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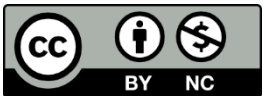

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Editorial Note

Editorial Note: December Issue of the Journal of Adult Education Tanzania (JAET)

Dear readers, it is with great pleasure that I welcome you to the December issue of the Journal of Adult Education in Tanzania (JAET). This issue presents insightful research on adult education, governance, workforce development, and the integration of technology in education and healthcare sectors.

A key theme in this issue is the role of micro-credentials in bridging skills gaps and aligning education with industry needs as advocated in the current Education and Training Policy of Tanzania. The study on this theme highlights how these certifications offer flexible learning pathways, supporting career mobility and lifelong learning. Another paper explores university financial stability through experiential learning, showcasing innovative strategies used by Tai Solarin University of Education in Nigeria to navigate economic challenges. The findings emphasize the importance of entrepreneurship, internal revenue generation and financial sustainability in higher education institutions.

The issue also includes research on technological infrastructure in healthcare, particularly the impact of power reliability on radiological digital imaging informatics in Tanzanian health facilities. The study underscores the need for stable energy supply and targeted investments to enhance diagnostic accuracy. Another study on the education sector, focusses on career preparation and progression of IAE graduates examines the effectiveness of adult education programmes in equipping learners with relevant skills. The findings reveal a strong alignment between graduates' expectations and labour market demands, reinforcing the significance of competency-based education.

A critical study on bureaucratic governance in Tanzanian universities evaluates its impact on institutional performance, using case studies from St. Augustine University of Tanzania and the University of Dar es Salaam. The study highlights how excessive bureaucracy can hinder adaptability and innovation, calling for governance reforms to improve efficiency. Another paper explores professional training for public secondary teachers, emphasizing workplace learning, self-driven professional growth, and the need for structured mentorship programmes.

These contributions offer valuable insights into education policy, governance, and workforce development, providing recommendations for enhancing institutional efficiency and promoting sustainable learning models.

I extend my gratitude to our authors, reviewers and the editorial team for their dedication to academic excellence. We hope this issue inspires further research and innovation in the adult education.

Sincerely,

Dr. Sempeho I. Siafu

Chief Editor

Journal of Adult Education Tanzania (JAET)

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Re-defining the Future of Lifelong Learning in Bridging Skills Gaps and Skills Mismatch through the Micro-Credential Frameworks

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Abstract

Micro-credentials are certifications of mastery in specific skills designed to reflect immediate industry needs and they ensure that students attain competencies required through bite-sized stackable credentials. The paper employs qualitative research methodology to explore the role of micro-credentials in education and workforce development, relying on a systematic review of secondary sources, including academic articles, industry reports, and policy documents. The findings explore how micro credentials have evolved, the benefits and challenges they bring to workforce development and education including closing skills gaps and skills mismatch as well as supporting career mobility and lifelong learning. Also, the paper underscores standardization frameworks like the National micro credentials Framework within the context of National Qualifications Frameworks to maintain quality, transferability and mobility. So, the current Tanzanian education initiatives should involve integrating micro-credentials along with traditional degrees thereby creating pathways for job-ready skills. The paper wraps up with some reflecting points on digital badges and block-chain as well as policy advice for educators, employers and policymakers about what to do in order to grow the micro-credential ecosystem in Tanzania.

Keywords: *National Qualifications Frameworks, Assessment Framework, micro credentials, Lifelong Learning, Skills Gaps, Skills Mismatch, Adult Education*

Introduction

In an era defined by rapid technological advancement, globalization, and the continuous transformation of the job market, the landscape of education and workforce development is undergoing significant change (Hossain, 2023; Popov, 2023). Traditional education pathways, characterized by multi-year degree programmes, are increasingly being complemented and sometimes even challenged by alternative forms of learning that offer greater flexibility and specificity. Among these alternatives, micro-credentials have emerged as a compelling solution that provides learners with targeted, accessible, and industry-relevant skills that can be acquired quickly and efficiently (McGreal & Olcott Jr, 2021; Oliver, 2019).

Micro-credentials are short, focused qualifications that certify the acquisition of specific competencies, often related to a particular skill or job role (Van der Hijden & Martin, 2023). Unlike conventional degrees, which tend to cover broad subject areas over extended periods, micro-credentials are modular and adaptable, catering to the immediate needs of both learners and employers (Selvaratnam, 2023; Yieng & Haron, 2023). This adaptability is critical in a world where the demand for new skills is constant and rapidly changing, driven by the advent of automation, artificial intelligence, and other technological innovations. As a result, micro-credentials are playing a crucial role in bridging the gap between traditional education and the dynamic requirements of the modern workforce (Cappelli, 2015; McGreal, Mackintosh, Cox, & Olcott Jr, 2022).

The appeal of micro-credentials lies in their ability to support lifelong learning and continuous skill development, which are essential for individuals to remain competitive in today's job market (Brown, Mairéad, Beirne, & Conchúr, 2021; Slattery, 2024). For many, the concept of a linear career path has been replaced by a series of transitions between different roles, industries, or even fields of expertise. This shift has created a need for education models that allow learners to upskill or reskill quickly and effectively. Micro-credentials meet this need by offering specialized training that can be completed in a matter of weeks or months, enabling learners to acquire skills that are directly applicable to their careers.

In addition to serving individual learners, micro-credentials have garnered significant attention from employers and educational institutions. Employers see micro-credentials as a way to ensure that their workforce remains agile and responsive to new challenges, while educational institutions are exploring micro-credentials as a means to enhance their offerings and meet the evolving expectations of students (Thi Ngoc Ha, Van Dyke, Spittle, Watt, & Smallridge,

2024). As a result, micro-credentials are increasingly being integrated into degree programmes and workforce development initiatives, creating new opportunities for collaboration between academia and industry (Varadarajan, Koh, & Daniel, 2023).

However, the adoption and implementation of micro-credentials are not without challenges. Issues related to quality assurance, recognition, and standardization are central to the debate surrounding their value and effectiveness (Brown & Duart, 2024; Hou, Lin, Su, & Chen, 2023). Without clear standards, the quality of micro-credentials can vary significantly between providers, leading to questions about their credibility and utility. Furthermore, for micro-credentials to be effective in supporting career mobility and further education, they must be recognized and accepted by a broad range of stakeholders, including employers, educational institutions, and regulatory bodies (Ashizawa, Ziguras, & Yonezawa, 2024). Addressing these challenges is essential for realizing the full potential of micro-credentials as a tool for education and workforce development (Lang, 2023; Thompsonowak, 2020).

This paper aims to provide a comprehensive examination of micro-credentials, exploring their historical evolution, defining characteristics, benefits, and the challenges they face. The discussion will include an analysis of how micro-credentials are implemented in workforce development, integrated into higher education, and how they are being adapted to meet the demands of a globalized economy. Additionally, the paper will examine the role of quality assurance and recognition in establishing the credibility of micro-credentials.

Through this analysis, the paper seeks to answer critical questions about the role of micro-credentials in modern education and workforce development. How do micro-credentials provide value to learners, employers, and educational institutions? What challenges must be overcome to enhance their recognition and portability? And what does the future hold for micro-credentials as they become an increasingly prominent feature of the educational landscape? Hence, this paper will contribute to a deeper understanding of how micro-credentials are shaping the future of learning and work, offering insights into their potential to transform traditional education models and support lifelong learning in a rapidly changing world.

Methodology

This paper uses a qualitative research methodology to explore the role of micro-credentials in education and workforce development, relying on a systematic review of secondary sources, including academic articles, industry reports, and

policy documents. The research design is descriptive, aiming to provide a comprehensive overview of current trends, benefits, challenges, and future opportunities associated with micro-credentials. Sources were carefully selected to ensure relevance and credibility, focusing on recent publications to reflect contemporary developments.

Thematic analysis was employed to identify key patterns and themes in the data, including the benefits of micro-credentials, challenges related to implementation, quality assurance, and emerging trends. Multiple rounds of coding and cross-case analysis were conducted to refine these themes and compare the experiences of various industries and institutions using micro-credentials. Triangulation was applied to corroborate findings across different types of sources, enhancing the validity and reliability of the study's conclusions.

The study acknowledges certain limitations, such as the reliance on secondary data, which may not capture all perspectives, and the absence of primary data from stakeholders like learners and employers. Ethical considerations were observed, with proper citations and adherence to academic integrity throughout. Overall, the methodology provides a structured approach to understanding the potential of micro-credentials as a flexible and responsive tool for lifelong learning and career advancement.

Results and Discussion

Defining Micro-Credentials

Guiding Research Question 1: What are micro-credentials, and how do they differ from traditional educational qualifications in terms of structure, purpose, and application?

Micro-credentials are certifications that indicate a learnt and mastered skill or ability in a concise programme. Micro-credentials are different from a traditional degree or diploma, which often cover wide topic areas across many years; they deliver specific skill sets that can be immediately used in the workforce (Tamoliune et al., 2023). Those who are employed and wish to up skill, students looking for specialized training in addition to their formal education or anyone learning new skills can benefit from this mode of flexible and accessible form of education platform. One key aspect of micro-credentials is how they are structured (Acree, 2016; Thi Ngoc Ha et al., 2024). As a rule, those are determined by brief time period classes or issues which have been separated in response to talent set. Some of these modules are much shorter and more concise (e.g., a few hours of online study)

while others can be quite intensive in terms of content delivery, duration, or hands-on workshops (Ahsan, Akbar, Kam, & Abdulrahman, 2023). Free from the confines of traditional credit-based course formats, micro-credentials can be designed to meet specific learning and industry needs through context-specific training (Staker, Arnett, & Powell, 2020).

From a purpose standpoint, micro-credentials exist to be nimble, allowing people to acquire skills without the long-term enrolment timelines of traditional degree programmes. This is especially beneficial in faster moving industries where there could be manpower at certain moments and surplus of skills little bit later. Micro-credentials, which concentrate on specific skills can help people adapt to shifts in the labour market rapidly whether that means upskilling for advancement within a career or reskilling altogether.

Micro-credentials also diverge from standard qualifications, in how they are awarded and understood (Ashizawa et al., 2024). The difference here is that traditional degrees and diplomas are awarded by reputable institutions, whereas micro-credentials can be issued by a larger range of providers not limited to the same level of formality including universities, private companies, industry associations etc. (Ashcroft, Etmanski, Fannon, & Pretti, 2021; McGreal & Olcott Jr, 2021). Most micro-credentials are digitally delivered and can provide learning opportunities from anywhere, often assessed via performance-based assessments. A micro-credential, when successfully completed results in a digital badge or certificate that can be shared across professional network connections and integrated within electronic learning profiles as evidence of the learner's developed skills (Fischer, Oppl, & Stabauer, 2022). A significant feature of micro-credentials is the ability to be stacked (Chakroun & Keevy, 2018). This means learners might stack several micro-credentials together to gain an integrated skillset or perhaps work on a larger qualification (Rajabalee, 2023). Learners also get flexibility to customize their learning paths for distinct career goals and interests using a modular approach. So, for example, a digital marketing professional might earn micro-credentials in content creation along with social media management which together form of one single skill set necessary as per the requirements of their job (Steel, Louder, & Drager, 2022).

Micro-credentials are very flexible and can be in different industries (Shariman & Damian, 2022). The tech industry leverages micro-credentials to verify skills such as coding, cyber security and data analytics (Tee, Song, Ho, Wong, & Lim, 2024). Micro-credentials for healthcare, which can be used to train employees in infection

control or telemedicine processes. Micro-credentials are also present in creative fields, teaching specialized skills like graphic design, digital media and film (Ifenthaler, Bellin-Mularski, & Mah, 2016). This flexibility guarantees the importance and appropriacy of micro-credentials in different contexts, while catering to the distinct requirements of both learners as well as employers.

Historical Evolution of Micro-Credentials

Guiding Research Question 2: What historical factors and trends have influenced the development and adoption of micro-credentials as an alternative form of education and training?

While micro-credentials are a newly innovated element of education, they have their roots firmly planted in centuries-old educational reforms and innovations developed over decades to meet the changing needs between learners and employers (Batool, Islam, Nawaz, & Khan, 2023; McGreal, 2023; Slattery, 2024). Degree programmes of the past increasingly have become anachronistic in the last two decades; their slow pace becoming less suited to a technological world where progress was occurring overnight (Adams, 2023; Levine & Van Pelt, 2021). There is such a significant gap between the skills that we are being taught traditionally and the real world needs making micro-credentials a sensible alternatives an alternative and lifelong learning (Díaz, Lim, Navia, & Elzey, 2022). The origins of micro-credentials are in the wider movement towards more flexible modes of study, as well as life-long learning (McGreal & Olcott Jr, 2021; Temjanovski, Chabukovski, Zlatkovski, & Todevski, 2023).

By the end of the 20th century, as industries became more specialized and almost every profession required some form of technology skills, employers began placing a greater emphasis on specific, recently acquired capabilities rather than broader educational qualifications (Leitch, 2006). The trend illuminated the pitfalls of traditional degree programmes, which take years to earn and focus on broad subjects as opposed to specific skills that employers are hiring (Tomlinson, 2008). To address this growing need for focused education, short courses and professional certifications gained popularity in technical & vocational fields (Holzer, 1996; Quintini, 2011). These early iterations of specialized training paved the way for what would later become micro-credentials, giving workers a route to developing specific skills without completing an entire degree (Van de Werfhorst, 2011).

The internet and online learning platforms made it easier to deliver short courses, marking the dawn of the micro-credential model we know today. The rise of

Massive Open Online Courses (MOOCs) from 2000 to 2012 gave a major boost to online learning (Welsh, et al. 2017; Welsh & Dragusin, 2013) A typical example is Coursera which started as a free online platform for the world to learn from top universities often at no cost or just nominal fees (Cusumano, 2016; Saadatdoost, Sim, Jafarkarimi, & Hee, 2016). Originally designed to stand alone, MOOCs quickly added assessments and certificates of completion (or digital badges). These advances also helped define the original concept of micro-credentials in that they indicated learning could be delivered in much smaller, more targeted units and paired directly to a discrete skill or competency. The idea of micro-credentials has expanded and developed over the years and more recently, supported by a growing appetite for elastic learning that is ultimately relevant to industry. Currently, apart from educational institutions, a lot of industries are actively involved in the design and planning of these programmes to ensure that their skills need is met with during the present time or near future (Carnevale, 1990; Carnoy, Hallak, & Caillods, 1999; Fink, 2013).

The Role of Micro-Credentials in Modern Workforce Development

Guiding Research Question 3: How do micro-credentials facilitate lifelong learning and adapt to the evolving needs of the workforce?

With the rapid development of technology combined with globalization and changing employment structures, traditional models in education & workforce training have struggled to meet industry standards (Hossain, 2023; Mindell & Reynolds, 2023). This is where micro-credentials come into play, providing incremental learning opportunities for those who wish to develop skills in a flexible and targeted way. In view of Thomsen (2023), a deeper dive into micro-credentials in the context of lifelong learning takes a closer look at how micro-credentials are supporting workforce development and helping individuals stay relevant and up to date in an ever-fluctuating job market. One response to the growing demand for ongoing education comes in large part from two historical trends: automation creeping into new fields and the role of (digital) transformation reconfiguring jobs. Automation is replacing routine work and AI (Artificial Intelligence) reshapes industries (Brown, 2024; Rahimi & Oh, 2024). The job landscapes will only continue to shift, therefore it becomes increasingly important that workers gain new skills (Carnevale, Smith, Van Der Werf, & Quinn, 2023; Popov, 2023). As such, micro-credentials have responded to this deeper need by providing shorter learning experiences directly aligned with industry needs allowing learners the competence

needed in real-time (Raj, Singh, Kumar, & Verma, 2024; Van der Hijden & Martin, 2023).

Additionally, the gig economy and remote work have become more prevalent which, upends a linear career path of years in one company (Sripada, 2024). In the world of work, this has translated to huge numbers of workers juggling a mix of short-term roles or projects in different industries (Herrmann, Zaal, Chappin, Schemmann, & Lühmann, 2023). Moving to this shift requires a number of skills which are easy on the acquisition/updating part. Micro-credentials are a way for gig workers and freelancers to stay nimble and remain up skilled with an ability to quickly adjust as they transition from project-to-project or industry (George, George, & Baskar, 2024). Everything is changing so fast that the idea of 'lifelong learning' with supporting micro-credentials has rapidly become indispensable for keeping your job (Lang, 2023; Van der Hijden & Martin, 2023). This clearly improves career mobility by giving workers the opportunity to learn in more detail and over time a specific set of job-relevant skills. It is therefore necessary to unpack how micro-credentials address these goals; the definition of a micro credential (what is and what isn't); why one should care about them today as fuel for workforce development.

Implementation of Micro-Credentials in Workforce Development

Guiding Research Question 4: How are micro-credentials being implemented to address workforce development needs, and what impact do they have on upskilling and reskilling within various industries?

The expanding need for targeted, agile workforce training has been fuelled by an ever-evolving industry landscape in response to market dynamics and technological breakthroughs. Enter the micro-credential, a focused tool for workforce development that provides companies and employees with an alternative to longer-term credentialing processes by targeting specific skills instead of broad-based credentials. The following section focuses on how micro-credentials have been used in workforce development and their potential to help address up skilling, reskilling, as well as the broader concept of adaptability within distinct sectors.

a) Closing the Skills Gap with Micro Credentials

The use of micro-credentials in workforce development is one way to rectify the question of skills gap and skills mismatch by offering training for skill sets that traditional programmes may not focus on (Cappelli, 2015). Continuous technological advancements and changing requirements of the industry can make

older skill sets redundant leading to one or all these shortage areas in any company. Micro-credentials are a solution targeting micro learning paired with micro-credits that focus on training employees for their most in-demand skills and competencies. Specialized training in areas like data analytics, cyber security and advanced manufacturing has taken centre stage for employers across sectors such as technology, healthcare or even with modern day manufacturers who are using micro-credentials (Brown et al., 2021). This means that, among other things a company might turn to micro-credentials in cloud computing, so it can staff IT across the world and know they have competency managing digital infrastructure (Nicholson, 1996). By utilizing this method, businesses can address specific skills gaps and fill it in order to have a skilled & agile workforce.

b) Case Studies: Industry-Focused Solutions

Micro-credentials are being used differently by industry, with each sector creating programmes unique to its particular demands. Here are a few ways in which micro-credentials are being used across different sectors for workforce development purposes:

i) Tech Industry

In the rapidly changing tech industry, skills such as coding and artificial intelligence (AI) or cyber security are becoming necessary (Tao, Akhtar, & Jiayuan, 2021). They provide these through partnerships with universities, online learning platforms for offering micro-credentials so employees can maintain pace in the increasingly rapid changes brought on by tech. A tech company, for one, might deliver Python or machine learning micro-credentials as well as credentials in ethical hacking to keep workers competitive.

ii) Healthcare

As the healthcare industry has respond to new pandemic-driven demands for more and specialized workers, micro-credentials have been used as a way quickly reskill to ensure sufficient supply (George et al., 2024). Healthcare providers have been able to respond effectively using micro-credentials focused on skills like telemedicine, infection prevention and providing mental health support (Guest et al., 2021). Hospitals and clinics could employ micro-credentials to educate nurses or medical assistants in new procedures, benefiting patient care while reducing overhead (Noyes, Welch, Johnson, & Carbonneau, 2020).

iii) Manufacturing and Engineering

As 4th industrial revolution unfolds, manufacturing and engineering firms in particular are starting to deploy micro-credentials as part of the workforce training model for advanced skills such as automated robotics or supply chain optimization (Hunt, Carter, Yang, Zhang, & Williams, 2022). An example of this would be a manufacturing plant providing micro-credentials in predictive maintenance or quality assurance in order to ensure workers have the capability to maintain control over production lines that are now automated (Laundon, McDonald, & Greentree, 2023). This customized training is aimed at ensuring employees remain competitive in an industry where technology continues to play a larger helping and instrumental role.

Archetypally, the examples above demonstrate how micro-credentials are being applied to meet industry-specific requirements and provide employees with skills that are not only current but also job-ready, thus improving performance and contributing towards overall organizational goals.

iv) Empowering Up skilling and Reskilling

Fundamentally, constant up skilling and reskilling is more essential in today's world with less linear career paths, ever changing job roles. Micro-credentials enable this by offering an on-demand, standardized way for workers to upgrade their skills as well as shift into new roles (Sripada, 2024). Because they can pick up new skills through micro-credentials, in quick and focused learning experiences that fit around their work schedule. For example, a person in marketing could take certain courses to gain experience specifically related to digital marketing analytics and make them more valuable for the organization (Oliver, 2019). A professional who still wants to transition out of his / her sales function into a project management role could learn specific micro-credentials in subjects like risk management, budgeting or setting up projects. Employers and employees alike may see the appeal in micro-credentials for upskilling and reskilling. The employers on the other hand are saved in terms of adaptable workforce and reduction in recruiting as well as training costs (Carnevale, 1990; Thi Ngoc Ha et al., 2024). Micro-credentials also offer more ways for employees specifically to continue down a pathway toward growth and mobility, maintaining (or increasing) their competitiveness in the job market.

v) Connected Employer-Driven Micro-Credentials and Industry Partnerships

Often the demand for micro-credentials is led by employers who are feeling pressure to ensure that his or her workforce remains up-to-date with relevant

industry standards and practices (Holzer, 1996). They team up with educational providers (like universities or online learning companies), industry associations, etc. to design micro-credentials that provide the skills their organization is looking for specifically (Carnevale, 1990). They allow companies to offer their employees industry recognized certifications that establish credibility and professional identity. An employer in the financial services space, for instance, might decide to work with a professional organization that actively issues micro-credentials around various compliance functions. By working in collaboration, this content is relevant, current and meets industry benchmarks so that it can potentially be recognized by others trading within the sector. In addition, micro-credentials designed by industries can promote common training among employers and establish a level of competence unique to an industry area. Besides, national standardization Micro-credentials not only helps the organizations who partner to establish it but also serves an interest in society in that workers have a common level of basic skills necessary in order to be successful within their field.

vi) The Impact of Micro-Credentials on Workforce Development

The measurement of micro-credential success across organizations includes employee performance metrics, retention rates and feedback from employer as well employees (Jeantet, 2018). Literature shows that there is successful job performance, increased levels of employee satisfaction and ultimately higher retention levels support the fact that micro-credentials are indeed a resource for workforce development (Raj et al., 2024). Micro-credentials are also more portable and brand neutral, allowing workers to carry their skills from organization to organization so they can move with the job market; this increased-driven approach yields benefits for businesses seeking a ready-to-go-skilled workforce. Organizations can use long-term outcome tracking of their micro-credential holders to evaluate the return on investment (ROI) in these programmes and refine training strategies.

Importance and Benefits of Micro-Credentials

Guiding Research Question 5: Why are micro-credentials significant in today's educational and professional landscape, and what benefits do they offer to learners and employers?

The rise of micro-credentials is indicative of our evolving approach to learning and skills attainment, one that is more aligned with the needs of a 21st century workforce. In this increasingly hyper-dynamic world of careers and industry

evolution the value being placed on micro-credentials is in their capacity to be targeted but simultaneously accessible and flexible for learners. Given the advantages of micro-credentials, they are fast becoming critical components that help learners and employers create a workforce better equipped to face uncertainty (Brown et al., 2021). Flexibility and accessibility are some of the greatest benefits of micro-credentials. For one thing, many micro-credentials allow students to be partially/fully-online and part-time where traditional degree programmes are usually full-time for several years (Oliver, 2019). As a result, micro-credentials are more convenient for many learners who are employed full-time have other responsibilities or do not live near large city centres. Micro-credentials cater to individual learning styles and schedules, enabling anyone from any walk of life or stage in their career to develop new skills, a scalable solution that makes lifelong education accessible (Chandler & Perryman, 2023; Duklas, 2020).

a) Modes of micro credentials Delivery

Many micro-credentials are also delivered online, enhancing their availability. Students may access course content from any point, thereby eliminating geographical limitations that surrounded traditional classrooms and education possibilities. It serves as a great advantage for those in rural or undeserved areas with no convenience to educational institutions. Further, digital micro-credentials use interactive design and media resources to create educational processes which can be both engaging and effective (Ifenthaler et al., 2016). Alignment with industry needs because micro-credentials are often co-created in association with industry, the skills and knowledge obtained through these new qualifications closely map onto what employers need. Especially important in fast-moving sectors like technology, health services or finance, keeping up with new developments is imperative.

Micro-credentials enable individuals to stay relevant in the market by keeping up with new trends and technologies, which can make them more employable or a stronger candidate for development roles (Shanahan & Organ, 2022). The industry standard alignment also translates to the skills that micro-credentials offer is instantly applicable in a workforce. Learners who have differentiated acquired skills in this way are able to contribute from day one, thereby lowering costs and time for employers or the need of onboarding newbies. A micro-credential in data analysis, for instance, could feature hands-on projects that mirror real world work to help learners gain practical experience while they learn. Better employability, alternate career opportunities as well as diversified skill sets are a rising asset in an

economy where the average worker can expect to change jobs multiple times throughout their career (Nicholson, 1996). With micro-credentials people are empowered to learn new skills that will help them find jobs or switch careers in a more agile manner. For example, a marketer might take micro-credentials in digital marketing, social media strategy and content creation to upscale his/her skills for new roles that are emerging in the space of Digital economy (Cappelli, 1997; Neffke & Henning, 2013).

Micro-credentials allow employers to ensure that their workforce is still relevant and able to meet new challenges of today as well tomorrow (Neffke & Henning, 2013). Through creating an environment in which employees have the ability to secure these micro-credentials, organizations are able to drive a continuous learning and developing culture within their workforce that is critical for performance advantage (Lang, 2023). This is especially useful for industries in flux that need to rapidly up skill or even reskill; it can mean the difference between success and failure (Holzer, 1996). Support for lifelong learning as the labour market evolves, people are becoming more convinced that they simply have to up skill and reskill themselves throughout their lives; hence, lifelong learning is a term we hear now everywhere (Slattery, 2024). At the same time, micro-credentials provide an important means of promoting lifelong learning and allowing people to remain engaged with ongoing education through a mode that is flexible as well as accessible (Thi Ngoc Ha et al., 2024).

Micro-credentials, unlike traditional degrees pursued once and at a younger age (except for the most elite), can be earned by any person at multiple points in their career, offering them intellectual engagement where they need it and job-relevance to stay alive over time. Micro-credentials also encourage a growth mind-set by challenging individuals to develop new skill sets and explore areas outside of what they are accustomed (Almeida, Behrman, & Robalino, 2012). Its primary focus on lifelong learning aims to not only encourage professionals but also enhance and engage personal development by supporting learners with education pathways that align with their objectives and desired capabilities.

b) Quicker Response to Changing Workforce

The COVID-19 pandemic has highlighted the necessity of being able to pivot quickly when unforeseen changes occur (Fitzgerald & Huijser, 2023). When a substantial number of workers were looking to upskill in order not to fall out from the job market, micro-credentials had an answer that could also be turned around quickly. Such as, health care provider micro-credential in infection control or

telemedicine or emergency patient care which could be available to help support the response back. The speed at which micro-credentials can be produced and deployed underscores the ability for these to play an important role in building workforce resilience (Thompsonowak, 2020).

Challenges in the Micro-Credential Landscape

Guiding Research Question 6: What are the key challenges associated with the adoption and implementation of micro-credentials, and how do they affect learners, educators, and employers?

Even though micro-credentials provide ample benefits, it has a set of difficulties which makes its adoption and implementation process complicated. Challenges such as these strain the potential relevance of micro-credentials within workforce development and education, but also among industries who may not immediately recognize their intrinsic value. The emphasis is further on the details of the major challenges faced by learners, educators, and employers within this micro-credential ecosystem such as standardization; industry relevance; accessibility & recognition.

a) A Failure to Standardize and Maintain Consistency

Though, it is the lack of standardization within different providers and across industries that remains one of the major hurdles plaguing micro-credentials (Murrin, 2018). With micro-credentials ranging from content to length of time needed for completion encompassing thirty minutes to a total semester or more with assessment coming in many forms and most likely an interpretation dozen if not hundreds unique methods specified by some mix-and-match combinations just are not helping when the target audience is at Slayer level. Examining micro-credentials with no quality assurance framework, it can be difficult at best to understand what kind of quality and rigor the holder went through for that recognition. This lack of standard guidance also challenges educational providers in creating their own rules for credit acceptance, assessment and moderation with existing qualifications. This means students have more challenges in transferring their credits between institutions or converting micro-credentials into pathways to further education. To combat this, nations including Australia have created systems like the National micro credentials Framework to establish a uniform basis (Desmarchelier & Cary, 2022). Yet, there is still a lack of consistency on a global level, which means that more cooperation between all actors involved in the industry will be needed.

b) Alignment with Industry Needs

As with many curricula, micro-credentials must also be in service to the needs of industry. On the other hand, those labelled "micro-credentials" sometimes lack intended employer input at all levels and may feature vast gaps in relevancy between what they think graduates need to know versus what employers are demanding (Carnevale, 1990). If micro-credentials are not designed with direct input from industry, they may be less likely to connect learners effectively and promptly with employers or align clearly to workforce needs. Effective learning and earning models will be built on a foundation of micro-credentials that can only come from an ever-evolving set of industry partners, for example, guard members in part-time status. The challenge and what it points to is the real need of rethinking basic to higher education, workforce boards and industry collaborations in creating programmes that leave citizens with marketable tech skills/soft gainfully employed tools. To close this divide, frequent conversations and collaboration are needed among all parties involved to ensure that micro-credentials have the ability to adapt as industry changes.

c) Development and Technology, Accessibility and Digital Inclusivity

While micro-credentials may be delivered online thus increasing access to education, there remain social and digital inclusion constraints. There is an indication that not all learners have the same internet access, digital devices and/or basic literacy required for engaging with online learning (Gunawardena & Dhanapala, 2023). The digital divide is particularly pervasive among those in rural and low-income communities, as well as developing regions where people may be less able to take advantage of micro-credential opportunities (Raihan et al., 2024). Furthermore, higher education institutions must resort to other methods of delivery or provide financial aid and technical support if universities are unable barrier. This is important so that we can close the digital inclusivity gap and allow micro-credentials to deliver on their accessibility and flexibility promise for all learners. In doing so, providers can open micro-credentials to an even larger audience and encourage a more equitable approach to lifelong learning.

d) Recognition and Portability

Micro-credentials need to be respected and transportable, reflecting learners' outcomes not just the interest of their sponsors. Yet the plethora of micro-credential offerings makes it hard for employers to get a handle on their worth in any predictable manner (Beukema, 2023). However, if the recognition of micro-

credentials is not provided with guidelines or metrics then employers may find it difficult to know where they should be fitting them in their hiring and promotion criteria. The recognition and portability of micro-credentials may also restrict how, or the extent to which, they help advance career mobility and workforce development. Additionally, micro-credential portability could be improved through the greater adoption of mechanisms like a broader acceptance of frameworks that align with qualifications (for equivalents) and quality assurance across institutions or geographically. Efforts such as the European Common Micro-credential Framework have been established to begin solving this problem by setting up interoperable standards that facilitate international recognition (Berkling, Hänisch, & Schütz, 2023). However, for greater mainstream adoption, the types that will be meaningful enough to build a rewarding career on micro-credentialing efforts must continue working towards embedding them next within existing qualification frameworks and developing accreditation systems enabling individuals to securely carry their credentials with them in ways the benefit all parties.

e) Accountability and Credential Resilience

Micro-credentialing credibility relies on high-quality quality assurance practices. If there are no clear means to measure learning and provide assurance for the value of micro-credentials, there may be danger that their quality will fall below what employers or higher education institutions would expect. The challenge is compounded by the diversity of providers including private companies and online platforms that may use disparate strategies to ensure quality (Hou et al., 2023). And from a transparency standpoint, learners and employers need better information about what is covered by a micro-credential (in terms of skills), how such credential holders are assessed, and finally the degree/difficulty level. In response, some frameworks mandate that providers present information about their micro-credentials in very granular terms; but all do not bind themselves to this threshold. Indeed, greater transparency and quality assurance will lead to greater trust in micro-credentials critical for their recognition and acceptance across different sectors.

Accessibility is difficult in most countries due to economic barriers. Micro-credentials are more affordable than traditional degrees, but even these low prices can be off putting for some prospective learners. A downside of some micro-credentials is that you have to pay for them in order to enrol or be certified, something which may make it hard if your financial situation limits ability. Moreover, some learners might require multiple micro-credentials to have a

complete set of skills they are aiming for and these costs can add up over time (Tamoliune et al., 2023). These are the types of economic realities that will likely require providers to come to market with well-advertised affordable options, including scholarships for some; other employer-sponsored training support such as subsidies may also be required. When micro-credentials are made more affordable, providers will have a greater chance to reach way beyond the traditional learner and contribute towards workforce development at scale.

Integration into Higher Education

Guiding Research Question 7: How are micro-credentials being integrated into higher education, and what impact does this integration have on traditional degree programmes and student outcomes?

This incorporation of micro-credentials within education is a meaningful change in the higher education delivery, enabling institutions to provide increasingly adaptable and tailored educations. Universities and colleges can support students' employability by integrating micro-credentials in their traditional degree programmes that offer granular, job-applicable skills that serve to meet industry demand (Ahsan et al., 2023). This post details the different ways that higher education is using micro-credentials, their benefits for students and institutions as well as why it's so difficult to integrate them.

a) Integration of Micro-Credentials with Degree Programmes

This often occurs through blended models where micro-credentials are offered as a subset of traditional degree programmes. Earning micro-credentials as they move along their path to traditional qualifications helps students build skills that are focused, in addition to a well-rounded academic foundation (McGreal & Olcott Jr, 2021). As an example, a business administration degree could consist of digital marketing, data analysis or project management micro-credentials and provide students with the opportunity to graduate not only holding that degree but also having acquired real-world industry experience. This is good news for students, who will leave the programme with actual skills which they can list on their resume and that employers recognize and appreciate. Moreover, it provides institutions the flexibility to adjust their curricula in response to changing labour market needs, which would render higher education more responsive and applicable.

b) Modular Learning and Stackable Credentials

Another strategy that makes micro-credentials easier to integrate into higher education is modular learning. Also, through slicing and dicing degree programmes into bite-sized chunks, institutions allow students to achieve micro-credentials that they can gradually build on top of one another toward a full-on degree or qualification (Yieng & Haron, 2023). So, it creates a kind of finish line that provides students with the flexibility to take time off or speed up their studies, depending on personal and work commitments. For adult learners or working professionals, these stackable micro-credentials can provide added flexibility since those who do not wish to enrol in a full degree programme may have the option of signing up for just one course at first (Yieng & Haron, 2023). Now, they can earn mini-individual credentials step by step and piece them together to achieve a full qualification. One of the major benefits is that it provides flexibility to students and also boosts lifelong learning for career progression.

Micro-credentials can also help build student engagement and retention by giving learners small, frequent wins along the learning path (Norman et al., 2024). In this sense, students completing micro-credentials on the way to their degree would feel more accomplished and motivated towards their goal, making dropout less likely. One example would be a student studying for a computer science degree earning micro-credentials in Python or Java, which all count towards their ultimate qualification (Alshehri, 2024). Also, micro-credentials are instantly applicable to real-life situations which show students the connection between their studies and what they can turn into a job. Embedding micro-credentials allows institutions to provide a more engaged and personalized learning experience for students, boosting satisfaction levels and improving student retention.

c) Micro-Credentials Integration Challenges

The advantages of micro-credential programmes appeared to be easy from the point of view, but it is not largely successful due to several barriers faced by academic institutions. The big problem, however, is connecting micro-credentials to the orthodoxy of traditional degrees and other qualifications. Institutions need to ensure the micro-credentials are not competitive or keep the value of a degree high (Schoenenberger, 2024). This entails thoughtful curriculum design and collaboration with other departments to promote coherence and avoid redundancy. A funny thing is there needs to be a lot of standardization and quality assurance (Varma, 2024). Higher education institutions also have work to do in setting consistent definitions of micro-credentials, how they are evaluated and

incorporated into an overall degree. The stakes here are high, especially when it comes to preserving the credibility and visibility of micro-credentials both in-house as well as on LinkedIn for what employers see (van Vuuren & Bunt, 2023). It is important to note that, ensuring micro-credentials are of an acceptable quality can be time-consuming and resource-intensive, requiring new policies to be developed as well as the upskilling or reskilling of faculty.

d) Gaming and Tech Industry Collaborations and Real-World Applicability

Higher education is recognizing that micro-credentials must be valuable to students, and many are partnering with industry stakeholders to build programmes based on current workforce demands (Raj et al., 2024; van Vuuren & Bunt, 2023). Through industry-academia partnerships, institutions can create micro-credentials that are academically challenging and rigorously designed as well rooted in the demands of industry. For example, a college could work with technological industries to provide badges on software development, cyber security or data science, all current and needed by end-users. The industry partnerships give students practical experience, networking and mentorship that make them more employable in their careers. This, in turn, permits industry experts to participate in the design and execution of micro-credentials making them academic enough (including submitting for credit), while also preparing students to enter into their desired industries.

e) Micro-Credentials on the Rise in Higher Education

With the increasing demand for flexible, job-relevant education, this integration of micro-credentials in higher education is only expected to increase (Tee et al., 2024; Temjanovski et al., 2023). It is part of a larger trend towards customized learning pathways that allow students to shape their education around the individual career paths they want to pursue. Micro-credentials will likely be incorporated into degree programmes, with a mix of both theoretical and applied training that can get students workforce ready. In addition, the progress of digital credentials technology, digital badges and block-chain in particular, is also streamlining proof for micro-credentials performance while magnifying such documentability and verification to lead its transferability and acceptance. As these technologies progress, they will increasingly underpin the incorporation of micro-credentials into higher education because micro-credentials ought to be a fundamental part of any contemporary and flexible educational system (Bourke & Garcha, 2024; Bozkurt, Akgün-Özbek, & Zawacki-Richter, 2017; Lovrec & Tič, 2023).

Quality Assurance and Recognition of Micro-Credentials

Guiding Research Question 8: How are quality assurance and recognition processes established for micro-credentials, and why are they essential for ensuring their value and credibility in education and the workforce?

As the use of micro-credentials grow as a more accessible and focused solution to educational standards and workforce development, it is important that their quality be closely monitored especially if they are to enjoy broader acceptance in any formal or informal context (Rajabalee, 2023). Quality assurance processes give the framework for maintaining the quality, rigor and trust of micro-credentials, whereas recognition mechanisms drive their value (Hou et al., 2023).

a) Quality Assurance in Micro-Credentials

The value of quality assurance in micro-credentials is building trust with learners, employers and educational institutions by ensuring that micro-credentials must adhere to the same standards of rigor and relevance (Hou et al., 2023). The lack of quality assurance could mean a large degree in variance between micro-credentials making it difficult to ensure that they are not truly valuable tools for learning. This is especially important as the number of micro-credential providers is well, encompassing universities and other traditional institutions along with new players like private companies or online platforms that vary in their pedagogical approach to curating instruction. Such processes will usually include the creation of standards on what constitutes a micro-credential in terms of learning outcomes, duration, rubrics and industry relevance. These guidelines are designed to help ensure the quality of micro-credentials and that they lead to employable skills. This could mean peer review, accreditation or benchmarking to prove the quality equivalence of micro-credentials with respect to traditional degrees and certificates.

b) Quality Assurance Frameworks

Various frameworks have been developed to assist in quality assurance of micro-credentials. *The Australian National Micro-credentials Framework,* for instance, even includes content and delivery standards and a set of criteria that can be used by providers to create micro-credentials in an organized way (Ngo, Dave, & Heggart, 2023; Nyeu, Lin, & Lin, 2024). At the European level, there is comparable with work underway on a framework for micro-credentials called *The European Common Micro-credential Framework* in an attempt to make it easier for countries to recognize each other's micro-credits by adopting cross-national standards (Berkling et al., 2023; Wylie, Widger, Brett, & Murphy, 2023). There is, thus, some

work to be done in articulating these frameworks which are essential for making micro-credentials relevant and meaningful from a credibility as well as transportability standpoint. Through the use of established frameworks, micro-credential providers will be able to boost their programmes' credibility and increase recognition from employers as well as other higher education institutions.

c) Micro-Credentials Recognition & Portability

Micro-credentials only work if employers, schools and regulators trust them (Holzer, 1996). Recognition denotes the official acknowledgement of a micro-credential as proof of certain skills or competencies; portability describes whether that same credential can be carried and recognized elsewhere, across other institutions (or geographic areas). They are both crucial for learners to be able to use their micro-credentials in applying for jobs or continuing education. Recognizing micro-credentials usually has a lot to do with how well the credentials align with industry standards and bona fide professional qualifications. Micro-credentials developed with industry partners are likely to be recognized by employers since they can see their desired skills embedded in the credentials (Holzer, 1996; Thi Ngoc Ha et al., 2024). Further, micro-credentials which are positioned in national or international qualifications frameworks offer a level of portability allowing learners to stack them together as steppingstones within wider educational and career pathways. Digital credentialing mechanisms, such as digital badges and block-chain, are also fostering micro-credential recognition. Often including metadata such as the skills developed, institution providing them and when completed, digital badges provide a secure and verifiable way of displaying micro-credentials on-line. This helps to introduce trust-building and cross-border recognition by maintaining a new layer of security with the help offered by block-chain technology, through which credentials are recorded safely without any changes.

d) Quality Assurance and Recognition-struggles

Despite advances and initiatives around quality assurance frameworks for micro-credentials there is some distance to go before we can say that they are recognized more widely or seen as easily transportable. A common problem is the heterogeneity of standards between different providers and regions. The quality and recognition of micro-credentials need to enshrined in some form but without a national framework, the guidelines are not standardized by countries (Brown & Duart, 2024). The second challenge for the concept is lack of visibility and recognition among employers and educational institutions. While many employers

do appreciate the benefits of micro-credentials, especially in technology and vocational areas, some will not understand what they are or continue to look for more traditional qualifications (Varadarajan et al., 2023). Continuing to educate stakeholders on the value of micro-credentials and how they align with industry needs will help give them more visibility and acceptance. Challenges can also be faced in recognizing micro-credentials across borders, as countries have different qualifications frameworks and often very divergent regulatory requirements. The European Common Micro-credential Framework is one such initiative, but we need more global guidelines to make micro-credentials easily portable across the entire globe (Wylie et al., 2023).

e) Influence of Accrediting Bodies and Industry Partnerships

The top challenge however can be surmounted by having accrediting bodies and industry partnerships validating the same, thereby providing formal recognition of micro-credentials (Brown et al., 2021; Varadarajan et al., 2023). Micro-credential programmes, meanwhile, are more likely to carry special types of accreditations from accrediting bodies that bestow credibility on these kinds of programmes, thus increasing their value in the eyes of employers and other educational institutions. Partnerships with industry associations or professional organizations, for example, could be used to create these micro-credentials then guarantee that they meet standards recognized in the field so as not to remain confined within specific sector (Laundon et al., 2023; Shanahan & Organ, 2022). They serve as a bedrock for ongoing improvement, offering a framework in which industry partners can share intelligence on new trends and demands. Partnering with industry allows micro-credential providers to build programmes that are longitudinal and current, thereby ensuring both learner and employer standards are consistently met.

Potential Implications for Policy and Future Research Directions

The potential of micro-credentials to address skills gaps, skills mismatches as well as foster lifelong learning is undeniable. Yet, realizing their full impact requires coordinated efforts from policymakers, educators, researchers, and industry stakeholders. The findings in this paper underscore the potential of micro-credentials to reshape education and workforce development. This sub-section outlines actionable implications for policy and identifies areas for future research to further understand and enhance the role of micro-credentials.

a) Policy Implications

The integration of micro-credentials into the Tanzanian national education and workforce frameworks requires well-thought-out policies to ensure their effectiveness and sustainability. One significant area for policy intervention is their alignment with Tanzanian Qualifications Frameworks (TQF). Establishing clear guidelines for recognizing micro-credentials within TQF can enhance their portability and acceptance, enabling learners to stack micro-credentials toward formal qualifications. This approach would also allow workers to use these certifications for career progression, fostering their relevance in both education and employment sectors.

Another critical policy focus is the standardization and quality assurance of micro-credentials. Variability in the design, assessment, and delivery of these certifications can undermine their credibility. Policymakers and in particular the Ministry of Education, Science and Technology (MoEST) should develop robust standards for learning outcomes, credit equivalency, and assessment methods, ensuring consistency across providers. This will increase trust among stakeholders, particularly employers and learners, and position micro-credentials as credible alternatives to traditional qualifications.

Accessibility and equity are also key considerations. Marginalized populations, including those in rural areas and low-income groups, often face barriers to participating in micro-credentialing programmes. There is a critical need to implement policies that address these challenges, such as providing financial subsidies, expanding digital infrastructure, and creating targeted outreach programmes. These measures would ensure that micro-credentials contribute to reducing, rather than exacerbating, existing inequalities in education and workforce participation.

Finally, incentivizing collaboration between educational institutions and industries is essential for maintaining the relevance of micro-credentials. Policies that encourage such partnerships, including tax incentives and grants, can facilitate the co-development of industry-specific micro-credentials. These partnerships ensure that the skills imparted align with real-world demands, making micro-credentials more valuable to employers and learners alike.

b) Directions for Future Research

The dynamic nature of micro-credentials creates numerous opportunities for research to address existing gaps and inform future practice. One area that requires

attention is the effectiveness of micro-credentials in bridging skills gaps and improving employability. Rigorous studies that measure the outcomes of micro-credentials across various sectors can provide empirical evidence to guide their broader adoption.

Another promising area for research is understanding the perspectives of learners and employers. Exploring satisfaction levels, adoption challenges, and perceived value can yield insights that help refine micro-credential programmes. Understanding how different stakeholder groups interact with and benefit from these certifications is crucial for optimizing their design and delivery.

Longitudinal studies are also needed to examine the long-term impacts of micro-credentials. Such research could investigate how micro-credentials influence career mobility, job retention, and economic productivity over time. These insights would be valuable for scaling up micro-credential programmes and demonstrating their strategic value to policymakers and industries. Similarly, cross-cultural studies provide another important avenue for research. Comparing the adoption and impact of micro-credentials across regions or countries can reveal insights into their adaptability to diverse economic and socio-cultural contexts. This knowledge can inform the development of more universally applicable frameworks and best practices. Moreover, there is a need to explore the role of digital innovations in advancing micro-credentials. Technologies like block-chain, digital badges, and artificial intelligence have the potential to enhance the credibility, scalability, and verification of micro-credentials. Research into these areas could uncover new opportunities to improve their adoption and acceptance across industries and education systems.

Conclusion and Recommendations

Enter micro-credentials, a revolutionary new category of educational offerings that are reshaping the future of education and workforce development by offering affordable, meaningful learning experiences at scale to keep pace with rapidly changing job market demands. Micro-credentials are therefore an accessible way for people to easily acquire particular competencies even if they need the skills quickly and employers have a possibility of upskilling their employees, which could come in handy with technological modifications that consistently redefine our economy on regular basis. Typically, micro-credentials are modular and stackable. This nature supports lifelong learning as learners should be constantly able to adapt to addressing new challenges or advancing in their careers. While the

benefits are many, a number of challenges exist with regards to quality assurance, recognition and standardization when it comes to wide-spread adoption of micro-credentials. Without addressing these challenges, micro-credentials will never succeed in gaining recognition on a large scale from employers and educational institutions across sectors or regions. Global standardization and better digital credentialing technologies such as block-chain are encouraging strides in this direction; however, attempting to provide a solution at scale or across borders so far remains elusive. In the coming years, we are likely to see micro-credentials playing an evolving role in the education sector and workforce development that integrates still more closely with educational institutions working hand-in-hand with industry stakeholders. In a world where the need for personalized, job-relevant education is exploding, micro-credentials will help drive the future of learning as key to building career mobility and economies that foster lifelong learning. If the challenges and opportunities of today are addressed, it is not difficult to imagine future where micro-credentials become as fundamental in education as traditional qualifications have been since childhood, finally closing said gap between formal education and real-world capabilities needed by modern industries.

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Innovative Approaches to University Financial Stability: The Role of Experiential Learning During Economic Crises

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Abstract

This study provides a detailed exploration of the financial challenges faced by Tai Solarin University of Education (TASUED), Nigeria, and the innovative strategies implemented to address them through experiential learning. Using a systemic problem identification approach, the research uncovered extensive financial leakages and inefficiencies stemming from unnecessary outsourcing, over-subcontracting, and underutilisation of resources. Data collection involved semi-structured interviews, discussions with key stakeholders, and a comprehensive SWOT analysis, which revealed actionable insights. The findings demonstrate how TASUED leveraged its internal capabilities, restructured operational units, and initiated entrepreneurial ventures to achieve financial stability. Key strategies included developing income-generating projects, enhancing staff capacity, fostering collaboration among departments, and reducing dependence on government funding. The university also adopted a pioneering curriculum integrating vocational skills and entrepreneurial training, transforming graduates into self-reliant professionals. These efforts not only mitigated financial instability but also positioned TASUED as a model for innovation and sustainable development in higher education. This study underscores the critical need for adaptability and creative governance in navigating financial constraints within the university system.

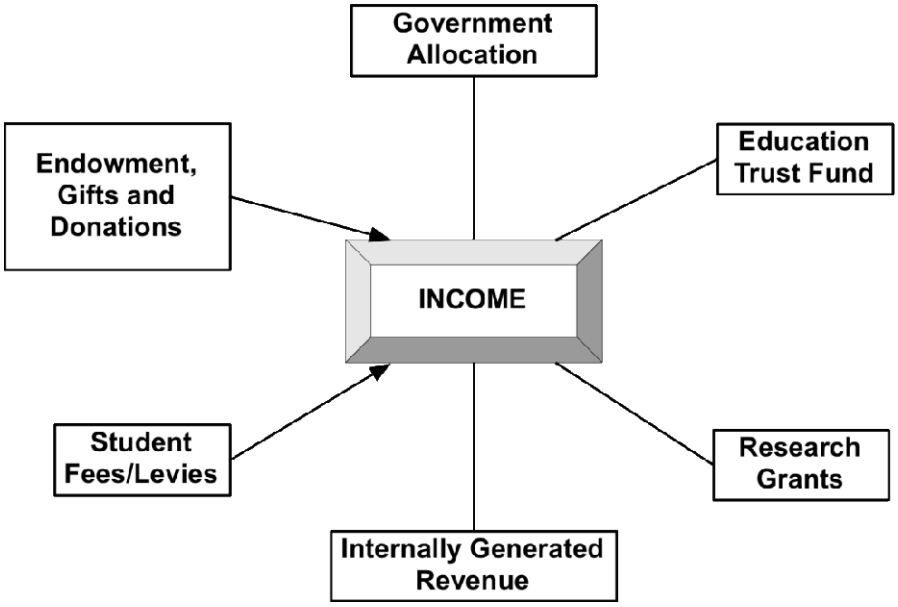
Keywords: *Experiential learning, innovative strategies, financial stability, Nigeria university system*

Introduction

One of the greatest challenges facing tertiary education in Nigeria is inadequate funding. This has impeded the efficacy of service delivery in university processes, programmes, and activities. The reduction in government funding has placed the Nigerian University System (NUS) in a situation comparable to an economic siege. As observed by Obilade (2014), the global and national economic recession has significantly limited the access of these tertiary institutions to critical resources. These resources are not only necessary for maintaining basic academic standards but also for repositioning our universities to compete globally with other twenty-first-century institutions. The undue financial pressure on Nigerian universities has inevitably led to the compromise of quality academic standards of excellence, impacting the quality of most graduates from Nigerian Universities today. World Bank (2020, p. 2) asserts that, 'The decline in public expenditure per student is having an adverse impact on the quality and relevance of education programmes.' Extending the argument further, Obilade (2014) posits that a consequence of the precarious financial situation in the Nigerian University System is that 'University governance is becoming a precarious and, at times, outrightly dangerous undertaking.' The dearth of finances has brought about simmering or full-blown misunderstandings between Governments (National/State), University Governing Councils/Management, and staff unions in many universities in Nigeria.

Bamiro (2012, see Fig. 1) identified the major sources of funding for public universities, listing them as government allocations, education trust fund, research grants, internally generated revenue (IGR), student fees/levies, as well as endowment, gifts, and donations. However, for public universities in Nigeria, the primary source of funds is the Government (Federal and State), either through direct subventions or through the Tertiary Education Trust Fund (TETFund). Student fees and levies come a distant second because public universities have their fee regimes strictly regulated by the government (often for political considerations). They are unable to charge economic fees/levies and, therefore, heavily depend on the government for their economic survival.

Figure 1: Major Sources of Funding for Public Universities



Source: Bamiro (2012)

Unfortunately, the government is unable to adequately meet the funding needs of the universities. The stark reality facing the Nigerian University System (NUS) is the gross inadequacy of much-needed funding to fulfil its mandate and compete favourably within the global university system. The NUS has been plagued by a need-availability imbalance, a consistent discrepancy between funding needs and availability. Over the last two and a half decades, at least, the flow from the government lifeline has slowed down or been turned off, causing massive financial distress for the NUS. Anao (2016) highlighted some of the causative factors for the financial distress of universities. These include persistent shortfalls between the amount requested by public universities and the yearly budgetary allocations made by the government, modest increases in yearly allocations that often fail to match the phenomenal growth in student enrolment, and the government's failure to disburse the approved budgeted amounts for various reasons. Additionally, the rapid technological advancement and intellectual dynamism of the present-day underscore global competitiveness.

Despite repeated lip service paid to the funding of education, Nigerian universities have never attracted the required level of funding to deliver on their mandate of teaching, research, and service to the community. The overwhelming dependence on government sources of funds by Nigerian universities has been encapsulated by Anao (2016) in a comparative analysis of funding sources between Nigerian

universities and their counterparts in the United States. His analysis revealed that while Nigerian public universities obtain only approximately 2% of their total revenues from fees, their counterparts in the United States obtain 18%. Similarly, Nigerian public universities derive only about 5% of their revenue from commercial operations, while their US counterparts derive 23%. Holistically, Nigerian public universities obtain less than 25% of their revenue from non-government sources, while comparable institutions in the US obtain up to 48%. This is an unacceptable situation that exposes the universities to the resultant impact of the vagaries in government finances and drastically limits their ability to deliver on their mandate of teaching, research, and service to the community.

In the NUS, the reality is that TETFund remains the major (and in most cases, the only) source of funding for research, staff training, as well as the provision of infrastructure and teaching/learning equipment in the universities. Therefore, there is a need to strengthen TETFund and continuously appraise its operational checks and balances to enhance its ability to deliver on its mandate. The University system, especially the relationship between university management and staff unions, is marred by tumult due to delayed or non-payment of salaries and other emoluments. This has negatively affected the smooth running of the university system and the academic calendar, with disastrous consequences. The ripple effects are evident in 'the high rate of unemployment and unemployable/unskilled university graduates that flood the labour market with good grades and qualifications in terms of certificates but without the ability to defend such certificates' (Obilade, 2016; Owoeye, 2016).

All over the world, universities are regarded as crucial national assets particularly in the provision of new knowledge and innovative thinking; in the provision of skilled personnel and credible credentials; as agents of social justice and mobility; contributors to social and cultural vitality and determinants of health and well-being (Bamiro, 2012). Kigotho (2021) asserts that one of the roles of universities is to generate developmental research, which entails contributing essential contextualised insights, knowledge, and locally applicable recommendations for policy development and implementation, addressing pressing issues, innovating technological solutions, and creating new knowledge adaptable for economic, political, and social advancements. In the knowledge-driven economy of the 21st century, universities play a central role as key generators of innovation and skills, facilitating the transfer of these assets to both business and society (Al-Youbi, Zahed, Nahas, & Hegazy, 2021). Consequently, great premium should be placed

on the sustainable financing of these institutions to enable them perform creditably the key functions of teaching, research and community development in tune with the development of the nation.

Despite several expressions of desire to fund most public higher education institutions to world-class standards, the opposite has been the case, hence the inability to realise the set goal of education for all by 2015 in Nigeria (Olupohunda, 2009).

The education sector in Nigeria has historically struggled to attract the required level of funding. The survival of universities in Nigeria now demands a paradigm shift, emphasising innovation, creativity, and thinking outside the box. Higher education faces significant economic, cultural, and macro-environmental challenges, prompting a strategic embrace of creativity (Gaspar & Mabic, 2015). Extending this further, Al-Youbi, Zahed, Nahas, and Hegazy (2021) assert that the true value of any institution, including universities, lies in creative capital or intellectual human capital—a reflection of the mental capacity to generate novel and high-quality ideas. Innovation, defined as the deliberate integration and application of creative ideas within a business or system, has become crucial for creating valuable, accepted, and marketable contributions to society. Creativity and innovation are essential for development, combining to generate knowledge and transform it into practical applications, thereby contributing to wealth creation and job opportunities (Alfantookh & Bakty, 2013).

Recognising that government subventions can no longer adequately cover recurrent and capital expenditures, it becomes imperative for universities to embrace a change in mind-set. They need to deconstruct and reconstruct institutional processes by thinking innovatively to raise crucial funds for survival. Developing reliable, diversified funding sources is crucial as a safeguard against fickle, unpredictable, and rapidly dwindling government funding streams that negatively impact the university system. The survival of public universities now hinges on collective and individual efforts to devise creative and innovative means of financial survival without compromising standards and quality. Universities must challenge the status quo, explore new avenues, and express dissatisfaction with traditional funding policies, politics, and processes that place too much reliance on government support—with attendant disastrous consequences for the Nigerian University System. To achieve a different outcome, there must be a change in procedure and process, moving beyond reliance on government handouts to a

strategic, mission-driven approach that aims for a significant level of self-reliance in financial resources.

Beyond addressing shortfalls, the internal efficiency of our institutions in managing financial resources prudently becomes of critical importance. Ongoing debates about education being a social service and public universities not being profit-driven entities appear less tenable given the current realities. Bamiro (2012) encapsulates this by suggesting that although public institutions are not generally in business, they must operate in a business-like manner, accounting for and managing resource inflows and outflows sustainably.

Individual institutions are increasingly required to justify government handouts and initiate creative means of financial survival and sustainability. In this context, the authors aim to share some practical experiential learning from the Tai Solarin University of Education (TASUED) Model. For one of the researchers, upon assuming the role of Vice-Chancellor at the university, the stark reality of the magnitude of the problem became evident. The challenges facing the Nigerian University System were mirrored in the university but on a more intense scale. These include inadequate funding, insufficient structures/teaching and learning equipment, observed internal inefficiency and prudence in the mobilisation and deployment of financial resources, along with unrealistic expectations from stakeholders, which had led to incessant conflicts between the Government/University Governing Councils/University Management and various unions (staff and student unions). These conflicts often disrupted the smooth running of the university and the academic calendar. In response, the State Government considered scrapping the university and merging it with a sister institution. All these factors underscored the urgent need for innovation if the university was to survive.

This article aims to provide first-hand 'experiential' learning insights from the university's model, emphasising the imperative of innovative thinking for university financial stability for survival and making a compelling case for embracing unconventional approaches. Specifically, the objectives of this article are to: document and analyse the multifaceted challenges faced by the university, highlighting the comprehensive process of problem identification; meticulously document and report the proactive measures and transformative efforts undertaken by the university management and staff in addressing multifaceted challenges facing it; and report the successful implementation of the university's strategic

efforts in achieving sustainable development, emphasising innovative approaches and resource utilisation in response to economic challenges.

This study is undertaken to explore how Tai Solarin University of Education (TASUED)—the first university of education in Nigeria and the second in Africa—has adopted innovative experiential learning approaches to achieve financial stability during periods of economic hardship. TASUED was established during a pivotal time when governments were beginning to adopt the concept of specialised institutions for teacher education, making it essential to understand the trajectory of such institutions. The emergence of additional universities of education in Nigeria signals a trend that calls for an analysis of its implications for pioneer institutions like TASUED, particularly in terms of competitiveness and sustainability. A critical issue is a declining interest in teaching courses as a first choice among students, which impacts the demand for programmes and ultimately reduces the market share of pioneer institutions. This challenge is compounded by dwindling resources, including inadequate budgetary allocations, the limited capacity of parents to finance education due to the absence of social structures like loans and bursaries, and rising operational costs, such as energy, wages, and salaries.

Moreover, TASUED operates under peculiar circumstances influenced by local political orientations, shifting policy priorities, and security concerns affecting staff and students. These challenges are further magnified by the lack of deliberate efforts to train managers and administrators in strategic planning and execution, which is vital for navigating such complexities. Despite these constraints, TASUED also faces opportunities for innovation, particularly in curriculum development to align with global trends in STEM, data analysis, artificial intelligence, and machine learning. By integrating these advancements with modern teaching techniques, such as online delivery, TASUED can reposition itself to meet contemporary educational needs. This study seeks to explore these dynamics, offering insights into how experiential learning can drive innovative strategies for financial sustainability in higher education. It aims to provide a framework for addressing the challenges faced by specialised institutions in Nigeria while leveraging opportunities to maintain relevance and resilience.

This study will provide a roadmap for universities grappling with financial constraints, offering innovative, experience-based strategies to achieve stability while maintaining educational quality. In terms of educational policy development, the findings will inform policymakers and stakeholders about the importance of

integrating experiential learning approaches into financial planning, aiding in the creation of resilient and adaptable higher education systems. The study will also enhance experiential learning research by showing how it contributes to problem-solving in challenging financial contexts, adding to the growing body of research on the practical applications of this methodology. Furthermore, the research supports sustainable development by aligning with the Sustainable Development Goals (SDG 4: Quality Education), providing tools for institutions to continue delivering education during economic hardships, and ensuring access and equity. Globally**,** the study's findings offer scalable solutions that can be applied to other regions and institutions worldwide facing similar economic challenges. Lastly, it offers inspiration for innovation in crisis management**,** encouraging universities and organisations to implement creative practices beyond traditional financial approaches, and fostering a culture of resilience and creativity.

The primary theory that informs this study is the Resource-Based View Theory, and incorporates elements of Contingency and Transformational Leadership theories to address broader aspects, such as adaptability and leadership's role in resource optimisation. This approach provides a holistic view of TASUED's transformative journey.

The Resource-Based View (RBV) Theory explains the importance of an organisation's internal resources and capabilities as key drivers of sustainable competitive advantage. It proposes that organisations achieve superior performance by effectively identifying, developing, and utilising their unique and valuable resources (Barney, 1991). For resources to generate a sustainable competitive advantage, they must exhibit specific attributes summarised in the VRIN framework: they should be valuable, rare, inimitable, and non-substitutable. Valuable resources "must enable a firm to do things and behave in ways that lead to high sales, low costs, high margins, or in others ways add financial value to the firm" (Barney, 1986: 658). Resources are valuable when they enable an organisation to exploit opportunities or neutralise threats within the industry and also "enable a firm to conceive of or implement strategies that improve its efficiency and effectiveness" (Barney, 1991:105). For resources to be rare, it means they should be unique or scarce within the industry. Inimitable means that resources should be difficult for competitors to replicate, while non-substitutable means that resources must not be easily replaced by alternative solutions.

By focusing on resources that are valuable, rare, inimitable, and non-substitutable (VRIN), RBV offers a lens to understand how Tai Solarin University of Education

(TASUED) optimised its existing capabilities to address financial instability and achieve long-term growth. This framework is particularly relevant in analysing TASUED's efforts to transform underutilised assets into income-generating ventures, reduce dependency on external funding, and enhance its competitive advantage in higher education.

Methodology

This article adopts a qualitative research approach to document and analyse the processes undertaken by Tai Solarin University of Education (TASUED) to address its financial challenges. The research design is a case study, chosen to provide an in-depth understanding of TASUED's specific context and the institutional strategies employed to achieve financial sustainability. The study sample consisted of 59 stakeholders who are instrumental in the university's financial and operational decision-making processes. A purposive sampling approach was employed to engage these key stakeholders, ensuring that those with the most relevant knowledge and expertise were selected for the study. These participants included five principal officers - the Vice-Chancellor, Deputy Vice-Chancellor, Registrar, Bursar, and University Librarian-who are responsible for institutional governance and strategic direction. Six deans, representing academic leadership across various faculties, were also part of the sample. Additionally, 24 heads of departments, who oversee academic and administrative functions at the departmental level, were included in the study. The sample also comprised four leaders of staff unions, who provided insights into employee welfare and institutional challenges. Twelve student representatives (four executives and eight members of the Student Representative Council) offered perspectives on student-focused financial strategies. Three-unit heads, who oversee specialised areas of university operations, were also included. Finally, five directors, responsible for managing specialised areas such as Academic Planning, quality Assurance, and Research were part of the sample.

Data collection for this study involved a multifaceted approach that combined brainstorming sessions, focused group discussions (FGDs), and Strengths, Weaknesses, Opportunities, and Threats (SWOT) analyses. These methods facilitated an in-depth exploration of innovative strategies to address financial instability in the university and ensured the inclusion of diverse perspectives from key stakeholders. The process began with initial brainstorming and FGDs involving 24 Heads of Departments (HODs), 6 Deans, 5 Directors of Academic Units, and 3 members of the academic management team (Vice-Chancellor, Deputy Vice-

Chancellor, and University Librarian). These sessions provided a platform for participants to share ideas and propose strategies to address operational gaps. A significant outcome of these discussions was the reorganisation of the Directorate of Academic Planning into the Directorate of Academic Planning, Quality Assurance, and Research (DAPQAR) to address gaps in research and quality assurance. Following this, DAPQAR led a comprehensive SWOT analysis across academic units. The analysis was conducted by a team comprising the Director, Deputy Directors (responsible for academic planning, quality assurance, and research), and the Senior Assistant Registrar. This team conducted department-by-department and unit-by-unit assessments, which were later synthesised into a university-wide framework to inform strategic decision-making.

For non-academic units, brainstorming and FGDs were held with representatives from the Registry, Bursary, and Audit Units to identify inefficiencies, financial leakages, and opportunities for service improvement. A dedicated team consisting of a Deputy Bursar, Deputy Registrar, and Deputy Auditor conducted detailed SWOT analyses within these units. For example, this process revealed significant financial leakages in ICT operations, prompting the development of an in-house platform to streamline student fee payments, thereby reducing reliance on external contractors. Unit-specific SWOT analyses were also conducted in the Directorate of Works and Maintenance, Directorate of Health Services, and Directorate of Physical Planning. These analyses identified areas of inefficiency and led to actionable solutions. For instance, inefficiencies in health services related to outsourced medical tests were addressed by terminating contracts and investing in university-owned X-ray facilities, which subsequently generated substantial revenue.

Additional informal brainstorming sessions were held with the ICT Unit and the Distance Learning Institute (DLI). These sessions emphasised opportunities to enhance internal systems and expand the university's revenue-generating programmes. For example, the ICT Unit developed new platforms to optimise financial and academic operations, while the DLI expanded its programme offerings, including the introduction of JUPEB. Engagement with staff unions also formed a critical component of the data collection process. Separate FGDs were conducted with leaders of academic and non-academic staff unions, who provided insights into institutional challenges and nominated members to participate in SWOT analysis teams. Similarly, specialised units, such as the furniture cottage industry and vocational and technical education centres, were involved in

brainstorming sessions to explore ways of enhancing their contributions to the university's financial stability.

The data collected through brainstorming sessions**,** focused group discussions (FGDs), and Strengths, Weaknesses, Opportunities, and Threats (SWOT) analyses were rigorously analysed to ensure credibility and reliability. Detailed notes from the sessions were organised and subjected to thematic analysis, allowing for the identification of recurring patterns and critical insights related to income generation, revenue leakages, and strategic governance, and financial sustainability strategies. The integration of insights from brainstorming sessions, focused group discussions (FGDs), and SWOT analyses provided a comprehensive understanding of TASUED's financial and operational challenges. This robust analytical approach facilitated the identification of innovative and actionable solutions to enhance the university's financial stability and operational efficiency.

Results and Discussion

This study was conducted to explore how universities can go through financial challenges by leveraging innovative and experiential strategies. The aim was to identify practical solutions that not only address immediate financial constraints but also promote long-term sustainability and resilience.

A Comprehensive Analysis of the University's Multifaceted Challenges through Systematic Problem Identification

As the saying goes, change is an inevitable constant. Whether viewed as desirable or not, change is an inexorable force that requires proactive readiness. Effectively managing change involves thorough preparation to prevent being caught off guard. Many individuals and institutions have succumbed to the tide of change simply because they were unprepared. For any organisation aspiring for positive transformation, it is crucial to recognise that change does not happen by chance. Positive change necessitates comprehensive planning and preparation. Therefore, the initial step toward meaningful change involves the identification of problems or needs, as tackling a problem begins with its clear identification and definition. In the context of universities, beyond the broad acknowledgment of funding challenges within the Nigerian University System, each institution must conduct a baseline survey to understand the specific issues it faces. Upon assuming leadership roles at the university, it became imperative to identify major challenges, enabling not only the exploration of new avenues for fund generation but also the prudent management of existing resources.

Recognising that positive change comes with adequate planning and preparation, processes were initiated and structures put in place for systematic execution of the desired plans for survival and financial sustainability when we came on board at the university. A critical first step was the identification of the sources and nature of funding for the university, the dramatis personnel and undergirding framework for the procurement and disbursement of funds, as well as the reporting, documentation and accountability processes for funds within the university. The exercise was indeed an eye-opener, revealing strategic areas where university managers need to focus attention. The next stage was a comprehensive and inclusive SWOT analysis to map out appropriate strategies for addressing the issues and mapping out the way forward. These are discussed below.

Extensive Leakages in the Financial Processes

The prevalence of financial leakages has become an accepted norm in many institutions across Nigeria, manifesting as 'business as usual'. TASUED was no exception, and a comprehensive examination of its financial management and operations, through a combination of methods, including interviews with key university personnel, analysis of financial records and operational reports, and structured group discussions using a SWOT analysis framework, revealed extensive leakages negatively impacting the already scarce financial resources. This was done through unnecessary outsourcing and over-subcontracting of services and inefficiency in the utilisation of existing facilities. These leakages had become institutionalised conduits for siphoning funds, exacerbating the financial strain on the institution. It should be noted that the examples highlighted in subsequent sections represent just a glimpse of the challenges unveiled during the problem identification process. Recognising the uniqueness of each institution, the university's model provides valuable insights for problem-solving, serving as a guide for critical study and application.

Furthermore, the University Ventures Unit, envisioned as a revenue generator, had deviated into a conduit for fund siphoning and inefficient salary structures and irregular salary payment for Ventures staff. The Centre for Vocational Studies and General Studies Department, brimming with untapped potentials, remained idle and unexplored. Despite its capacity for substantial fund generation and practical teaching opportunities, the Centre's potentials were overlooked. This, however, changed as the institution addressed these issues through comprehensive problem identification.

Outsourcing, Over Sub-Contracting and Inflationary Cost of Services and Products

Inefficiency, outsourcing of profitable enterprises was one key issue that exacerbated the problem of financial insolvency of the university. The act of over 'sub-contracting' services and products was also observed during the baseline data collection. The situation at the university was particularly concerning because the university was at the verge of being merged with another state-owned university. There was a dearth of much needed funds to run the university and pay staff salaries. Paradoxically, almost every service in the university was outsourced to external entities including tasks for which the university had employed staff and provided facilities and equipment. Some of these occur in several units and processes within the systems and operations of the university, as highlighted below:

The Financial Processes and Units

Findings showed that financial processes and units within the university constituted another significant drain. Prior laxity had allowed a cartel to siphon institutional funds undetected, posing a threat to the university and its staff. Some findings on these are highlighted below:

Fee Payment Contract

Despite the existence of the bursary department with qualified staff, and the presence of a well-equipped department of ICT, it was discovered that payment of school fees by student was contracted out to private organisations. Apart from the fact that the university was paying heavily to the contractors, the university was at the mercy of the contractors in that it did not have absolute control of its data regarding students' fee payment and financial status. It encouraged a lot of fraudulent practices with respect to institutional funds.

E-payment System

While other institutions had adopted e-payment practices, the university was still operating on a cash payment system. This allowed individuals to engage in financial fraud by printing and issuing their payment receipts to unsuspecting students. Some students realised too late that they had fallen victim to fraud.

ICT Department and Outsourcing of its Services

An illustrative case of financial incompetency was discovered in the ICT centre, which equipped with competent staff and cutting-edge technology. One might have assumed that a university equipped with a well-established ICT department should

be capable of managing its own technology. However, in the case of the 'old TASUED,' this was not the situation. Regrettably, it had been rendered redundant, functioning more as a financial drain than a vital asset. The ICT unit, designed to play a pivotal role in university processes, had its major functions outsourced at considerable cost, leading to demoralisation among qualified and willing staff. This situation was paradoxical, with substantial monthly wages and promotions, yet the unit failed to fulfil its intended purpose. Tasks that should have been handled by the department were outsourced, leading to the unnecessary expenditure of funds.

The University Ventures

Unfortunately, the University Ventures, which were envisioned to be a gold mine for the institution, had deviated into a conduit for fund siphoning, with the University having contracted out all their 'cash cows,' including the University Guest House, satchet -water factory, Petrol station, and several others. The contractors were obligated to remit only a minute percentage of the profits to the university, which they flagrantly failed to do. The implications of such actions are apparent to any sensible person. The contractors consistently profited, while the university found itself in financial hardship. This deprived the university of it critical revenue needed for operations and development. This resulted in significant financial losses for the university, exacerbated its financial instability, and created an imbalance where external contractors profited at the expense of the institution. This failure to remit agreed-upon profits undermined the university's ability to fund critical operations, highlighted lapses in contract enforcement, and eroded trust in the institution's financial management practices.

Health Centre Key Services Outsourcing

The Health Centre of the university was another unit that was affected. For instance, the university has a fully operational state-of-the-art X-ray machine. Every year, thousands of prospective students go through the admission process, which includes a medical examination. One would have expected the University Health Centre to play a significant role in this regard, especially considering the availability of human and technical resources. However, inexplicably, student medical examinations, including X-rays, were outsourced to businesses and organisations. These entities then turned around and utilised the university facilities, equipment and sometimes staff, without adequate remuneration to the university. This practice led to significant financial losses, strained resources through increased wear and tear, demotivated staff due to unrecognised contributions, missed revenue opportunities, and showed weaknesses in

governance and policy enforcement, ultimately undermining the university's financial sustainability.

Catering and Welfare Outsourcing

The catering needs and welfare demand of the university were also outsourced. Refreshments served at meetings, catering services during major university events such as graduation ceremonies and conferences, were contracted out, leading to significant financial implications. Ironically, the school has a fully operational Department of Home Economics and Hotel Management that should have undertaken these responsibilities. This would have served not only as a source of Internal Generated Revenue (IGR) but also provided a space for more efficient, practical teaching and learning experience for the students. Fortunately, this issue has been rectified, and the university has progressed beyond this stage. In the course of this presentation, attempts will be made to elucidate on the strategies employed to overcome these challenges.

Redundant and Untapped Valuable Opportunities and Resources

Further investigations revealed that the University possessed an abundance of latent, untapped potentials in both human and natural resources. As a premier university of education, it offered unique programmes and courses that could serve as a veritable source of income. Being the first university of education in Nigeria, it had distinctive peculiarities, especially in terms of programmes, curricula, and various other areas. However, none of these had been deliberately explored to benefit the university financially. For example, the Technical Education Department, with its significant potential to serve the dual function of teaching/learning and practical skills, could have enhanced Internal Generated Revenue (IGR) through the production of wooden and metal furniture and other household equipment. Regrettably, these possibilities were not developed or explored, and the department remained underutilised.

Over Dependence on External Funding

The University exhibited a concerning level of reliance on state funding, reaching a point where its operations were practically paralysed without government subvention. This over-dependence left the institution vulnerable and incapable of proactively addressing or effectively managing various crises that could have been pre-empted. The consequence was frequent disruptions to the academic calendar due to recurring industrial crises.

Lack of Cohesion and Coordination between Departments and Units within the University

Another problem identified was the lack of cohesion and coordination among departments and units, even in situations where one would have expected natural cooperation, cohesion, and collaboration. Departments and units were operating in isolation rather than working together, viewing themselves more as competitors than collaborators. As a result, there was no synergy, leading to challenges in accessing information and optimising resources through sharing and pooling of facilities, courses, and staff. Staff members began hoarding information and resources that could have been shared for the greater benefit of the university. This issue was significant and required urgent attention, as it not only hindered the university's financial stability but also disrupted the smooth functioning of the institution.

Lack of Proper Attention to Capacity Building

No institution can thrive as expected without paying proper and particular attention to the capacity building of its staff, and the university is no exception to this. There were many academic staff members with potential who should have been rightly motivated and supported towards capacity building, but they were unable to access such opportunities. This affected their morale and caused distractions on the job, as some ventured into other activities that occupied their time when they should have been focused on their teaching and research duties. Their job and organisational commitment, as well as job satisfaction, were all negatively affected. Many staff members, particularly academics, did not have access to funds for further education or to attend conferences. This experience was frustrating for those who were aware of the opportunities available to academics in other universities. Additionally, a considerable number of non-teaching staff had not been able to avail themselves of opportunities for local and international workshops.

Lack of Requisite Research Culture

Undoubtedly, the absence of the essential research culture that should inherently characterise an ivory tower was evident at the inception of the university. On transitioning from a College of Education to a university, it would have been expedient for the university to build the research capacity of its staff and provide the necessary infrastructure and equipment for an uptake of all existing/generated research ideas from the onset. This was not done and the deficiency had significant implications for both the institution and its staff, particularly concerning national

and international impact and visibility. The lack of activity in research resulted in the inability to access research funds, and research activities remained at a snail's speed within the university.

Lack of Leadership Credibility

In some of our universities, and in this university in particular, a deficiency in openness and accountability within governance and financial matters creates an environment of mutual suspicion and distrust. This dynamic, if left unaddressed, can lead to unnecessary tension in the working relationship between university management and unions. Establishing easy access to information during meetings with unions is crucial for fostering better relationships, enabling unions and management to collaboratively address challenges. The absence of trust in leadership poses a significant hurdle to the progress of any institution, and resolving this issue is imperative for a promising future. Moreover, there have been unrealistic expectations from both staff and students, reflecting a lack of understanding of current realities. This mismatch between expectations and the existing circumstances can hinder effective institutional progress. Additionally, the power, contribution, and role of stakeholders in providing support funding have been underestimated and underutilised for an extended period.

Lack of Focus

In the selection of products and services, the primary mission of a university, encompassing Teaching, Learning, Research, and Service to the community, should take precedence. Unfortunately, the core focus of the university was neglected, leading to a significant misplacement of priorities. The institution found itself pursuing superficial aspects rather than concentrating on substantive areas.

Absence or Lack of Adherence to Clear Philosophical Foundations

Philosophies describe our values, interests, assumptions, world views, and meaning-making processes; in short, what we stand for (Obilade, 2016). They are like anchors that provide us some stability in the face of fiercest turbulent societal tides. Philosophies, which are meant to define our values and provide stability, appear to be neglected at the university, creating a problematic situation. These guiding principles, crucial for decision-making, policy formulation, curriculum development, and interpersonal communication, have not been strictly adhered to. This lack of adherence undermines the potential benefits and stability they could bring to the institution. In some instances, institutions with established philosophies

have abandoned them without due consideration. The failure to uphold and implement these philosophies poses challenges for the university, impacting its decision-making processes and overall cohesion. Urgent steps are needed to address this issue and restore the institution's commitment to its foundational values.

Charting a Course for Transformation: Meticulous Documentation of the University Management's Proactive Measures in Addressing Multifaceted Challenges

Achieving meaningful transformation amidst multifaceted challenges required Tai Solarin University of Education (TASUED) to implement a series of proactive measures aimed at addressing its financial and operational difficulties. These initiatives were guided by a commitment to innovation, efficiency, and sustainability, laying a foundation for long-term institutional success. By sealing financial leaks, harnessing untapped opportunities, reducing external funding dependency, and fostering internal cohesion, the university was able to strengthen its financial base. Additionally, a renewed focus on capacity building, research culture development, stakeholder engagement, and credible leadership further solidified TASUED's commitment to excellence. The following sections detail these measures, showcasing how each contributed to the university's transformative journey.

Sealing Financial Leaks: Strengthening Fiscal Integrity and Accountability in University Processes

A life-saving 'surgical intervention' was undertaken. As pointed out earlier, a detailed and inclusive SWOT analysis was undertaken, highlighting the strengths, weaknesses, opportunities and strength of the university. The results of the SWOT analysis formed the building blocks for the way forward. One crucial and urgent action was re-evaluating existing contracts, leading to the revocation and termination of non-essential agreements. Staff, adequately qualified and skilled, were now actively involved in generation of ideas for IGR, project execution and management. This move not only saved funds but also served as a motivation for the staff, contributing to enhanced job satisfaction. Obilade (2016) asserted that the action of revoking and cancelling needless contracts did not only save the university a lot of funds, it also became a motivation for staff as well as a step towards enhancing job satisfaction of staff.

Transformative measures were implemented, turning the various units into productive building blocks in the new funding and sustainability structure of the university. The first point of focus was the ICT Centre which underwent a significant overhaul, transitioning from a state of redundancy to full functionality. The ICT unit was turned into a central hub for university activities and gradually evolving into an income-generating entity. Empowered with responsibilities, it ceased being a financial drain and became a self-sustaining entity, offering services not only to the university but also to external entities, including hosting examinations for bodies like Joint Admission and Matriculation Board. The ICT, through some brilliant, research-oriented staff, became a spring board for the development of a payment platform for use within and outside the university and ultimately became an important source of income for the university. The ICT Centre, now fully functional, not only fulfils its original mandate but has become a source of income. The university conducts e-tests, offers the computer centre for external examinations, and facilitates online registration and payments, transforming what was once a financial drain into a revenue-generating asset. In addition, the e-payment platform developed by the institution's ICT Centre has been adopted and is being used by all the tertiary institutions in Ogun State.

Simultaneously, the Bursary department underwent a comprehensive reorganisation and system re-engineering. Recognising the importance of financial integrity, accountability and monitoring as well as the issue of efficiency and effectiveness the overall wellness of the institution, the university automated all financial processes, implementing a cashless policy with stringent monitoring, effectively curbing financial fraud and leakages which had proven detrimental, not only to the growth but also its ability to fulfil stated mandate for its establishment. Attention was paid to staff training, redeployment, process overhaul, use of cutting-edge financial management tools and equipment towards the implementation of greater efficiency and fraud prevention.

Another area of focus was the University Ventures Unit which witnessed a complete restructuring, involving the reconstitution of its board and placing it under a more efficient management team. The different units were re-organised, facilities and services upgraded, and new ventures introduced. One key area was the establishment of a block making industry, which was able to capture the market of contractors of contractors/builders working on projects within and outside the university, and supply blocks on to staff constructing their own houses, through instalment deductions from their salary. This not only guaranteed the quality of

blocks used in the construction of buildings on campus but also freed staff from heavy indebtedness to financial organisations in the course of home ownership. The practice of sub-contracting services and production of goods was cancelled and contractors were replaced with a more hands-on approach through the appointment of a competent university staff as the University Ventures Manager. This ensured optimal monitoring of various ventures and services.

Other productive units such as Institute of Vocational Training and Research in Agriculture (IVOTRA), Centre for Entrepreneurial and Vocational Studies (CENVOS), Department of Home Economics and Hotel Management as well as the Health Services were also revisited, restructured with expanded roles and services. The Health Centre, previously under-utilised, now actively participates in student medical examinations, maximising the potential of the X-ray machine for the university's benefit. Catering needs and welfare demands are no longer outsourced; instead, the Department of Home Economics and Hotel Management handles internal services, providing refreshments at meetings and catering for major university events, it also supervises services at the University Guest House. Also, a fast-food outlet, The Texas Kitchen, which had been built by a philanthropist, was handed over to the university and operated by the same Department. Other catering outlets were opened in various locations. Thus, apart from IGR, the Department is able to enrich the undergraduate and graduate training through practical, hands-on training for its students.

Furthermore, the CENVOS, in collaboration with the Departments of Creative Arts and Chemistry became major producers of university souvenirs and Conference/Workshop materials. Conference shirts, bags, jotters, branded pens, liquid soap, air freshener, hand wash, disinfectants are some of the CENVOS products. In addition, the collaboration between the Department of Vocational and Technical Education, the Directorate of Works and Maintenance Services and the University Ventures Unit, resulted in the birth of the University Furniture Making Cottage industry. Through this, TASUED was not only able to meet its furniture needs internally, but was also able to bid for and produce furniture for other educational institutions as well as government ministries and parastatals within and outside Ogun State. This restructuring and expansion of services not only resulted in expected dividends flowing into the university's coffers but also became the bedrock of the Work-Study programme with its attendant multiplier benefits.

These transformative initiatives have not only fortified the financial stability of the university but have also positioned it as a more efficient, transparent, and

accountable institution, ready to thrive in the ever-evolving landscape of higher education.

Unlocking Value: Harnessing Redundant Opportunities and Resources for University Advancement

Transformative actions were taken, restructuring each unit to align with its revenue-generating potential. The university's latent potentials are no longer overlooked; instead, the management embarked on actively exploring and harnessing these untapped opportunities. Currently, the institution developed a blueprint towards venturing into industrial agriculture and agricultural produce processing, engaging in animal husbandry and dairy production. Additionally, the institution, through its cottage furniture industry has diversified into crafting executive furniture for schools, industries, hotels, and offices. Leveraging on the institution's status as a premier university of education, her distinctive programmes have become a major attraction. In fact, the demand for enrolment has surpassed available capacity, indicating the widespread interest in becoming part of TASUED's academic community.

Substantially Minimised External Funding Dependency

In response to the pressing financial challenges, the university, driven by the necessity to secure its future, embarked on a journey of innovation, discovering genuine and legitimate avenues for generating funds. Today, the once underutilised university ventures have transformed into significant sources of income, elevating the institution's brand and fostering active student involvement. Additionally, the university has successfully attracted funds from TETFUND for its development, a feat that once appeared insurmountable. Notably, the institution addressed the lack of financial support for academic and non-teaching staff's education and workshop opportunities with assistance from TETFUND and other stakeholders, alleviating the frustrations faced by many staff members.

Harmonious Collaboration and Efficient Coordination among University Units

A visit to the university is a testament to the seamless cohesion and effective coordination among the university staff. Acknowledging the detrimental impact of the lack of cohesion and coordination among departments and units at the university on both financial well-being and institutional effectiveness, proactive measures were taken. Resource mapping was undertaken, and workshops were organised for stakeholders to help them understand their roles within the new framework.as well as to foster cohesion, collaboration, and synergy among various departments and

units, aiming to enhance overall functionality and financial health. The advantages of this synergy are vast, ranging from easy data accessibility and stress-free information retrieval to an improved working environment devoid of fear of victimisation, fostering a positive atmosphere free from animosity and rancour. These elements collectively contribute to enhancing the university's positive image.

Enhanced Focus on Capacity Building

Emphasising the significance of staff development and capacity building, Okojie (2016) recommends that universities aiming to overcome financial challenges must prioritise these aspects. The university has diligently heeded this advice, intensifying its focus on staff capacity building. The university has successfully sponsored a substantial number of academic and non-teaching staff to attend conferences and workshops, both domestically and internationally. This commitment to continuous learning is pursued without accumulating unnecessary debts, showcasing the institution's dedication to enhancing the capabilities of its workforce.

Development of Research Culture

While the University cannot assert a complete achievement of a requisite research culture, there has been a substantial improvement in this aspect. This issue was, and still is being, effectively addressed, mostly with the assistance of TETFund and a few other stakeholders. Furthermore, a percentage of the IGR from Part Time and other similar programmes were set aside for attendance and participation in national and international research conferences for academic staff.

Engaging Stakeholders for Financial Support

For a long time now, there has been a lack of active involvement of other stakeholders in the education sector in contributing to the innovative and creative management of the university, especially concerning funding. The university has recognised and embraced the crucial role that all stakeholders within and outside the educational sector play in making substantial contributions to university funding, whether in cash, kind, or ideas. Consequently, the institution has initiated efforts to actively engage these stakeholders, especially leveraging on the concept of Corporate Social Responsibility (CSR) for businesses and organisations and appeals to individuals. The university is in anticipation of more positive outcomes beyond the current results.

Integrated Credibility in Leadership: A Paradigm Shift at the University

The university implemented a comprehensive approach to credibility in leadership, emphasising openness, accountability, inclusion, and participatory decision-making within the university's administration and management structure. This inclusive strategy involved active involvement, consultations, and participation of stakeholders in various university processes, fostering a sense of 'ownership' among the community members. By adopting a bottom-up approach in needs assessment and addressing them, the university has successfully cultivated a culture where the university community takes ownership of processes and outcomes. This approach has not only contributed to a peaceful and harmonious relationship between the university management and unions but has also propelled the institution to be more focused and determined in pursuing its goals and objectives.

Strategic Triumph: The University's Successful Implementation of Innovative Approaches for Sustainable Development Amid Economic Challenges

Amidst the economic downturn and insufficient government funding for universities, institutions must proactively devise innovative and sustainable survival strategies. The university's experience offers valuable insights. After a thorough analysis, we strategically identified our strengths and innovatively developed them to generate funds, ensuring the university's sustainability during this severe economic recession. The subsequent section details the practical steps taken.

Curriculum Review

The university, being the premier university of education in Nigeria, embarked on a proactive initiative to address the unique challenges and responsibilities it faced. Recognising significant deficiencies in the traditional university curriculum, particularly in vocational skills and entrepreneurial knowledge, the university took a pioneering approach to curriculum development. The university identified the need to produce graduates capable of working independently and creating job opportunities for others. The institution, implemented a bold and unconventional curriculum that directly addressed social needs and realities. The innovative curriculum offers a dual training approach, allowing candidates to pursue their chosen academic discipline (Bachelor's Degree in Education, Arts, or Sciences) alongside vocational and entrepreneurial skill training in their preferred vocation. Clearly, successful completion of vocational/entrepreneurial courses became a

mandatory requirement for graduation, irrespective of the Cumulative Grade Point Average (CGPA) achieved.

The profound impact of the innovative curriculum at the university is evident in the outcomes it has generated. Graduates not only possess a solid foundation in content and pedagogy within their core disciplines but also emerge as self-reliant individuals after graduation. Rather than being mere job-seekers, they transform into employers of labour, reflecting the university's commitment to shaping entrepreneurial and skilled professionals. This distinctive approach to education has made it a preferred choice for numerous applicants seeking relevance in addressing contemporary social and economic challenges. The university's curriculum has played a pivotal role in reducing youth unemployment, contributing to the broader societal goal of fostering economic empowerment. Moreover, the University's success in implementing this pioneering model has not only elevated its reputation but has also proven to be financially rewarding for the institution.

Recognising the university as a trailblazer in this transformative education model, the National Universities Commission (NUC) has granted approval for various programmes at different levels. This approval underscores the university's competence in introducing and defending innovative programmes aligned with its core mandate. The university's exceptional achievements extend to being the sole university in Nigeria authorised to establish a College (Faculty) of Technology Education. This approval was granted in response to the university's compelling case highlighting the need to train teachers equipped with relevant pedagogical skills to instruct in over 30 recently introduced trade subjects in secondary schools.

Stepping up Commercial Activities and Consultancy Services that include Training of Students

Human resources at the university comprise our esteemed highly matured students, who have always demonstrated high level of culture of superiority of logic over violence; committed and reliable staff; open, visionary and sacrificial management team and a highly supportive governing council. The effective synergy among these sub-systems has created a conducive and business-friendly environment which has proved very productive in the university system. Thus, the university commercial and consultancy services include: block making; paint production; furniture (wood work); iron fabrication venture; university guest house; catering and hotel management; university bottled/sachet water factory; shoe making, bee keeping and honey production, fashion designing and fabrics, poultry and fish farming and so on. There are many standard products proceeding from these ventures for the

benefit of the university staff, students and the larger society as well as being veritable sources of Internally Generated Revenue (IGR), an issue that the Executive Secretary of the Nigerian Universities Commission has emphasised …"We must broaden and diversify our internally generated income base, bearing in mind the fact that there is a limit to which we can exploit students fees and charges as means of IGR…" (Ojoye, 2016). The same view was expressed by Gbadegesin (2016) at the 4th Biennial Conference of the Committee of Pro-Chancellors of State-owned Universities (CPSUN) in Nigeria held at Tai Solarin University of Education, Ijebu Ode, between June 27 - 30, 2016. The resultant effect is that the university now supplies furniture to government agencies and parastatals as well as other tertiary institutions. The CENVOS/Ventures operations serve multiple purposes in the university system. First, for students undertaking courses in the particular area of expertise, it provides a space for teaching and learning; secondly it serves as a veritable source of IGR for the university, and finally it provides financially challenged students a source of income through the work study programme inherent therein.

Engaging and Involving Host Community

One should never underestimate the possible influence and contributions of the university's host community. Experience has shown that many times there is no rapport between the university and other stakeholders in the education sector, particularly the host community. The university has benefited immensely in actively engaging and involving the host community in the aspect of sustainable agricultural investment which is not only going to be financially rewarding to the university as well as the host community; it is also geared towards the realisation of the expected relationship between Gown and Town. It will not only provide employment for youth in the community, it will also assist in reducing crime and making the university environment more peaceful.

Harnessing External Opportunities: A Strategic Approach to Grants and Funds Acquisition

It is not out of place to 'think outside the box' by looking for external sources of fund in terms of grants and philanthropic donations/support for the institution. Individuals can be approached to donate lecture halls; hostel accommodation; laboratory equipment etc. to support the university. Research grant could be competed for and if won could contribute significantly to the progress and development of the university.

Fostering Alumni Engagement and Participation

Universities across the globe have since discovered the importance of the Alumni body of the institutions in funding and supporting university programme and development. Although, it may not be very popular in this part of the globe, but it is worth trying out. Significant contributions in cash and kind could be embarked upon by the Alumni body of the institution if they are involved and given the opportunity to participate. Keeping the Alumni informed and engaged in contributing to the financing of some school's project will not only bring some financial relieve for the university management; but it will also create a sense of belonging to the Alumni. TASEUD experience bears witness to this. The Alumni has been actively involved in the provision of much needed equipment and investing in certain ventures of the university.

Attribution to the Resource-Based View Theory (RBV)

In line with the first objective of this study – to document and analyse the multifaceted challenges faced by the university, highlighting the comprehensive process of problem identification—RBV emphasises that organisations must first identify and assess their internal resources to effectively address challenges. This aligns with the study's findings, where TASUED's comprehensive problem identification process, which revealed financial leakages, redundant resources, and inefficiencies, aligns with the RBV principle of recognising valuable but underutilised assets. By systematically evaluating its internal capabilities and weaknesses through SWOT analysis, TASUED laid the groundwork for strategically managing its resources to create a competitive advantage. For example, the identification of inefficiencies in the Ventures Unit and ICT department, both of which were initially financial drains, demonstrates TASUED's ability to assess and understand the potential value of its resources, a key tenet of RBV.

With respect to the second objective – to meticulously document and report the proactive measures and transformative efforts undertaken by university management and staff to address multifaceted challenges – RBV emphasises the importance of developing and deploying resources that are valuable, rare, inimitable, and non-substitutable (VRIN). TASUED's transformative efforts, such as restructuring its ICT department, reclaiming outsourced services, and revitalising entrepreneurial ventures, reflect the practical application of RBV. These measures turned previously undervalued or mismanaged resources into productive assets that contributed to financial stability. For example, the

transformation of the ICT department into a revenue-generating unit aligns with RBV by turning a previously redundant resource into an inimitable and valuable asset. Similarly, the revocation of unnecessary outsourcing contracts exemplifies the strategic management of internal capabilities.

Concerning the third objective – to report the successful implementation of the university's strategic efforts in achieving sustainable development, emphasising innovative approaches and resource utilisation in response to economic challenges. RBV emphasises leveraging unique and non-substitutable resources to achieve long-term sustainability. TASUED's introduction of an entrepreneurial curriculum, establishment of income-generating ventures, and focus on vocational training showcase the creation of rare and valuable offerings. These innovative approaches not only addressed financial challenges but also positioned TASUED as a leader in higher education transformation. The development of TASUED's vocational and entrepreneurial curriculum embodies RBV principles by creating a rare and valuable educational model. This innovation strengthened the university's reputation while generating additional revenue streams through student engagement in practical ventures.

Conclusion

All the foregoing has underscored the need for innovation, thinking outside the box, for the survival and sustainability of the university system in Nigeria. Universities in Nigeria must come to terms with this reality and adjust accordingly to avoid jeopardising their future and mortgaging quality on the altar of political expediency. Essentially, the need to start thinking creatively and innovatively is predicated on the reality that the major source of funding generally dependent upon is no longer feasible, and there is a widening gap between IGR in form of fees paid by students and the cost of education. It portends a classic situation of sink or swim, and sooner rather than later, the universities may have themselves to blame if nothing is urgently done. There is thus, a critical need to pro-actively harness the resources available within and outside the university, beyond the grossly inadequate handouts by government for survival and sustainability. Recognising the shortcomings of this reliance, TASUED took bold initiatives to break free from the shackles of almost total dependence on insufficient government subventions and was able to stand out as one of the limited numbers of public universities successfully maintaining a stable academic calendar, free from disruptions as well as. This achievement is coupled with a significant proportion of staff actively engaging in and taking ownership of processes and programmes geared towards ensuring the university's

financial sustainability. As Adult Educators, who are trained to be change agents, we are bound to share the results of our experiential learning for mutual growth and benefit.

The application of the Resource-Based View (RBV) theory in this study highlights the strategic importance of leveraging internal resources to achieve financial stability. TASUED's success in transforming its challenges into opportunities emphasises the value of identifying and developing VRIN resources. This approach offers a model for other institutions seeking to navigate financial instability and achieve sustainable growth.

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Assessment of Power Infrastructure and its Impact on Radiological Digital Imaging Informatics Systems in Tanzania's Health Facilities

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Abstract

Digital imaging informatics systems are essential for enhancing diagnostic accuracy and overall healthcare delivery; however, their success is largely dependent on reliable power sources and robust infrastructure. This study examines the readiness of Tanzania`s health facilities to adopt and maintain radiological digital imaging informatics systems, with a focus on the availability and quality of electrical power infrastructure. A mixed-method approach was utilized, involving structured questionnaires and in-depth interviews with biomedical and ICT engineers from selected healthcare facilities. The findings reveal that while many facilities report having access to electrical power and meeting basic voltage and grounding standards, frequent power disruptions remain a significant challenge. These disruptions not only undermine the sustainability of the digital imaging systems but are also more pronounced in rural areas where infrastructure development lags behind urban centres, thereby widening the healthcare disparity. Additionally, the study highlights gap in compliance with voltage requirements despite the overall availability of power. The analysis details these infrastructural challenges and offers actionable recommendations, including targeted investments in power infrastructure, capacity building for technical staff, and the establishment of enhanced maintenance programmes. By addressing these issues, Tanzania can improve its readiness to leverage digital imaging informatics, ultimately bridging the technological gap between urban and rural regions and enhancing healthcare outcomes nationwide.

Keywords: *Power infrastructure, digital imaging informatics, Tanzania healthcare facilities.*

Introduction

Digital imaging informatics has transformed healthcare delivery globally, enabling accurate and timely diagnoses through advanced radiological systems like X-ray, MRI, and CT scans (Chris, 2015; IAEA, 2015; IAEA, 2023; Kruse & Beane, 2018; WHO, 2009; Sakafu, et al., 2023). These systems have proven instrumental in improving patient outcomes and enhancing the overall quality of care. However, the successful implementation of these systems in Low- and Middle-Income Countries (LMICs) such as Tanzania faces significant barriers, including unreliable power infrastructure (Huang, 2010; Siegel & Reiner, 2020).

The global advancements in digital imaging informatics highlight its potential to revolutionize healthcare, particularly in diagnostic radiology. In high-income countries, these systems have become indispensable tools, facilitating early disease detection, personalized treatment planning, and efficient patient management (IAEA, 2015; IAEA, 2023). However, translating these global successes into the context of LMICs requires addressing unique challenges, such as; limited resources, inadequate infrastructure, and policy gaps (Grover, 1997). Understanding the Tanzanian context is crucial to illustrating these challenges and framing the problem.

In the Tanzanian context, adopting digital imaging informatics systems faces some obstacles, including unreliable power infrastructure standing out as a primary barrier (MOHCDGEC, 2021; Sakafu et al, 2023). While these technologies hold immense promise for elevating healthcare standards, their functionality is contingent upon a consistent and reliable power supply, a factor often compromised in resource constrained settings. The interplay between advanced healthcare technologies and foundational infrastructure underscores the urgent need to address systemic gaps to ensure the sustainability and effectiveness of digital imaging informatics.

As healthcare facilities across Tanzania adopt digital imaging informatics systems, significant challenges emerge, particularly in rural areas. These include frequent power outages, voltage instability, and inadequate backup solutions, which are exacerbated by limited resources and policy gaps. These issues are particularly acute in rural areas where infrastructure development is lagged behind historically (Ngoya & Muhogora, 2016; MOHCDGEC, 2021). For instance, the frequent power

outages and lack of robust surge protection mechanisms directly impact the performance and lifespan of radiological equipment, undermining the potential benefits of digital imaging technologies. While urban facilities may have more robust infrastructure, rural health centres often lack reliable access to electricity, compromising the sustainability and functionality of imaging systems. The interplay between advanced medical technologies and basic power requirements necessitates comprehensive studies to identify and address these challenges systematically.

The primary objective of this study is to assess and analyse the availability and reliability of electrical power infrastructure in Tanzania's health facilities concerning their readiness to adopt digital imaging informatics systems. Specific areas of focus include: power availability and reliability, voltage compliance, surge protection, power backup options and frequency of outages. By situating the discussion within the Tanzania's healthcare context, this study aims to shade light on understanding of the power infrastructural prerequisites for effective digital imaging informatics implementation. Ultimately, the findings inform policymakers, healthcare administrators, and development partners on strategies to bridge the infrastructural gap and enhance healthcare delivery through sustainable technology of digital imaging informatics systems adoption.

Methodology

The study employed a cross-sectional descriptive design which enabled the assessment of the electrical power infrastructure supporting radiological digital imaging systems in selected healthcare settings in Tanzania. This design was chosen to provide a snapshot of the existing infrastructure and operational challenges. The study was conducted in selected healthcare facilities to provide a comprehensive assessment of the electrical power infrastructure supporting radiological digital imaging systems. The sample size was determined by using Cochran's formula to ensure statistical representativeness. A combination of random and purposive sampling methods was applied to select respondents from selected healthcare facilities at different administrative levels, including national Hospitals, regional referral, district, and rural community health centres. The sampling approach was structured based on geographical and administrative classifications (urban, semi-urban, and rural) to ensure comprehensive coverage.

Within each selected health facility, technical personnel, specifically Radiographers and Biomedical Engineers were chosen based on their roles in

operating and maintaining medical imaging systems. Additionally, Heads of Radiology Departments were purposively selected for interviews to provide further insights.

A total of 30 respondents participated in the study was distributed as follows: In urban facilities: 6 technical staff from Muhimbili National Hospital (MNH) and 6 from Muhimbili Orthopedic Institute (MOI). In Regional Referral Hospitals: 5 respondents from Tumbi Regional Referral Hospital (Coast Region) and 5 from Kitete Regional Referral Hospital (Tabora Region). In District and Rural Health Centres: 3 respondents from Nzega District Hospital, and 5 from rural community health centres (3 from Busondo and 2 from Itobo). This structured sampling approach ensured a representation of healthcare facilities across different administrative and geographical contexts.

Data were collected using questionnaires and structured interviews. The questionnaires were administered to Radiographers and Biomedical Engineers captured quantitative information related to power infrastructure specifications, including power reliability, voltage compliance, outages, and backup systems. Interviews were conducted with Heads of Radiology Departments to gather qualitative insights on operational challenges, system performance, and the reliability of power supply. The data analysis process integrated both quantitative and qualitative methods, enabling a holistic assessment of the power infrastructure challenges faced by Tanzania`s healthcare facilities.

Results

This section presents the results of the study on assessing the power infrastructure that supports radiological digital imaging systems in Tanzania`s healthcare facilities. The findings are presented in line with the research objectives as follow:

Power Availability in supporting radiological digital imaging systems in Tanzania`s healthcare facilities

The survey revealed that 93.33% of selected health facilities possess the necessary power infrastructure to operate digital imaging systems while 6.66% lack adequate infrastructure (Table 1). This high percentage suggests strong overall preparedness though gaps remain in the rural facilities. The survey findings indicate that 93.33% of health facilities in Tanzania possess the necessary power infrastructure to support the operation of digital imaging systems, reflecting a strong level of readiness across the majority of facilities. This demonstrates a commendable

commitment to improving healthcare delivery, particularly in urban and semi-urban areas where reliable power infrastructure is often more accessible. The availability of power infrastructure in these facilities is an enhancing factor for the effective deployment and utilization of radiological digital imaging informatics systems which are essential for diagnosis, timely treatment, and overall patient care improvement. Furthermore, these findings align with broader national efforts to modernize healthcare systems through the integration of technology-driven solutions, emphasizing the role of infrastructure as a foundational element in achieving these objectives. However, the 6.66% of facilities lacking adequate power infrastructure highlights a significant gap, particularly in rural and underserved regions. This shortfall could potentially hinder equitable access to quality healthcare since these areas may struggle to support the operational requirements of digital imaging systems. The disparity in power availability and stability suggests the urgent need for targeted interventions, especially to decrease dependence on the national grid, which often fails to consistently reach or adequately serve remote areas.

The disparity in power availability and stability emphasizes the need for targeted interventions, particularly in reducing reliance on the national grid, which may not consistently reach or serve remote areas. Tanzania should diversify its energy sources by investing in alternative solutions such as solar and wind power which offer reliable and sustainable energy even in off grid locations. Solar and wind power systems could significantly mitigate the challenges that rural health facilities face, ensuring reliable access and supply of electricity required for operating advanced radiological imaging technologies. While energy access is important, statement overlooks the more fundamental issues within healthcare systems, such as lack of trained medical personnel, outdated equipment, inadequate healthcare facilities, and poor access to medical supplies; without addressing these core challenges, simply introducing renewable energy may not lead to substantial improvements in healthcare quality.

By adopting such renewable energy strategies, the country can not only solve the existing infrastructural gaps but also foster inclusivity in healthcare delivery, ensuring that even the most remote facilities are equipped to provide high-quality diagnostic services. Addressing these challenges is critical not only for solving the infrastructural gap but also for fostering inclusivity in healthcare delivery.

Table 1: Power Infrastructure in Tanzania's Health Facilities

Status of Power At the health facility	Agree (in %)	Not agree (in %)	Not sure (in %)
Availability of power infrastructure to operate medical imaging equipment.	28(93.33%)	2(6.66%)	0
Reliability of electrical power supply.	26(86.66%)	4(13.33%)	0
Power source (i.e. National Grid)	29(96.66.%)		1(3.33%)
Voltage Compliance	29(96.66%)	1(3.33%)	0
Grounding and surge-protection to safeguard the medical equipment	30(100%)	0	0
Availability of Power backup to mitigate power disruptions	28(93.33%)	1(3.33%)	1(3.33%)

(Source: Field data 2024)

Reliability of Electrical Power in operating medical imaging equipment

The survey revealed that 86.66% of health facilities have reliable electrical power, signifying a robust foundation for supporting the operational requirements of digital imaging systems in most areas. This reliability is essential for maintaining the reliability and efficiency of radiological imaging processes for timely and accurate diagnoses. However, the remaining 13.33% of facilities, primarily in rural areas, reported frequent power disruptions, underscoring persistent inequities in infrastructure development. These disruptions can significantly hinder the performance and reliability of digital imaging equipment, leading to delays in service delivery and compromising patient outcomes. The findings highlight the need for tailored solutions to address these disparities, such as investing in decentralized power generation systems, including renewable energy sources like solar or wind power. Moreover, strategic upgrades to existing grid infrastructure and incorporating energy storage systems, technological and environmental challenges could mitigate not only the risks associated with power outages but also to have sustainable energy practice and long term investment in resilient energy system. Addressing these challenges is pivotal in ensuring that all health facilities, regardless of their location can maintain consistent and reliable power, resulting in fostering equitable access to advanced radiological services across Tanzania.

Voltage Compliance and Surge Protection

Voltage compliance

The findings highlight a positive trend in electrical infrastructure compliance and protection measures in health facilities. The voltage compliance aspect revealed that most facilities (96.7%) had the required voltage range essential for the optimal functionality of imaging equipment. Maintaining the appropriate voltage is critical for ensuring the optimal performance and longevity of sensitive medical imaging equipment. Voltage instability is a known factor that can lead to frequent breakdowns, inaccurate imaging results, and increased maintenance costs (Ballan, et al., 2021; Shem, et al., 2022). The compliance reported by the majority of facilities indicates that healthcare centres have prioritized stable electrical supply, a key driver for the reliability of digital imaging systems.

This compliance is particularly encouraging for the successful implementation of digital imaging informatics systems. Maintaining stable voltage levels helps minimize the risk of equipment malfunctions, ensuring reliable imaging quality and enhancing patient safety. However, it also raises the need to address the remaining 3.3% of facilities that are not yet compliant. Identifying and resolving issues in these facilities should be a priority to ensure uniform service delivery.

Grounding and Surge Protection

The universal implementation of grounding and surge protection measures reflects an excellent standard of electrical safety across the surveyed facilities. Surge protection plays a vital role in protecting medical imaging equipment from power surges caused by lightning, grid fluctuations, or internal electrical faults (Sahu & Madani, 2024); Balan et al; 2021). Such measures not only reduce the risk of equipment damage but also minimize downtime and repair costs, leading to better service continuity. Grounding, on the other hand, ensures electrical safety by providing a pathway for excess current to flow safely into the ground, protecting both equipment and personnel. The 100% compliance indicates a robust adherence to safety protocols, which is critical in environments that rely heavily on electrical and electronic equipment.

Generally, the findings urge for a strong commitment by health facilities to uphold electrical standards necessary for modern healthcare equipment. This reflects a progressive infrastructural development, a cornerstone for successful

implementation of digital imaging informatics systems. The emphasis should now shift towards sustaining these standards, addressing gaps in voltage compliance, and ensuring consistent quality across all healthcare facilities. Additionally, these findings can serve as a benchmark for other developing countries aiming at modernizing their medical infrastructure.

Frequency of Power Outages

Power outages present another critical barrier to effective healthcare delivery, particularly in facilities relying on power-intensive radiological equipment. During the interviews conducted with the Head of Radiology Department and Biomedical engineers at Kitete regional referral healthcare facility, it was highlighted that power outages pose a significant challenge to effective healthcare delivery. They emphasized that these disruptions occur on a weekly and sometimes monthly basis, affecting severely the operation of power-intensive radiological equipment. These interruptions cut down the continuity of healthcare services, posing significant challenges for departments which are heavily dependent on digital imaging systems. Radiological procedures such as X-rays, CT scans, and MRIs require a stable power supply to operate effectively, and any power instability can result into delayed diagnoses, postponed treatments, and patient dissatisfaction. Moreover, frequent outages increase the risk of damage to sensitive imaging equipment, leading to costly repairs, or replacements. During the interview with Radiographer in charge at the MNH, he said that "***The situation worsens emergency departments where immediate imaging diagnostics are crucial for saving lives".*** **Source:** (Field data, 2024). This suggests for a call of a more effective strategy that will address the root causes of power outages through grid upgrades, improving energy efficiency, and exploring hybrid models that combine renewable energy and reliable backup systems.

Power Backup Options in health facilities

The survey findings indicate that 83.3% of healthcare facilities have implemented power backup solutions such as Uninterruptible Power Supplies (UPS) or auxiliary generators to mitigate the impact of power outages. These systems are vital for ensuring the continuous operation of critical medical imaging equipment during power interruptions. UPS systems provide immediate power to bridge the gap until generators or other long-term power sources are back, preventing abrupt shutdowns of sensitive equipment and ensuring data integrity. Similarly, auxiliary generators supply the necessary power during extended outages enabling healthcare services to run uninterruptedly.

However, the findings also reveal gaps in power backup readiness. About 11.1% of facilities lack backup power solution, leaving them vulnerable to service disruptions during outages. This poses a serious risk, particularly on radiological departments that depend heavily on power intensive equipment. Furthermore, 5.6% of respondents were uncertain about the presence of backup solutions in their facilities, suggesting a lack of awareness or inadequate communication regarding infrastructure capabilities. Such uncertainty can lead to delayed responses during outages and further compromising healthcare delivery.

Quantitative data from the selected health facilities indicate that the majority have implemented backup power solutions, which is a positive step towards enhancing resilience in healthcare service delivery, especially to power-intensive radiological departments. In addition, qualitative interviews were conducted with key personnel, including heads of radiology, and technical staff from the radiology departments in order to validate and enrich these findings.

According to the data obtained from field interviews, while most facilities benefit from backup power, 11.1% of facilities reported a completely absence of such systems and 5.6% were uncertain about their status. Based on the Field Interview, one head of the radiology department commented, ***"Without reliable backup, our radiology services remain vulnerable during power outages"*** (Field Interview, December 2024). Furthermore, the data obtained from the interviewees in the field emphasized that adopting sustainable energy solutions such as solar-powered backups, could further enhance system resilience and reduce dependency on conventional power sources, thus, paving a way to a more robust healthcare infrastructure (Field Interview, December 2024). This sentiment underscores the urgent need for stakeholders to align and allocate resources to equip all facilities with adequate backup solutions.

Discussion

This section highlights the critical role of power infrastructure in the successful implementation and operation of digital imaging informatics systems. This section is setting the foundation for a detailed discussion of the study's findings and their implications on the electrical power infrastructure supporting radiological digital imaging systems in Tanzania`s healthcare facilities.

Centralized Power Systems and Associated Risks

The findings show that, most Tanzanian health facilities are connected to the National Grid which provides a centralized source of electricity. While this connectivity is a foundational strength, it also introduces vulnerabilities. Dependence on a single, centralized system increases susceptibility to national wide power crises as documented in other studies (Holland, 1995; Ogunyemi & Raji, 2018; Soroosh et al., 2019). Such crises can lead to widespread outages that disrupt healthcare services, particularly in facilities without robust backup solutions. This is a concern to radiological departments where power is essential for the operation of equipment like CT scanners, MRI machines, and X-rays, as well as for maintaining the integrity of imaging data in digital systems.

Infrastructure Readiness and Gaps

The survey findings provide convincing evidence for infrastructure readiness in many facilities. Voltage compliance in 96.7% of surveyed facilities ensures optimal equipment performance and minimizes the risks of device malfunctions caused by electrical instability. Similarly, 100% compliance with grounding and surge protection standards safeguards sensitive imaging systems from damage due to electrical faults or fluctuations. These indicators reflect significant steps towards creating a stable foundation for digital imaging informatics.

However, the study also underscores critical inequities. Frequent power outages remain a common challenge with 22% of the surveyed facilities experience weekly outages, and 78% reporting monthly disruptions. These interruptions compromise service delivery, particularly in rural areas where backup power solutions are less installed. The finding that 11.1% of facilities lack backup power options and 5.6% are uncertain about their availability further highlights disparities in infrastructure preparedness. Such gaps are particularly evident in rural areas where limited resources and logistical challenges hinder the deployment of reliable backup systems like UPS and generators.

Equity in Power Infrastructure Development

The disparity in power infrastructure between urban and rural healthcare facilities raises important questions about equitable access to healthcare services. The urban centres are more likely to benefit from stable power supply and advanced backup solutions, enabling seamless operation of digital imaging informatics systems. In contrast, rural facilities often face a burden of power outages and insufficient backup capacity, leading to equipment downtime (Balan, 2021). Addressing these

disparities require strategic investments in decentralized energy solutions such as solar power systems and hybrid energy models which can enhance stability and reduce dependency on the National Grid.

This study underscores the critical interplay between power infrastructure and the effective deployment of digital imaging informatics systems. Although the progress in voltage compliance and surge protection reflects commendable efforts towards infrastructure readiness, the frequent power outages and limited backup solutions highlight the challenges of achieving equitable access. A sustainable and inclusive approach to power infrastructure development, emphasizing decentralized energy solutions and strategic investments in rural facilities are essential for ensuring that all health facilities can fully leverage the benefits of digital imaging informatics. By addressing these gaps, Tanzania's health facilities can significantly enhance diagnostic capabilities and healthcare outcomes, particularly in rural areas.

Conclusion and Recommendations

Generally, this study assessed the electrical power infrastructure supporting radiological digital imaging systems in selected healthcare facilities in Tanzania. The findings highlight the critical role that reliable power supply plays in ensuring the continuous and effective functioning of medical imaging equipment. Despite the fact that the adoption of renewable energy sources and the improvement of backup systems offer promising solutions, the implementation of these measures presents significant challenges. These challenges include financial constraints, logistical hurdles, and the social dynamics of rural infrastructure expansion. Additionally, the intermittency of renewable energy sources and the limitations of backup power systems need to be addressed to ensure sustainable and reliable power for healthcare facilities.

Also, a more effective and integrated approach considering energy efficiency, long-term sustainability, and collaboration among key stakeholders is required for the successful implementation of digital imaging informatics in healthcare settings. Ensuring equitable access to modern medical imaging in both urban and rural areas, it requires a holistic strategy that engages community stakeholders, strengthens local infrastructures, and supports capacity building for sustainable energy practices. Based on the study's findings, the following recommendations are made:

Investment and Policy Support: there is a need for increased investment to support the development of reliable power infrastructure in healthcare facilities, particularly

in rural areas. Financial mechanisms should be explored to address the high upfront costs of renewable energy and backup systems.

***Capacity Building*:** healthcare facilities should invest in training the technical staff to manage and maintain advanced power infrastructure, including renewable energy solutions and backup power systems to ensure optimal performance.

Stakeholders Collaboration: a collaborative approach between healthcare providers, energy suppliers, government agencies, and local communities is essential to develop integrated solutions that address the unique challenges of power supply in healthcare settings.

Sustainability Strategy: a clear and actionable long-term sustainability plan must be developed, with a focus on maintaining and upgrading power infrastructure, especially in rural and underserved areas.

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Career Preparation and Progression for the Institute of Adult Education Graduates in Tanzania: An Exploratory Study

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Abstract

This paper presents a follow-up survey on the Institute of Adult Education (IAE) bachelor degree graduates from 2019 to 2023 academic years, assessing their career preparation and progression in Tanzania. As a public institution mandated to provide adult and non-formal education (ANFE) programmes in Tanzania, IAE must evaluate its programmes to ensure they meet occupational demands. A quantitative research method was employed, using a self- administered questionnaire to gather data on graduates' career readiness, professional growth and leadership development at the workplace. Stratified sampling with probability proportional to size (pps) was adopted in determining the number of female and male participants, such that a big group have big contribution in the sample size. The questionnaires were sent to 607 (236 males and 371 females) participants via their email address and WhatsApp. Only 241 questionnaires (female =139 and male =102) were returned, giving a response rate of 40%. The 241 respondents exceeded the minimum sample size of n=235 required to represent the entire population for this study. Data were analysed quantitatively using descriptive and inferential statistics with the aid of IBM SPSS version 21. The findings revealed that graduates were satisfied with their education and had achieved their goals. 90% of the respondents stated that IAE prepared them well for employment while 80% were satisfied with earning their bachelor degree. Additionally, 64% reported that their current job positions aligned with their career exceptions, and 74.2% found a strong match between their occupational aspirations and available job opportunities. The graduates rated highly their overall learning experience, and the quality of IAE programmes whereas over three-quarters (80%) believed that they had been empowered to become leaders with the highest degree of ethical

integrity and social responsibility. Given the importance of quality education, this study highlights the need for IAE to extend its focus beyond employment preparation by equipping graduates with additional skills, knowledge and values to support Tanzania's industrialization goal and economic advancement.

Keywords: *Career, preparation, progression, graduates, Tanzania*

Introduction

Despite the notably achievements of the Institute of Adult Education (IAE) in designing and implementing quality adult and continuing education and training programmes, resulting into an increased number of graduates, inadequate follow-up study has been carried out to see how IAE graduates are performing in their career, and whether they are able to navigate the world of work. Currently, IAE offers two bachelor degree programmes namely; Bachelor degree in Adult and Continuing Education (BACE), and Bachelor degree in Adult Education and Community Development (BAECD) with a total number of 607 graduates in which 79 and 548 students completed their bachelor degree programmes in the two programmes respectively from 2019-2023.

As Tanzania strives to improve the skills and employability of its people, many authors argue that it is very important to develop a "place-based curriculum" which matches the reality that graduates will face, and produce people who are equipped to address the needs of the society, both materially and spiritually (URT, 2024; UNESCO, 2015; World Bank, 2003). For education to be an emancipation tool for socio-economic development and poverty alleviation in Tanzania, IAE strives to ensure that its programmes produce skilled and knowledgeable graduates who are able to think independently, synthesize their skills and knowledge and critically analyse the input, process and learning outcomes of education that are needed for the knowledge economy in the 21st century (IAE, 2024; URT, 2023; IAE, 2020a&b).

In line with the sustainable development goals-2030 and the Five-Year National Development Plan 2020/2021-2025/2026, IAE has incorporated national priorities in its curriculum covering the sectors of education, health, environment and agriculture, especially the latter, as it impacts the lives of majority of Tanzanians living in rural areas. It is crucial for the learning process to focus on realistic outcomes rather than idealistic; thereby failing to deal with the situation existing in the day-to-day teaching and learning world (IAE, 2020a). Addressing national skills and employability gaps calls for strengthening of teaching and research

capabilities of academic institutions to provide graduates with the new knowledge, information and skills. These competences are essential for sustainable development, and achievement of the national development vision of 2025 and the upcoming 2050 development vision while maintaining the middle-income status (URT 2024; URT 1999; URT, 2017). Therefore, this study sought to assess the career preparation and progression of IAE bachelor degree graduates, examining whether the programmes prepared them for employment and leadership roles within 1-5 of graduation.

Methodology

The participants in this study were 607 (371 females and 236 male) IAE graduates of the BAECD, or BACE programmes from 2019-2023 who met the study criteria. The researchers utilized the bachelor degree information files to identify them all. The survey was developed and sent to the female and male graduates via email or WhatsApp between September and December, 2023, with an introductory note explaining the purpose of the survey and encouraging their participation. The sample size required for this study was n= 235. This was computed based on the 0.05 margin of error, p=0.5 and Z=1.97 (Bartlet et al, 2001). The 241 responses make a good representation of the entire population. The stratified sampling with probability proportional to size (pps) was adopted to identify the number of female and male participants. The researchers expected to collect data from144 females and 91 males, but due to reasons beyond the researchers' control, we managed to collect data from 139 females and 102 males (n=241), which is not deviated too much from the actual sample size required of n=235).

A survey consisted of 24 questions dealing with the three main constructs of career preparation, career progression, and leadership development. The construct of career preparation dealt with graduates' level of academic preparation and the competencies acquired. The construct of career progression related to the level of employability and job-related demands, and leadership development related to how graduates felt about their ability to function effectively and competitively as leaders in and outside their work settings. To ensure validity and reliability of a survey the following issues were considered:

1. The pilot study was conducted with a small sample (n=44) randomly selected in order to identify issues concerning survey questions and the methodology.
2. Continuously revise the survey and interview questions based on feedback from the pilot study (participants) and experts in the field.

3. Clear and concise instructions were provided to participants to minimize misunderstandings and errors
4. The Cronbach's alpha was computed for all the three constructs and the values found to be between 0.7 and 0.8 which is acceptable range.

The collected data were analysed quantitatively by descriptive and inferential statistics with the aid of IBM SPSS version 21. The descriptive statistics produced the frequency distribution table for the social and demographic variables, as well as the mean and standard deviations for the scales of the three constructs, namely; career preparation, career progression and leadership development. The inferential statistics was used to test the significance of the pair-wise correlations between the scales of the aforementioned three constructs. An independent t-test was also conducted to compare the significance of the average score of the three constructs by sex (male versus female graduates) to identify whether they were the same or different.

A further comparison was done between graduates who are employed and those who are not. Each test was given a type I error rate of 5 percent.

Findings

Social and Demographic Information

The first eight questions in the survey centred on obtaining demographic information from the respondents. Their ages ranged from 20 to 55, with a mean age of 29.4. Given the fact that the respondents represented graduates of IAE with one up to five years since graduation from 21 regions of Tanzania mainland, and whose ages differ at graduation; these appear to be a representative sample of graduates.

The majority of respondents (86%) had been employed before joining bachelor degree programmes at IAE. This is an added advantage for IAE as the unemployment rate climbs as high as 30.8 percent among university graduates due to the short demand by the labour market for those who are highly skilled (ILO, 2014).

Several features of the respondents deserve a mention. The majority were full-time teachers in public schools (77%), and predominately females (57%). This may reflect the characteristics of the target population, in that the majority of graduates (57%) over the past five years were female. It is worth noting that the public sector accounts for 33.7 percent of total formal employment, mostly in public

administration and education, due to graduates' perception of its stability and benefits (ibid).

Tables 1-4 provide descriptive information about the sample that returned the survey instruments in this study.

Table 1: Sex of the respondents

Sex	Frequency	Valid Percent
Male	102	42
Female	139	58
Total	**241**	**100**

Source: SPSS data output

A reasonable distribution of returns was attained by graduation year (See table 2)

Table 2: Respondents' year of graduation

Year graduated	Frequency	Valid Percent
2019	21	9
2020	18	7
2021	49	20
2022	74	31
2023	79	33
Total	**241**	**100**

Source: SPSS data output

7 out of 10 respondents reported working as full-time educators in public schools (77%), 1 out of 10 reported working as school administrators, and 0.5% of graduates reported having quitted the teaching profession (not teaching). The data on employment status are shown in table 3.

Table 3: Employment status of respondents

Employment status	Frequency	Valid Percent
Full-time teachers	177	74
School Administrators	29	12
Not Teaching	4	2
Other	29	12
Total	**239**	**100**

Source: SPSS data output

Table 4 indicates that more than a half of the respondents (57%) reported their occupational level as being primary school teachers, followed by secondary school teachers (22%) and heads of schools (17%). As more years of graduate that follow-up data are collected, it will be increasingly possible to disaggregate by programme. At this point (2023), it is probably expeditious to produce separate reports for BACE and BAECD.

Table 4: Current position/title of respondents

Position	Frequency	Valid Percent
Primary school teacher	131	54
Secondary school teacher	55	24
Heads of schools (Administrators)	34	14
Education officers (Administrators)	13	5
Nursery school teachers	8	3
Total	**241**	**100**

Source: SPSS data output

Career Preparation

The survey was interested in learning about graduates' experience of being at IAE, their reasons for choosing IAE, the quality of teaching and the curriculum, and their objectives in terms of advancing their career. Experience of IAE is defined as students' involvement in academics and co-curricular and extra-curricular activities, including student organizations, para-professional roles, sports and games, as well as engaging with the IAE community.

The construct of career preparation sought to find out what IAE graduates gained in terms of knowledge and skills pertaining to their career. The majority of graduates (99.5%) decided to study at IAE because they believed its curriculum would help to develop their career and enable them to function better in their workplaces. Over the past five years, only 0.5% of graduates were automatically selected by the Tanzania Commission for Universities (TCU) to join the IAE's bachelor programmes. It is worth mentioning that the majority of graduates acknowledged IAE's wide experience in equipping graduates with the competencies that employers expect of new bachelor degree holders. Their practical field experiences, the "student teaching programme" was extremely valuable to the majority of learners (90%) because it enabled them to reflect on what they had learned in the class, thus, improved their performance and contributed to develop their career.

It is heartening that the majority of the respondents appreciated that IAE lecturers and other staff were approachable and helpful. More than three-quarters of the respondents (86%) shared what was expressed by one female graduate who felt she had a good relationship with many lecturers and could utilize their skills and knowledge. She commented that the lecturers understand and use formal and informal assessment strategies to ensure the continuing intellectual, social and physical development of learners. The statements below describe the extent to which the respondents rated their experience of IAE.

Table 5: Responses on all individual items on career preparation (descending order by percent satisfied/agreed level- Strongly Agree=4, strongly Disagree=1)

Statement	Frequency	Mean	Standard Deviation	Level of satisfaction/agreement
Satisfaction with my bachelor's degree	234	1.6	0.5	99%
Quality of bachelor's degree	234	1.5	0.5	98%
Adequate training for work	231	1.4	0.5	95%
Relevance of curriculum	239	1.4	0.6	95%
Preparation for further education	229	1.9	0.1	94%
Competitiveness of IAE bachelor's degree	213	1.9	0.9	79%

Source: SPSS data output

A large number of respondents indicated that some improvements are to be made on key areas of the programmes delivery with the exception of the curriculum, which over a half of the respondents indicated no needed improvement, as it can be seen in Table 6. However, due to the wind of change in education as far as the Tanzania Education Policy of 2014 (version 2023) and the need to update its curriculum to respond to national demands, a review of the curriculum and development of IAE programmes are in the final stages of approval.

Table 6: Responses on Programme Delivery Improvement in Descending Order (Substantial improvement 3; Some improvement 2; No improvement 3)

Statement	Frequency	Mean	Standard Deviation	Level of agreement
Some improvements are needed in instructors' competencies	234	1.9	0.4	82%
Some improvements are needed in teaching and learning environment	227	1.9	0.4	81%
Some improvements are needed in instructors' commitment to quality delivery	234	1.9	0.4	81%
Some improvements are needed to increase opportunities for practical school	234	2.0	0.5	79%
Some improvements are needed in content knowledge (theory)	234	1.9	0.5	78%
Some improvements are needed in instructional delivery methods	234	2.5	0.5	62%
Some improvements are needed in language level and textbooks	237	2.5	0.6	58%
No improvement is needed in curriculum	235	2.5	0.6	56%

Source: SPSS data output

Career Progression

With regard to the career progression of IAE graduates, more than a half (64%) of the respondents indicated that their positions in their career were close to what they hoped for, while almost three-quarters (71.5%) reported that their current positions do require them to have a degree.

The findings further revealed that 74.2% of teacher respondents indicated that they are teaching the subjects that they specialized at IAE, revealing a good match between graduates' occupational aspirations and existing employment opportunities. However, in a few cases, the respondents commented that their specialization limited them from taking advantage of wider employment opportunities or from being able to switch professions. This can be attributed by the fact that the IAE bachelor programmes for primary (55%) and secondary school teachers (26%) are confined to their respective disciplines.

A large number of respondents (93%) were able to identify areas where they had seen professional growth and took advantage of, while actively "owning" and managing their careers.

Table 7: Responses on Career Progression in Descending Order (Strongly Agree =4, Strongly Disagree =1)

Statement	Mean	Standard Deviation	% Some form of agreement/achievements
Degree of effectiveness in the work/job performance	1.6	0.5	98
Employers' satisfaction	1.6	0.6	95
Current job/position satisfaction	1.6	0.5	94
Ability to identify areas of professional growth, take advantage of opportunities and manage career	1.7	0.6	93
Employment flexibility in the area of specialization	1.8	0.9	75
Subject specialization	1.3	0.4	74
Bachelor's degree requirement for the current position	1.3	0.5	72
Ability to get a job/adjust to existing one	1.9	0.9	69
Closeness between the position and career aspirations	2.2	1.2	64
Continuation with further education	1.9	0.3	8.7

Source: SPSS data output

Leadership Development

Table 8 shows graduates' responses in descending order on how IAE helped them to develop leadership traits in general. The majority believed that attending IAE programmes improved their critical thinking and problem-solving skills (97%), oral/written communication skills (90%), collaboration/teamwork skills (91%) and digital technology skills (83%). Over three-quarters of the respondents stated that they gained leadership skills (87%) whereas (92%) increased their work ethic professionalism.

Table 8: Responses on Leadership Development in Descending Order (Strongly agree=4, Strongly disagree=1)

Statement	Mean	Standard Deviation	Level of satisfaction
Critical thinking/problem solving	1.7	0.44	97%
Professionalism (work ethic)	1.5	0.58	92%
Teamwork/Collaboration	1.8	0.48	91%
Oral/written communication	1.1	0.41	90%
Leadership skills	1.5	0.46	87%
Digital technology (use of computers, etc.)	1.8	0.66	83%

Source: SPSS data output

Correlation and Scale of Constructs

Table 9 shows the correlation between each of the constructs. The findings indicate a weak positive pair-wise correlation between the three constructs as the values approach zero. The coefficient of correlation between career preparation and leadership development was 0.1164, with p=0.0950.

With regard to career preparation and career progression, the coefficient correlation was 0.0122 with p=0.8619 while the coefficient of correlation between leadership development and career progression was 0.0962 with p=0.1679. This indicates the conceptual and statistical inter-dependence of the constructs measured. In each case, the correlation coefficients are statistically insignificant and are treated as equal to zero because p>0.05. Therefore, it can be concluded that the degree of closeness between the three constructs is weak but positive as they all move in the same direction.

Table 9: Correlation matrix & reliability analysis

Construct Number	Constructs	C1	C2	C3	α
C1	Career preparation q14, q16, q17, q18	1.000			0.681
C2	Career Progression q20a-q20h	0.0122^{NS}	1.000		0.901
C3	Leadership dev q21-q27	0.1164^{NS}	0.0962^{NS}	1.000	0.723

NS-The correlation coefficient is not statistically significant at α=5% (p-value>0.05), ***α=*** *Cronbach's Alpha*

Independent t-test

A comparison was also made between female and male graduates in all three constructs, namely; career preparation, leadership development and career progression. Of all the three constructs, only career progression was seen to be statistically significant at 5% level [t (190) =-2.802, p=0.006, d=0.18889]. The construct of career preparation comparing female and male graduates is statistically insignificant [t (204) =0.226, p=0.821, d=0.0171], and leadership development [t (182) =-1.913, p=.0.057, d=0.07198]. This means that there are no differences between female and male graduates in terms of career preparation and socially related leadership development.

Table 10: Independent t-test for the equality of means of the constructs based on sex of respondents

Construct	t-test for Equality of Means (male and female)						
	t	**df**	**Sig. (2-tailed)**	**Mean Difference**	**Std. Error Difference**	**95% CI of the Difference**	
Career preparation	.226	204.771	.821	.01709	.07558	-.13193	.16612
Career progression	-2.802	190.896	.006	-.18889	.06742	-.32187	-.05590
Leadership development	-1.913	182.608	.057	-.07198	.03763	-.14623	.00227

Note: Equal variance not assumed

A further comparison was made between employed and unemployed graduates in all constructs. In terms of career preparation, the test showed a significant difference between employed and unemployed graduates [t (45) =-6.197, p=0.000, d=0.5473]. The graduates who were unemployed (M=2.208) showed that they were better prepared for a career than their employed counterparts (M=1.66). For the other constructs of career progression [t (41) =1.955, p=0.057, d=0.1785), and leadership development [t (-2.44), p=0.809, d=0.1275), both tests showed to be statistically insignificant at 5% level. This means that there is no difference between employed and unemployed graduates in terms of career progression and leadership development.

Table 11: Independent t-test for the average score of the scale of constructs by employment status

Constructs	t-test for Equality of Means (employment status)						
	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% CI of the Difference	
						Lower	Upper
Career preparation	-6.197	45.542	.000	-.54732	.08832	-.72514	-.36949
Career progression	1.955	41.102	.057	.17846	.09131	-.00592	.36284
Leadership development	-.244	39.799	.809	-.01275	.05232	-.11851	.09301

A further comparison was made between graduates who are primary school teachers and those who teach in secondary schools. All three constructs of career preparation [t (73) =-0.199, p=0.843, d=0.0207], career progression [t (71) =-0.381, p=0.704, d=0.0364] and leadership development [t (84) =-0.711, p=0.479, d=0.0335] showed insignificant differences between primary and secondary school teachers at 5% level. This suggests that career preparation and progression as well as leadership development do not depend on the level of school at which someone teaches. The mean scores for the constructs of career preparation, career progression, and leadership development were 1.766, 1.666 and 1.609 for secondary school teachers, and 1.746, 1.6293 and 1.5752 for primary school teachers. Although the differences were insignificant, the mean scores indicate that secondary school teachers were better prepared career-wise, progressed better, and developed more leadership skills than primary school teachers.

Table 12: Independent t-test for the average score of the scale of constructs by occupation level

Constructs	t-test for Equality of Means (Primary-secondary school teachers)						
	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% CI of the Difference	
						Lower	Upper
Career preparation	-.199	73.432	.843	-.02065	.10385	-.22761	.18631
Career progression	-.381	71.299	.704	-.03641	.09563	-.22707	.15425
Leadership development	-.711	84.862	.479	-.03354	.04717	-.12732	.06024

Future contacts

All the respondents were glad to be in contact and network with IAE in one way or another, and showed great interest in enhancing an Alumni Association by providing the Institute with their contact details.

Discussion

In this era of the internationalization of education curricula and systems, IAE has continued to ensure that its teaching forces are motivated and capable of equipping graduates with competencies in how curricula should be adapted to meet the demands of the knowledge economy and real world of work. IAE has proven to respond to this demand as large number of respondents (98%) reported that they had become more effective in their current jobs using the skills they had acquired, and had been given a high rating by their employer for their performance at work; which is similar to other studies that highlighted teachers' commitment and their ability to improve the quality of teaching and students' learning outcomes (Mnubi, 2018; Mkumbo, 2012).

The Tanzania Education and Training Policy of 2014 (version of 2023) highlights the urgent need to recruit, train, deploy and retain an adequate number of qualified and motivated male and female teaching force (URT, 2023). In line with this policy, although the majority of respondents (94%) agreed that IAE degree programmes prepared them well for continuing with further education, a few (8.7%) only pursued further education due to financial constraints and competing social and family priorities. As large percentage of those who pursued further post graduate education (70%) were pushed into it by the rise in wages and the chance of obtaining a stable job.

Young leaders are powerful change agents and the greatest country's asset in Tanzania and the rest of African countries, but they are not given enough opportunities or support to enable them to take up responsible leadership positions and be involved in socio-economic development. The African Union and United Republic of Tanzania define youth as a person aged 15-35. According to census data, more than 75 percent of Tanzanians are under 35 (URT, 2022), a similar age to this study with a mean age of 29.4. Therefore, IAE needs to empower its students with leadership skills and ensure that they possess the highest degree of ethical leadership with integrity which will enable them to tackle Tanzania's major challenge of poverty, socio-economic instability and irresponsible leadership.

Conclusion and Recommendations

Many studies have identified achievements, prospects and challenges that academic institutions face in relation to the quality and relevance of their programmes, employability of graduates, preparation of students for the transition from school to the world of work, as well as responding to the needs of the community (Kibona, 2024; ILO, 2014; World Bank, 2002). This study has provided solid evidence that IAE is dealing with these challenges while advancing its graduates' career development. A great number of graduates reported that they were satisfied with the quality of training they had received while studying their bachelor degrees. Therefore, IAE proves to be a good training ground in terms of graduates being equipped with academic qualifications and leadership skills since majority of them were progressing well in their careers. In addition, graduates had received a good quality education, their skills had been developed and they had acquired the competencies, attitudes and values that would make them responsible and productive members in the society as emphasized by other research findings and documents, including the World Bank, CCM manifesto 2020 and the Education and Training Policy of 2014 (version of 2023); which are central for realizing the sustainable development goals and reducing poverty while promoting social well-being among Tanzanians.

Based on the findings and the given importance to higher learning institutions in Tanzania to provide high quality education, this study highlights the need for graduate teachers to be exposed to teaching and learning strategies/philosophies other than the traditional rote learning methods, and to behaviour management strategies when teaching students with challenging behaviour or those who are disabled. IAE teaching force should consider encouraging more use of interactive approaches to teaching and learning such as; discussions, debates, brainstorming and projects, to produce new ideas and encourage creative thinking, which are little utilized.

IAE should invest more in teaching and learning facilities and materials. The ongoing efforts to improve access to adult education in Tanzania in which there is a growing demand need to be matched by the efforts to produce graduates exhibiting creativity and independent thinking.

IAE should consider using Information, Communication and Technology (ICT) more than it does as a means for enabling acquisition of knowledge, skills and attitudes as it was noted that ICT was hardly used by the lecturers.

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Exploring the Impact of Bureaucratic Governance on Institutional Performance in Tanzania: A Case of St. Augustine University of Tanzania and the University of Dar es Salaam

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Abstract

This study investigates the impact of bureaucratic governance on the performance of Tanzanian universities, focusing on St. Augustine University of Tanzania (SAUT) and the University of Dar es Salaam (UDSM). This study employed a qualitative approach with a descriptive case study design. The study sample comprised 67 participants, including council members, senate members, human resource officers, directors, deans, students, and academic and administrative staff members. The data were collected through interviews and documentary reviews and were analysed through thematic analysis. The findings reveal the dominance of bureaucratic governance that affects universities both positively and negatively, whereas negative impacts outweigh positive ones. If bureaucratic practices remain unchecked, they could affect institutional autonomy, timely institutional transformation, and adaptability in this competitive world. This study recommends reducing bureaucratic practices and integrating other models to enhance the institutional performance of Tanzanian universities.

Keywords: *Bureaucratic governance, university management, institutional performance, Tanzanian universities.*

Introduction

Many scholars and practitioners have debated the concept of governance in higher education in the 21st century (Rowland 2017). Although this concept is gaining interest, governance models operating in these entities seem to be abstract concepts and are not well-known to most educational stakeholders. In African higher

education, governance models have evolved over the decades, but their impact on university leadership and institutional performance does not appear to be highly significant. Focusing on the application of the bureaucratic governance model in the contemporary world, empirical evidence shows that this model does not accurately reflect the realities of contemporary university structures and governance processes due to the developments that have taken place in universities (Buckner, 2016; MacGregor, 2016; Rowlands, 2017; Scott, 2011). Such developments include globalisation, advanced technology, knowledge-based economies, and market forces. These developments have not only affected their educational status but also moved them from the traditionally known university management to modern management systems that require the commodification of knowledge and governance to cope with emerging challenges (Samir, 2022). Okwakol (2009) asserts that developments such as globalisation have been enhanced by increasing the mobility of people, the demand for university education, and access to knowledge across borders. With these developments, university management have been forced to think more about devising the best ways to make their institutions survive and thrive in this era of competition for market forces (AIDhean, 2017). The pressure for change necessitates universities to adopt and integrate new leadership styles and management approaches to achieve sustainable leadership and human resource development and to facilitate the building of an enabling working environment for employees and institutional performance (Samir, 2022). However, the bureaucratic model prevails in university governance (Fielden, 2008).

Focusing on the impact of the bureaucratic model, there is a need for a detailed understanding of its features and operation. The bureaucratic governance model, also known as bureaucracy, is an administrative system designed to accomplish large-scale administrative tasks by systematically coordinating the work of many individuals in an organisation (Pandya, 2011). Prasad (2022) identifies three types of powers in organisations: traditional, charismatic, and rational-legal, with the features of the bureaucratic organisation as follows: administrative class responsible for maintaining and coordinating the activities; division of work, formalized official rules, and hierarchical structures with a well-defined chain of command; and the impersonal relationship among individuals through a system of official authority and rules where the lower offices are supervised by higher authorities to ensure accountability within the organization. In bureaucratic systems, tasks are assigned based on merits and expertise to promote systematic operations and a clear hierarchy of authority, with a specialized division of labour,

recruitment, and promotion being merit-based, emphasizing technical competence and rewarding seniority or achievements, to ensure professionalism and minimize personal bias (Prasad, 2022).

Moreover, the bureaucratic model is designed to ensure efficiency, predictability, and accountability, making it widely adopted in complex organisations such as universities. Divjak (2016) highlights that the complexity of universities is in terms of diversified functions, operating budgets, compact structures, the number of employees, high student enrolment as well as the programmes operating. Divjak further notes that, managing complex organizations such as universities creates governance challenges in the process. However, with such complexity, public administration practitioners such as Weber, as cited by Pandya (2011), suggest that the bureaucratic model fits in the context of university governance, as it is one of the most influential frameworks in higher education. This model emphasizes efficiency and accountability through specialization, hierarchical structures, and merit-based systems.

Similarly, Nyarugwe (2014) sees the bureaucratic governance model as effective in managing large, resource-intensive institutions such as universities by providing stability and clarity in roles and processes. Universities, as complex organizations, need this model to suit their purposes. In addition, Prasad (2022) identifies some aspects of bureaucracy that may positively contribute to efficiency in institutional performance: (i) extensive rules and regulations that clarify what employees are expected to do as they focus their attention; (ii) decision-making is rational, as it is governed by rational factors, but not by decision-makers and personal factors; (iii) there is proper maintenance of official records; therefore, employees may refrain from doing any wrong.

However, the bureaucratic governance model has faced significant criticism in the field of higher education. Although this model offers stability and clarity in structures, roles, and governance processes, it is often criticized for its rigidity (Shattock, 2013). Having authority and control-oriented focus, this model has been noted to hinder responsiveness to the dynamic and rapidly changing environments of modern higher education (Prasad, 2022; Shattock, 2013). Its static nature makes it slow to adapt to changes in the current era subjected to globalization, technological advancements, and market-driven demands (Mzenzi, 2022). The concentration of power in higher offices further exacerbates the lack of inclusivity, marginalizes diverse perspectives, and reduces opportunities for shared governance. These limitations underscore the need for alternative governance

models that balance the structure and stability of bureaucracy with greater adaptability and inclusivity to modern challenges in higher education (Trackman, 2008). Additionally, bureaucratic systems tend to implement existing policies rather than foster innovative or participatory governance strategies in the formulation of these policies (Harmsen, 2014).

Additionally, Prasad (2022) highlights more shortcomings of the bureaucratic model, including goal displacement, unintended consequences, and inhuman organization, where there is an impersonal relationship and a closed system perspective. Prasad further describes bureaucracy as a system that depends on the internal environment alone, without interacting with the external environment. They are static and do not adapt to the environment. Buckner (2016) adds that bureaucracy is unable to predict change, including a rapid shift toward market logic in education. Harmsen (2014) also sees that hierarchical structures and centralized decision-making often limit stakeholders' engagement and adaptability in dynamic environments.

In addressing the inefficiency of the bureaucratic model, Taylor (2013) suggests that the shared-leadership model can address the powers and status differentials associated with the bureaucratic model in managing bureaucratic tendencies in an organization. Taylor further, contends that, if the administrators do not delegate authority among their members, and fail to ensure that team members feel open to voice opposition. As a result, leaders may not understand how less powerful members feel alienated or disempowered. With shared governance, Nyarugwe (2014) sees stakeholder involvement as an important aspect of institutional performance in the sense that it can contribute effectively to the development of an organization by providing innovative ideas. Samir (2022) adds that engaging people in workplace management requires training to equip them with skills in steering management issues. This implies that the issue of competence is important when engaging workers in an organization.

However, in assessing the governance and performance of universities, it is worth noting that these entities have unique features which necessitate a detailed understanding of the nature and operation of universities compared to other service institutions, as they are governed differently from businesses or other institutions in the corporate world. The legal establishment of universities worldwide mainly depends on two key concepts: institutional autonomy and academic freedom (Fielden, 2008). The principle of academic freedom is a key driver of many reforms in academic institutions and institutional performance, and a cornerstone for

autonomy, as it enables institutions to manage their affairs as fully as the state allows (Trackman, 2008).

Regarding institutional autonomy and academic freedom, Mzenzi (2022) revealed that Tanzanian universities respect these two concepts. In recent years, government control over university affairs has decreased, while the autonomy of universities in internal decision - making has increased. This is manifested in the University Act of 2005, which established the TCU as a regulatory body and repealed acts of parliament relating to individual universities enacted before 2005. Universities' increased autonomy is also reflected in their charter. The argument raised by Mzenzi implies that institutional autonomy and academic freedom are valued in reducing bureaucratic practices.

Apart from respecting academic freedom and institutional autonomy, these universities are also guided by their legal establishment. Tanzanian universities are guided by acts, national and institutional guidelines, and policies in their governance and operation which they should abide by. UDSM is governed by the University of Dar es Salaam Act of 1970, as stipulated in the University Charter (2007). The UA2005 repealed acts relating to individual public universities and established TCU as the regulatory body for HE institutions across the country (URT (2005). Similarly, the SAUT was established in 1998, subject to University Act No.7 of 2005.

Mzenzi (2022) notes that Tanzanian universities are guided by national and institutional guidelines and policies, as indicated in the methodology section. Although university governance arrangements are generally dictated by national governance frameworks, Bisaso (2017) highlighted that many researchers have reported the former (national policies) in isolation from the latter. This entails overreliance on national policies and guidelines rather than institutional policies, thus denoting the influence of bureaucracy from the government. Fielden (2008) notes that bureaucracy from the government, such as intervention from the government, creates fertile ground for increased government interference, thereby limiting institutional autonomy. Overreliance on the bureaucratic model in the operation of universities, national guidelines, and policies has been noted to affect institutional performance by limiting institutional autonomy and academic freedom to innovations and developments.

In light of this, several initiatives have been made to address the challenges associated with governance in Tanzanian universities in order to improve their performance. For example, establishing more units to make the institution function

well, adapting income-generating projects, developing partnering in and outside Tanzania, reviewing organizational structures, increasing leadership positions, student enrolment, and programmes. Several studies have been conducted regarding the governance and operation of universities, yet some governance challenges, such as the low pace of transformation towards institutional performance, still exist. It is assumed that this might be attributed to the prevalence of the bureaucratic model.

Notwithstanding the important role governance models play in the governance of universities, the impact of governance models operating in universities has been under-researched, as they appear insignificant on institutional performance and other governance-related aspects (MacGregor, 2016). Nevertheless, there is insufficient evidence to support the empirical literature that clarifies the impact of governance models on university performance, with Tanzanian universities as a particular case (Mzenzi, 2022). Moreover, in recent years, there have been several developments at different universities worldwide. Following these developments, various managerial methods and models aimed at making organisations more accountable, transparent, and manageable have been introduced into universities and their efficiency and accountability have been enhanced (Bora, 2014).

Despite the changes taking place in many universities in this globalised world, bureaucratic governance frameworks continue to prevail in the governance of universities, impeding effective institutional performance in terms of transformation and other operational issues (Shattock, 2013). Furthermore, governance challenges in universities continue to affect institutional performance. Drawing on these insights, this article intends to explore the impact of the bureaucratic model on the institutional performance of the selected universities, SAUT and UDSM as particular cases, and propose strategies that can be employed to manage the shortfall of models in place to ensure institutional performance in the competitive and fast-changing environment of higher education.

Methodology

This study was conducted in the Dar es Salaam and Mwanza regions, where the two universities are located. The choice of the two universities was based on their representation of the other universities in the country, both private and public, and among the leading universities in Tanzania. The researcher used a qualitative approach with a case study design to guide the study. The study sample comprised sixty-seven respondents drawn from council members and senate members

including the Vice Chancellor, DVC (Academics), DVC (Administration) as well as DVC (Research). Other respondents were Heads of Schools and Departments, middle-level managers (Human Resource Managers), trade union leaders, academic staff, and administrative staff. The study employed purposive and convenience sampling techniques to obtain the respondents. Purposive sampling was used to select the two universities and key informants including the Council and Senate members, Vice Chancellors, DVCs, and SAUT's Board of Trustees. Convenience sampling was used to select academic and administrative staff based on accessibility. Data were collected through interviews and documentary reviews. The documentary review involved empirical studies, previous research reports, journals, official documents, policies, and guidelines related to university governance at both institutional and national levels. Additionally, key governance frameworks, including university charters (UDSM Charter, 2007; SAUT Charter, 2010), TCU guidelines, and the Universities Act of 2005 (CAP 346) were analysed to provide the study context. The data analysis employed thematic analysis procedures, going beyond identifying codes, patterns, and themes to uncover broader insights. Using thematic analysis, the data were coded into small categories of information based on sub-themes (Poth, 2018). The sub-themes focused on the impact of bureaucratic model based on respondents' views.

Findings and Discussion

This section presents the findings and discussion focusing on the main theme of this study. Generally, the findings reveal that bureaucratic model has both positive and negative impact. The following section presents the positive impact of bureaucracy governance model.

Bureaucracy enhances order and stability within the organization

With regard to the positive impact of bureaucratic model, the findings reveal that, this model maintains order and stability within universities. This is attributed with systematic procedures, formalized structures and rules which are adhered with individual within the organization. Respondents from the administrative rank strongly felt that some bureaucratic components, such as chain of command, extensive rule-governed regulations, rational decision-making, and proper maintenance of official records are well applied and can enhance institutional order and performance. Administrators believe that if these aspects are well applied in the governance of universities, they can bring efficiency to the institutional performance. Commenting on this, one participant had the following to say:

> In my views, some bureaucratic components should be maintained in complex organisations, such as ours as they assure order within the institution. If well implemented, it will have a positive impact within the institution (*Interview # 25, UDSM, July 2023*).

This view was also shared at the SAUT, where a respondent in a superior position said:

> Bureaucracy is necessary for institutions, such as ours. If those in power are held accountable, subordinates will follow suit. If properly applied, it can enhance institutional performance *(Interview # 71, SAUT, August 2023).*

These views show that administrators consider bureaucracy as a positive tool of governance within universities. They see that universities need bureaucracy to make things move, as it creates order within the institution, especially when it is well applied.

Bureaucracy maintains professionalism based on competence

This is one of the positive impacts of the bureaucratic governance model. The issue of professionalism considers competence and qualification of the employees for skilled man power. This takes place through appointing top leaders and allocating different officials in different position based on competence. One respondent had this to say:

> The appointment and allocation of top managers rely on government guidelines and policies. For example, vetting and appointment of VCs and DVCs are based on TCU guidelines. Professors should hold the positions of VC and DVCs (*Interview # 85, SAUT, June 2023).*

Similar findings were observed at UDSM. The universities, whether public or private, are regulated by the same regulatory body, TCU.

Bureaucracy calls for observance of rules and regulations

With bureaucracy, there is an observance of fixed rules and regulations that suggest order in the organisation. It has been noted that the supervision of daily activities is governed by rules and regulations. One of the respondents from middle management said:

> In UDSM, operations are organised hierarchically and governed by rules and regulations. In executing these duties, nothing is done without following fixed rules and regulations to maintain order in the universities and enable universities to perform their duties systematically *(Interview # 30 UDSM, June 2023).*

Similarly, at SAUT, when meetings are conducted on certain operational issues, they have to follow the hierarchies and chains of command as asserted by one of the members of the top management:

> In our case, nothing could or should be implemented without approval from the board of trustees, except for academic matters. For matters of students and appointment of professional academic members for higher academic positions of leadership, there is external bureaucracy which is done by the TCU as a regulatory body for universities *(Interview # 30 SAUT, June 2023).*

Based on the assertions above, the issue of order has positive implications for organising matters within respective universities as it maintains order within the institution. It is easy to note, however, that only few aspects namely order, professionalism, rules and regulations of bureaucracy are noted as positive. The positive side of bureaucracy is mainly noted by the top-ranking respondents who see bureaucracy as an instrument that can help such complex institutions like universities. Meaning that, in some circumstances, bureaucratic model has to be applied in order to maintain stability for institutional performance. The issue of professionalism is also an important aspect on the institutional performance as it ensures availability of skilled personnel in running of the institution. observance of rules and regulations. Therefore, when applying the concept of bureaucracy in organization, it should be noted that there are strengths of bureaucratic model that could help in organizational performance.

However, the negative impacts of bureaucratic model have been noted at SAUT and UDSM. The following section presents the negative impact of bureaucracy.

Implementation of the organizational plan is affected by too many procedures

Employees from lower cadres feel that the bureaucratic model impedes some governance aspects as a result of the long processes attributed to the chain of command and centralised decision-making. Centralised decision-making within the respective universities and the central government negatively affects institutions' performance in terms of delay in institutional transformation, allocation of resources, and financial resources in particular. An administrative officer stated:

> In daily operations, some matters take too long for approval because of the prolonged decision-making process. Some issues should wait for approval from higher authorities such as the councils or senates. On my side, I see that some matters could be handled by the heads of departments, but in our

> case, most of the issues are taken to a higher authority for approval (*Interview #26, UDSM, July 2023*).

One human resource officer suggested that:

> For quick implementation of organizational goals, it is high time for heads of departments to be empowered to solve some of the issues rather than channelling all the issues to top management. We should reduce the number of procedures (*interview # 72, UDSM, August 2023).*

This implies that, in the absence of prolonged decision-making and approval, these institutions would be making headway towards the desired transformation. For example, if internal matters must wait for approval from the government or any higher authority, particularly those related to national policies and big projects, then the pace of implementation decreases. Organizational structures such as a chain of command and hierarchy stand in the way of progress. This calls for the reduction of lengthy procedures to ensure institutional performance.

Delay in responding to workers' requests leads to demotivation

Through long procedures, bureaucracy has been noted to negatively affect worker affairs. The pace of responding to the worker requests is too low. When one wants to process a request within the institution, one has to follow several procedures following hierarchies and chain of commands through different sections starting from the department and college level up to high-level management. One of the academic staff members said:

> Before 2021, that is, in the 1990s and the early 2000s, when one wanted to process a travelling permit or any request, had to write a letter channelled manually through files. One can imagine that one has to be authorised centrally for a simple thing, such as travelling within the country. I suggest that management should be more responsive to workers' well-being, especially in good working conditions (*Interview # 24, UDSM, July 2023).*

One respondent further explained that long procedures have affected even promotion procedures among the staff, as asserted hereunder:

> Promotion procedures versus remuneration packages for lecturers do not go on time. Until now, some lecturers have been promoted to different positions, yet they have not received new salaries. These procedures take a long time because of hierarchies and long procedures *(interview # 80, UDSM, August 2023*).

The findings indicate that some procedures lengthen the communication process. This delays the provision of feedback on workers' requests and needs, which are

essential aspects of workers' well-being. This tendency has negative effects on institutional performance. It kills the working morale to contribute fully to the organizational development in the operations of universities. The findings suggest that an immediate response to requests promotes working morale, thereby promoting institutional performance.

Financial management systems suffer due to centralization

The bureaucratic model is in the form of centralisation, in which governance systems are centralised which negatively affects institutional performance. The government's centralisation process has reached the point of centralising financial matters by establishing financial management systems. The centralisation of financial management systems has caused delays in the processing of financial matters. One ICT analyst said:

> I have noted some new financial systems, such as Mfumo wa Ulipaji Serikalini (MUSE). This system complicates universities' operations in terms of accessing funds for immediate institutional operations. There is a time when the fund is needed to address immediate issues, but you find that the process takes a long time to reach the approval stage (*Interview # 27, UDSM, July 2023).*

This indicates that the system delays the processing of financial matters and, consequently, the operation of institutions. Similar findings were shared by SAUT, as one respondent said:

> Provided that financial matters depend mostly on internal sources, internal financial systems are responsible for these processes. When the proposed budgets are requested, they should pass through many procedures. When a department proposes a budget, it should be taken to the VC, who then channels the request to the Board of Trustees. Here, it takes longer to process and approve *(Interview # 73, SAUT, August 2023).*

The assertion gives a very systematic way to be followed from the department level to the VC and up to the Board of Trustees, where the processes are too procedural. Public universities suffer more through MUSE, but private universities suffer from a longer tiring chain when the money is in the same neighbourhood. What we gather is that financial issues are key to every step in an institution, and when complaints are deafening, transformation is an illusion.

Bureaucracy from the government leads to skill drainage in universities

The findings indicate that, currently, the government has been noted to take out professors and other senior lecturers for administrative and political responsibilities. This type of bureaucracy which comes in terms of appointments from the government, negatively affects institutional performance. This leads to labour turnover and skill drainage from academic cadres. One of the administrative officers from the UDSM noted the issue of elite drainage as asserted hereunder,

> There has been a tendency to take several professors and other senior staff out of universities through government appointments to fill in different administrative and political posts. Producing a professor is not a simple task because it requires many resources. This tendency is real unhealthy for sustainability of universities *(Interview # 82, UDSM, June 2023).*

Since most university professors have been at the university since their tutorial assistantship days, and money has been spent on developing them in their careers. All of a sudden, they are appointed to fill the political and administrative posts, this negatively lead to shortage of professors at universities. The question is, for how long will the government continue appointing professors and other senior academic staff for leadership and political posts? If this issue remains unchecked, it leads to decreasing skilled manpower, hence affect sustainability of universities.

Bureaucracy limits institutional autonomy

This concern was reported by several respondents (across the two universities), who revealed the government's great control over universities. One administrative officer said,

> In the operation of our institution, we see government influence over universities has an impact on institutional decisions. The government provides directives. This situation makes our university depend on directives, policies, guidelines, and funding. Consequently, institutions' autonomy and freedom are limited, thus affecting some decisions on matters needing immediate measures *(Interview # 88, UDSM, October 2023).*

The findings imply that bureaucracy from the government affects institutional autonomy and freedom in the decision-making process, policies, guidelines, and financial matters through centralised systems monitored by the government. Universities do not operate independently. Some instruments guide operations to maintain quality and standards, whether public or private.

Bureaucracy affects the appointment of top university management

For UDSM, procedures on how the leaders are obtained have been mentioned by employees as one of the governance concerns of their respective institutions. Members of academic and administrative staff see that they are limited in the election of leaders for higher positions. One senior academician said,

> Employees are partly involved in proposing the names of leaders, which makes their participation minimal. There is a search committee that I see as 'tailor-made' to suit a predetermined leader. In my view, the staff should be given the right to propose and choose the people they want. *(Interview # 83, UDSM, July 2023).*

Despite the existence of a search teams, this assertion reveal limited democracy in the appointment of top managers. The appointment procedures for top management leaders of the university such as Council members, the Chancellor, and the Vice-Chancellor are presidential appointees. These procedures are stipulated

This suggests a change in appointment procedures, such as less engagement of the search committee and direct election rather than appointments.

Bureaucratic practices affect the rate of transformation

With regard to the impact of bureaucratic model on institutional performance, the effects have been noted on the transformation. The findings reveal that the model affect the transformation rate in a negative way. At UDSM, one of the Human Resource officers said:

> The pace of change in our university has been gradual. I think this is due to the way the system works. Long procedures, a chain of commands, and rigidity to changes affect the implementation of some issues. These bureaucratic practices slow down transformation in terms of implementing organizational plans *(Interview # 84, UDSM, July 2023).*

The delay in the transformation process may be attributed to long procedures. In turn, this impedes innovation and development in universities, thus affecting institutional performance as suggested by Taylor, (2013). Bureaucratic practices affect the pace of change and transformation within universities.

Similar findings are attested by one member of the top management from the same institution:

> When an institution relies on bureaucracy, the pace of transformation or change becomes very slow, thus affecting some innovations and

> developments that must occur in the respective institution. *(Interview #9, UDSM, June 2023).*

With these assertions, it is an indication that bureaucratic model prevails in the operation of these universities which prevent transformation to occur as it was expected. Both employees and top management see bureaucratic model as a hindrance factors for transformation. The findings suggest that, for university to attain effective transformation, it should reduce bureaucratic procedures such as centralised decision-making, hierarchies, and the chain of command

Similar findings are shared at SAUT, as attested by one member from the top management:

> In our case, as a private university establishing new centres, there are conditions that the institute has to meet. For example, TCU guides and permits expansion into new centres based on the requirements stipulated in the guidelines. This practice denotes the bureaucracy imposed by government organs *(Interview # 86, SAUT, June 2023).*

Respondents have a feeling that some of these 'good' standards are sought in a way that is too domineering to private universities. Most of these respondents see bureaucracy from higher authorities as having negative implications, as they perceive the concept negatively. The findings are in line with Mzenzi (2022), who revealed that in the current legislation, the chancellors of all public universities are required to be people of outstanding integrity with academic and administrative experience. This means that universities put emphasis on professionalism and competence of those responsible in governance matters and other related areas. In the respective universities, bureaucracy is associated with the influence of the final decision-making bodies, such as the councils and senate that provide directives to be implemented at different levels. Pollitt and Bouckaert (2023) see that bureaucratic management does not tell us how and who is engaged in formulating these policies and decisions within the institution. Such practice making limits employees' involvement at different levels. However, other bureaucratic components such as rules and regulations, hierarchies, and a chain of command affect institutional performance, both positively and negatively.

Based on the respondents' views, bureaucracy affects these institutions' performance in several ways. It has more negative than positive implications for institutional performance. This implies that the bureaucratic model has been found with limitations in the operation of SAUT and UDSM in the following ways; First, with bureaucratic models, management can be top-down rather than down-top

management. This limits the participation of employees in contributing fully to organizational development, as top-down management tends to give directives rather than receive from employees (Shaw, 2018). Consequently, it impedes several developments and innovations within the respective universities. Second, there are directives that comes from government regarding the operation of universities, appointment of top academic managers (such as VCs and DVCs), procedures regarding students' enrolment systems, and provision of loans for students' welfare. Due to the fact that universities operate under national guidelines, they must adhere to and operate according to government policies, rules, and regulations so as to maintain quality and standards in the provision of services. With regard to the operation of TCU, it is important to understand that, TCU operates at the country level and not to individual university as it is responsible for regulating all universities in Tanzania. Therefore, for the matter of quality, universities should run their internal matters while adhering to national policies

The findings suggest that when this model is applied, it might be inefficient to foster organizational performance in several aspects, such as the transformation equation. Most probably, those who responded to this question were raised by a non-leading group, the academic group, and the administration group.

Considering the role of the government in the operation of universities, it should be noted that the state wishes to monitor and assess institutional performance in terms of quality and standards. The institution has to have a governing board (council) that holds its managers accountable for achieving institutional goals, particularly the vice chancellor. There is an implicit acknowledgement that, the Ministry of Education, Science and Technology is entitled to hold institutions accountable in many respects and must retain overall strategic control over the sector (Fielden, 2008). Therefore, it is worth noting that TCU does not only monitor the performance of private but also public universities for the matter of maintaining quality and standards.

At the two institutions, the bureaucratic model affects the decision-making process as it makes it centralised. In the case of UDSM, directives come from the top management, starting from the council, senate, directorates, dean of colleges, and heads of department, and go downward to the level of employees. Similarly, at SAUT, bureaucratic practices are imposed by the Board of Trustees and the University Council under the Catholic Bishops of Tanzania (Tanzania Episcopal Conference) (SAUT Charter, 2010). With bureaucracy, the direct involvement of employees to meet their managers is minimal because of the structures and

hierarchies within the specified universities. Instead, a representational form of leadership is employed, where they are represented by the heads of departments in management forums. This limits workers' contribution to organizational performance, as they are not sure that all their views from the department are presented to the management. For example, employees from lower cadres perceive that limited participation kills innovative ideas for organizational performance. These findings are in line with Chuks (2017) and AIDhean (2017), who see the involvement of employees as an important aspect of an organisation's performance.

The findings of this study are in line with those of earlier studies that found that universities are characterised by bureaucratic components. This means that most universities remain highly hierarchical, practising centralised decision-making as top-down management, which is dominant and persistent (AIDhean, 2017; Buckner, 2016; Chuks, 2017; Pandya, 2011; Prasad, 2022). These bureaucratic components, such as centralised decision-making, have caused most universities to delay achieving organizational goals, including transformation (Buckner, 2016). On the other hand, the bureaucratic model maintains order due to hierarchies, chains of command, fixed rules, regulations, and division of labour, as well as professionalism within the respective universities. This suggests that the operation of different governance models in universities may help them benchmark their governance models with those of other institutions. If universities opt to practice extreme institutional autonomy, they should have the capacity to run their affairs, including funding and other issues that require support from the government.

However, when it comes to practice, the situation shows that state influence over the governance and operation of universities through their organs is inevitable, as most universities depend on government grants to run their affairs, particularly public universities. However, government control over Tanzanian public universities has existed since the establishment of the first university in Tanzania, with UDSM being the case (Lawi, 2008; Luhanga, 2009). TCU (2020) highlights that the state-control model (bureaucracy from the central government) sets standards to be observed by all universities and colleges in the provision of quality education and the conduct of some academic matters. As stated by Mzenzi (2022), for the matter of quality, government organs set standards for quality provision of services. This means that bureaucracy is inevitable because of the government's role in the operation and sustainability of these institutions. Based on these arguments, there is controversy regarding the practice of institutional autonomy, as opposed to the role of the government in Tanzanian universities.

What is needed is checks and balances on the operation of these universities and the way autonomy and state control over universities are practiced to strike a balance towards institutional performance. As stated by Buckner (2016), state control over universities ensures that standards and quality in the provision of education are maintained according to the country's guidelines and policies. It is worth-noting that bureaucracy from the government is a matter of quality and standards, but not for suppressing other universities. Weber's notion does not guarantee the acceptance and overreliance of this model in the operation of universities. Other governance models should be put in place to supplement one another in terms of their strengths and weaknesses (Trakman, 2008).

Evidence from the documentary review resonates with the main findings from the field. For example, Mzenzi (2022) and TCU (2020) reveal that the bureaucratic model has several implications for the performance of universities as academic institutions. The analysis of these implications is based on features of bureaucracy as per Weber (in Pandya, 2011; Prasad, 2022), including the chain of commands, hierarchies, long procedures, and centralised decision-making. Moreover, the issue of authority has been noted to affect the university's performance in terms of the flexibility of the institution, due to legitimacy and formalised powers. This kind of authority limits the university's flexibility in accommodating non-formal kinds of power and influence from the external environment. In addition, bureaucracy falls short as it emphasises a formal structure that gives very little about the process of dynamism. This affects university performance. Moreover, the bureaucratic paradigm does not explain how an organisation changes over time, thus negatively affecting the arrangements and pace of change within universities. Furthermore, bureaucratic paradigm does not deal with extensive policy formulation rather, it explains how policies may be carried out most efficiently after they are set but says little about the process by which a policy is established in the first place (Buckner, (2016). The issue of carrying out policies without taking part in their formulation, mighty have implication on the way those policies are implemented, as may be reinforced out of context.

Finally, bureaucracy, does not deal with political issues, such as class struggles of groups within the university that want to force policy decisions toward their special interests, where participation can be manifested (Trackman, 2008). This argument implies that, bureaucracy does not allow class struggles, which brings about competition between managers and subordinates. Rather, it suppresses such acts to avoid resistances, strikes and the related consequences. The issue of preventing

such class struggles among workers has implication on institutional performance as it reduces resistance and strikes among workers, hence institutional stability. However, suppressing the workers from class struggles, may also lead to resistance, strikes as well as complaints, hence preventing changes within a given institution. This suggests giving chances to workers to air out their views and working on workers' complaints so as to reduce class struggles within the institution, which in a long run could have negative implication to institutional performance.

It is worth-noting that the centralization exercised by the government in terms of introducing centralised financial management systems such as MUSE were intended to enhance efficiency in financial matters to monitor the expenditure and flow of government funds. On the contrary, these systems have complicated the financial flow for operations of public institutions, universities in particular as there is delay in approval of such fund. The issue I see here is that, the delay in the approval and provision of fund for operational issues might be caused by inefficiency of the system or implementers who are involved in the process. It should be noted that the challenges associated with centralised systems are not only for public universities, but also for private universities and other government institutions. The centralised systems by the government are not only for MUSE, but also for other centralised systems, such as National e-Procurement System of Tanzania (NEST) which operates centrally to monitor government procurement arrangements. Similarly, NEST has been associated with a number of challenges, including delays in the implementation and completion of big government projects. This calls for rechecking the efficiency of these centralised systems, along with those responsible for decision-making, channelling, and approving financial matters. The findings suggest that the reduction of bureaucracy from higher authorities and within universities and the integration of other models to supplement the inefficiency of bureaucratic. Through this, institutional performance in terms of transformation and timely implementation of organizational plans can be realized, hence, help universities move from where they are to another point, particularly, enhancing transformation in universities.

However, the complexity of universities should not justify embracing bureaucratic practices that hinder institutional performance. As suggested in the findings, some components of bureaucracy that could foster institutional performance, such as assigning tasks based on merits and expertise, with a specialised division of labour, recruitment, promotion based on merits, emphasising technical competence, and rewarding seniority or achievements, to ensure professionalism, as well as a clear

hierarchy of authority, order, a clear hierarchy of authority, and rational decisions, can be maintained to ensure high performance of these entities. This suggests rechecking the way bureaucracy is practiced within these institutions to see whether the delay or long processes are caused by the bureaucratic governance system itself or the implementers responsible in the given sections to approve such matters. In addition, follow-up on the causes of these delays in processing financial matters or other requests that need immediate measures is important. However, bureaucratic practices that lead to inefficiency in institutional performance, such as static to changes, centralised decision making, goal displacement, unintended consequences, and inhuman organisation where there is an impersonal relationship and closed system (Prasad, 2022), should be reduced or eliminated to enhance institutional performance.

Empirical evidence (Trackman, 2008; AIDhean, 2017; Mzenzi, 2022; Taylor, 2013; MacGregor, 2016; Buckner, 2016; MacGregor, 2016; Rowlands, 2017; Scott, 2011) suggests that to achieve effective institutional performance, the issue of governance models in place should be taken into consideration along with other structural matters and resources. In addition, other performance drivers such as quality leadership, managerial procedures, and other governance tools such as policies and guidelines should be considered. Moreover, the decentralisation process through employees' and other stakeholders' involvement is of great importance as it helps in obtaining innovative ideas from employees to foster development and enhance institutional performance within the given institutions (Chuks, 2017). The shared governance model also adds value to universities because it involves reviewing and improving the university's policies and procedures, allowing contributions of stakeholders in leadership governance from the internal and external environments (Taylor, 2013). However, there is a need to revise and devise governance systems to adopt a governance model that strikes the balance between bureaucratic practices and stakeholder engagement (AIDhean, 2017). This study proposes the integration of governance models, such as collegial and shared governance, to complement each other in terms of strength and weaknesses. A dynamic environment and adaptability to changes should be considered to cope with global trends and the competitive environment of HEIs, particularly those changes which are beneficial for organizational growth.

Conclusion and Recommendations

This study explores the impact of the bureaucratic governance model on institutional performance. The study found that, bureaucratic model affects

institutional performance in several ways, both positively and negatively. The impact has been noted in timely implementation of the organizational plans as well as performance of the respective universities. The study found that SAUT and UDSM embrace bureaucratic features, such as centralised decision-making, hierarchies, a chain of command, fixed structures, rules, division of labour, and authority. All these components of bureaucracy have been noted to have both positive and negative implications for the performance of SAUT and UDSM, with the negative outweighing the positive. In conclusion, university leaders should be flexible and ready to adapt to positive changes taking place in external environments to meet the market demands in this competitive environment of HEIs subjected to globalisation, knowledge-based economy, advanced technology, and market forces. This study recommends the adoption of a hybrid, that could help reduce bureaucratic tendencies from the government and within respective institutions. This kind of governance framework allows the application of other governance models and approaches that could help universities move from where they are to a better position. The hybrid model helps universities sustain competition in the current era of globalisation and a knowledge-based economy. Several aspects of governance can be achieved through hybrid governance framework. Regarding recommendations Policymakers and education leaders can use these results to examine their practices and set strategies to address the governance challenges associated with governance models. Policymakers and university administrators should revise national and institutional policies and guidelines to reflect and cope with current changes and challenges associated with globalisation, knowledge, and market forces to ensure the good performance of universities. Furthermore, the study recommends that the government reduce bureaucracy (state control model) over universities to enhance institutional autonomy without limitations. Meanwhile, administrators should reduce bureaucratic practices within their institutions and adopt a more flexible model that fosters institutional performance, along with revising other governance tools such as organizational structures, policies, and guidelines to suit the needs of universities in this current era subjected to several changes. Provided that this study focuses on the bureaucratic model, the study recommends that future studies focus on other subdimensions of governance that have not been examined at this level, such as undertaking research on individual governance model.

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Analysis of Modalities in Which Professional Training Are Executed at Workplace: A Case Study of Public Secondary Teachers at Morogoro Municipal

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Abstract

This study focused on a critical analysis of the modalities in which professional training are executed at workplace among public secondary school teachers in Morogoro Municipal. It explored the modalities used by public secondary school teachers in Morogoro Municipal to execute their professional training at workplace by educators and administrators. The study adopted a qualitative case study approach, and one-on-one semi-structured interviews. Although, respondents commented that professional training which are conducted at their workplace help them to attain new knowledge, skills, attitudes, values, and dispositions still within such dispositions there are pride, self – esteem, team spirit, commitment, drive, adventure, creativity, and vision. These findings indicate that teachers must appreciate and accept the need to grow professionally. This study contributes significantly to the understanding of the various ways in which teachers' professional training are conducted at the workplace. Finally, the study recommends that teachers' intrinsic drive towards self-professional training at the workplace cannot be matched with any external pressure from the educational managers.

Key Words: *Professional training, work place, secondary schools*

Introduction

Many modern organisations and corporations support lifelong learning at the workplace to enhance the working process and innovation (Clow, 2013). Clow

adds that training at workplace develop some skills and abilities necessary for the effective exercise of duties or tasks with a high degree of complexity and diversity to those previously exercised, according to the job description. In an increasingly competitive and dynamic educational landscape, the quality of professional training received by educators plays a crucial role in shaping students' outcomes and overall institutional effectiveness (Neacsu, 2015). Moreover, effective teacher trainings are pivotal not only for enhancing pedagogical skills but also for fostering a culture of continuous improvement among educational staff. However, the effectiveness of these training modalities can vary significantly based on factors such as administrative support, resource allocation, and the specific needs of the teachers. For example, public secondary schools in Morogoro Municipal, Tanzania, face unique challenges and opportunities in delivering professional development programmes tailored to the needs of their educators. This study seeks to critically analyse the modalities through which professional training is implemented within these institutions, encompassing both formal and informal learning mechanisms. By exploring the nuanced modalities through which training initiatives are implemented, and their impact on individual and collective performance, this research bridges the gap between theory and practice in the real education profession. The study analysed the modalities in which professional training is executed at the workplace. The research aims to address understanding current training practices in order to identify successful training strategies that enhance teacher performance and student outcomes. Also, the study aims to evaluate effectiveness impact on teaching quality in order to explore how feedback from training sessions is utilized to improve future training initiatives. Moreover, the study may seek to uncover the challenges faced in implementing effective training modalities such as resource limitations, insufficient time for training, and lack of trained trainers. These will help in proposing solutions or improvements to the training process in order to provide a comprehensive understanding of how professional training is executed at the workplace, ultimately leading to improved training strategies, enhanced employee performance, and better organizational outcomes for public secondary school teachers. The study was guided by Victor's Vroom expectancy theory of motivation (ETM) in 1964 (Desimone, 2009). The theory falls under the group of process theories of motivation as opposed to needs theories of motivation. This theory has three major concepts; valence, expectancy, and instrumentality. Valence involves a person's emotional attitude towards the end result of a given action or behaviour. Expectancy involves a person's belief that they can successfully accomplish a particular action. While instrumentality

involves the belief that one will get something from an action, one will receive a reward (outcome) from a given action. This theory is relevant to this study because teachers' commitment to implementing the curriculum cannot be ignored, and students' commitment to learning is paramount to learners' academic achievement. Not only that, but also Vroom's Theory is valuable at the workplace through helping managers and leaders motivate their staff (Riggio, 2015). Alternatively, the theory will be applicable by managers and leaders as a valuable tool in understanding and potentially alleviating workplace bullying.

Methods

The study was conducted in Morogoro Municipality, located in the eastern part of Tanzania, approximately 196 kilometres west away from Dar es Salaam. The target population was public secondary school teachers who are the employees of Morogoro Municipal Council. The reason behind targeting only public schools is due to the use of various teacher retention strategies which include job security. The study involved a sample size of 20 female teachers and 20 male teachers based on their number at workplace, age, years of experience in teaching, and educational background. This was observed purposely to ensure gender diversity and balance in analysis of professional modalities. Selection criterion was based on the factors that allow a balanced perspective, contributing to a more equitable analysis of the training modalities. Data were gathered through semi-structured interviews and focus group discussion. A thematic data analysis was used in this study. This type of data analysis involved three steps; transcribing the interview results and synthesising the data into themes. Thick description quotes, and presentation of participants' views and attitudes towards the modalities in which secondary teachers' professional training are executed at workplace in Morogoro Municipal.

Findings and Discussion

Facts from interviews on the ways in which professional training are executed at the workplace, and focus group discussion revealed several ways in which secondary school teachers can use professional training at the workplace. The ways observed in this study are based on staff academic gatherings. The next section provides details of the results.

Training through practice

The interview data showed that the teachers learned from their daily routines and practices. This happened when teachers performed their teaching and learning tasks

such as administrative duties, preparation of schemes of work, lesson plans, and lesson notes. Their work duties developed their professions at their workplaces. When Teacher 'A' and Teacher 'B' began teaching, they were incapable of performing on-duty tasks (TOD). They were unconfident in what they were doing. Eventually, they became knowledgeable and confident about their work through their daily practices. This was captured when one teacher asserted the following excerpt:

> At the beginning it was not easy, most of the things were new, I did not know how to conduct and prepare duties and activities when I was on duty, for example to give announcements during the school parade even to teach! But with time I managed… *(Data from the field:11/6/ 2023).*

Moreover, the current findings revealed that teachers learned by reflecting on their daily practices. For instance, novice teachers were not confident in teaching upper classes, such as form four. To support this, one teacher asserted,

> …when I began my work, I was assigned to teach form four classes. I was afraid of teaching form four because it is an examination class. Therefore, when I taught and reflected on students to see whether they understood what I taught, and if they were motivated to learn or not. If I found that they were not motivated I had to find out what caused that situation to my students. Then I made sure that the problem solved. But nowadays, I thank God, I am a competent teacher teaching geography in form four *(Data from the field:14/6/2023).*

The findings from the field and experiences showed that through the training, and daily activities at their respective workplaces, teachers develop professionally. Moreover, dealing continuously and directly with student in the course of learning made teachers recognize the discrepancies between what they thought they taught and what students seemed to have learned. Additionally, examining students' work gave teachers the opportunity to closely examine their work in collaboration with their colleagues. This is a very potential and powerful professional development activity. It was made clear that any type of assignment can be used, as long as it is detailed to offer insights to students' thinking capacity.

In addition, this study revealed that appointed heads of departments and different committee chairs had learned by doing. There was no programme that helped them learn how to go about. They learned through experience as they solved the problems they encountered. This means that teachers learned to perform their duties in the course of work and enabled them to develop professionally in their school context. This current finding appears to relate to that of Fullan (2007) who noted that

teachers acquire a variety of skills and knowledge by performing their professional roles effectively. He added that teachers need to learn while working through which they can test out, refine, and receive feedback on their practice.

It was also observed that very little was going on in terms of teacher induction. This means that the school leaders did not understand the meaning and importance of induction. The interpretation from the interviewed teachers regarding induction at the selected secondary schools were very narrow. The new teachers were introduced to the school environment and students at the assembly for only one or two days, marking the end of their orientation stage. In reality, induction involves not only introducing new teachers to staff and students but also showing them the school library and classrooms. It should also include full lessons in teaching as a profession. Induction needs to be given more serious attention and time for teachers to familiarize themselves with the new job, position, and context. Anthony and Haigh (2012) state that in New Zealand, induction programmes are planned in schools as systematic programmes of sustained assistance to beginner or novice teachers for two years.

This finding supports the results of Blandford (2000) who investigated how professional development can be managed in London schools. He argues that effective induction ensures that newly qualified teachers or any new teacher in the school context feel supported, comfortable, and confident. The contrary was discovered in this research conducted at the Institute of Adult Education. The interview as revealed by one head of school who had this to say:

> …we have no training system for the new teachers. What I do I send them to the heads of departments who introduce them to other teachers, students and the school complex… *(Field data:18/6/2023).*

This study revealed that teachers learned a variety of skills required for their work while participating in their daily routines. These skills included preparing schemes of work, lesson plans, lesson notes, writing logbooks, and setting tests and examinations.

Interaction with staff members

Interviews with teachers, heads of schools, and heads of departments from studied secondary schools indicated that teachers had learned through informal or formal interactions with other teachers. The interviewed new teachers said that through their good relationships with each other, they were able to learn different tasks, content knowledge, and good teaching approaches. This was done through

discussions with more experienced teachers, especially those teaching the same subjects. It was also revealed that interaction was one of the ways in which teachers developed professionally at their workplace. One teacher said:

> …when I find something very difficult relating to teaching and learning, I talk to other teachers and hear from them. I discuss with them, and I learn something new from the discussions. *(Field data: 20/6/2023).*

Furthermore, the data from the interviews with secondary school leaders and teachers revealed that teachers in secondary schools learnt from formal discussion in staff meetings, as well as in departmental meetings. Among the things that teachers said to have learned in the academic meetings were the current challenges in the teaching of their subjects and how to go about them. To merit this, one teacher said,

> ...Our head of department has conducted several departmental meetings, and the last one was on 9/ 11/ 2012. We discussed different departmental problems. For example, what caused our students to perform very poorly? We took time to talk to each other about the causes of poor performance to our students. There were a lot of contributions. Finally, we produced some strategies on what to be done in order to attain our goals *(Data from the fied:25/6/2023).*

Similarly, the analysis of documents from science stream (physics) departmental meeting supports this. It was noted that from the document that "We discussed several issues concerning our profession, and came up with strategies of teaching and learning such as group discussion that would hopefully improve our school academically."

This is similar to a study by Bezzina and Calleja (2018) who revealed that teachers learn when they come together and talk about classroom practices. Similarly, Eraut (2002) discovered that teachers grow professionally by asking questions, seeking feedback from colleagues and students, and generating knowledge for their practice by working in teams. Participants from different backgrounds share information that help to solve problems, and help each other gain knowledge. This enables teachers within the school or their departments to work collaboratively, and share information (Elseveier, (2010).

This study also supports the findings of Russell et al. (2009) in Malaysia whereby in their article on initial and subsequent trials, they examined the need for support and interaction in distance professional development. Koda (2014) adds that

opportunities should be designed to enable teachers to share knowledge and develop professionally.

In this study, it was discovered that teachers learned by working with others, sharing knowledge and skills, and seeking help or solutions. This indicates that interpersonal relationships within the schools were good to the extent that brought them to informal discussions. The interactions between and among teachers were good and emphasized in departmental and staff meetings. As Moller et al. (2009) adds that teachers develop professionally when there is meaningful interaction between them.

Furthermore, the current findings of the study show that there were structured departmental, and staff meetings in the school calendar where teachers shared their experiences and learned teaching skills and strategies. This indicates that perhaps the leadership recognized meetings as important structures for teachers to gain knowledge, improve their practices, and develop professionally. This finding concurs with Komba et al., (2006) who clarified the practices of in-service teachers' training in Tanzania. The trainings include formal mentoring programmes developed in situations such as advice that new teachers receive from head teachers and ward education officers. Other forms of practices were meetings held at the school and cluster levels to review and reflect on a regular basis practice. Again, Komba et al., (2006) emphasize that the establishment and effective utilization of teachers' resource centres (TRC) is an important element in TPD. Informal practices include team teaching and the sharing of experiences and educational resources among teachers, which greatly contributes to self-improvement. The teachers also developed professionally through reading books as discussed in the following section.

Reading Books

Field data revealed that most teachers learned as they read books. They learned by reading books available at their workplaces before going to teach in the classroom. Although books were not enough, every subject had reference books kept by the heads of the departments. The availability of reading materials encouraged most teachers to read. The studied secondary school teachers liked reading several books and texts. Incidental observation revealed that some teachers who were busy in the staff room prepared lessons by reading books before going to classes.

Ancheta (2022) conducted a study on teachers' knowledge level of reading, content areas, and reading instruction admitted that teachers acquire knowledge and skills

by reading books and educational journals. This also corroborated the developmental plan document analysis of one of the studied schools which indicated that "in July next year-2024, we will increase the number of books for teachers to improve lesson preparation and to promote a reading culture in the school that will help teachers to develop their skills and knowledge" (Minutes of school development plan, 2012-2015).

Teachers, as a group of adult learners are self-directed, ready to learn, experienced, task-centred, and intrinsically motivated (Knowles, 1983). Typically, they prefer open-ended learning opportunities and voice in the direction and pace of their learning. They approach learning with clear goals in mind and use their life experiences to make sense of new information. Additionally, adult learners tend to be intrinsically motivated by opportunities to address problems and create solutions that directly relate to their lives (ibid).

This study also revealed that both the studied secondary schools had no libraries. Books were kept in the heads of school or academic offices. This was verified when the head of the geography department at one school said:

> …. Books for at least every teacher is there in the head of the school's office…, but books are not enough for all students… *(20/6/2023).*

In addition, one head of school had this to add:

> … here we have a number of books of different subjects as you see these four big boxes...I purchased them a few days ago and I received them yesterday…but the problem is that we have no library to keep them… *(Field data:14/6/2023).*

This implies that both school leaders understand the importance of the availability of books for teaching and learning processes and TPD. This is related to Caspersen (2015) who argued that teachers learn in their workplace by reading books because they are available. According to Caspersen (2015), writing a research paper about teachers' learning activities at workplace and found that reading is one of the important ways in which teachers can develop professionally in the school.

Networking

Through networking, teachers can learn and develop their teaching professions. This was evident during interviews with school leaders, heads of departments, and teachers. They revealed that the schools had networks with other schools in the zones and districts. This network provided teachers with opportunities to learn with other teachers from other schools. Networking involved setting, moderating,

marking mock, zonal, ward, and regional examinations. During the interview, one teacher said,

> We have subject panels where we set tests and examinations, moderate marking schemes... also we participate in marking regional, ward, zonal and mock examinations. There we gain experience in marking papers so when we come back we tell other teachers how we have experienced from the whole process. *(Data from the field:14/6/2023).*

This was supported by staff meetings minutes which expressed that "we have organized marking panels for form two and form four; teachers should make sure they mark the examinations together". Additionally, the study found that there were subject clubs whereby teachers who teach the same subjects from different schools meet and discuss classroom practices. In subject clubs, teachers solve problems related to teaching and learning. This was revealed when one head of the school said,

> …teachers have to attend subject associations for each subject, and this helps teachers from different schools to learn from each other…each school raise funds so as to facilitate this activity. *(Data from the field:18/6/2023).*

This was confirmed by one head of the science stream from one school, who said:

> If there is any difficult issue related to our practices, we refer it to the one who is going to present it before the members of the subject association. The members of the subject association would discuss it and when the representative comes back the solution is given to the teachers. *(Data from the field:12/6/ 2023).*

Networking helped teachers gain skills and knowledge from other teachers both outside and inside the school. The knowledge and skills gained were then taught to teachers in the schools through formal staff and departmental meetings. Moreover, networking worked as a motivation to teachers who liked attending outside seminars as they got paid. This demonstrates the significance of networking as a TPD source.

However, Mosha (2006) found that teachers' motivation was the most important factor. A teacher's intrinsic drive towards self-improvement cannot be matched by any amount of pressure from educational managers. In TPD, the teacher must perceive it positively. The teachers must appreciate and accept the need to grow professionally. Teachers who positively perceive professional development are eager to attain new knowledge, skills, attitudes, values, and dispositions. Within such dispositions are pride, self – esteem, team spirit, commitment, drive,

adventure, creativity, and vision. The teacher must own all of these attributes (Komba & Nkumbi, 2008).

This finding supports the results of Moolenar (2012) in a study conducted in Chicago regarding a social network perspective on teacher collaboration in schools. It was found that networking facilitates teachers' learning and motivates them to work hard in schools. Also, Swai (2015) added that teachers develop professionally by networking with teachers from other schools or institutions where they meet and share ideas. Through networking teachers interact with other members both within and out of school to share subject matters or activities that have an impact on teaching and learning. The study shows that school leaders promoted a collaborative culture between teachers and schools to develop teachers professionally. School leaders understood the benefits of networking with teachers from different schools, which led to better teaching.

Classroom Scrutiny

During the interviews with the teachers, it was found that they did not use classroom scrutiny to develop professionally at their workplaces. Most of the teachers interviewed said that classroom study was not a common practice for them to develop professionally at their schools, and there was no evidence of formal classroom observations in their schools. In fact, there was soreness among the teachers who observed each other in the class. This was revealed when one of the heads of the department said,

> We used to inspect only student teachers from colleges when they come to our schools for teaching practices but in this school, we do not observe each other. *(Data from the field:12/6/2023).*

This was also confirmed by one teacher who asserted that:

> Classroom study is not common in our school…here there is a tendency that if teachers are teaching and if you pass near their class they keep quiet, they do not want other people to hear what they are teaching. *(Field data:14/6/ 2023).*

Moreover, current findings indicate that class observations rarely occur within departments. This makes it difficult to teach a team on some topics. When one teacher was teaching others, they sat in the classroom listening and observing. At the end of this period, they sat together to discuss and share their experiences.

Findings from this study also concur with Siddiqua's (2019) study on professional growth opportunities to support staff in Athens. She discovered that classroom

observation is a type of learning whereby teachers observe each other's teaching. This leads to the acquisition of new knowledge, teaching and learning skills (strategies), and professional development.

However, during the interview, one of the participants, a science teacher, said that a very few teachers, especially in science streams, learned by observing other teachers teaching. This happened coincidentally. This happened when others were preparing for practical in the laboratory, and other teachers were teaching. In his explanation, he says,

> … a very few teachers learn incidentally by observing others teaching. This happens when one is preparing for practical and at the same time another teacher is teaching in the same laboratory, therefore, teachers can observe each other... *(Data from the field:12/6/ 2023)*.

This implies that the majority of teachers had not learned through classroom observations or studies, except for a few teachers who only engaged in incidental general observation. According to Ovens (1999), knowledge is not fully communicable by written accounts, and the best way for one professional person to understand another's professional practice is to witness, share, and discuss it with them.

These results are in line with a study in Pakistan by Alman (2006) who conducted a study on the effects of in-service training programmes and teacher professional growth as self-perceived based on gender, location, teaching experience, level of certification, and service after training in two variables: motivational techniques and subject matter knowledge. He argues that efficiency that teachers gain by virtue of training remains for a short time. After a few years, they forget many principles and practices learned during their training period. Therefore, it was obvious that to reach the objectives, employees should be retrained through often seminars and in-service training programmes. It was concluded that teachers with high academic qualifications performed well in terms of content knowledge and motivational techniques. Therefore, TPD is very important to teachers' capabilities.

Similarly, the current study supports Akinyele (2007) who conducted a study to determine whether staff training had any implication on the professional growth, behaviour, attitudes, skills, knowledge, and achievement of the business goals of organizations in Nigeria. The study found that effective professional training led to the acquisition of the skills and knowledge required for employees to achieve effective professional development and job performance. It was also revealed that

training had a highly positive impact on employees and reduced the nature of job hazards in the accomplishment of corporate objectives.

Sumra (2004) indicated that in Tanzania, primary school teachers' working conditions in terms of housing, transport, ongoing training, adequacy, and out-of-school income were associated with professional growth and job performance. The study also examined the attitudes of teachers towards the teaching profession and reasons for joining and staying in the profession. The research report concluded that teachers' living conditions do not reflect their status. On the other hand, Sumra supported that extrinsic and intrinsic motivation were the most essential performance factors. Mark (2015) commented that not all performance problems are explained by lack of motivation. The lack of training can prevent a motivated employee from professional development and performing well. The author and his colleagues question the tendency to hire a motivated person to do a job without training him/her to do so properly.

However, Combes et al. (2021) found that teachers' intrinsic and extrinsic motivations are the most important factors. A teacher's intrinsic drive towards self-improvement cannot be matched by any amount of pressure from educational managers. In TPD, the teacher must perceive it positively. The teacher must find important and accept the need to grow professionally. Teachers who positively perceive professional development are eager to attain new knowledge, skills, attitudes, values, and dispositions. Within such dispositions are pride, self – esteem, team spirit, commitment, drive, adventure, creativity, and vision must be owned by teachers (Asio, & Riego de Dios, 2018).

Conclusion and Recommendation

In conclusion, the findings of this study suggest that teachers' intrinsic drive towards self-professional training at the workplace cannot be matched with any amount of pressure from educational managers. This is due to the fact that the heads of secondary schools in Tanzania do not have structured programmes for developing the teachers in different spheres. Therefore, teachers can use several methods such as personal effort and staff academic gatherings. There is a need for other research that will determine the outcome of teachers' professional diversification in their workplace if it is suitable or not to what extent. Basing on the findings and conclusion made, the study recommends the following: First, a combination of different training modalities to cater various learning preferences and needs of teachers. Second, professional development programmes should be

tailored to the specific context and challenges faced by teachers in Morogoro Municipal. Understanding the local educational environment can help in designing more relevant and effective training. Third, providing continuous support after training sessions, such as follow-up workshops or mentorship, to ensure that teachers are able to implement what they have learned in their classrooms. Fourth, encouraging collaboration among teachers, such as through peer learning groups or teacher networks, could be a key recommendation to promote the sharing of best practices and continuous improvement. Fifth, regular assessments and feedback mechanisms be put in place. This paves a way for improvements to be made and ensures that teachers are gaining valuable skills. Six, integrating modern teaching tools and technology in professional development programmes is recommended, especially when is deemed to enhance the effectiveness of the training.

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Evaluating the Availability of Radiological Diagnostic Imaging Equipment for Digital Imaging Informatics Systems in Tanzania's Health Facilities

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Abstract

Radiological digital imaging informatics is potential in enhancing healthcare delivery in resource-limited settings, particularly rural areas in developing countries. It enhances diagnostic precision, reduces unnecessary referrals, and facilitates access to expert's radiological advice. In Tanzania, access to radiological imaging services is limited, especially in rural areas due to the shortage of radiologists. This study examines the availability of radiological imaging equipment to support the adoption of digital imaging informatics systems. A mixed-method approach collected data from 56 radiographers in selected healthcare facilities, including; national, regional, and district hospitals, as well as community health centres. Findings reveal the presence of imaging systems like Digital Radiography (DR), Computed Radiography (CR), along with advanced modalities such as CT Scan and Magnetic Resonance Imaging (MRI.) This study underscores the importance of transitioning to digital imaging informatics to bridge the diagnostic gap in Tanzania's healthcare sector. By addressing existing challenges, the adoption of digital imaging informatics systems can contribute significantly to the realization of universal health coverage in Tanzania.

Keywords*: Digital imaging informatics, radiological equipment, healthcare facilities, Tanzania.*

Introduction

In developing countries, rural health facilities often lack expert knowledge to diagnose and treat some clinical cases correctly, resulting in referrals of patients to higher health systems. To reduce the quantity of needless referrals, radiological digital imaging informatics should provide expert with knowledge and advice at the point of care, both within and outside health facilities. In order to achieve this, proper functioning of diagnostic imaging equipment is required.

Digital imaging informatics systems are integral part to enhancing healthcare delivery and diagnostic precision. Globally, the shift from analogue to digital diagnostic imaging system has improved diagnostic capabilities and accessibility of radiological medical imaging (Siegel & Reiner, 2020; Chriss, 2015). Studies indicate that digital imaging informatics not only improves diagnostic accuracy but also accelerates workflow compared to traditional systems (Smith et al., 2020; Martinez & Villalba, 2020.). Additionally, digital systems support secure image storage and retrieval, reducing the risk of loss or damage to radiographs (Soroosh et al., 2019).

The government of the United Republic of Tanzania (URT) is committed to provide and ensure access to the improved medical care to its citizens by 2030, especially in rural areas in which the government is working hard to make radiology and imaging services accessible (URT-MoH,2022). Despite these efforts, the current literature point that Tanzania has a few medical Radiologists (a fewer than 122) who can interpret diagnostic medical imaging to serve a population of 61,741,120 (MoH, 2022; MOHCDGEC, 2021; NBS, 2022, Ngoya, 2016). Due to such a shortage of experts, patients in rural areas frequently get referrals to referral hospitals to receive health care. This situation further poses pressure on social services including healthcare sector, more particularly in a country like Tanzania which is experiencing a rapid population increase.

In a resource-limited setting, transitioning to digital systems faces challenges due to technological, proper medical imaging equipment and infrastructure constraints (Grover, 1997; Ngoya & Muhogora, 2016; URT MoH, 2022; WHO,2009; Ogunyemi & Raji, 2018). This paper examines the availability of Radiological medical imaging equipment in the selected healthcare facilities in Tanzania in order to adopt digital imaging informatics systems.

Methodology

This study used a mixed-method approach in order to provide a comprehensive analysis of the research study (Creswell, 2022). Structured questionnaires were used to collect quantitative data from 56 radiographers in the selected healthcare facilities in Tanzania. The study was carried out in the following health facilities; Muhimbili National Hospital (MNH), Muhimbili Orthopedic Institute (MOI) both serving as National referral hospitals located in Dar es Salaam. Others are Tumbi and Kitete Regional referral hospitals located in Coast and Tabora regions. In one hand, the Community health centers included; Busondo and Itobo, representing health facilities in rural areas. On the other hand, district hospitals with access to medical doctors were represented by Nzega district hospital.

These health care facilities were selected for their professional experience and expertise in health care, geographic representation, variation in healthcare settings (urban hospitals, rural clinics and infrastructural and technology set ups). This means that, MNH and MOI have the required experience and knowledge in implementing radiological imaging systems. The questionnaire assessed the availability of key radiological imaging equipment, including DR X-ray machines, CR X-ray systems, analogue X-ray machines, CT scanners, MRI scanners, and ultrasound machines. Qualitative data were also gathered from different Government reports, and policy documents.

Findings

This section presents the results of the study on Evaluating the Availability of Radiological Diagnostic Imaging Equipment for Digital Imaging Informatics Systems in Tanzania's Health Facilities. The findings are presented in line with the research objectives as follow:

Availability of Medical Radiological Diagnostic Equipment

All 56 respondents (100%) reported the presence of radiological medical imaging equipment in their departments as shown in Table1.

Table 1: Availability of Radiological Equipment.

Equipment Availability	Frequency	Percentage (%)
Available equipment	56	100 %
Equipment that is not available	0	0%
Total	**56**	**100%**

Source: (Field data, August 2024)

Types of Available Radiological Equipment

The study revealed that 54 respondents (96.42%) of the health care facilities claimed to have DR X-ray machines, 27 (48.21%) of the health care facilities use CR X-ray machines. Meanwhile, 7(12.5%) still use analogue X-ray machines. Further findings indicate that 39 (69.64%) of the health care facilities have CT scanners, 32 (57.14%) have MRI scanners, and 56 (100%) have ultrasound machines. This is a positive indicator for digital imaging systems transformation.

Table 2: Types of Radiological Equipment in the selected Healthcare Facilities in Tanzania.

Types of available radiological medical equipment	Frequency of 56 (Radiographers)	Equivalent Percentage
Analogue X ray	7	12.5%
CR X ray	27	48.21%
DR X ray	54	96.42%
CT Scanner	39	69.64%
MRI Scanner	32	57.14%
Ultra sound	56	100

Source: (Field data, August 2024)

Discussion

This section highlights the critical role of Radiological diagnostic imaging equipment in the successful implementation and operation of digital imaging informatics systems. This section is setting the foundation for a detailed discussion of the study's findings and their implications on supporting radiological digital imaging systems in Tanzania`s healthcare facilities.

The findings indicate that Tanzanian healthcare facilities are prepared for transition to radiological digital imaging informatics systems. This readiness is evidenced by

the availability of essential digital-compatible imaging systems such as digital radiography (DR) X-ray machines, computed tomography (CT) scanners, magnetic resonance imaging (MRI) scanners, and ultrasound devices in several facilities. These systems provide a foundation for integration of digital imaging informatics as they are designed to facilitate the capturing, processing, storage, and transmission of high-quality diagnostic images. The presence of these modern imaging modalities reflects a crucial step towards bridging the diagnostic gap and enhancing healthcare delivery in both urban and rural settings.

The availability of such equipment also indicates that many healthcare facilities in Tanzania are making a significant move from traditional analogue imaging systems, which are more prone to inefficiencies and workflow limitations to the modern and digitized imaging systems. The adoption of digital systems not only ensures a quick- diagnostic processes but also improves image quality, enabling precise and timely clinical decisions (Kruse & Beane, 2018). Furthermore, digital imaging informatics platforms support secure storage, easy retrieval, and seamless sharing of imaging data, which is essential for collaborative diagnostics to ensure equitable access to digital informatics images across the varied healthcare facilities in the country.

Conclusion and Recommendations

This study highlights the potential of Tanzania's healthcare facilities to adopt Digital Imaging Informatics Systems, supported by the widespread of digital medical equipment such as Digital Radiography (DR) X-ray, Computed Tomography (CT), Magnetic Resonance Imaging (MRI), and ultrasound machines. The presence of these technologies forms a strong foundation for transitioning from conventional imaging methods to fully integrated digital imaging systems, which can enhance diagnostic accuracy, storage efficiency, and remote access to medical images. However, to ensure a smooth transition and maximize the benefits of digital imaging, it is recommended that:

a) Procurement policies should discourage the acquisition of analogue X-ray machines in favour of digital alternatives. This will facilitate interoperability, improve image quality, and enhance efficiency in radiological workflows.

b) Capacity-building programmes should be implemented to train healthcare professionals on the use, maintenance, and management of digital imaging systems to ensure sustainable adoption.

c) Financial and technical support should be reinforced to equip rural and lower-tier hospitals with digital imaging technology, reducing disparities in healthcare access.

By addressing these aspects, Tanzania's healthcare facilities can achieve a fully digitized and interconnected medical imaging ecosystem, improving diagnostic capabilities, patient care, and healthcare efficiency.

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