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Implementing a Web-Based Solution to Address Challenges in the Admission Framework for Advanced Level Private Schools in Tanzania

Mwapashua H. Fujo [a++*], Samwel Katwale [a++] and Mussa Ally Dida [a#]

ABSTRACT

This study introduces the Tanzania Central Processing Admission System (TCPAS) as a groundbreaking web-based solution designed to revolutionize the admission processes in Advanced Level (A-Level) private schools. The research meticulously explores the existing challenges within manual admission procedures, emphasizing inefficiencies, delays, and transparency issues in Tanzania's educational landscape. An in-depth analysis of prevalent admission methodologies reveals the urgent need for a modern, streamlined approach that prioritizes efficiency, accessibility, and fairness. TCPAS emerges as a comprehensive solution, featuring modules such as Centralized Data Handling, Applicant-School Interaction, Multiple Admissions Control, Certificate Verification, and Payment. These modules collectively address key issues, offering a transformative shift from traditional, paper-intensive methods to an eco-friendly, paperless system. TCPAS promises to enhance transparency and accessibility, providing a user-friendly interface for applicants to navigate school options, receive prompt feedback, and manage multiple admissions efficiently. The Certificate Verification and Payment Module eliminate the need for physical certificates, incorporating electronic verification and payment processes. While TCPAS represents a significant advancement, the study acknowledges the necessity for ongoing research to evaluate its long-term effectiveness, adaptability in diverse educational contexts, and potential enhancements. Future

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exploration into predictive technologies, such as machine learning, could further refine TCPAS, ensuring it remains a robust, adaptable, and globally applicable solution, transforming admissions processes not only in Tanzania but also in educational institutions worldwide.

Keywords: Admission framework; advanced level education; private schools, Tanzania; web-based solution; challenges; education technology; enrollment management; educational access; online admission process.

1. INTRODUCTION

The admission process into higher education institutes worldwide operates within a framework that can either be centralized or decentralized. These frameworks govern how prospective students apply and gain entry into universities, colleges, or technical institutions [1]. Centralized systems are characterized by a single governing authority managing admissions through a unified online platform, streamlining application submissions, progress tracking, and access to eligibility criteria [2]. Conversely, decentralized systems grant autonomy to individual educational entities, allowing them to independently define and administer admission procedures [3]. This autonomy results in varied admission criteria, procedures, and timelines across different institutions [2]. Centralized admission systems offer efficiency by reducing paperwork, standardizing processes, and providing seamless access to information for applicants. However, they come with challenges such as handling high volumes of applications, ensuring fairness in selections, and guarding against fraudulent practices [4]. On the contrary, decentralized systems offer institutions flexibility but may introduce inconsistencies, varying admission standards, and potential inefficiencies due to each entity setting its unique criteria. This variability complicates the application and selection process, posing challenges for applicants navigating through multiple procedures [3]. Thus, the dichotomy between centralized and decentralized admission frameworks profoundly impacts students, institutions, and the quality of the admission process [1].

In developed nations such as the United States, United Kingdom and China, admission processes into tertiary institutions have evolved into centralized systems. These streamlined systems leverage web portals, enabling applicants to navigate the admission landscape without the burden of physical forms. Instead, they access school or college websites, finding all eligibility criteria conveniently outlined online [5]. Prominent examples of such systems include the Common Application in the United States, the Joint University Programmed Admission System in Hong Kong (JUPAS), China's University College Admission System (CUCAS), and the Universities and Colleges Admission Service (UCAS) in the United Kingdom. The adoption of these centralized admission systems aligns with the goal of resource and time efficiency, benefiting both applicants and institutions. By standardizing processes, these systems aim to reduce the consumption of resources, minimize time spent on admissions, and ensure a smoother turnaround during the application process [6]. However, despite these advancements, several unresolved challenges persist within these systems.

Issues such as managing multiple admissions while safeguarding admission vacancies, centralizing data handling for a widely dispersed candidate pool, and preventing forgery of entry certificates during applications remain significant concerns. In countries like China and others with similar systems, government boards or agencies oversee admission processes by conducting standardized admission exams [6]. While intended to streamline the selection process, this approach has led to a significant investment of time and effort by students preparing for these exams. However, the performance on these standardized exams might not accurately reflect the candidates' true abilities, potentially resulting in the enrollment of unqualified individuals by colleges. Consequently, this process has been criticized for its inherent drawbacks being costly, less equitable, and lacking consideration for individual merit [6].

In the context of developing nations, the pressing need for fair and transparent student admission systems within both public and private educational institutions, including universities, colleges, and schools, remains paramount. Challenges stemming from limited resources, underdevelopment, gender inequality, and the pursuit of advancements in science and technology serve as catalysts, driving the necessity for a transparent and equitable method of admission selection. This ensures an equitable distribution of available admission vacancies across candidates aspiring to join Higher Educational Institutions (HEIs) and pre-college institutions [7].

For instance, in Nigeria, despite efforts by researchers to develop intelligent decision support systems for university admissions, the current approach remains decentralized, affecting both pre-college and tertiary institutions. Under this system, each university, college, or school operates autonomously, holding the authority to independently decide on admissions. As a consequence, aspiring candidates often find themselves in a perplexing situation, receiving offers of admission from multiple institutions simultaneously. This scenario creates a dilemma where a candidate might secure admission to several colleges but ultimately opts to abandon some of the offers [8]. The repercussions of this decentralized approach have led to intensified competition for the limited available spaces in both pre-college and university education in Nigeria. Consequently, admission seekers face heightened desperation, driven by the urgency to secure admission in a highly competitive environment. The challenges emanating from this system are multifaceted and impactful. They include the prevalence of multiple admissions, a lack of uniformity in admission processes across institutions, increased financial costs for applicants, inconsistencies, inaccuracies, difficulties in setting standardized admission standards, and challenges in ensuring strict adherence to admission procedures [9]. This decentralized system's drawbacks have become apparent, highlighting the pressing need for a more structured, standardized, and transparent approach to admissions in Nigeria's educational institutions [10]. Addressing these challenges would not only alleviate the burden on admission seekers but also enhance the fairness, efficiency, and integrity of the admission processes, ultimately contributing to a more equitable and accessible higher education landscape in the country [11].

Similarly, in Uganda, the admission procedures for public and private universities are structured under two separate systems: the Joint Admissions Board (JAB) oversees admissions into public universities, while private universities manage their admissions directly. The JAB functions periodically, gathering to assess candidate applications and determine eligible individuals, subsequently allocating them to different public universities and specific disciplines based on their qualifications and preferences [12]. However, concerns have surfaced within this admission framework, primarily regarding issues of fairness and transparency. For prospective students seeking admission into private universities or university colleges, the process diverges from the centralized approach of the JAB. Applicants interested in private institutions typically navigate a more decentralized process, which involves physically obtaining and submitting application forms directly to the respective private universities or colleges [12]. This method often incurs additional expenses in terms of both time and money for applicants, who must personally collect and deliver their application materials. This departure from a centralized system, seen in the application processes for private institutions, raises concerns about accessibility, equity, and the overall transparency of the admission procedures in Uganda's higher education landscape [13].

Conversely, in Tanzania, admission system for higher education has undergone significant evolution over the years. Historically, the admission process was primarily conducted through manual procedures, involving physical submission of application forms and extensive paperwork. Students would apply directly to individual institutions, each with its own distinct requirements and processes. This method often resulted in administrative inefficiencies, longer processing times, and a lack of standardized criteria across institutions [14]. However, with technological advancements and educational reforms, Tanzania has transitioned toward more centralized and digitized admission systems. The country has introduced centralized application systems for higher education, such as the Tanzania Commission for Universities (TCU) Central Admission System. This system aims to streamline the admission process by providing a unified platform where students can apply to multiple universities and university colleges across the country using a single application. It has brought about standardization in application procedures, allowing for a more efficient and transparent process for both applicants and institutions [15]. Simultaneously, the realm of technical education overseen by the National Council for Technical and Vocational Education and Training (NACTVET) also underwent notable changes, aligning with the broader transformation in admissions across various educational sectors in Tanzania [16].

The digitization of the admission process has enabled online applications, reduced paperwork, and simplifying the submission and tracking of applications. It has also introduced more standardized criteria for evaluating applicants, ensuring a fairer and more consistent approach to admissions across various institutions [17]. The centralized system implemented by TCU facilitates a more systematic handling of admissions, enhancing accessibility for students and promoting equal opportunities in accessing higher education [18]. While the shift

toward centralized and digital admission systems in Tanzania marks a positive stride in modernizing the education sector, challenges such as ensuring the reliability of online systems, providing adequate support for students unfamiliar with digital platforms, and maintaining transparency in the selection process remain areas of focus for continual improvement. Nonetheless, this transition represents a significant departure from the traditional manual admission procedures, aiming to enhance efficiency, accessibility, and fairness in Tanzania's higher education admission landscape [19].

In 2017, the Tanzanian government took significant steps to address various concerns surrounding the fairness and integrity of the admission process into both private and public universities. Issues such as managing admission vacancies, preventing forgery of entry certificates, ensuring timely feedback, and aligning students with their preferred programmes were among the primary concerns [20]. To remedy these challenges, a restructuring of the admission process was initiated through the TCU. This restructuring mandated institutions to independently handle admissions, introducing a new protocol where each institution manages its admission processes. Subsequently, institutions are now required to select their candidates and upload their selections into the system for TCU's/NACTVET approval. This ensures that the chosen candidates meet the minimum entry requirements set by both TCU and the NACTVET for each specific programme. The primary goal of this overhaul was to strike a balance between granting institutions more autonomy in their admission procedures while maintaining standardized criteria for fairness and quality across higher and technical education admissions in Tanzania. This approach aimed to address previous concerns about fairness, integrity, and efficiency within the admission process, seeking to enhance the overall quality and equity of higher education opportunities in the country [21].

In Tanzania's educational framework, the A-Level education plays a pivotal role, serving as the bridge between secondary and higher education. However, within the distinct 7-4-2-3 system, where students progress through seven years of primary education, four years of Ordinary Level (O-Level) education, and subsequently two years of A-Level education, a significant disparity surfaces in the admission procedures, particularly within A-Level private schools [22]. Remarkably, ministry reports in 2017 underscored a notable trend: more than 35% of students entering technical and higher educational institutions yearly originate from A-Level private schools [17]. Despite this substantial contribution to higher education, the admission process into A-Level private schools remains entrenched in archaic practices [19]. Unlike the streamlined systems governed by the TCU and the NACTVET for higher and technical education admissions, A-Level private schools predominantly rely on manual methods using ink and paper for admissions. This reliance on manual procedures poses inherent challenges, creating a notable gap in the educational landscape. The admission process into A-Level private schools suffers from various issues, including inefficiency, inconsistency, and a notable lack of transparency. These antiquated methods are perceived as unfair and fall short in ensuring equitable opportunities for students seeking access to A-Level education, subsequently impacting their pathways to

higher education [14]. This disparity highlights a critical gap in Tanzania's educational system, specifically within the admission procedures for A-Level private schools. The contrast between the contemporary, centralized admission systems in higher education and the outdated, manual approaches within pre-college education emphasizes the need for modernization and standardization within A-Level admissions [15].

The urgency to address this disparity becomes evident in the quest for fairness, transparency, and equal access to quality education across all educational levels in Tanzania. This study assumes pivotal importance as it takes the helm in envisioning and implementing a crucial solution aimed at bridging the gap observed in admission protocols, a challenge faced not only in developing nations like Tanzania but also in developed counterparts [23]. By addressing these challenges head-on, this proposed solution aims to revolutionize the very essence of admissions, advocating for standardized, technologically advanced, and efficient processes within Tanzania's educational landscape. Beyond merely rectifying an issue, this innovative solution stands as an opportunity to reshape the entire approach to admissions, transcending the confines of Tanzania's A-Level education. It seeks to pave the way for a contemporary, web-based admission system tailored to the specific needs and challenges of educational systems, not only within Tanzania but also potentially serving as a guiding framework for higher education globally [14]. By embracing and implementing such pioneering solutions, educational institutions both in Tanzania and worldwide can make substantial strides toward fostering inclusivity, transparency, and efficiency in their admission processes. Ultimately, this transformation endeavors to ensure that every aspiring student, regardless of background or circumstance, gains equitable access to higher education opportunities [24].

2. MATERIALS AND METHODS

The methodological underpinnings of this study were rooted in the principles of a comprehensive case study approach. This methodological choice allowed for an in-depth exploration and examination of multifaceted aspects associated with admissions processes, institutional frameworks, and ICT integration within A-Level private schools. The deliberate selection of participants across clusters; parents, admission officers, and students aligned methodologically with the aim to capture diverse perspectives and holistic insights into the admissions ecosystem. Furthermore, employing a purposive sampling technique and leveraging tools like the Open Data Kit (ODK) for data collection and Python for analysis reinforced the methodological robustness of the study, ensuring systematic data collection, meticulous analysis, and rigorous exploration of the research objectives.

Therefore, this study merged established theories in educational management, ICT integration, and decision-making processes within a methodological framework rooted in a comprehensive case study approach. The primary goal was to deeply explore the intricacies encompassing admissions procedures within A-Level private schools in Tanzania. Moreover, the study was particularly

oriented towards designing and implementing a web-based solution aimed at elevating the transparency, efficiency, and fairness of admission procedures within these educational institutions.

2.1 Theoretical Framework

The study drew from established theories in educational management, Information and Communication Technology (ICT) integration in academic settings, and decision-making processes in admissions. The theoretical underpinning provided a scaffold for exploring and understanding the complexities inherent in A-Level private schooling. Theoretical insights in educational management offered a lens to comprehend the institutional frameworks, administrative policies, and decision structures within these educational institutions. Moreover, theories addressing the integration of ICT in academic settings laid the groundwork for understanding the role of technology in admissions processes, offering a lens to analyze the impact of digital infrastructure on educational systems. Additionally, theoretical frameworks concerning decision-making processes in admissions facilitated an exploration of the criteria, policies, and considerations underpinning admissions decisions in A-Level private schools.

2.2 Research Design

This study meticulously employs a case study approach to delve into the nuanced operations of A-Level private schools in Tanzania, centering its investigation on the Kilimanjaro region. The selection of A-Level private schools as the focus of this research is substantiated by their pivotal role in shaping the educational landscape and their distinct characteristics compared to other educational institutions. These schools often exhibit unique administrative processes, varied admission criteria, and differing approaches to ICT within their academic frameworks.

Moreover, choosing the Kilimanjaro region as the study sample stems from several justifiable reasons. Firstly, Kilimanjaro emerges as a pivotal administrative region within Tanzania, distinguished by a significant prevalence of A-Level private educational institutions, setting it apart from many other regions in the country. Secondly, historical and demographic factors, coupled with significant religious activities in the region, have contributed to a distinct educational environment within A-Level private schools. This unique blend of factors fosters an environment conducive to studying diverse admission processes, institutional frameworks, and ICT integration within the educational milieu. The choice of this specific region aligns with the study's aim to deeply analyze the multifaceted aspects associated with admissions, institutional mechanisms, and technological integration, thereby offering comprehensive insights into A-Level private schooling in Tanzania [25]. The geographical and institutional peculiarities of the Kilimanjaro region make it an apt and representative sample for a detailed investigation into the operational dynamics of A-Level private schools within the country.

2.3 Participant Selection and Sample Size Determination

A purposive sampling technique was employed to select 150 participants, categorized into three distinct groups: parents, A-Level students, and school staff. This sample size was determined to ensure adequate representation and diversity within the study. The breakdown of participants comprised 25 households strategically identified for their higher probability of having A-Level candidates among their members. These households were selected to provide a nuanced parental perspective regarding the admissions process and educational choices. Additionally, 25 school admission officers were included in the study sample, chosen to provide insightful institutional viewpoints and administrative insights regarding the admissions procedures within A-Level private schools. The largest cluster within the participant breakdown involved a random selection of 100 A-Level students from the broader pool. This cohort was chosen to offer a representative sample of the student population, aiming to capture diverse experiences, perspectives, and insights into the challenges and opportunities encountered within A-Level private schooling.

2.4 Data Collection Method

In this phase, the distribution of questionnaires and surveys was facilitated through a dual approach, utilizing both hardcopy and softcopy questionnaires administered via the ODK software. The survey distribution strategy was carefully orchestrated, beginning with targeted households expected to have A-Level candidates, followed by school staff members and the inclusion of randomly selected A-Level students from the broader participant pool. The utilization of ODK software provided flexibility and efficiency in data gathering, enabling seamless collection while ensuring uniformity and accuracy in responses across various clusters.

2.5 Data Analysis Technique

Upon the completion of the data collection phase, the gathered data underwent comprehensive analysis using Python programming language. Python's robust analytical capabilities and diverse libraries facilitated an extensive examination of the collected data. To enhance the interpretation and meaningful representation of the data, the study employed various visualization techniques such as frequency tables, pie charts, and histograms. These visual aids were instrumental in presenting and interpreting the data more easily and meaningfully, enabling to derive insightful conclusions from the analyzed information, aiding in the exploration of predictive relationships and the assessment of various factors impact on admissions processes within A-Level private schools.

2.6 Analytical Procedures

The collected data underwent rigorous examination and manipulation within the Python environment. Initial data cleaning involved removing redundance entries,

handling missing values, and ensuring data integrity. Leveraging Python for data analysis enabled an in-depth exploration of the dataset, ultimately yielding detailed insights essential for understanding the complexities of admissions processes within the educational context under study.

2.7 Design and Development Procedures

The Agile methodology was chosen for its iterative approach, enabling incremental development and continuous refinement of the web-based solution. This flexibility allowed for the integration of stakeholder feedback and evolving requirements throughout the development process. By embracing this methodology, the study was guided through distinct phases, ensuring adaptability and responsiveness to effectively tackle the intricacies of A-Level private school admissions.

2.7.1 Analysis phase

During this phase, a detailed review of prevailing admission procedures was conducted, engaging stakeholders and appraising existing systems. This comprehensive assessment aimed to extract vital functional and non-functional prerequisites pivotal for the envisioned web-based solution. To align with the study's primary goal, the ideal web-based software solution was envisioned to fulfill the following specific user requisites: - Implement a centralized data handling system for admission information, accessible and manageable within the software; Enable direct applicant-school interaction, allowing each school to autonomously decide admission criteria through the system's interface; Enable schools to set admission criteria and provide an applicant interface for filling applications; Manage multiple admissions, ensuring vacancies are saved while limiting the number of applicant admissions; Support a two-way communication approach for applicants, facilitating interactions during the admission procedure; Enable web and mobile responsiveness, supporting queries through mobile messages, compatible with USSD technology; Ensure equitable access for geographically dispersed applicants using computers and mobile devices; Eliminate the need for printed or scanned entry certificates; applicants submit their Certificates of Secondary Education Examination (CSEE) index numbers; Verify entry certificates through an Application Programming Interface (API) connected to the National Examinations Council of Tanzania (NECTA) database integrated within the designed web-based solution; Enable electronic payments for admission processing via mobile financial services or banking; Establish a notification mechanism for weekly or rapid updates on admission progress, allowing applicants to provide valid contact information; Enable multiple applications at an affordable price.

2.7.2 Design phase

Building upon the insights garnered from the analysis, the design phase involved conceptualizing the web-based solution, outlining system architecture, functionalities, and user interfaces. Each design aspect was meticulously crafted

to address the identified challenges while prioritizing transparency, efficiency, and fairness in admission procedures. This phase directly linked the design considerations with the study objectives of enhancing the admission process within A-Level private schools.
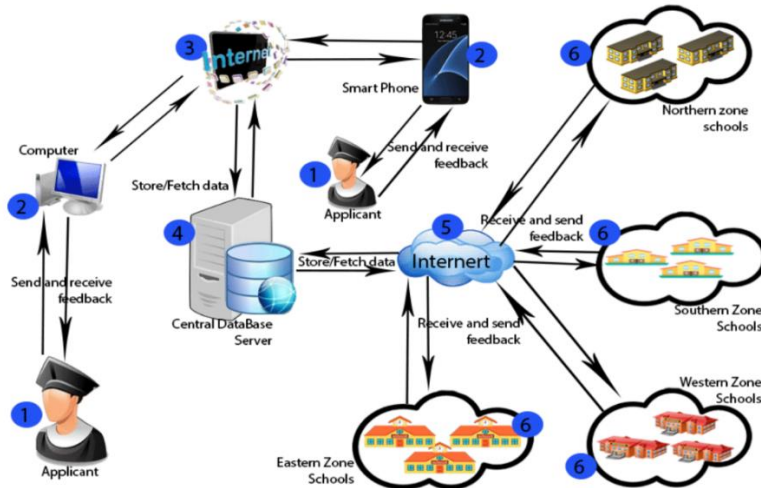

Fig. 1. Conceptual Framework of the Designed Solution

The design framework depicted in Fig. 1 outlines a comprehensive software solution model addressing the admission challenges. Steps 1, 2, and 3 illustrate the process allowing applicants to seamlessly interact with the admission system using computers or mobile devices connected to the internet. This interaction facilitates the sending and receiving of admission feedback, ensuring applicants stay informed throughout the process. Step 4 portrays the centralized database, indicating the storage of applicant requests for efficient management and accessibility. Step 6 demonstrates the categorization of schools into zones, simplifying applicant navigation to identify suitable schools and subjects for admission. Finally, Step 5 highlights the integration of an internet-based system enabling schools to receive applicant requests and promptly respond with acceptance or rejection acknowledgments. This model demonstrates a holistic approach, facilitating applicant-school interactions and streamlined admission procedures through a centralized system, benefiting both applicants and educational institutions.

2.7.3 Development phase

During the Development Phase, the focus was on creating modules within the web-based solution to directly tackle the identified admission challenges. Iterative cycles of coding and development were undertaken, ensuring alignment with the study objectives of enhancing transparency and efficiency in

admissions. Several modules were developed to address specific requirements.

Centralized Data Handling Module: This module facilitated the representation, access, and management of admission information in a centralized manner, ensuring easy retrieval and handling of data.

Applicant-School Interaction Module: Developed to enable direct applicant-school interactions, this module empowered schools to set admission criteria and allowed applicants to file applications via an intuitive interface.

Multiple Admissions Control Module: To manage multiple admissions and save vacancies, this module provided control mechanisms, restricting the number of applicant admissions and supporting a two-way interaction approach for better control.

Web and Mobile Responsiveness Module: This module facilitated application submissions through web portals and mobile phone messages, ensuring compatibility across platforms and integration with USSD technology for mobile messages.

Equitable Access Module: Geographically dispersed applicants were provided equitable access through a module supporting access via computers and mobile devices, promoting inclusivity.

Certificate Verification and Payment Module: This module eliminated the need for physical certificates, allowing applicants to submit CSEE index numbers, and verified certificates through an API connected to the NECTA database. Additionally, it facilitated electronic payments for admission processing through various mobile and banking services.

Notification and Communication Module: A mechanism for notifications on admission progress and two-way communication was developed, enabling applicants to stay informed and engaged throughout the admission process.

2.7.4 Testing phase

During the testing phase, rigorous evaluations were conducted simultaneously with development to ensure the effectiveness and performance of the developed solution. User acceptance testing (UAT) engaged stakeholders in assessing the system's functionality. JMeter software was utilized for load and performance testing, while Selenium and Postman verified specific functionalities within the modules.

2.7.5 Deployment phase

The developed solution, named the TCPAS, was successfully implemented and hosted, becoming operational across more than 20 A-Level private schools. This

deployment marked the practical integration of TCPAS into the existing admission infrastructure, aligning with the study objectives to enhance transparency, efficiency, and fairness in admissions.

3. DISCUSSION OF THE MAJOR FINDINGS

3.1 Geographic Distribution of Applicants

The assessment of applicants' residences in relation to the location of A-Level private schools within the Kilimanjaro region illuminates the geographic dispersion of candidates. The data reveal that 63% of applicants originated from within the Kilimanjaro region itself, indicating a significant local interest in admission to A-Level schools within the area. Conversely, 37% of applicants hailed from regions outside Kilimanjaro, showcasing a notable appeal from areas beyond the immediate vicinity. This dispersed representation underlines the widespread recognition and attractiveness of A-Level private schools in Kilimanjaro, drawing candidates from diverse geographic locations.

Table 1. Residence of Applicants Relative to Kilimanjaro Region Private Schools

Residence	Frequency	Percentage
Kilimanjaro Region	95	63%
Outside Kilimanjaro Region	55	37%
Total	150	100%

The dominance of applicants from within the Kilimanjaro region, constituting a substantial majority, emphasizes a strong local demand for quality A-Level education. This sizable interest implies a recognition of the value offered by educational institutions within Kilimanjaro. Simultaneously, the noteworthy representation from outside Kilimanjaro signifies a broader acknowledgment and appeal of these institutions, contributing to a more varied applicant pool. These findings underscore the necessity for an admission system that caters efficiently to local candidates while remaining accessible and accommodating for applicants from diverse geographical areas.

3.2 Awareness and Access to A-Level Private Schools

The study underscores the critical need for a web-based solution owing to the evident challenges faced by A-Level private schools in reaching prospective applicants. It was revealed that (51%) of school's resort to traditional methods like printing flyers, brochures, and small banners to create awareness, while 42% utilize radio and only 7% use television for advertising. This data highlights the reliance on conventional approaches for disseminating information, emphasizing the limited reach and effectiveness of these methods. Therefore, there's a substantial gap in utilizing digital platforms, reinforcing the necessity for a comprehensive web-based solution. Such a solution could bridge the current

awareness gap by providing a more accessible, cost-effective, and widespread means of reaching geographically scattered candidates, ensuring equitable access to information about A-Level private schools across Tanzania.
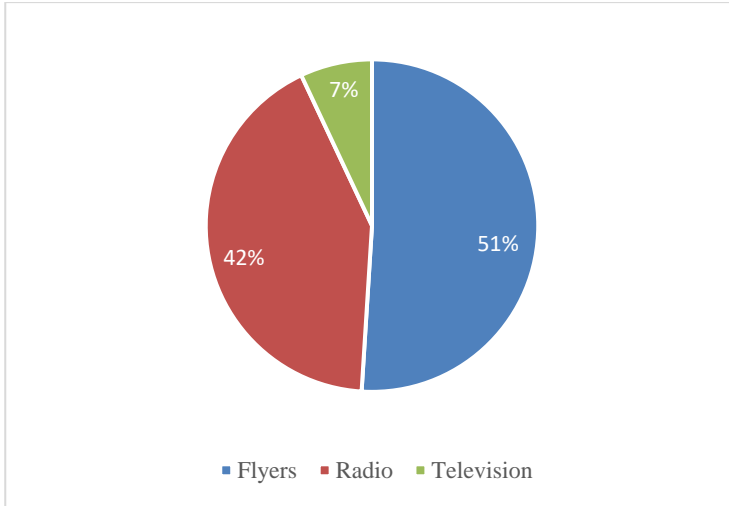

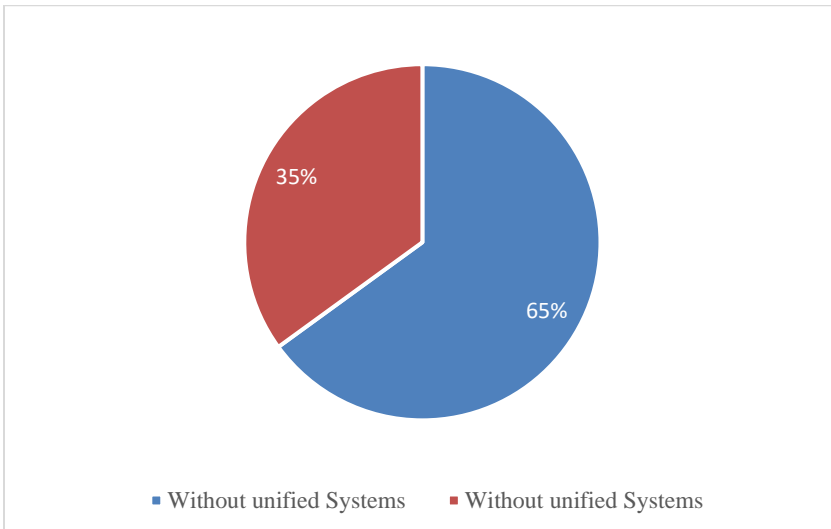**Fig. 2. Methods Used by A-Level Private Schools for Awareness Creation**

Fig. 3. Fragmented Handling of Applicant Information in A-Level Private Schools

3.3 Assessing Challenges in Current Admission Procedures

3.3.1 Centralizing data handling

The study shed light on a critical aspect within A-Level private schools: the notable absence of centralized data management systems. Surprisingly, 65% of these schools operate without unified data systems, resulting in fragmented handling of crucial applicant information. This decentralized approach leads to inefficiencies and errors in admissions processes due to the absence of streamlined coordination. Consequently, the implementation of a centralized data management system emerges as a pivotal solution, aimed at enhancing the efficiency of admissions, fostering organizational coherence, and ensuring uniformity across all participating schools.

3.3.2 Delay caused by manual admission procedures

Another substantial revelation from the study pertained to the decentralized nature of admission procedures. Schools independently process admission requests, resulting in prolonged timelines for application processing. A significant majority of A-Level private schools, approximately 70% take over a month to process applications and respond to applicants. This prolonged duration not only delays the start of academic sessions but also complicates applicants' decision-making processes regarding their preferred schools and subjects. Addressing this issue calls for a revamped admission system that ensures timely decisions, facilitating smoother transitions for applicants entering the academic sphere.
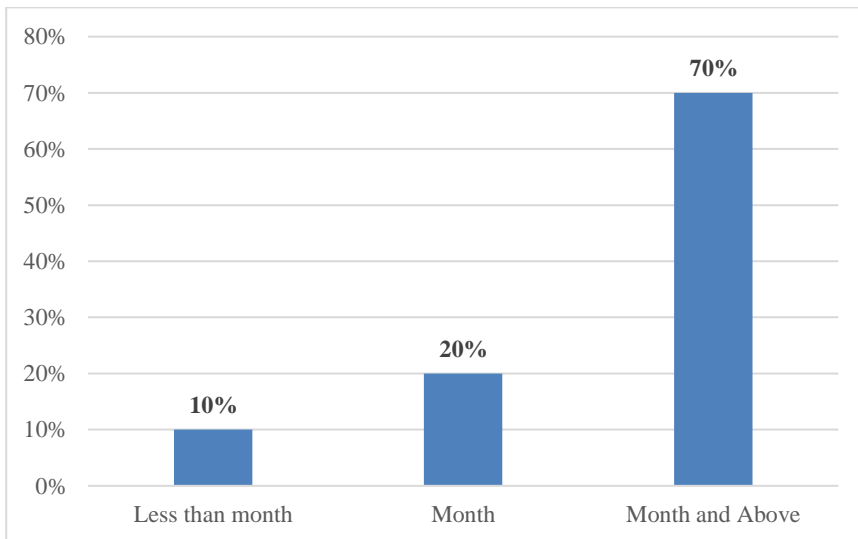

Fig. 4. Admission Processing Time for A-Level Private Schools

3.3.3 Preventing forgery of entry certificates during applications

The analysis of survey data, illustrated in Fig. 5, sheds light on a critical challenge faced by 87% of A-Level private schools in the Kilimanjaro region: the cumbersome verification of certificates. These schools encounter difficulties in verifying the authenticity and quality of applicants' certificates, primarily due to the absence of an education regulatory board tasked with assessing applicant qualifications before admission. Consequently, the admission processes lack fairness and transparency, compromising the integrity of the entire process.
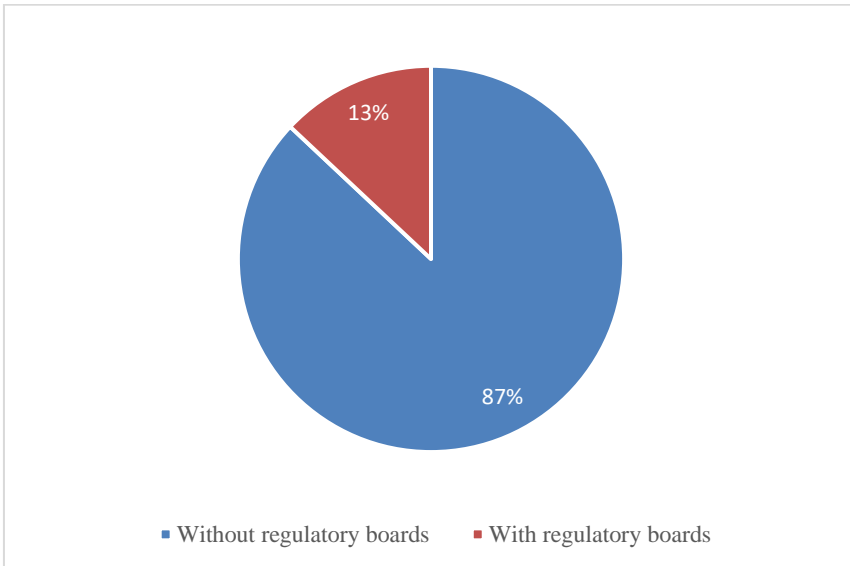

Fig. 5. Availability and Applicability of Regulatory Boards in A-Level Private Schools

It's noteworthy that only a mere 13% of A-Level private schools in the Kilimanjaro region have established their education boards. These boards are instrumental in managing, overseeing, and ensuring fairness and transparency throughout the admission process. However, the overwhelming majority lacking this infrastructure highlights a significant gap in the system, emphasizing the urgent need for standardized verification mechanisms to maintain fairness and transparency in admissions.

3.3.4 Cost-efficiency in admission procedures

The survey findings, depicted in Fig. 6, reveal a stark reality: despite a significant 35% of higher educational institution enrollments originating from A-Level private schools, a staggering 94% of admission procedures within these schools are still reliant on manual methods. This reliance on manual processes results in

extensive time consumption, often stretching up to a cumbersome three-month period. Moreover, the average cost incurred per applicant throughout the entire admission process amounts to a substantial US$22. Such protracted timelines and exorbitant costs render the application procedures not just expensive but also cumbersome for applicants.
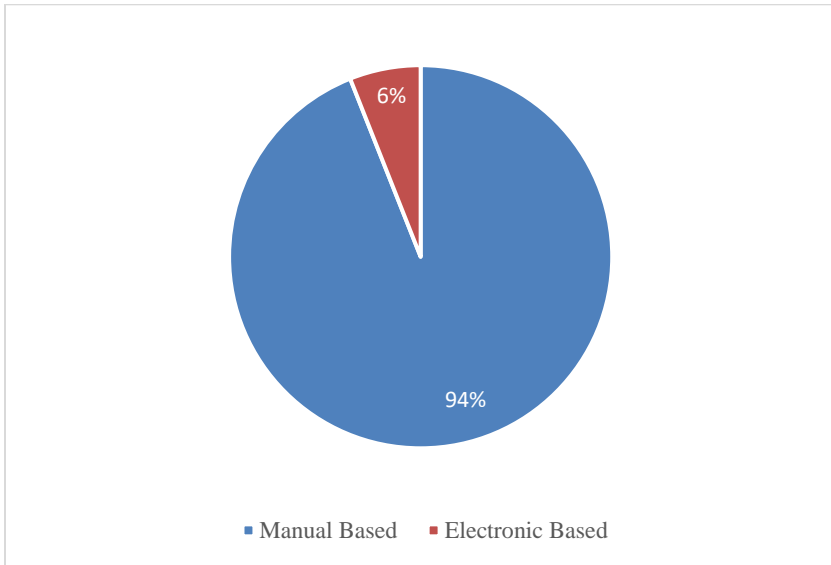

Fig. 6. Admission Procedures in A-Level Private Schools

These findings underscore the urgent need for a paradigm shift towards more efficient, cost-effective admission methodologies within A-Level private schools. The prevalent manual approaches not only strain resources but also deter potential applicants due to their expense and time-intensive nature. Embracing modern, web-based solutions can substantially streamline these processes, offering a more accessible, transparent, and economical pathway for applicants seeking admission.

3.3.5 Managing multiple admissions

Table 2 from the survey data highlights a critical predicament faced by A-Level private schools in Tanzania: the absence of an overarching education board or centralized system to effectively regulate and monitor the admission procedures. A staggering 78% of schools in the Kilimanjaro region grapple with a persistent issue; the discrepancy between the anticipated and actual number of candidates admitted. This discrepancy arises due to the prevalent practice wherein applicants physically collect admission forms from multiple schools, subsequently applying to several schools and, eventually, abandoning a portion of the vacancies.

Table 2. Number of A-Level Private Schools Meeting Candidate Expectations

Variables	Frequency	Percentage
Below Expectations	117	78%
Within/Above Expectations	33	22%
Total	**150**	**100%**

Consequently, this unregulated process leads to several unfavorable outcomes. Some applicants are unable to apply to multiple schools, limiting their opportunities, while others secure admission to more than one school, resulting in a surplus of admitted candidates. Such discrepancies not only impact the fairness and integrity of the admission process but also create inefficiencies in utilizing available admission vacancies. Addressing this challenge requires the implementation of a centralized system or framework that effectively manages admissions, curbing the issue of vacant positions and ensuring equitable opportunities for all aspiring candidates.

3.3.6 Transitioning to paperless admissions

Fig. 7 highlights a stark reality in A-Level private schools across Kilimanjaro-Tanzania: a considerable reliance on traditional, paper-based admission methods. Surprisingly, only 30%, 16%, 3%, and 51% of these schools respectively utilize postal services, phone calls, electronic mail, and physical means to manage admissions. Despite these attempts to modernize, the impact on reducing ink and paper usage remains marginal.
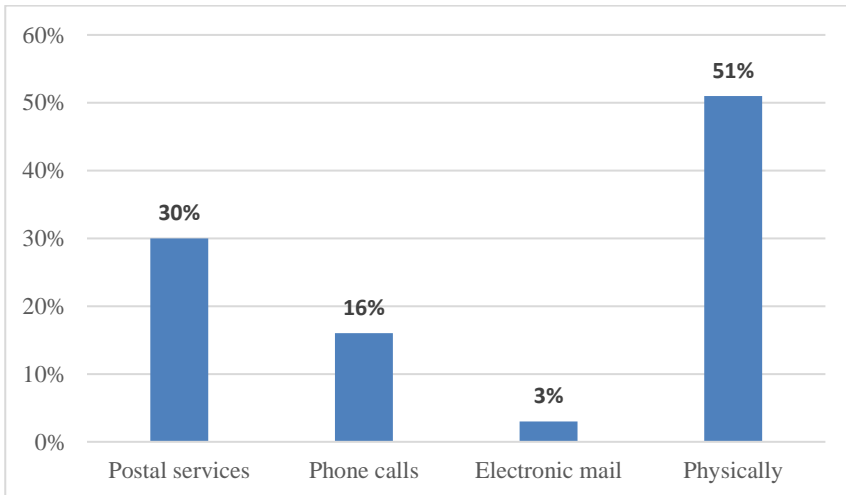

Fig. 7. The Current Landscape of Admission Processing in A-Level Private Schools

The majority of A-Level private schools persist with manual admission processes, which not only translate into significant time and financial costs but also present operational inefficiencies. These manual methods are inherently slow, prone to errors, and labor-intensive, hampering the overall efficiency of the admission process. There's a clear need for a paradigm shift towards embracing paperless admission methods that leverage digital technologies.

4. DESIGNED SOLUTION

4.1 Centralized Data Handling Module

This module plays a pivotal role in addressing the fragmented data handling challenges prevalent in A-Level private schools. It ensures seamless retrieval, processing, and management of admission data in a centralized database. This approach allows applicants to access comprehensive information about registered schools, including crucial details such as school name, location, available vacancies, and their positions in national exams. By providing an organized interface, TCPAS offers a user-friendly experience for applicants, presenting a list of A-Level private schools arranged by zones. This interface simplifies navigation, allowing applicants to explore various schools, review available vacancies, apply directly, and access additional details about school services and subjects offered, based on their preferences. This centralized database system significantly streamlines the admission process and assists applicants in making informed decisions regarding their preferred schools and subjects.
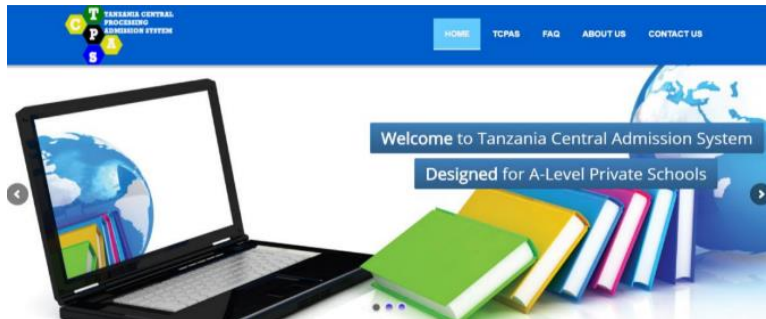

Fig. 8. Shows Centralized Access of Web-portal

4.2 Applicant-School Interaction Module

This module serves as a direct, efficient communication channel between schools and applicants. It empowers schools to set admission criteria and offers applicants a seamless, user-friendly interface for submitting their applications. This intuitive system enhances transparency throughout the application process, facilitating smoother and quicker submissions. By transitioning from manual processes to this streamlined digital approach, the system drastically cuts processing delays, ensuring a faster and more efficient handling of admission

requests. Its electronic features enable applicants to send requests and receive feedback promptly, thereby reducing turnaround times in admission procedures.

Fig. 9. Shows Applicant-Schools Interaction

4.3 Multiple Admissions Control Module

To address the challenge of managing multiple admissions, the designed TCPAS solution implements robust control mechanisms. It strategically limits the number of admissions per applicant and employs a two-way interaction approach, enhancing control over the admission process and reducing instances of abandoned vacancies. Specifically, TCPAS introduces a phased approach to handle multiple admissions and save admission spaces effectively. In the initial phase, applicants are allowed to make multiple admission requests and receive acknowledgements from multiple schools. Subsequently, in the second phase, applicants can acknowledge and accept admission from a single school, thereby leaving vacancies for others. This approach, depicted in Fig. 10 and Fig. 11 of the user interface, ensures that applicants can manage multiple applications while also allowing schools to efficiently handle admissions, optimizing the allocation of admission spaces.

4.4 Certificate Verification and Payment Module

This module presents an innovative solution to the challenge of verifying entry certificates and streamlining payment processes. It eliminates the need for physical certificates, requiring candidates only to provide their CSEE index numbers. By integrating an API connected to the NECTA database, the system autonomously verifies applicants' results, eliminating the manual processing of entry certificates. Additionally, TCPAS facilitates electronic payments, reducing paperwork and enhancing the overall efficiency of admissions. As depicted in

Fig. 12 and Fig. 13 the system retrieves applicant details from the integrated NECTA database, including personal information and examination results, ensuring accurate and efficient verification. Moreover, applicants are offered the convenience of confirming their eligibility through a verification link sent to their provided email addresses, contributing to a more streamlined and secure admission process.
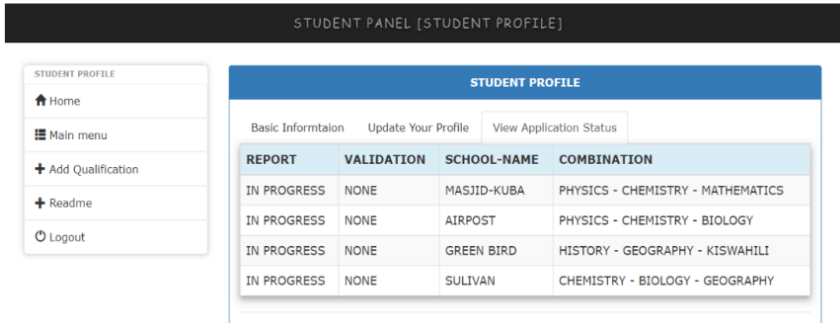

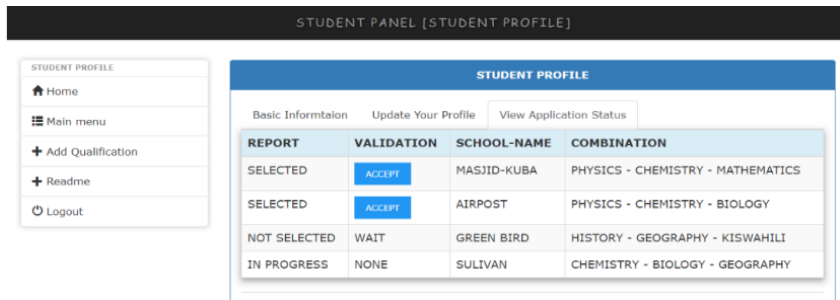**Fig. 10. Shows Response when an Applicant Performs Multiple Admissions**

Fig. 11. Shows Response after Schools Accept or Reject Toward Applicant Requests

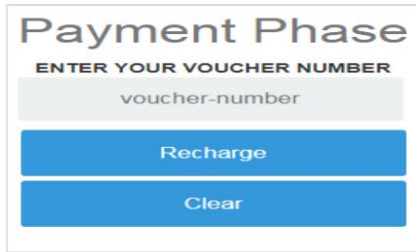**Fig. 12. Shows Interface for Verification of Applicant Details**

Fig. 13. Shows Interface for Applicants to Pay for Admission Application

4.5 Electronic Admissions and Reporting Module

In TCPAS, the admission process operates entirely electronically, eliminating the need for applicants to collect and fill physical admission forms. Through a user-friendly web portal, all admission procedures are streamlined and automated, effectively addressing applicant queries and requests. Notifications are seamlessly delivered to applicants via mobile messages and email, catering to both mobile and computer users. This innovative approach significantly reduces paper usage and aligns with the system's commitment to eco-friendly, paperless admissions. Moreover, TCPAS generates comprehensive admission reports in PDF format, as illustrated in Fig. 14, offering detailed insights without the necessity for paper documentation.
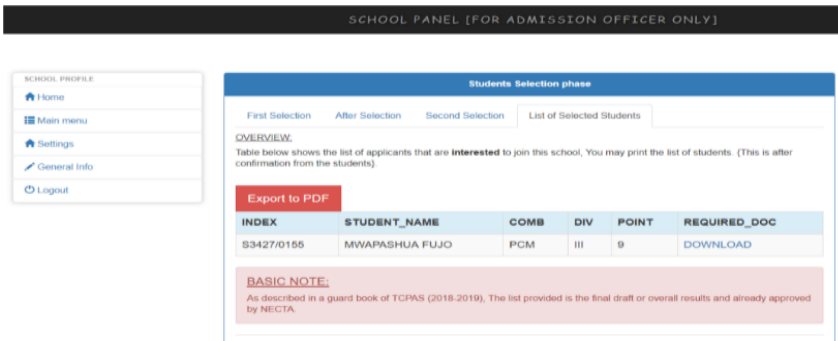
Fig. 14. Shows Interface for Schools to Generate Reports Showing the List of Selected Students

5. CONCLUSION AND RECOMMENDATION

A study on designing and implementing web-based admission framework in A-Level private schools in Tanzania highlights the pressing need for streamlined processes and centralized systems. The findings underscore the myriad challenges present in the manual admission processes, emphasizing the urgency

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for innovative solutions like TCPAS. This study outlines a pivotal shift from paper-based, time-consuming procedures to a comprehensive web-based solution that promises efficiency, transparency, and accessibility. However, while TCPAS represents a substantial leap forward, there's still a need for ongoing research. Future studies could explore the system's long-term effectiveness, its adaptability across diverse educational landscapes, and the potential for continuous improvements. Additionally, delving into predictive technologies like machine learning could further refine the system, particularly in entry certificate verification and admission trend forecasting. By leaving this gap for further exploration and improvement, researchers can continue to refine and evolve TCPAS, ensuring it remains a robust and adaptable solution that revolutionizes admissions in A-Level private schools in Tanzania.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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