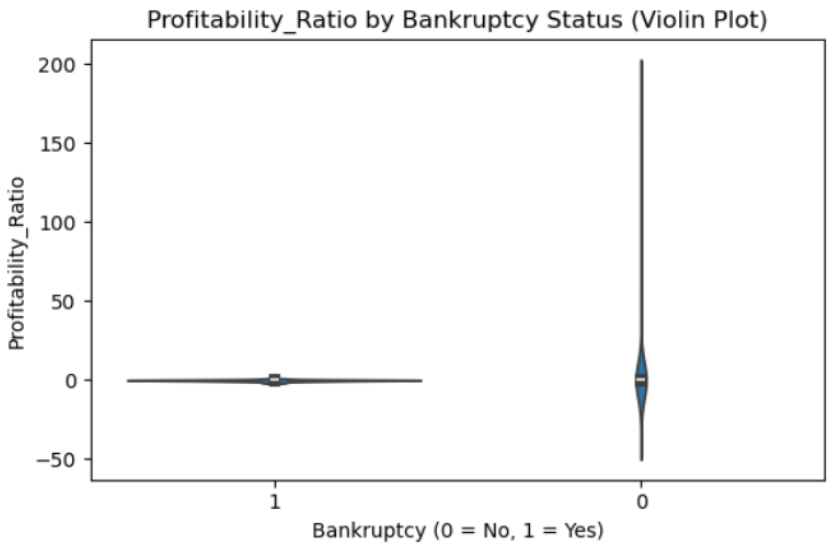
Liquidity Ratio by Bankruptcy Status



The liquidity ratio provides clear discrimination between solvent and bankrupt firms. Non-bankrupt firms possess more spread but higher median values and liquidity ratios, with more concentrated distributions at higher liquidity levels. Bankrupt firms are concentrated at lower levels of liquidity ratios, which demonstrate less ability to meet short-term debt obligations. This pattern is designed to confirm that low liquidity is a major predictor of bankruptcy risk in the data set considered.

Figure 4

Profitability Ratio by Bankruptcy Status



The violin plot in figure 4 illustrates the distribution of profitability ratios for solvent (0) and bankrupt (1) firms. The solvent firms have a more spread and wide distribution of profitability ratios where some of them have very high positive profitability, and others are heavily loss-incurring. The median profitability of solvent firms is slightly positive with high variation. In contrast, insolvent firms have much more limited distribution, very tightly clumped around zero with minimal dispersion. This shows that insolvent firms tend to be at or near break-even profitability levels with no higher positive margins that solvent firms possess. But overlap and

slight difference in medians indicate that profitability does not differentiate the two groups markedly, consistent with earlier statistical findings that profitability ratio was not a good indicator of bankruptcy risk for this sample.

Figure 5

Acid Ratio by Bankruptcy

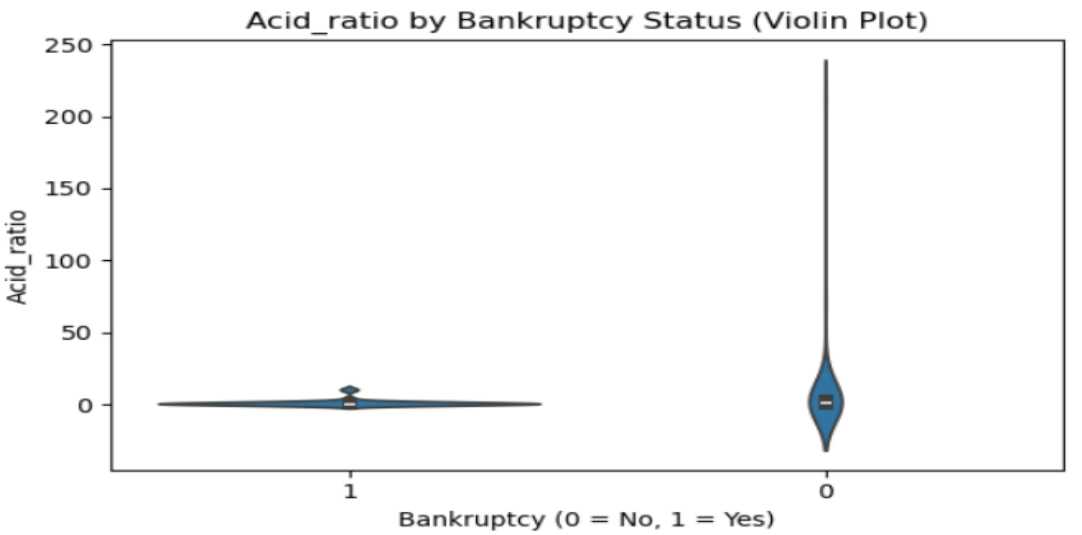


Figure 5 acid-test ratios for solvent companies (0) and failed companies (1). Solvent companies are more widely distributed with a higher median acid-test ratio than failed companies, which are tightly grouped at lower values. Certain solvent companies have very high acid-test ratios, indicating good quick-asset coverage for current liabilities. By comparison, bankrupt firms carry low acid-test ratios with low volatility, which suggests poor liquid assets to pay short-term obligations. This pattern is directionally in line with theoretical expectations that lower acid-test ratios are associated with higher bankruptcy risk, even though earlier statistical tests indicated this relationship was not statistically significant in this sample. In general, the plot shows solvent firms to have stronger quick liquidity cushions than bankrupt firms.

In conclusion, the violin plots indicate that there are great differences in the distribution of key financial ratios for bankrupt and non-bankrupt firms. The bankrupt firms have low and tightly distributed solvency, liquidity, profitability, and acid-test ratios, indicating consistently poor financial health in these categories. By comparison, non-bankrupt firms show higher variability and occasionally extreme positive figures for these ratios, particularly for liquidity and acid-test ratios, suggesting that stronger and more flexible financial positions mitigate the risk of bankruptcy. Overall, the analysis highlights that low and stable but negative financial ratios are associated with higher likelihood of bankruptcy, while higher heterogeneity and improved performance in these ratios are the characteristics of financially healthy firms.

Hypotheses

For the first hypotheses, we test $H_{(a_1)}$: There is a significant difference between the solvency ratios of bankrupt and non-bankrupt companies against H_{0_1}: There is no significant difference between the solvency ratios of bankrupt and non-bankrupt companies. The results of the correlation analysis show a statistically significant positive relationship between solvency ratio and bankruptcy risk ($r = +0.25, p = 0.013$). Because the p-value is less than the significance level α= 0.05, we reject the null hypothesis H_{0_1} and accept the alternative hypothesis H_{a_1}. From this outcome, we infer that solvency ratios for non-bankrupt and bankrupt firms differ. But observe that the direction of the differential is reversed from tradition, since more bankrupt firms have higher solvency ratios in this sample. This suggests that, in this instance, greater solvency may be a sign of over-leverage or the utilization of debt financing instead of good financial well-being.

For the second hypotheses, we tested H_{0_2} : There is no significant difference in liquidity ratios between bankrupt and non-bankrupt companies and H_{a_2}: There is a significant difference in liquidity ratios between bankrupt and non-bankrupt companies. Correlation analysis revealed a statistically significant negative correlation between liquidity ratio and bankruptcy risk ($r = -0.23, p = 0.024$). Since the p-value is less than the significance level of 0.05, we reject the null hypothesis H_{0_2} and accept the alternative hypothesis H_{a_2}. This indicates that there is a difference between the liquidity ratios of bankrupt and non-bankrupt firms. Specifically, bankruptcy firms are more illiquid, supporting the earlier theory that a shortage of liquidity prevents a firm from fulfilling its short-term obligations and increases the risk of bankruptcy. This finding further corroborates the validity of liquidity as a critical early warning indicator of financial distress.

Qualitative Results

Financial Management Strategies, Systemic Pressures, Government Influence, and Organizational Adaptation in State-Owned Enterprises

The findings reveal an interconnected structure of financial management practices, systemic operational pressures, sector-specific vulnerabilities, government influence, and organizational response strategies among State-Owned Enterprises (SOEs). Collectively, these factors shape financial sustainability, operational performance, and long-term strategic positioning of SOEs. The main themes that emerged from this study were as follows:

Core Financial Management Strategies

The results identified several core financial management strategies adopted by SOEs to sustain financial performance and operational viability. These strategies primarily relate to cost management, revenue generation, debt management, and financial monitoring practices.

Cost Control and Budgeting

The findings indicate that most organizations experience significant challenges in adhering to allocated budget lines. These deviations were reported to contribute to inefficient resource utilization and elevated operational costs. Consequently, strengthening budget enforcement mechanisms and improving expenditure monitoring were identified as key priority areas.

Revenue Diversification

The results show that many SOEs rely heavily on single-source income streams, resulting in limited revenue diversification. However, respondents reported ongoing efforts to explore and develop multiple revenue sources. These diversification initiatives are being designed to remain aligned with the core mandates and strategic objectives of the respective SOEs.

Debt Management

The findings reveal that a significant number of SOEs operate under high debt burdens. In response, organisations reported implementing active debt management strategies, including debt restructuring and strengthening collection systems. These measures were reported to improve liquidity positions and enhance overall financial sustainability.

Financial Analysis and Modelling

The results further indicate widespread use of financial performance monitoring tools across SOEs. Common practices include financial ratio analysis, cash flow forecasting, and variance analysis. These tools were reported to support financial decision-making and enable early identification of financial performance deviations.

Common Pressures and Systemic Challenges

The findings demonstrate that SOEs operate under shared external and operational constraints that negatively affect financial performance and strategic planning.

First, economic and market volatility was consistently reported as a major challenge. Fluctuations in macroeconomic conditions create financial uncertainty, thereby complicating budgeting, forecasting, and long-term financial planning processes.

Second, respondents highlighted the impact of external disruptions, including policy shifts, regulatory uncertainty, and delayed payments from clients and government institutions. These disruptions were reported to significantly affect cash flow stability and hinder the implementation of strategic initiatives.

Third, high operational costs emerged as a persistent systemic constraint. Respondents attributed rising operational expenses primarily to inflationary pressures, which increase input costs. As a result, cost containment and operational efficiency remain ongoing challenges for most SOEs.

Industry-Specific Vulnerabilities

In addition to shared systemic pressures, the findings demonstrate the existence of sector-specific risks that vary depending on the operational context of each SOE.

For SOE A, the results show high sensitivity to fluctuations in energy demand and volatility in global energy prices. These factors were reported to directly influence revenue predictability and operational sustainability.

For SOE B, the findings indicate a strong dependency on seasonal tourism patterns. This seasonal variability exposes the enterprise to external shocks, resulting in revenue instability and periods of low financial performance during off-peak seasons.

For SOE C, respondents identified aging infrastructure, including road and rail systems, as a major operational burden. Additionally, increased competition from private transport providers was reported to place pressure on market share and pricing structures.

For SOE D, the results indicate direct exposure to government policy changes, particularly subsidy adjustments and regulatory reforms. These policy shifts were reported to have immediate and significant effects on financial stability and operational continuity.

Role of Government and Strategic Autonomy

The findings highlight the complex relationship between SOEs and government institutions, characterized by both stabilizing support and structural dependency.

Government as a Stabilizer

The results indicate that government support plays a critical role in sustaining SOE

operations. Most respondents reported that financial assistance mechanisms, including grants and guarantees, as well as regulatory frameworks, contribute significantly to financial stability and provide strategic direction for organizational decision-making.

Government Dependency

The findings further reveal that many SOEs remain highly dependent on government support. Respondents noted that this dependency limits the development of long-term financial sustainability, financial independence, and strategic agility. However, organizations reported that their strategic objective is to utilize government support as a transitional mechanism while gradually building long-term financial self-sufficiency.

Organizational Responses and Mitigation Strategies

The results also show that SOEs are actively implementing internal measures to address both shared systemic pressures and sector-specific risks.

Strategic Approaches

The findings indicate that many SOEs are developing and implementing strategies aimed at operational and revenue diversification. These strategies are intended to reduce exposure to single-source revenue risks and improve organizational resilience.

Building Internal Resilience

Common responses across SOEs include strengthening operational efficiency, improving adherence to strategic plans, enhancing internal technical and managerial capacity, and implementing formal risk management frameworks. These measures were reported to support organizational stability and improve long-term operational sustainability.

Implications of Findings

1. Financial Management Practices: Comprehensive financial management practices are crucial for mitigating bankruptcy risks and enhancing stability.
2. Government Influence: Government support is essential but poses risks of over-reliance, affecting long-term autonomy.
3. Strategic Planning and Oversight: Improved financial oversight, strategic planning, and operational efficiency are vital for financial health.
4. Sector-Specific Insights: Tailored strategies are needed to balance immediate needs with sustainable growth.
5. Operational Resilience: SOEs must develop strategies to promote financial independence while leveraging government support.

Discussion of Findings

This study combined quantitative financial ratio analysis with qualitative sector-based insights to provide a comprehensive understanding of bankruptcy risk among state-owned enterprises (SOEs). The integrated results suggest that financial distress in SOEs is driven not only by measurable financial indicators but also by structural, operational, and institutional factors, including government influence, sector-specific vulnerabilities, and financial management practices.

From the quantitative analysis, liquidity emerged as the most consistent early warning indicator of bankruptcy risk. The statistically significant negative relationship between liquidity ratio and bankruptcy risk supports classical financial distress theory, which identifies liquidity deterioration as one of the earliest signals of potential failure (Beaver, 1966; Altman, 1968;

Brealey et al., 2020). The qualitative findings reinforce this relationship, as multiple sectors reported delayed payments, high operating costs, and working capital pressures as key operational risks. These results suggest that short-term cash flow constraints, rather than long-term profitability alone, are central to financial survival in SOEs.

Interestingly, solvency showed a statistically significant positive relationship with bankruptcy risk in this sample. While this finding appears counterintuitive relative to traditional financial theory, it aligns with capital structure literature suggesting that high leverage may increase financial vulnerability rather than improve stability (Myers, 1984; Titman & Wessels, 1988). The qualitative data provide context for this result, as several SOEs rely on debt financing, restructuring, and government-supported borrowing structures. In such environments, higher solvency ratios may reflect increased debt exposure rather than improved financial health, particularly where government backing reduces perceived borrowing risk.

The feature importance analysis further supports the multidimensional nature of financial distress. Although solvency carried the largest predictive weight, liquidity remained the most theoretically consistent and practically observable early warning indicator. This supports prior research suggesting that financial distress prediction is strongest when combining multiple financial indicators rather than relying on single-ratio measures (Ohlson, 1980; Lessmann et al., 2015).

The qualitative results further highlight that financial stability in SOEs is strongly influenced by operational realities. Common financial management strategies across sectors included cost control, revenue diversification, debt management, and financial modeling. These practices are consistent with corporate finance literature emphasizing efficient resource

allocation and financial planning as key to organizational sustainability (Ross et al., 2019). However, qualitative evidence also indicates that external pressures such as policy changes, delayed government payments, economic shocks, and infrastructure challenges significantly affect financial outcomes, supporting prior findings that SOE performance is often shaped by governance and institutional environments (Megginson & Netter, 2001).

Government influence emerged as a critical cross-cutting theme. While government grants, subsidies, and policy support enhance short-term financial stability, qualitative evidence suggests that over-reliance on state backing may weaken financial discipline and strategic autonomy. This finding aligns with prior SOE literature showing that government support can both stabilize and distort financial decision-making, particularly in capital structure and investment behavior (Boubakri et al., 2005).

Sector-specific qualitative insights further demonstrate that financial distress risk is not uniform across SOEs. For example, power utilities face demand and cost volatility, hospitality firms face tourism dependence and external shocks, railway firms face infrastructure and competition challenges, and petroleum firms face policy and subsidy uncertainty. These findings reinforce the importance of contextualizing financial ratio analysis within operational and sectoral realities.

Overall, the integrated findings suggest that bankruptcy risk in SOEs is best understood as a combination of financial structure, liquidity capacity, operational efficiency, and institutional environment. While quantitative models can identify early warning signals, qualitative evidence provides critical context explaining why these signals emerge and how they manifest across sectors.

The study demonstrates that financial distress prediction in SOEs requires both numerical financial indicators and contextual institutional understanding. Liquidity constraints consistently signal distress risk, while solvency indicators must be interpreted cautiously in environments characterized by high leverage and government financial support structures.

Conclusion and Recommendations

Conclusion

This study set out to examine the differences in solvency and liquidity ratios between bankrupt and non-bankrupt State-Owned Enterprises in order to identify early warning indicators of financial distress. The findings demonstrated that the median solvency ratio was slightly higher among bankrupt firms than their solvent counterparts. Correlation analysis further revealed a statistically significant positive association between solvency and bankruptcy risk ($r = +0.25, p = 0.013$). This unexpected result suggests that, in this context, higher solvency may reflect over-leverage or poor financial management rather than genuine financial strength. The first objective was therefore achieved, as a significant difference in solvency ratios was identified, albeit contrary to theoretical expectations. The analysis of liquidity ratios confirmed that bankrupt firms exhibited significantly lower liquidity compared to solvent firms, with a statistically significant negative correlation between liquidity ratio and bankruptcy risk ($r = -0.23, p = 0.024$). This finding aligns with established theory, affirming that inadequate liquidity compromises a firm's ability to meet short-term obligations and increases the likelihood of bankruptcy. Accordingly, both null hypotheses were rejected in favor of the alternative hypotheses, establishing that significant differences exist in both solvency and liquidity ratios between bankrupt and non-bankrupt firms

Our findings suggest that liquidity ratios, in particular, serve as a critical early warning indicator of bankruptcy risk. Lower liquidity ratios were significantly associated with higher bankruptcy risk, consistent with the role of liquidity as a measure of a firm's ability to meet its short-term obligations. Strengthening liquidity management, therefore, should be prioritized as part of broader efforts to enhance the financial sustainability of SOEs. Moreover, predictive tools, whether based on simple financial ratios or more sophisticated models, can complement governance reforms by providing actionable insights to managers and policymakers.

Recommendations

Based on the observed patterns in solvency, liquidity, profitability, and acid-test ratios between bankrupt and non-bankrupt companies, to strengthen the financial resilience of Zambian State-Owned Enterprises (SOEs), the following recommendations are proposed:

Firstly, liquidity management should be prioritized as the basic financial strategy. Because low liquidity was identified as a persistent and strong initial warning sign of bankruptcy risk, SOE management should devote greater attention to the maintenance of adequate current and quick assets to meet short-term obligations. This includes adopting conservative working capital practices, monitoring liquidity ratios regularly, and adopting internal benchmarks that initiate action. Second, there must be no over-interpretation of Solvency ratios.

The unanticipated finding that higher solvency ratios have been associated with higher bankruptcy risk suggests that, here, solvency is likely capturing over-leverage as well as true strength. SOE managers and policymakers ought to exercise caution in the interpretation of solvency measures, complementing them with qualitative assessments of debt sustainability and ability to repay to avoid making decisions on the basis of partial information from solvency measures.

Third, SOEs need to construct and establish early warning systems in which they institutionalize the use of early warning systems consisting of liquidity monitoring and other critical financial indicators to identify and prevent bankruptcy risk ahead of time. These can comprise frequent stress testing, trend analysis of ratios, and risk dashboards so that early corrective actions can be taken before financial stress takes root.

Lastly, SOEs must improve mechanisms for governance and financial control. This has been revealed by qualitative proof that mismanagement of finance is prompted by poor governance, over-government intervention, and a lack of autonomy. Reforms of governance structure, transparency enhancement, and enhanced authority for SOE managers in making decisions regarding financial strategies are required to allow sustainable operation and minimize state bailouts.

Limitations

The following were the limitations of the study:

- Distinction Between Administrative and Commercial Inventories: Lack of a clear distinction affected financial analysis precision.
- Incomplete Financial Data: - Some SOEs lacked comprehensive or up-to-date financial statements.
- Data Collection Challenges: - Difficulty in accessing and digitizing financial records increased the potential for errors.

Suggestion for Further Studies

Future research should focus on the impact of technological integration (AI, IoT, blockchain) on enhancing efficiencies and mitigating financial risks within Zambian SOEs. Case

studies and supportive government policies will offer insights into technological solutions for financial resilience and long-term viability. Last but not least, the counterintuitive solvency findings merit further investigation of whether government backing influences borrowing behavior, the temporal ordering of financial deterioration in SOEs, as well as industry-specific influences that might mediate these relations.

References

Altman, E. I. (1968). Financial ratios, discriminant analysis and the prediction of corporate bankruptcy. *Journal of Finance, 23*(4), 589–609.

Altman, E. I. (2018). Applications of distress prediction models: What have we learned after 50 years from the Z-score models? *International Journal of Financial Studies, 6*(3), 70.

Beaver, W. H. (1966). Financial ratios as predictors of failure. *Journal of Accounting Research, 4*, 71–111.

Bellovary, J., Giacomino, D., & Akers, M. (2017). A review of bankruptcy prediction studies: 1930 to present. *Journal of Financial Education, 33*, 1–42.

Boubakri, N., Cosset, J., & Saffar, W. (2013). The role of state and foreign owners in corporate risk-taking: Evidence from privatization. *Journal of Financial Economics, 108*(3), 641–658.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101.

Brealey, R. A., Myers, S. C., & Allen, F. (2020). *Principles of corporate finance* (13th ed.). McGraw-Hill.

Brown, K., Smith, L., & Jones, R. (2022). *Corporate insolvency law: Principles and practice.* Oxford University Press.

Buchanan, J. M., & Tullock, G. (1962). *The calculus of consent: Logical foundations of constitutional democracy.* University of Michigan Press.

Chen, Y., & Lin, C. (2020). The influence of ownership structure on firm performance: Evidence from Chinese listed companies. *Emerging Markets Review, 45*, 100719.

Creswell, J. W., & Plano Clark, V. L. (2018). *Designing and conducting mixed methods research* (3rd ed.). Sage Publications.

Davis, J. H., Schoorman, F. D., & Donaldson, L. (1997). Toward a stewardship theory of management. *Academy of Management Review, 22*(1), 20–47.

DiMaggio, P. J., & Powell, W. W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *American Sociological Review, 48*(2), 147–160.

Fereday, J., & Muir-Cochrane, E. (2006). Demonstrating rigor using thematic analysis. *International Journal of Qualitative Methods, 5*(1), 80–92.

Fink, A. (2019). *Conducting research literature reviews* (5th ed.). Sage Publications.

Glaser, B. G., & Strauss, A. L. (1967). *The discovery of grounded theory.* Aldine.

Hillman, A. J., Withers, M. C., & Collins, B. J. (2009). Resource dependence theory: A review. *Journal of Management, 35*(6), 1404–1427.

International Monetary Fund (IMF). (2022). *Zambia: Selected issues.*

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm. *Journal of Financial Economics, 3*(4), 305–360.

Kader, A. R., & Khan, M. H. (2019). Financial distress and corporate bankruptcy: A review. *Asian Journal of Accounting Perspectives, 12*(1), 95–115.

Kanyinga, K., & Okello, D. (2021). The challenges of state-owned enterprises in Kenya. *African Journal of Economic Review, 9*(3), 28–45.

Lessmann, S., Baesens, B., Seow, H. V., & Thomas, L. C. (2015). Benchmarking classification algorithms. *European Journal of Operational Research, 247*(1), 124–136.

Lungu, M., & Mulenga, M. (2021). Financial distress and performance of state-owned enterprises in Zambia. *Journal of Economics and Business, 15*(2), 78–92.

Megginson, W. L., & Netter, J. M. (2019). From state to market. *Journal of Economic Literature, 39*(2), 321–389.

Merriam, S. B., & Tisdell, E. J. (2015). *Qualitative research* (4th ed.). Jossey-Bass.

Miles, M. B., Huberman, A. M., & Saldaña, J. (2019). *Qualitative data analysis* (4th ed.). Sage Publications.

Miller, D. (2019). *Bankruptcy and insolvency law.* LexisNexis.

Modigliani, F., & Miller, M. H. (1958). The cost of capital. *American Economic Review, 48*(3), 261–297.

Muguchia, L. (2018). Financial management practices in Kenya. *Journal of Finance and Accounting, 4*(1), 21–30.

Musili, A. M. (2018). Agency problems and financial performance. *International Journal of Business and Management, 13*(8), 127–137.

Myers, S. C. (1984). The capital structure puzzle. *Journal of Finance, 39*(3), 575–592.

Nhete, T. (2021). SOEs and economic development in Zambia. *African Journal of Economics and Management Studies, 12*(4), 602–618.

OECD. (2021). *State-owned enterprises: Governance and accountability.* OECD Publishing.

Ohlson, J. A. (1980). Financial ratios and bankruptcy prediction. *Journal of Accounting Research, 18*(1), 109–131.

Otoo, I. (2024). Financial management practices and distress. *Journal of Financial Research, 48*(1), 112–130.

Palinkas, L. A., et al. (2015). Purposeful sampling in mixed-method research. *Administration and Policy in Mental Health, 42*(5), 533–544.

Patton, M. Q. (2015). *Qualitative research and evaluation methods* (4th ed.). Sage.

Pfeffer, J., & Salancik, G. R. (1978). *The external control of organizations.* Harper and Row.

Policy Monitoring and Research Centre. (2015). *The role of SOEs in Zambia's economy.*

Policy Monitoring and Research Centre et al. (2019). *Zambia economic report.*

Porter, M. E. (1980). *Competitive strategy.* Free Press.

Prabowo, R. (2019). Bankruptcy prediction models. *Journal of Economics, Business, and Management, 7*(3), 92–97.

Putra, P. R., Sugiyanto, S., & Maryono, M. (2021). Financial sustainability. *International Journal of Economics and Financial Issues, 11*(2), 90–96.

Ragin, C. C. (2008). *Redesigning social inquiry.* University of Chicago Press.

Rahman, R., Shah, S. Z. A., & Iqbal, Z. (2021). Governance and SOE performance. *Journal of Public Administration Research and Theory, 31*(3), 499–518.

Ross, S. A., Westerfield, R., & Jaffe, J. (2019). *Corporate finance* (12th ed.). McGraw-Hill.

Saunders, M., Lewis, P., & Thornhill, A. (2019). *Research methods for business students* (8th ed.). Pearson.

Scott, W. R. (2001). *Institutions and organizations.* Sage Publications.

Shirley, M. M., & Walsh, P. (2020). Public vs private ownership. *World Bank Research Observer, 15*(2), 79–101.

Shmueli, G., Patel, N., & Bruce, P. (2010). *Data mining for business intelligence.* Wiley.

Silverman, D. (2016). *Qualitative research* (4th ed.). Sage.

Simeon, N., et al. (2023). SOE distress prediction in Zambia. *Journal of Business and Economics, 14*(1), 67–82.

Singh, J. P., et al. (2019). Financial management practices in developing countries. *International Journal of Business and Management, 14*(6), 45–56.

Tashakkori, A., & Teddlie, C. (2010). *Mixed methods research.* Sage.

Titman, S., & Wessels, R. (1988). Capital structure choice. *Journal of Finance, 43*(1), 1–19.

Trochim, W. M., & Donnelly, J. P. (2006). *Research methods knowledge base.* Atomic Dog.

Venkatesh, V., Brown, S. A., & Bala, H. (2013). Mixed methods in IS research. *MIS Quarterly, 37*(1), 21–54.

Voda, A. I., et al. (2021). Bankruptcy prediction in emerging markets. *Emerging Markets Finance and Trade, 57*(1), 47–67.

Walliman, N. (2017). *Research methods: The basics.* Routledge.

Wang, H., & Shiu. (2017). State ownership and firm performance. *China Economic Review, 45*, 1–17.

Whitaker, R. B. (1999). Early stages of financial distress. *Journal of Economics and Finance, 23*(2), 123–132.

Wisuttisak, P., & Rahman, R. (2021). Political interference and SOE performance. *Asian Journal of Political Science, 29*(1), 56–73.

World Bank. (2023). *Zambia economic outlook.*

Yin, R. K. (2018). *Case study research and applications* (6th ed.). Sage.

Zmijewski, M. E. (1984). Methodological issues in distress prediction. *Journal of Accounting Research, 22*, 59–82.

© 2026 CGE – Consortium for Global Education

Elizabeth Chacko, Piyali Roy Chowdhury

Christ University, Bangalore India

Vol 5:9 2026

Abstract

The discussion of Triple Bottom Line (TBL) is now at the highest priority level as the countries are trying to reach their level of targeted sustainability. While environmental, Social and Governmental (ESG) issues are now focused more on measurable criteria, the requirement of research based on ESG and sustainability has come to forefront. On this context, the pillars of Triple Bottom Line (TBL) emphasize on finding the justification on people, planet and profit with aligning the objectives of ESG. The parameters of ESG are dealing with the economic indicators, social indicators and governance indicators of the respective countries. Based on this, the current study extracts prominent variables from each framework and tries to ascertain the conceptual theories behind the same. On one hand, previous studies have focused on finding the relationship among the three pillars of ESG with respect to extraneous variables, while, on the other hand, our current research focuses on finding the impact of economic pillar on the social pillar in Asian economies. The uniqueness of the current research is that it finds the impact inside the Triple Bottom Line whereas, the previous studies have concentrated on the influence of TBL on the other external variables. Thus, the requirement of TBL to be discovered as independent factors' effect has been the major focus of the study. Here, the article tries to focus on the impact of economic growth (SDG) on two of the social pillars, gender equality (SDG) and hunger valuation (SDG). During the analysis, the key focus of the study was to extract the importance of gender sensitivity along with hunger assessment to promote sustainability in economies. As the poverty remains the maximum concern for Asian economies, the study choses countries as China, India, Indonesia, Japan and Korea for the data analysis. As these five economies are prominent in their development path, they strive towards sustainable economy considering reaching all the pillars of their respective goals. But unfortunately, the basic hindrance remains as poverty in these countries. Eradicating poverty will overcome the difficulties towards smooth sustainable transition for them. Thus, the research focuses on

formulating short run and long run strategies for the countries to reach zero hunger (SDG) by focusing on gender equality, hunger index and economic growth. Also, it directs to emphasize gender equality primarily in Asian nations to channelize ultimate development towards sustainable path.

Keywords: *Gender Equality, Sustainability, Triple Bottom Line (TBL), Economic Growth, Zero Hunger*

Introduction

Over the last two decades, the integration of Environmental, Social, and Governance (ESG) factors into decision-making has become one of the most transformative shifts in global finance, corporate strategy, and policy research. ESG has not only reshaped investment portfolios and corporate accountability frameworks but has also entered the mainstream of public discourse on sustainability. The change reflects the demand of society for more balance. Profit must now align with responsibility toward people and the planet. The growing focus on sustainability signals change. Development and corporate success are no longer judged by economics alone. At the center of this shift is the Triple Bottom Line (TBL) framework. It was introduced to expand performance assessment beyond financial results. TBL argues that value should be measured not only in economic terms but also through social and environmental impact. Value is defined not only by profit but also by social and environmental contributions. The emphasis on ‘people, planet, and profit’ has gained wide traction. Policymakers, businesses, and scholars view it as a holistic framework for assessing long-term impacts. Over time, the framework has transitioned from a conceptual guideline to an operational principle. It is now institutionalized through corporate reporting standards, sustainability indices, and global development discourse. (Nogueira et al., 2023, 2025).

The rapid growth of investments driven by ESG factors, along with the business response to climate change, has created new social challenges. These developments highlight stability as not just desirable but an urgent economic necessity. There is increasing movement towards interest in ESG-coupled investment. Which, by realizing outstanding amounts of sustainable investments with outstanding amounts of capital. It is forecasted that ESG property can surpass $50 trillion by the year 2025, comprising the bulk of future managed global investments. (Bloomberg, 2022). Institutions such as Bloomberg became symbols of this shift. They were recognized as leaders in ESG indexing. This illustrates how sustainability metrics have moved to the center of financial evaluation (Bloomberg, 2025). This remarkable growth highlights not just financial reallocation but a deeper generational realignment of investor behavior and public values. ESG can be understood as more than a set of reporting standards. It represents a cultural and economic transformation where accountability, long-term sustainability, and social justice define business models. Against this backdrop, Asia offers a complex yet fertile ground for studying ESG and TBL frameworks. The region is experiencing rapid demographic change, large-scale urbanization, and fast industrial growth. These dynamics create unique challenges as well as opportunities for sustainability. Unlike Western contexts, where ESG debates are often centered on decarbonization and climate finance. Asian contexts also bring in additional dimensions. These include inclusive growth, labor rights, institutional diversity, and gender dynamics. Recognizing these regional patterns is crucial. It allows sustainability to move beyond one-size-fits-all models toward approaches that are more nuanced and context-sensitive.

Despite its growing influence, scholarship on TBL and ESG remains uneven. Most studies focus on external and aggregate outcomes. These include firm performance, stakeholder trust, environmental impact, and governance effectiveness (Nogueira et al., 2023, 2025). While these studies reveal important benefits, they sometimes overlook internal linkages and interactions among the three pillars of TBL—ESG. This neglect limits our ability to capture how progress (or setbacks) in one domain, such as economic development, may reinforce or undermine dynamics in other domains, especially gender equity and social inclusion.

This research gap is particularly salient in Asian contexts. While global models emphasize universal metrics, Asia's unique development trajectories complicate their straightforward application. For instance, rapid urbanization, persistent gender inequalities, and varying state-society relationships create specific patterns of trade-offs and synergies across the three TBL dimensions. Gender dynamics, in particular, illustrate the subtle interconnections between economic growth and social sustainability, a dimension underexamined in mainstream ESG debates. Research shows that women's participation in decision-making enhances both social inclusion and ecological outcomes (UNWOMEN, 2023). Yet, structural barriers, such as restrictive norms, discriminatory resource allocation, and weak institutional frameworks, continue to curtail the agency and influence of women in sustainability transitions (Lwamba et al., 2022; Rahim, 2016). Existing work does hint at important dynamics. Feminist economic perspectives demonstrate that closing gender gaps in employment and financial inclusion can unlock trillions of dollars of GDP potential in Asia-Pacific economies (Woetzel et al., 2018). Similarly, case studies across Asia show that gender-responsive initiatives improve resilience

against climate disasters, ensure food security, and accelerate environmental innovations (Kamal, 2025; Leach, 2015). However, few empirical studies have systematically analyzed the intra-pillar relationships within TBL, specifically how economic initiatives directly shape or constrain social outcomes, and reciprocally, how gender equity influences economic sustainability. The result is an important theoretical and empirical blind spot: while sustainability frameworks emphasize interdependence, scholarly practice has often examined each pillar in isolation. Furthermore, while international reports frequently highlight "women's leadership" as critical to sustainability, the threshold effects of gender equality remain poorly understood. For instance, questions such as whether incremental gains in women's participation yield proportional sustainability benefits, or whether more substantial and meaningful inclusion is required to cross a "tipping point," remain insufficiently explored in academic discourse. This gap limits effective policymaking, which needs evidence-informed benchmarks for designing accountability measures like gender quotas, inclusive labor policies, or gender-responsive financing.

This study positions itself within this gap by investigating the intra-pillar relationships between economic initiatives and social outcomes in the TBL model, with a particular focus on gender dynamics in Asian contexts. Specifically, it seeks to demonstrate how gender equality functions not only as a social norm or ethical imperative but also as a driver of economic resilience, innovation, and long-term sustainability outcomes. By reframing gender equity as an engine of sustainability rather than a secondary concern, the research advances both theoretical and applied debates about ESG integration in emerging economies. Accordingly, this paper addresses the following guiding questions: How does gender equality interact with economic and social dimensions of the TBL framework in Asian contexts? Do threshold effects exist in

women's participation such that sustainability outcomes are significantly amplified only beyond a certain level of inclusion? What theoretical and policy implications follow from recognizing gender equity as a structuring principle of sustainable development rather than an auxiliary variable? The study makes several original contributions. First, it empirically establishes gender equality as a determinant of economic sustainability in Asia. Using evidence across diverse sectors—from community adaptation and agriculture to manufacturing and financial inclusion, it shows how women's participation strengthens resilience, inclusiveness, and long-term economic outcomes. By doing so, it treats gender not merely as a variable but as a structuring principle at the heart of sustainable economic systems. Second, the research clarifies critical thresholds in gender parity. It hypothesizes and demonstrates that sustainability outcomes are significantly amplified. When women's participation in labor markets or political decision-making surpasses a minimal benchmark. This finding challenges models of partial inclusion and symbolic representation. Underscoring the necessity of meaningful and institutionalized participation. By identifying these thresholds, the study provides actionable insights for policymakers and development organizations. By seeking to align national strategies with the SDGs, particularly SDG 5 (Gender Equality) and SDG 8 (Decent Work and Economic Growth). Third, the paper advances theoretical debates by grounding analysis within Gender and Development (GAD) theory and Feminist Economics perspectives. By addressing issues of power, equity, and justice, these frameworks offer deeper insight. They help explain how the dynamics within each TBL pillar operate in practice. Crucially, the study grounds these theoretical insights in diverse Asian contexts. This helps bridge the gap between abstract theory and region-specific realities. Lastly, the implications of this research extend beyond academia. For policymakers, the study suggests that effective sustainability strategies need gender-sensitive institutions, stronger leadership

training, and targeted financial tools. For businesses, it shows that including women in governance and decision-making is not only about equity. It also improves innovation, risk management, and long-term growth. For development practitioners, it offers concrete strategies for embedding gender equity into climate resilience, food security, and ecosystems.

Overall, the study shows that tackling climate change, advancing sustainable finance, and promoting inclusive development all require a new focus on gender. These goals cannot be met without treating gender as a central driver of TBL and ESG frameworks. By filling conceptual gaps, the study builds a base for rethinking sustainability in Asia. It views economic and social pillars not as separate tracks but as forces that shape and support each other. The rest of the paper is structured as follows. Section 2 reviews theories, literature, and hypotheses. Section 3 describes the data and methodology. Section 4 presents the results. Section 5 concludes with implications for policy, practice, and future research.

Literature Review

The Triple Bottom Line (TBL), introduced by Elkington (1997), extended the traditional focus on profit to include social and environmental outcomes, people, planet, and profit (Narbel & Muff, 2017). TBL integrates economic performance with social responsibility and environmental protection, making it relevant for global priorities. Over time, it has grown beyond a reporting tool. Today, it shapes business strategy, public policy, and development planning. (Deininger et al., 2023). Despite its influence, the framework remains contested. Studies argue that it lacks clear metrics for measurement. Applications are often superficial. In practice, economic outcomes are prioritized over social and environmental goals (Srivastava et al., 2022). In this study, TBL serves as a framework to explore how gender equality supports

economic sustainability in Asia. The study places gender at the heart of the 'people' dimension. It focuses on TBL beyond corporate boundaries into national policy. The message is clear, inclusion is not optional; it is essential for lasting growth

ESG Criteria and Measurement

The growth of ESG criteria shows efforts to turn the TBL into quantitative factors for evaluating investments, company strategy, and policies. (Nogueira et al., 2023). The three pillars of sustainability cover economic, social, and environmental dimensions. The economic pillar considers GDP growth, financial performance, cost efficiency, and innovation capacity. The social pillar focuses on equality, health, education, and community well-being. The environmental pillar addresses resource use, pollution control, and ecological balance. These metrics focus on long-term profitability. They also stress the need to balance economic gains with social and environmental goals. (Warouw et al., 2024). **Social indicators** focus on equity, human rights, and labour practices. Foremost, among them are gender equality, poverty reduction, and hunger alleviation, which are also priorities within the SDGs (Warouw et al., 2024). Studies show that gender equality is more than a social goal. It strengthens resilience, boosts productivity, and supports inclusive growth, especially in developing regions. **Governance indicators** address accountability structures such as board diversity, transparency, ethical codes, and compliance mechanisms. Effective governance is consistently associated with stronger ESG performance and improved sustainable economic outcomes (Warouw et al., 2024). Despite their growing influence, ESG frameworks face important challenges. Scholars point to inconsistent data, weak comparability across countries, and the risk of symbolic reporting rather than substantive change (Baratta et al., 2023; Nogueira et al., 2025). These limitations are

particularly evident in emerging Asian markets, where disclosure practices vary widely. (Bais et al., 2024) Global benchmarks such as the Global Reporting Initiative (GRI) and the UN Global Compact have improved comparability, but measurement gaps remain a significant obstacle to rigorous analysis.

TBL in Asian Context

Asia's diverse economies, both the promise and the limitations of applying the TBL framework to sustainability, particularly in advancing gender equality, poverty reduction, and hunger eradication (Nogueira et al., 2023). Rooted in stakeholder theory and development economics, TBL emphasizes the interdependence of economic viability, social equity, and environmental stewardship (Norris, 2024). In Asia, however, empirical applications reveal uneven implementation, reflecting institutional, cultural, and governance differences across the region. China presents both opportunities and contradictions. Rapid economic growth has raised awareness of social and environmental costs. This has prompted the integration of TBL principles into policies and corporate agendas. (Chen & Kamarudin, 2024; Taylor, 2002). However, persistent rural poverty, gender inequality, and environmental degradation reveal that progress often trails behind stated commitments. India reveals a similarly complex picture. Growth has lifted many out of poverty. But gender gaps and food insecurity endure. Stronger integration of TBL with social protection and environmental policy is needed. (UNGC; Russell Reynolds et al., 2020). Indonesia exemplifies the struggle to reconcile growth with sustainability (Nemoto & Morgan, n.d.; UNGC; Russell Reynolds et al., 2020). On the other hand, Japan and Korea, which are both sophisticated economies, have mature ESG processes that follow TBL principles. Their emphasis on governance reforms, gender-sensitive innovation, and

sustainability-driven industrial strategies positions them as regional exemplars (Taylor, 2002; UNGC; Russell Reynolds et al., 2020). However, disparities in rural and marginalized communities reveal that even highly developed contexts require more nuanced, context-sensitive approaches. Across the literature, gender equality consistently emerges as a pivotal component of the social bottom line. It not only shapes inclusive economic outcomes but also strengthens resilience against poverty and hunger. Nevertheless, significant research gaps remain. First, sustainability research in Asia continues to underutilize gender-disaggregated data, limiting the ability to assess differentiated impacts across social groups. Second, while poverty and hunger are widely studied, they are rarely analyzed through the integrated TBL lens that simultaneously accounts for economic, social, and environmental trade-offs. Third, much of the existing scholarship applies Western-derived TBL frameworks without adapting them to Asia's institutional realities, cultural norms, or governance structures. Taken together, existing studies suggest that while TBL and ESG provide robust analytical lenses for examining sustainability in Asia, their effectiveness depends on three interrelated factors: governance quality, methodological rigor in measurement, and inclusive policy design. Embedding gender equity and multidimensional poverty reduction as core elements within TBL is not merely complementary but essential for building sustainable and resilient Asian economies. Addressing the above research gaps provides a critical agenda for advancing theory and practice of TBL in diverse Asian contexts.

Addressing the Research Gap

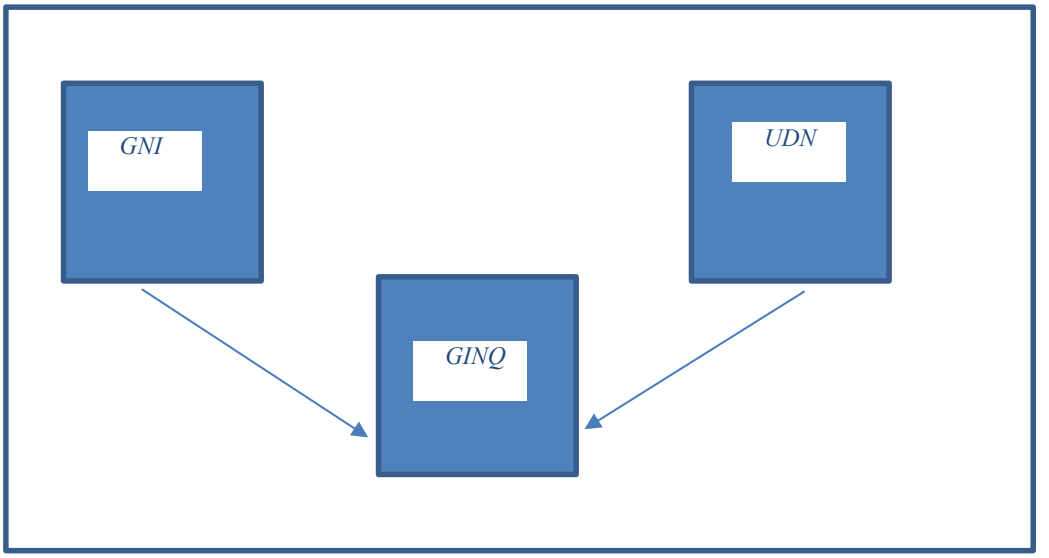
Much existing research examines gender's influence on economic or environmental outcomes in isolation, thereby overlooking critical interconnections. Emerging qualitative

evidence from Asia reveals important intra-pillar pathways. Women's economic empowerment has been shown to strengthen social cohesion and community resilience, while their social participation enhances inclusivity and effectiveness in environmental governance. Despite these contributions, persistent socio-cultural barriers and the scarcity of gender-disaggregated data continue to constrain fuller understanding of gender's role in sustainability transitions. These limitations hinder both policy development and the ability to measure women's contributions systematically across different contexts. Such evidence suggests that gender should not be treated as an external variable but as a transformative pillar that actively shapes economic, social, and environmental trajectories. Recognizing this central role implies that investing in women's leadership, embedding gender-sensitive policies, and addressing structural barriers are not optional add-ons but necessary conditions for durable sustainability outcomes. Future research should prioritize context-specific case studies and develop robust gender-disaggregated sustainability metrics. Advancing these lines of inquiry would allow for more systematic assessment of women's contributions and provide stronger empirical foundations for policy interventions across Asian economies.

The study is guided by three central research questions: RQ1 investigates whether there is a statistically significant long-run equilibrium relationship between Gross National Income (GNI), Governance Quality (GINQ), and Urban Development Needs (UDN); RQ2 explores how short-run changes in Governance Quality (GINQ) and Urban Development Needs (UDN) affect Gross National Income (GNI); and RQ3 examines the extent to which the error correction mechanism indicates significant adjustment of GNI toward long-run equilibrium when short-run deviations occur. These research questions are directly aligned with the objectives of the study,

which are: (i) to examine the long-run relationship between GNI, GINQ, and UDN; (ii) to analyze the short-run impact of changes in GINQ and UDN on GNI; and (iii) to assess the speed and significance of adjustment toward long-run equilibrium in response to short-run deviations. Correspondingly, the study tests three null hypotheses: H_o1, which states that there is no statistically significant long-run relationship between GNI, GINQ, and UDN; H_o2, which posits that changes in GINQ and UDN do not significantly affect GNI in the short run; and H_o3, which asserts that the error correction mechanism is not statistically significant, implying no meaningful adjustment toward long-run equilibrium.

Conceptual Framework



Methodology

The data are collected from the World Bank open data source annually from 2001 to 2022 for the countries China, Indonesia, India, Japan and Korea Republic. The data are then compiled and considered for normalization. The logarithmic values of the variables are

considered mainly for the procedure of normalization. The factors considered here as the prevalence of undernourishment (percentage of population), proxied for social goals SDG 2, Gross National Income per capita, proxied for economic growth of the countries – SDG 8 and school enrolment, primary (gross), gender parity index proxied for gender equality- SDG 5. The data are then tested for unit roots. The combination of data integration between I (0) and I (1) direct the application of ARDL model in panel data framework. The model considered for this study is the panel Auto Regressive Distributed Lag Model. The Panel ARDL (Autoregressive Distributed Lag) model is significant as it enables us to examine both short-term and long-term relationships among variables across nations or groups, while considering heterogeneity.

Panel ARDL, in contrast to conventional methods, accommodates variables with mixed integration orders (I(0) and I(1)), rendering it adaptable for empirical data. It illustrates dynamic adaptations, demonstrating how economies or sectors react over time to disturbances and policy modifications. In policy analysis, it is especially beneficial for comprehending the impact of interventions on growth, inequality, or trade, both in the short term and long term, thereby offering substantial evidence for informed decision-making.

Data Analysis and Results

Table 1
Unit Root Test Results

Test Method- *ln(GNI)*	Statistic (Level)	Prob. (Level)	Stationarity (Level)	Statistic (1st Diff)	Prob. (1st Diff)	Stationarity (1st Diff)
Levin, Lin & Chu t*	-4.58007	0	Stationary	-2.15143	0.0157	Stationary
Im, Pesaran and Shin W-stat	-0.80479	0.2105	Non-stationary	-1.72113	0.0426	Stationary
ADF - Fisher Chi-square	13.8046	0.1821	Non-stationary	17.0624	0.073	Stationary

PP - Fisher Chi-square	34.7174	0.0001	Stationary	36.5753	0.0001	Stationary

Table 2

Unit Root Test Results

Test Method- ***ln(GNIQ)***	**Statistic (Level)**	**Prob. (Level)**	**Stationarity (Level)**	**Statistic (1st Diff)**	**Prob. (1st Diff)**	**Stationarity (1st Diff)**
Levin, Lin & Chu t*	-1.83369	0.0333	Stationary	-3.89667	0	Stationary
Im, Pesaran and Shin W-stat	-1.5207	0.0642	Borderline	-5.0767	0	Stationary
ADF - Fisher Chi-square	19.6924	0.0323	Stationary	43.9646	0	Stationary
PP - Fisher Chi-square	13.9737	0.1742	Non-stationary	75.0528	0	Stationary

Table 3

Unit Root Test Results

Test Method ***ln(UDN)***	**Statistic (Level)**	**Prob. (Level)**	**Stationarity (Level)**	**Statistic (1st Diff)**	**Prob. (1st Diff)**	**Stationarity (1st Diff)**
Levin, Lin & Chu t*	-3.02824	0.0012	Stationary	-3.35946	0.0004	Stationary
Im, Pesaran and Shin W-stat	-1.56648	0.0586	Borderline	-4.78687	0	Stationary
ADF - Fisher Chi-square	13.4393	0.0976	Borderline	45.7282	0	Stationary
PP - Fisher Chi-square	4.54575	0.8048	Non-stationary	29.5597	0.001	Stationary

The unit root test results in tables (1), (2) and (3) reveal the time series properties of the variables used in the analysis: ln(GNI), ln(GNIQ), and ln(UDN). All three variables exhibit non-stationarity at levels for most test methods, particularly under the Im, Pesaran and Shin and ADF-Fisher tests, with some borderline significance in a few cases. However, when differenced once, all variables become stationary, as shown by highly significant p-values across all test statistics. This confirms that ln(GNI), ln(GNIQ), and ln(UDN)are integrated of order one (I(1)),

making them suitable candidates for ARDL modeling, which accommodates variables of mixed order (I(0) and I(1)).

In terms of short- and long-run dynamics, the ARDL models yield mixed results. When ln(GNI) is the dependent variable, both ln(GNIQ), and ln(UDN) show positive coefficients in the long run, but the relationships are not statistically significant. However, in the short run, Δln(UDN) exhibits a significant negative effect on Δln(GNI) (p = 0.0006), suggesting urban development needs may constrain national income growth in the short term. When ln(GNIQ) is the dependent variable, both GNI and UDN positively and significantly influence it in the long run. The short-run model shows a significant and negative error correction term (ECM1 = -0.3295, p = 0.0047), indicating meaningful adjustment toward equilibrium. Conversely, the ARDL model for ln(UDN) as the dependent variable reveals no statistically significant coefficients in either the long or short run, implying weak or inconclusive causal relationships in that direction.

Table 4:a

Long Run: ln(GNI) is dependent Variable

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ln(GINQ)	38.34633	30.14084	1.272238	0.2086
ln(UDN)	10.55872	10.87221	0.971166	0.3341

Table 4:b

Short Run: ln(GNI) is dependent Variable

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ECM	-0.01289	0.007384	-1.74587	0.0844
Δ *ln(GINQ)*	-1.22366	2.318051	-0.52788	0.5989
Δ *ln(UDN)*	-0.15162	0.042608	-3.55839	0.0006
C	0.099103	0.070375	1.40821	0.1626

Table (4a) and (4b) explain the long run and short run dynamics of ARDL. ln(GINQ) and ln(UDN) both have positive coefficients (38.35 and 10.56 respectively), suggesting a positive long-term relationship with the dependent variable (D(LN_GNI)). However, the p-values (0.2086 and 0.3341) are greater than 0.05, indicating these coefficients are not statistically significant at the 5% level. ECM is negative and close to significance (p = 0.0844), implying moderate speed of adjustment towards long-run equilibrium. Δ ln(UDN)has a significant negative effect (p = 0.0006), indicating short-run changes in UDN significantly and negatively impact Δ ln(GNI) . Δ ln(GNIQ)and the constant are statistically insignificant in the short run.

Table 5:a

Long Run: ln(GINQ) is dependent Variable

Variable	Coefficient	Std. Error	t-Statistic	Prob.
lN(GNI)	0.025619	0.004498	5.695211	0
ln(UDN)	0.014895	0.005768	2.582169	0.0115

Table 5:b

Short Run: ln(GINQ) is dependent Variable

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ECM_1	-0.3295	0.113697	-2.89801	0.0047
Δ*lN(GNI)*	0.014623	0.028015	0.521956	0.603
Δ*ln(UDN)*	-0.02741	0.018846	-1.45433	0.1404
C	0.120188	0.03679	-3.3682	0.0012

Table (5a) and (5b) explain the long run and short run dynamics of ARDL. ln(GNI) and ln(UDN)both have positive coefficients (0.025619and 0.014895 , respectively), suggesting a positive long-term relationship with the dependent variable ln(GINQ). ΔlN(GNI) and Δln(UDN), however, are having the p-values (0.603 and 0.1404) are greater than 0.05, indicating these coefficients are not statistically significant at the 5% level. Error correction term is

negative and close to significance (p = 0.0047), implying moderate speed of adjustment towards long-run equilibrium.

Table 6:a

Long Run: ln(UDN) is dependent Variable

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ln(GINQ)	-336.165	419.4441	-0.80145	0.4249

Table 6:b

Short Run: ln(UDN) is dependent Variable

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ECM	-0.01812	0.021316	-0.85018	0.3974
Δ *ln(GINQ)*	8.229129	7.85785	1.047249	0.2977
C	0.019728	0.058709	0.336034	0.7376

Table (6a) and (6b) explain the long run and short run dynamics of ARDL. ln(GINQ) has negative coefficient (-336.165), ΔlN(GINQ) however, are having the p-values (0.2977) is greater than 0.05, indicating these coefficients are not statistically significant at the 5% level.

Discussion & Conclusion

Discussion

Undernourishment (UDN) negatively affects Gross National Income (GNI) in the short run, as poor nutrition reduces labor productivity, increases healthcare burdens, and limits human capital development. These factors directly hinder economic output. However, in the long run, undernourishment positively influences Gender Inequality (GINQ) indicators, likely due to targeted interventions aimed at vulnerable populations, including women and children. Such efforts may promote access to nutrition, healthcare, and education for women, thereby improving gender equality. This shift indicates that although undernourishment initially lowers income

levels, ongoing policy interventions can mitigate inequality, promoting a more inclusive and equitable socioeconomic landscape over time. In Asian economies, undernourishment adversely affects GNI by diminishing workforce productivity and elevating health-related expenses, especially in low-income areas. On the contrary, targeted nutrition and welfare programs aimed at women and children help improve Gender Inequality (GINQ) indicators. Long-lasting efforts to handle observation often prefer women's empowerment through better health care, education and social inclusion. As a result, gender disparities gradually decline. While undernourishment impedes short-term growth, sustained health and gender-specific interventions alleviate inequality. These measures underpin inclusive and resilient economic expansion in Asian economies.

Policy Implications

Asian policymakers must introduce targeted nutrition programs to counter undernourishment's immediate drag on Gross National Income. School feeding, maternal nutrition, and improved rural food access boost labor productivity. Embedding gender-sensitive measures ensures women and girls gain equal access to food, healthcare, and education. This approach fosters lasting reductions in gender inequality and supports economic growth. Cross-sector collaboration and consistent monitoring are essential to optimize outcomes. These policies support inclusive growth by addressing both immediate economic needs and structural inequalities.

Conclusion

Undernourishment is one of the major challenges seen in Asian economies. As this research points out that removing undernourishment is the key driver an economy can scrutinize for its uninterrupted growth. If a country tries to reduce undernourishment, it can actualize the growth in national income. As this is based on the short run, increasing productivity, enhancing higher healthcare infrastructure will be the ultimate goal for governments to initiate. By enhancing productivity in employment, this study aims to build a robust framework on gender inequality. Gender development with respect to gender equality is a crucial factor of developing economies, considering various fields. Thus, by improving women's access to resources, education, and healthcare justifies the contribution to the economy and make it more efficient. This will make them stronger in the long run and help them grow by promoting gender equality.

Financing nutrition represents a significant economic policy for Asia and serves as a crucial aspect of social policy. They can tackle the pressing issue of undernourishment in GNI through a comprehensive nutrition policy. This will incorporate gender equity, thereby promoting inclusive and sustainable development.

References

Bais, B., Nassimbeni, G., & Orzes, G. (2024). Global Reporting Initiative: Literature review and research directions. Journal of Cleaner Production, 471, 143428. https://doi.org/10.1016/J.JCLEPRO.2024.143428

Baratta, A., Cimino, A., Longo, F., Solina, V., & Verteramo, S. (2023). The Impact of ESG Practices in Industry with a Focus on Carbon Emissions: Insights and Future Perspectives. Sustainability , 15(8), 6685. https://doi.org/10.3390/SU15086685

Bloomberg. (2022, January 24). ESG May Surpass $41 Trillion Assets in 2022, But Not Without Challenges, Finds Bloomberg Intelligence | Press | Bloomberg LP. Bloomberg. https://www.bloomberg.com/company/press/esg-may-surpass-41-trillion-assets-in-2022-but-not-without-challenges-finds-bloomberg-intelligence/

Bloomberg. (2025, June 30). Bloomberg Indices named ESG and Climate Index Provider of the Year at Environmental Finance 2025 Sustainable Investment Awards | Press | Bloomberg LP. Bloomberg. https://www.bloomberg.com/company/press/bloomberg-indices-named-esg-and-climate-index-provider-of-the-year-at-environmental-finance-2025-sustainable-investment-awards/

Chen, S., & Kamarudin, K. M. (2024). Interfacing triple bottom line sustainability and metropolitan governance: An empirical exploration of stakeholder value co-creation and conflict. Heliyon, 10(19), e38772. https://doi.org/10.1016/J.HELIYON.2024.E38772

Deininger, F., Woodhouse, A., Kuriakose, A. T., Gren, A., & Liaqat, S. (2023). Placing Gender Equality at the Center of Climate Action. Placing Gender Equality at the Center of Climate Action, January. https://doi.org/10.1596/39436

Kamal, N. (2025, May 23). Gender at the heart of climate action: New framework charts a transformative path. Times Of India. https://timesofindia.indiatimes.com/india/gender-at-the-heart-of-climate-action-new-framework-charts-a-transformative-path/articleshow/121368733.cms

Leach, M. (2015). Gender equality and sustainable development. In Gender Equality and Sustainable Development. Routledge. https://doi.org/https://doi.org/10.4324/9781315686455

Lwamba, E., Shisler, S., Ridlehoover, W., Kupfer, M., Tshabalala, N., Nduku, P., Langer, L., Grant, S., Sonnenfeld, A., Anda, D., Eyers, J., & Snilstveit, B. (2022). Strengthening

women's empowerment and gender equality in fragile contexts towards peaceful and inclusive societies: A systematic review and meta-analysis. Campbell Systematic Reviews, 18(1), e1214. https://doi.org/10.1002/CL2.1214

Narbel, F., & Muff, K. (2017). Should the Evolution of Stakeholder Theory Be Discontinued Given Its Limitations? Theoretical Economics Letters, 7(5). https://doi.org/10.4236/tel.2017.75092

Nemoto, N., & Morgan, P. J. (n.d.). Environmental, Social, and Governance Investment: Opportunities and Risks for Asia.

Nogueira, E., Gomes, S., & Lopes, J. M. (2023). Triple Bottom Line, Sustainability, and Economic Development: What Binds Them Together? A Bibliometric Approach. Sustainability , 15(8), 6706. https://doi.org/10.3390/SU15086706

Nogueira, E., Gomes, S., & Lopes, J. M. (2025). Unveiling triple bottom line's influence on business performance. Discover Sustainability 2025 6:1, 6(1), 1–18. https://doi.org/10.1007/S43621-025-00804-X

Norris, S. (2024). In the eye of the beholder: Stakeholder perceived value in sustainable business models. Long Range Planning, 57(1), 102406. https://doi.org/10.1016/J.LRP.2023.102406

Rahim, M. M. (2016). Improving Social Responsibility in RMG Industries Through a New Governance Approach in Laws. Journal of Business Ethics , 143(4), 807–826. https://doi.org/10.1007/S10551-016-3131-9

Srivastava, A. K., Dixit, S., & Srivastava, A. A. (2022). Criticism of Triple Bottom Line: TBL (With Special Reference to Sustainability). Corporate Reputation Review, 25(1), 50–61. https://doi.org/10.1057/S41299-021-00111-X/METRICS

Taylor, G. (2002). World Trade Organisation. Journal of Fashion Marketing and Management: An International Journal, 6(2), 367–374. https://doi.org/10.1108/jfmm.2002.28406baa.001

Teselkin, A. (2017, June 18). Spreckley's Triple Bottom Line – The Foresight Guide. Foresight. https://foresightguide.com/spreckley-triple-bottom-line/

UNGC; Russell Reynolds, Reynolds, R., Global, P., DNV GL Group, Äüôú, Ö., Rabay, P. L., Unidos, E., Figura, C. A., Circular, C. A. E., Saad, P. F., Pelos, Z., Propósitos, V. E., Organização, D. A., & UNGC; Russell Reynolds. (2020). Leadership for the decade of action. 1, 6–8. https://www.mottmac.com/equality-diversity-and-

inclusion%0Ahttps://tede.pucsp.br/bitstream/handle/21547/2/Pedro Fernandes Saad.pdf%0Ahttps://sustainabledevelopment.un.org/content/documents/2149Impact Transforming Business.pdf

UNWOMEN. (2023). Gender Equality in the Sustainable. United Nations Industrial Development Organization.

Warouw, F. F., Mashudi, Arafah, M., Noviany, H., & Hendarto, T. (2024). The Rise of Environmental, Social, and Governance (ESG): Assessing the Impact and Implications for Global Business Practices and Policy Formulation. International Journal of Science and Society, 6(1), 810–821. https://doi.org/10.54783/ijsoc.v6i1.1066

© 2026 CGE – Consortium for Global Education

JoRIE

Journal of Research for International Educators

https://www.jorie.org