2019-03

Centralized admission system for advanced level private schools: case of Kilimanjaro region, Tanzania

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CENTRALIZED ADMISSION SYSTEM FOR ADVANCED LEVEL PRIVATE SCHOOLS: CASE OF KILIMANJARO REGION, TANZANIA

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A Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree of Master's Degree in Information and Communication Science and Engineering of The Nelson Mandela African Institution of Science and Technology

Arusha, Tanzania

March, 2019

ABSTRACT

This research takes a look at the various challenges facing admission procedures for Advanced Level (A-Level) private schools case of Kilimanjaro Region in Tanzania. A total of 150 questionnaires was distributed to parents, A-Level students and school staffs, to find out procedures likewise the challenges being faced in the course of carrying out admission procedures and their level of satisfaction of the existing admission system. Thereafter, the analysis of the survey results confirms and quantify that 93.5% of admissions into A-Level private schools are performed manually by ink and paper. This manual system has its major problems which include difficulty in locating an appropriate school and subjects an applicant can get admissions, crucial times, wastage of time, and loss of forms and mutilation of forms throughout the entire method for admission. Consequently, the findings determined that, the admission system can only be improved by a new online software tool. To mitigate these challenges a centralized web-based solution, namely a Tanzania Central Processing Admission System (TCPAS) has been developed to resolve the identified admission challenges. The TCPAS tool has indicated outstanding changes towards maintenance of admission costs, control of forgery on entry qualifications, encourage the use of paperless admission, simplify admission process, reach of several geographically scattered candidates, and enhancing centralized data handling capability.

DECLARATION

I, Mwapashua H. Fujo, declare that this dissertation/research paper is my own original work and that it has neither been submitted nor being concurrently submitted to any other University for a similar or any other degree award.

Candidate Name: Mwapashua H. Fujo

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CERTIFICATION

The undersigned certify that he has read and found the dissertation accepted by the Nelson Mandela African Institution of Science and Technology.

Supervisor Name: Dr. Mussa A. Dida

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The above certification is confirmed by the Supervisor.

ACKNOWLEDGEMENTS

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ABBREVIATIONS

AfDB	African Development Bank
A-Level	Advanced Level
API	Application programming Interface
CAS	Centralized Admission System
CSEE	Certificate of Secondary Education Examination
CUCAS	University College Admission System in China
FM	Frequency Modulation
HEIs	Higher Education Institutions
JAB	Joint Admissions Board
JAMB	Joint Admissions and Matriculation Board
JUPAS	Joint University Programmed Admission System in Hong Kong
MoE	Minisitry of Education
NACTE	National Council for Technical Education
NBS	National Bureau of Standard
NECTA	National Examination Council of Tanzania
NM-AIST	Nelson Mandela Africa Institution of science and Technology
ODK	Open Data Kit
O-Level	Ordinary Level
OLTP	Online Transaction Processing
SPSS	Statistical Package for the Social Sciences
TCPAS	Tanzania Central Processing Admission System
TCU	Tanzania Commission for Universities
TV	Television

UCAS   Universities and Colleges Admission Service

UNDP   United Nations Development Programme

URL   Uniform Resource Locator

CHAPTER ONE

INTRODUCTION

1.1 Background Information

Throughout the world, millions of students apply for admission to schools, colleges or universities during the last year of their pre-college education. And normally the admission approaches differ from country to country (Hafalir and Kübler, 2014). For instance, in China, like in most countries, there are Government boards or agencies which harmonize the admission process by offering admission exams to applicants. This has caused students to invest a lot of time and effort to prepare for such exams. However, candidates perform differently on these exams, which do not necessarily reflect their real abilities. Therefore, the colleges might end up enrolling unqualified candidates (Zhang, 2009).

In developing countries, like Nigeria, the processes for admission into tertiary institutions are decentralized in the sense that each university or college has an equal chance to decide on their admission independently. This led to problems in terms of setting standards, uniformity in the admission processes and multiple admissions. As a result, it was possible for one candidate to receive offers of admission from more than one institution or college. This has been proved to be costly in terms of time and money. While some applicants will not be able to apply to many colleges, also others would be admitted to more than one college and abandon some of the vacancies. In a way, this makes the application procedure, even less fair and less considerate (Judith and Asein, 2007).

In contrast, in developed countries in Europe (e.g. the United Kingdom, France, etc.), the admission into tertiary institutions, universities, colleges, and schools are centralized. In the sense that, colleges or schools receive applications through a web portal, and applicants are not required to collect and fill the physical forms; rather they would only visit the admission website of a particular school or college, and all eligibility criteria will be mentioned on the site (Hafalir and Kübler, 2014). Such admission procedure was adopted as a means of saving resources time and money to both applicants and colleges and harmonizes the turnaround time during the admission process (Internationalization of Education [IoE], 2015).

1.2 Problem Statement

In the case of Tanzania, in 2010 to 2011 the Government directed higher and technical education institutions to enroll students through a Centralized Admission System (CAS), which was under the supervision of National Council for Technical Education (NACTE) in collaboration with the Tanzania Commission for Universities (TCU). Unfortunately, both of these two boards were focused only on the tertiary education level. Also, in the absence of fairness and transparency throughout the admission processes, has led to unequal chance for applicants to achieve admission to a course applies to their proficiency and desire. Thus, in 2017, the Government of Tanzania revoked the admission process through TCU. Currently, institutions can process the admissions on their own. Tanzania Commission for Universities (TCU) and NACTE only foresee admission processes and set the criteria for enrolment to different programs. Once candidates are admitted, institutions are required to upload the selected candidates into the system for TCU to approve. Therefore, Tanzania has gone back to the previous system of admission, which is very costly, unfair and not transparent. However, the previous decentralized/institutionalized admission system encourages institutions to work hard for good reputation (TCU, 2017).

Apparently, it has been reported that over 35% of students enrolling each year in higher level learning and technical education in Tanzania are from A-Level private schools. And the number of A-Level private schools is increasing by 2%, each year (Mangindaan *et al.*, 2013). However, the enrollment of students to A-Level private schools is done manually; that is paper based, which is difficult to perform, less accurate and very slow to complete the overall admission process (Ministry of Education [MoE], 2016).

This study reports on an approach to address the challenges facing the admission system into A-Level private schools in Tanzania. The proposed solution is a software-based Centralized Admission System (CAS) that has the capabilities to deal with the challenges of abandoned CAS from TCU, as well as to control and manage the performance and enrollment of students to A-Level private schools.

1.3 Objectives of the Research

1.3.1 General Objective

The main objective of this research is to create a software tool that will be used as centralized students' admission to Advanced Level (A-Level) private schools in Tanzania, Kilimanjaro region as a case study.

1.3.2 Specific Objectives

Specific objectives of this research are:

(i)   To identify and establish a collection of requirements for the admission process into A-Level private schools.

(ii) To design a web-based admission system for A-Level private schools.

(iii) To implement, test and validate the designed system.

1.4 Research Questions

This research intends to answer the following questions:

(i)   What are the requirements for designing a web based students' admission system for A-Level private schools?

(ii) What are the design tools, procedures and techniques for designing a web-based students' admission system based on A-Level private schools?

(iii) What are the test tools, validation procedures and implementation process for a web-based students' admission system based on A-Level private schools?

1.5 Significant of the Study

The study will contribute to debates about the motive and role of admission systems among the candidate who are desired to attain pre-college education in Tanzania private schools. Not only that, but also the output of this study contributes to the following.

(i) Immediate feedback: the designed system answers all the queries of the candidates/applicants and it provides immediate feedback after getting any request from the applicants.

(ii) Reduce the cost of admission processes: the main aim of the system is to reduce the cost required for Admission processing, the designed system reduces the manual

power needed to perform the entire task for admission procedures and improve the quality of the work.

(iii) Make the interface simple as possible: the designed system provides the simple and easy interface for beginners and also provide facilities for technical peoples who are using the system.

(iv) Reduce time: to perform any task time is one of the important factors to be considered. The designed system utilizes time properly, than the entire time consumed in processing students' admission requests.

(v) Reach to geographically scattered students: one of the important objectives of this designed system is to establish active communication with all the applicants scattered geographically.

(vi) Encourage paperless admission: the designed system reduces the transportation cost required to perform the entire admission and administration task, by reducing the paper works needed. For this reason printed or scanned copy of certificates will no longer required.

CHAPTER TWO

LITERATURE REVIEW

2.1 Students' Admission Systems in Developed Countries

Globally, there are different admission systems that evaluate the applicant's quality before being admitted into schools or colleges and control the widening access to higher education. But, there are unsolved difficulties like, how to save admission vacancies (the applicant cannot be approved to join more than one school or college at once), centralized data handling, how to reduce the cost of admission process (through reduction of turnaround time for entire admissions process), how to reach geographically scattered applicants, how to reduce paper uses in admission, and how to ensure control over forgery of certificates during applications (Mahundu, 2016).

Such admission systems that face named challenges include University College Admission System in China (CUCAS). Joint University Programmed Admission System in Hong Kong (JUPAS). Universities and Colleges Admission Service (UCAS) in the United Kingdom. And the Common Application in the United States of America (Zhang, 2009).

For instance, the CUCAS may be one of the most unique college admission systems in the world. It consists of two stages. Stage one is a standard exam, called the National College Entrance Examination, and stage two is the recruitment procedure which starts soon after exam results are released. Such admission procedures have caused students to consume plenty of time and energy to prepare for such exams. Conversely, this admission procedure is very difficult and annoying (Zhang, 2009). For this reason, it has been agreed that the answer to this challenge is to have automated Centralized Admission System (CAS) (Mahundu, 2016).

2.2 Students' Admission Systems in Developing Countries

In developing countries, the introduction of a CAS is one of the greatest initiatives for monitoring and controlling quality of admission into tertiary education. Additionally, it is very important to provide a transparent and fair admission procedure for candidates aspiring to join Higher Education Institutions (HEIs). Some drawbacks like gender inequality, scarce resources, underdevelopment and the quest for advancement in science and technology, has led to the need to use a fair method of selection for admission, to ensure an equitable distribution of the available spaces in Ordinary, Advanced and Tertiary institutions (Bailey, 2014).

For instance, in Nigeria, the introduction of Joint Admissions and Matriculation Board (JAMB) has become the greatest initiative that has increased candidates into tertiary education from 30 000 to one million. Also, the challenges associated with admissions into universities are addressed, and the number of candidates seeking admissions into polytechnics and colleges of education increased dramatically by 3% per academic year (Judith and Asein, 2007).

Also, admission into public universities in Kenya is done by the Government exclusively through a body popularly known as the Joint Admissions Board (JAB). It is this board that sits periodically to select qualified students whom it assigns to different disciplines and to different public universities and university colleges. However, in such a process, there is a lack of fairness and transparency during the admission processes (Wabwoba and Mwakondo, 2011).

Similarly, in Tanzania, TCU and NACTE as education regulatory boards jointly established a CAS that become operational in 2010 (TCU, 2014). The TCU and NACTE admission systems were to assist applicants to deploy and retrieve their applications through a web-mobile application (TCU, 2014). However, it remained a challenge to have TCU provide a fair and transparent admission process that provides equal opportunity for all candidates regardless of their background and gain admission to a course appropriate to their proficiency and ambitions. Consequently, the Government of Tanzania decided that there is no easy way to improve the current admission procedure than to invent a new software tool. This discussion left institutions with the mandate to process the admissions on their own. Instead, TCU and NACTE now only guide the admission process as well as monitor the criteria for enrolment in various colleges and universities (TCU, 2017).

Parallel to the TCU/NACTE system, applications for admissions to Ordinary Level (O-Level) and A-Level secondary (pre-college) education in Tanzania is processed by two systems: A Central Regulatory Board that is governed by the Government for public schools and direct applications for private schools. The Central Regulatory Board provides forms for O-Level students to select the schools of their choice for their A-Level studies. However, the only listed schools in the forms are public schools (Mangindaan *et al*., 2013). Private schools' applicants have to identify a school and physically collect the application forms themselves. Then, they are required to take the forms back to the specific school's administration. After processing the application, the respective school sends feedback of acceptance or rejection back to the applicant. This makes the application procedure very tiresome and costly. Additionally, less awareness of the existence of private schools and cost to a school are the major drawbacks of

the current admission procedure (Kapinga, 2016). Therefore, this study reports on a research work aimed the development of a trustworthy application tool (at CAS) that has the ability to enhance the performance of admission processes and resolve admission challenges facing admission system into A-Level private schools in Tanzania.

CHAPTER THREE

MATERIALS AND METHODS

3.1 To Identify and Establish Collection of Requirements for TCPAS

3.1.1 Description of Study Area

For this study, Kilimanjaro region one of the 31 administrative regions of Tanzania, was selected as a study area. Kilimanjaro has a population of 1 640 087 (National Bureau of Standard [NBS], 2017). The region is located on the slopes of a temporarily inactive volcano of Mount Kilimanjaro, the biggest mountain in Africa. Also, it is bordered by Tanga Region in the south, with Kenya in the east and north, with Arusha Region in the west, and to the southwest of the Manyara Region (UNDP, 2014).
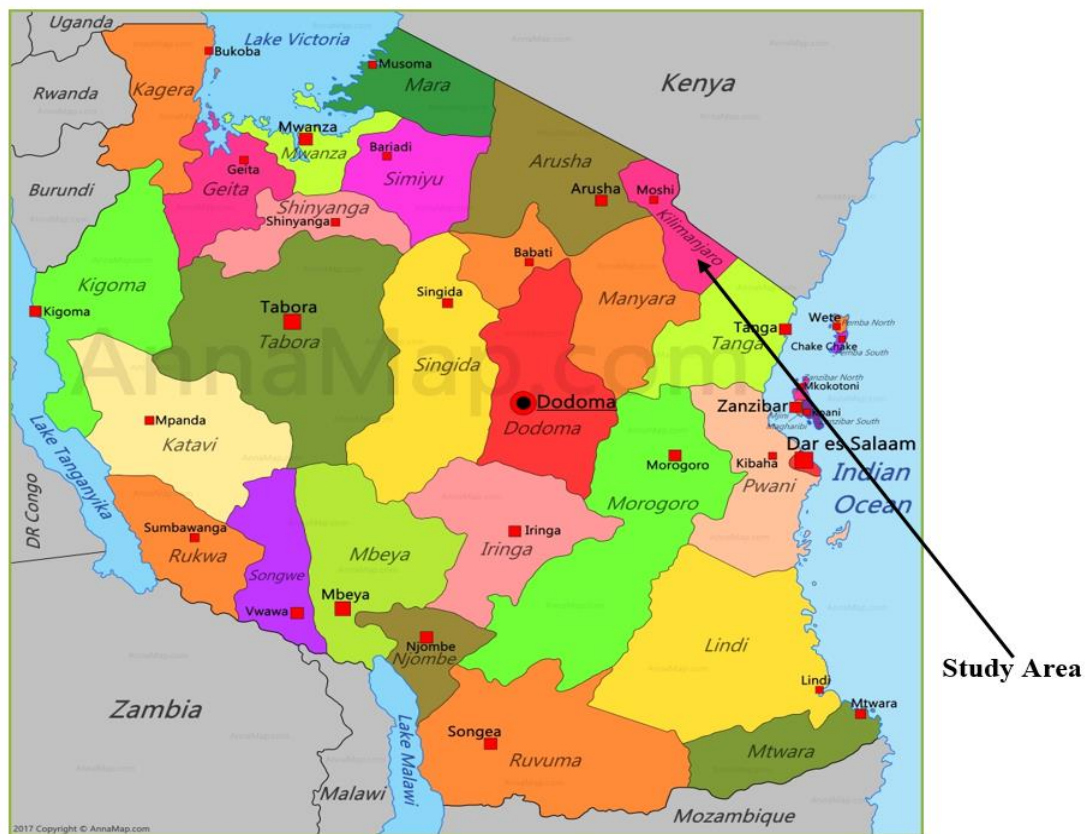
Figure 1: A map of Tanzania showing the Kilimanjaro Region as a study area.

The basis for selecting the Kilimanjaro Region as a case study is due to colonialism impacts, and demographic factors as causal factors resulting in having more A-Level private schools compared to other regions in Tanzania, as shown in Fig. 2. Likewise, 68% of Kilimanjaro

parents strive for the best learning environment for their children. And most private schools have proven to have the best quality A-Level education (Ministry of Education [MoE], 2016).
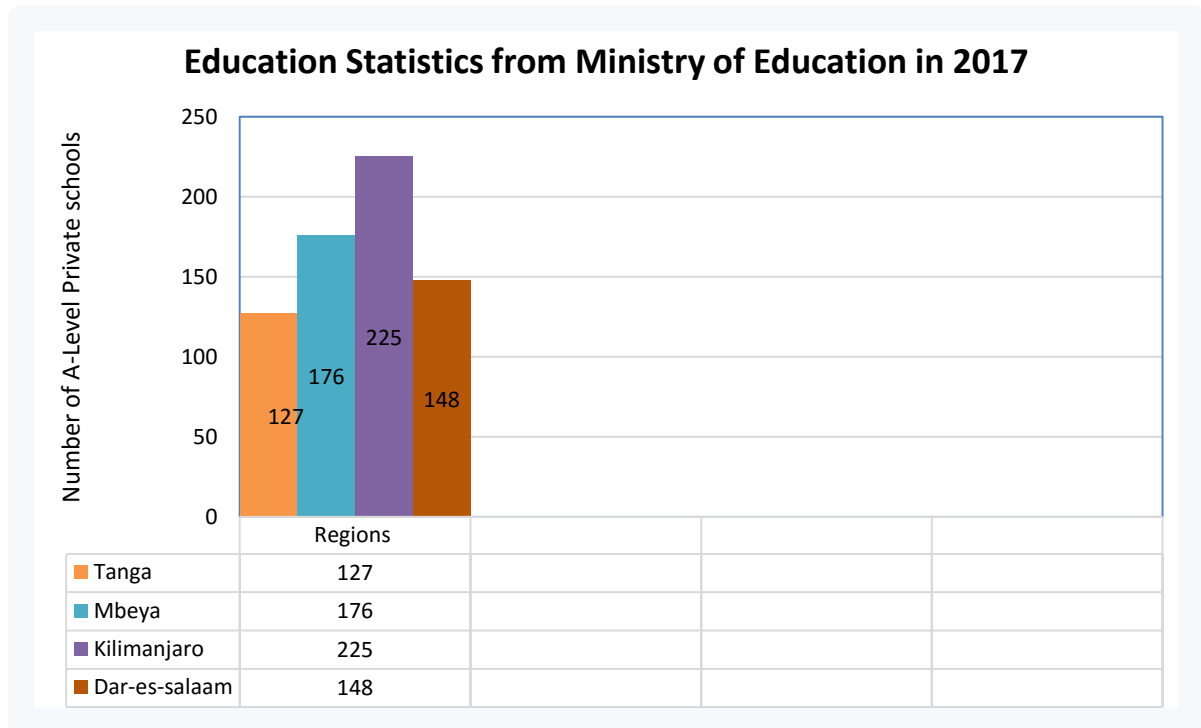
Figure 2: The number of A-Level private schools in selected regions of Tanzania.

3.1.2 Sampling Strategy

As revealed from the reported literature, it was considered necessary to confirm and quantify the unsolved admission challenges and its impacts on current procedures for admission into A-Level private schools in Tanzania. To achieve that, during the month of February 2018, the authors made every effort to reach all relevant users of the current admission systems in A-level private schools in Tanzania; namely: parents, pre-college students and school staffs, to ensure that credible data are collected for the success of the study. However, data were collected from 150 respondents through the use of questionnaire method and all entries retrieved as correctly filled were subsequently used in the analysis.

Nevertheless, it is recommended that, in order to determine the margin of error in the number of sample size range in between 150 to 250, the sample entries should be divided into three units (Mangindaan *et al*., 2013). Thus, the 150 sample entries were clustered into three groups of system users. In the first group, a sample of households was considered, in which 25 houses which were expected to have at least one applicant were selected. Second group involved a sample of school staffs: in which 25 admissions officers were selected. And in the last group,

a sample of students was considered; in which 100 pre-college students were selected randomly from the study sample in order to reach the targeted group. The motive of getting 100 pre-college students rather than 50 entries, is because, a confidence level of pre-college students confirmed to be close to less to 95%. Therefore, so as to cut back the possibility of creating a wrong conclusion regarding the population from the sample estimate, this study most well-liked to double the present entries, that's 50 to 100 entries. Thereafter the remained sample was divided equally to both school admission officers and households by 25 entries for every cluster. These three groups of samples were used to harmonize the chance of selection among the system users and giving them equal opportunity to participate in the study.

3.1.3 Data Collection Methods

Questionnaires were used to collect data from the parents who were sending their children to A-Level private schools than public schools. Also, used for selected A-Level students who have already interacted with current admission procedures and gained admissions in A-level private schools. In the third group, school admission officers who demonstrated to be familiar with all procedures and methods of processing students' admission requests for A-Level private schools were consulted and interviewed. A questionnaire was selected for this research because it is a reliable and quick method to gather information from multiple respondents in an efficient and timely manner. Again, this study was no exception and questionnaires were a quick and effective approach for the researcher to reach multiple respondents at interval within several weeks.

3.1.4 Methods for Data Analysis

The distributed survey questionnaires had both hard-copy, and soft-copy structured questions which were administered by using the Open Data Kit (ODK) software. Thereafter, the collected statistical data (both quantitative and qualitative data) were analyzed with the intention of; firstly, to identify the applicant's residence in relation to the school location, to measure the delay caused by manual admission procedures, to assess availability and applicability of regulatory board for current admission procedures, and to know how current admission procedures in A-Level private schools are handled, to measure the level of fairness of current admission procedures in A-Level private schools, to measure delivering candidates' expectation rate for A-Level private schools, and finally to assess the current methods for admission processing in A-Level private schools. In these cases, SPSS software as statistical package was used for analyses, because, SPSS provides the simplest and standard virtualization

of tables and charts (pie charts and histogram) compared to alternative statistical packages like R, Excel and SAS. For instance, in Excel each and every calculation needs manually entering a formula, leaving ample room for error. Parallel to that, R and SAS it is tricky to learn, depending on programming background.

3.2 To Design Web-Based Admission System for A-Level Private Schools

3.2.1 Prototype Selection

Code-and-fix model was selected because; it is a kind of methodology in which the developer writes some code, debug it, repeat until finished and meet user requirements or business needs. The current study used code-and-fix model, although this methodology is expensive to fix (bugs are not found until late in the process), but it proves high customer or client satisfaction at the end of the project, because it can test the earlier version of the code and debug it till meet the user needs. As shown in Fig. 3.
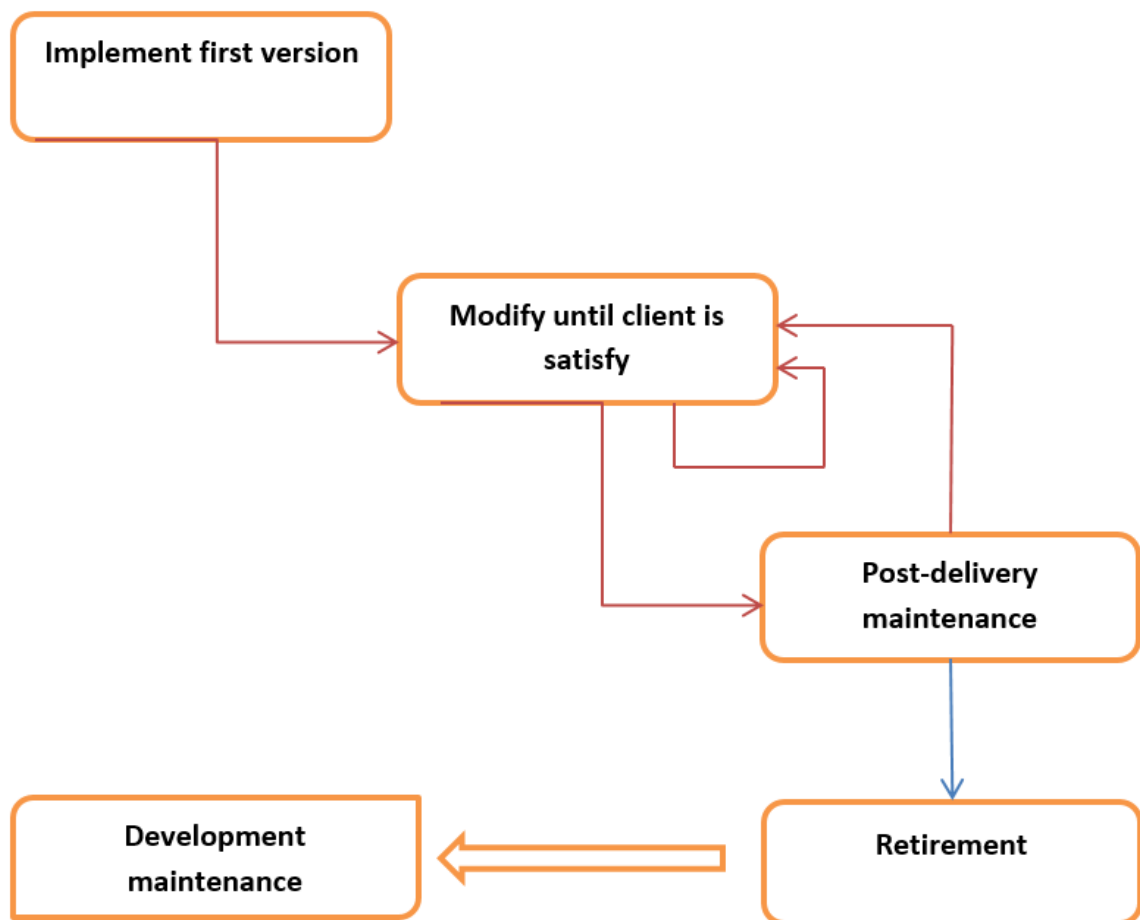
Figure 3: Present code and fix model.

3.2.2 Logical Design of TCPAS Software Tool

Data flow Diagram (DFD) and Entity Relationship Diagram (ERD) techniques were used to model the user requirements and system specification of the proposed software solution, because DFD technique provides a detailed representation of system components, so that it is easily understood by technical and non-technical users.

3.2.3 Physical Design of TCPAS Software Tool

The physical design of the proposed software solution (TCPAS) were involved the use of Hyper Text Makeup Language (HTML5), Cascading Style Sheets (CSS3), Hypertext Preprocessor (PHP5), JavaScript and MySQL database. Parallel to that, the MD5 encryption algorithm was used, because MD5 is compatible with MySQL and use a hash function to produce a 128-bit hash value of securities of critical users' information; mainly password.

3.3 To Implement, Test and Validate the Designed System (TCPAS)

In this case, the designed system (TCPAS) hosted on an online server and made available for user/applicants scatted geographically through a web link, which is http://www.tcpas.ac.tz for both mobile and computer users. Thereafter, unit testing, integration testing, system testing and acceptance testing were performed so as to evaluate the system in compliance with the specified requirements. JMeter and Google speed insight tool were used to test and validate if the designed software solution perform well in a physical environment.

3.4 Software Requirements and Design Considerations

3.4.1 Software Requirements

The main objective of this study is to develop a Tanzania Central Processing Admission System (TCPAS) for A-Level private schools, to replace the existing manual admission system. To achieve the main objective of the study, an ideal TCPAS software solution should meet the following user expectations extracted from the analysis of survey data, as revealed in this study.

(i) The software must provide a means of representing, accessing and handling the admission information/data in a centralized way.

(ii) The software should allow applicants to apply directly to schools, then the system should make decisions based on criteria for admitting students specific to that particular school on its own.

(iii) The designed software solution should guarantee best encryption mechanism for both financial transactions (online payments of admission fee) and admission information, to ensure confidentiality, integrity and availability of potential users' information.

(iv) The software should allow schools to set admission criteria. Also, should provide an interface for applicants to file their applications.

(v) The software must provide a means for controlling and managing multiple admissions and saving admission vacancies. The applicants should be given a slot/limit number of admissions. As well, the admission procedure should support two-way interaction (to-and-fro) approaches.

(vi) The software should allow applicants to perform the applications through a web portal and answer all the required queries by using mobile phone messages. Also, it should be compatible with both web-mobile platforms, and integrated with Unstructured Supplementary Service Data (USSD) for mobile messages technology.

(vii) The software must provide a means of providing an equitable access for applicants scattered geographically by using their computers and Smartphones.

(viii) The software should make sure that, printed or scanned copies of applicants' entry certificates will no longer be required during the admission process. An applicant should be required to submit the Index Number of their Certificates of Secondary Education Examination (CSEE). Also, all verification of applicants' entry certificates should be done through an Application Programming Interface (API) to the NECTA database which must be integrated within the TCPAS.

(ix) The software should allow all payments for admission processing to be made electronically through mobile (Tigo-Pesa, Mpesa, etc.) or banking financial services.

(x) The software should set a mechanism that will provide weekly or rapid notifications on the progress status of admission processing. Also, it should permit each applicant to provide valid E-mail and phone number for notification.

(xi) The software should allow an applicant to make multiple applications for admission at affordable prices; International Telecommunication Union (ITU) recommends a monthly affordability of less than 5% of monthly income (UN-OHRLLS, 2018). In the case of Tanzania, basic salary per month is US$78. The 5% of this amount is approximately US$3.9, which translates into US$0.13 per day. It is considered that the admission processing fees per applicant should not exceed this amount.

3.4.2 Design Considerations

(i) Internal Data Structure

The internal structure of a designed software solution (TCPAS) is divided into two categories that are client-side and server-side. The CAS is embedded with PHP, which provides a link between client and server, and MySQL database which keeps the records and provides information to the user interface.

(ii) Global Data Structure

The global data structure of the designed web-mobile software solution (TCPAS) is achieved through the use of a centralized database. Consequently, each global user of the designed web-mobile application will be able to access the system and retrieve data as if they are local users of the system.

(iii) System Architecture

The designed TCPAS is a client-server based system, which consists of the following interfaces: user interface and server-side interface that are linked together via an internet connection. For this reason, initially an applicant will be able to send admission requests by either his/her computer or smart-phone through a web-based application, or web-mobile application (as shown in step 1 and 2 of Fig. 3). Then in (step 3 to 4) all applicant requests will be stored within the centralized database server with the help of internet connection between the client and server-side. Then, sever sending these requests to several schools for processing (either in location 5, 6, 7 or 8), depending on school location or zone. After the school receives the applicant queries, instantly will process it, store and send acknowledgement feedback of acceptance/rejection back to the centralized database server (in step 4). Thereafter, the server allocates these notifications of acceptance/rejection to the respective applicants through mobile phone messages, E-mail and applicant profile, through a web portal (as shown in step 3,2 and 1). Therefore, it is necessary to conclude that, the designed software solution uses bi-directional approaches, that means support two-way interaction (to-and-fro/forward-and-backward) approaches.
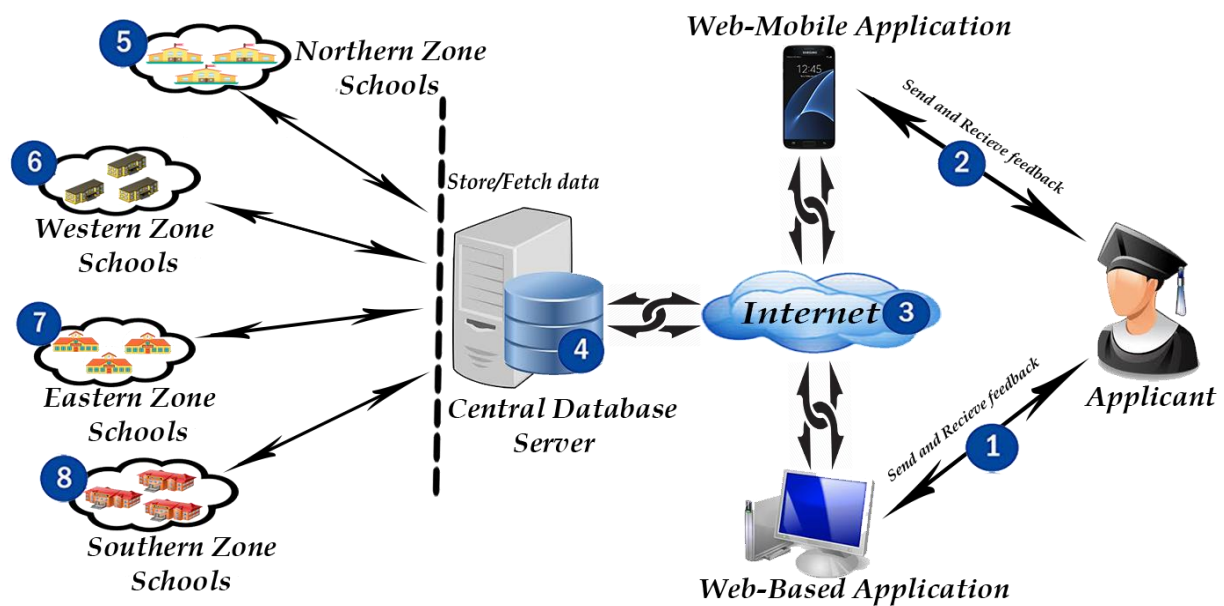
Figure 4: Framework of the designed software tool (TCPAS).

(iv) Database Architecture

Entity Relationship Diagram (ERD)

An entity-relationship diagram (ERD) used to represent entities (things about which system needs to record information about) and relationships (necessary associations between entities). Also, the ERD diagram used to present the structure of a designed system (TCPAS). Therefore, the ERD for TCPAS was designed through the following cases.

- **Case 1: Determination of Entities of the Relation for TCPAS Database**

This section is going to describe any object within the proposed system that we want to model and store information concerning. In this study entities are outlined as all recognizable concepts, either concrete or abstract. Such entities include: 1. School; necessary for storing school's name, location, zone, subject offered and additional school services, like meals and accommodations. 2. Student; necessary for storing student name, examination index number, physical address and gender. 3. Application; necessary for storing requested subjects' combination, requested school index number, student index number and application status. 4. Combination; necessary for storing subjects' combination (that is; a combination of three respective subjects like Physics, Chemistry and Mathematics, which formulate a PCM combination), subject code and subject name. 5. Transaction; necessary for storing transaction-code, voucher-number, transaction-date and student-index-number. 6. Voucher; necessary for

storing voucher-id, issued-date and secret code. And lastly is Qualification; necessary for storing qualification code and date of completion, student index number.

- **Case 2: Determination of Relation between Entities**

This section is going to describe an Entity-Relationship (ER) model of a new proposed software (web-mobile) solution. During this case, ER model is employed to present all entities required based on user requirements, and their relationships to each other. Therefore, Fig. 5: presents only the relationship among the entities used during the design of TCPAS database.
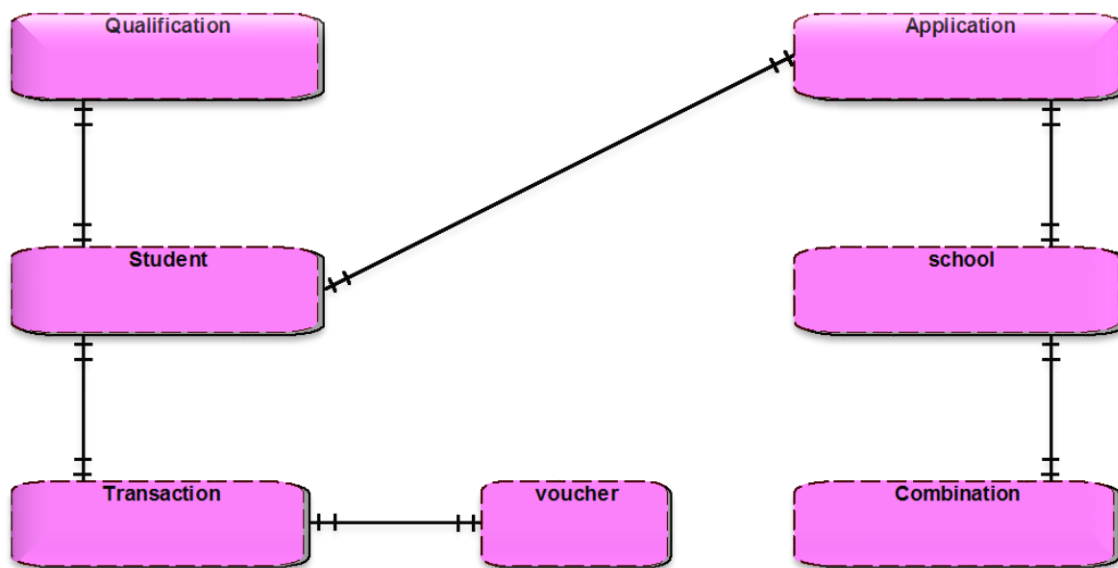
Figure 5: Relationship between entities of TCPAS database.

- **Case 3: Determination of Degree of Relation between Entities**

This section is going to explain the cardinality or the degree of relationship among entities employed in this study. During this case, ER model is employed to identify the number of occurrences in one entity which are associated or linked to the number of occurrences in another. As shown in Fig. 6.
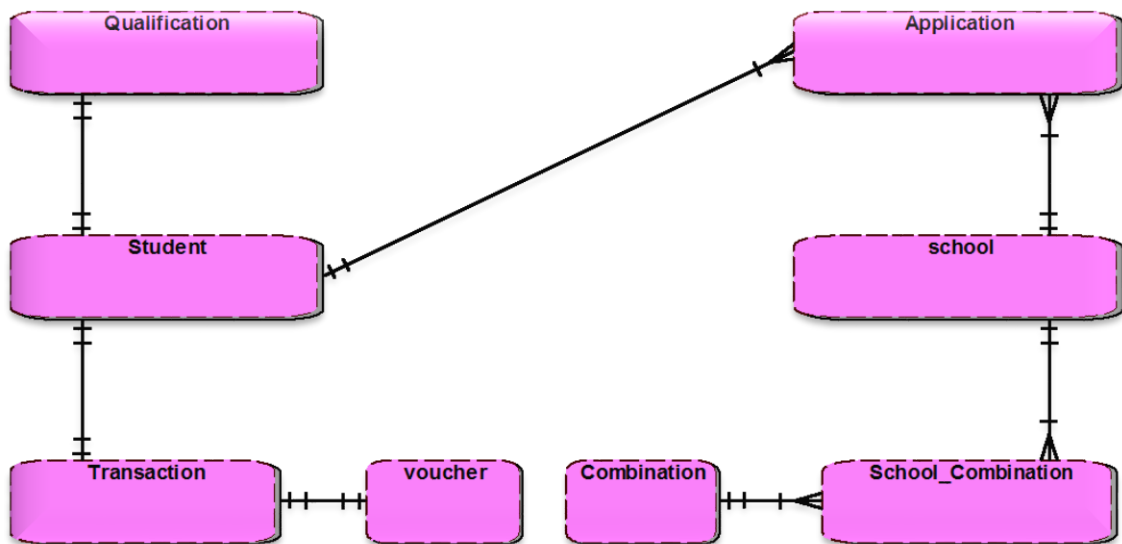
Figure 6: Degree of relationship between entities of TCPAS database.

- **Case 4: Database Schema**

In this final case; a database schema is employed as a skeletal structure which represents the logical view of the entire TCPAS database. Also, employed to define how the data is organized and how the relations among them are associated. Also, used to formulate all the constraints that are to be applied to the database. Such constraints are Primary Key, Composite Key and Foreign Key. Thus, the underlined attributes are termed as Primary Key; the attributes with an asterisk sign are named as Foreign Key; and if there are more than one attributes with an asterisk sign in the same entity, such attributes are termed as Composite Key. As shown below.

 (i)   School (School_Index, School_Name, Zone, Address);
(ii)   Student (Student_Index, Student_Name, Address, Gender);
(iii)   Qualification (Qualification_Id, Student_Index*, Issued_Date);
(iv)   Transaction (Transaction_Id, Voucher_Number*, Student_Index*, Status);
 (v)   Voucher (Voucher_Id, Voucher_Number, Amount, Issued_Date);
(vi)   Combination (Combination_Code, Subject_One, Subject_Two, Subject_Three);
(vii)   School_Combination (Combination_Code*, School_Index*);
(viii) Application (School_Index*, Student_Index*, Combination_Code*);

Data Flow Diagram

A data flow diagram (DFD) used to illustrate how data are processed by a system in terms of inputs and outputs, or flow of information in and out of the system. That is, where the data comes from, where it goes and how it gets stored. In this study DFD consist or represent processes (activities which transform data from one form to another), data stores (holding areas for data), and external entities (things which send data into a system or receive data from a system) and finally data flows (routes by which data can flow). Therefore, the DFD for TCPAS was designed through the following cases.

- **Case 1: Data Flow Diagram (DFD)-Level Zero of TCPAS**

This section is going to describe a top level data flow diagram which contains one process node for the proposed web application, namely TCPAS, and that generalizes the function of the whole system in relationship to external entities. In this case a student is confirmed to be an external entity for the proposed software, because it is the only object/entity which offer and receive data from a central process node, which is TCPAS. As shown in Fig. 7.

Tanzania Central Processing Admission System [TCPAS] - Context Diagram

a Student	**b** Student	**c** Student

Student_details   Qualification_details   payment_details

```
0
```
Tanzania Central Processing Admission System [TCPAS]

Approve_selections

Email_notification   Application_results   Issue_registration_form

d Student	**e** Student	**f** Student	**g** Student
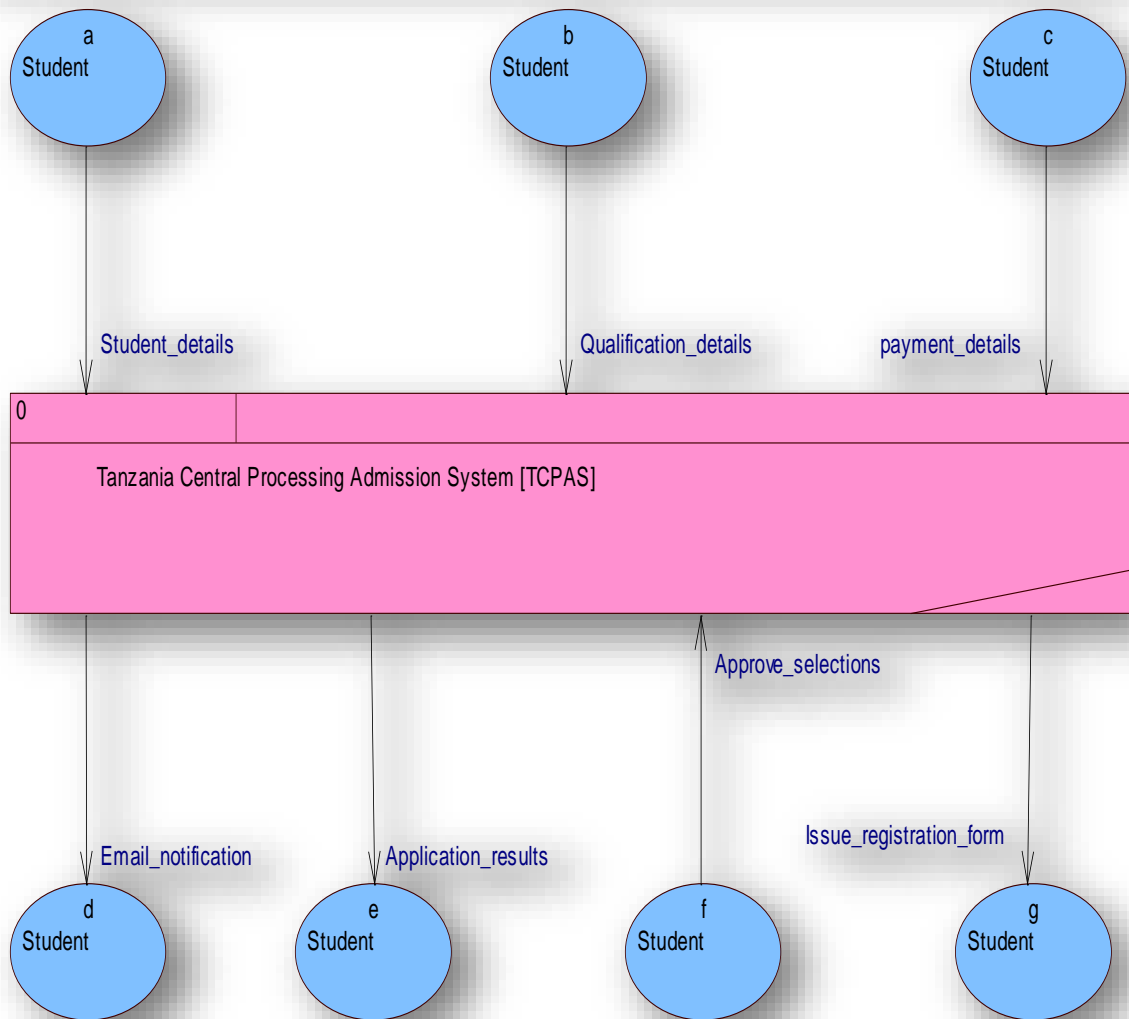
Figure 7: Data Flow Diagram (DFD)-level zero of TCPAS.

- **Case 2: Data Flow Diagram (DFD)-Level One of TCPAS**

This section is going to elucidate a level 1 data flow diagram (DFD) which offers a more detailed look at the processes that make up a proposed web-based application than a level 0 DFD does. In this case DFD level 1 is employed to plan or record the specific makeup of a planned system (TCPAS), that embody processes, external entities, storages and flow of information from process to process or process to storage. As shown in Fig. 8.
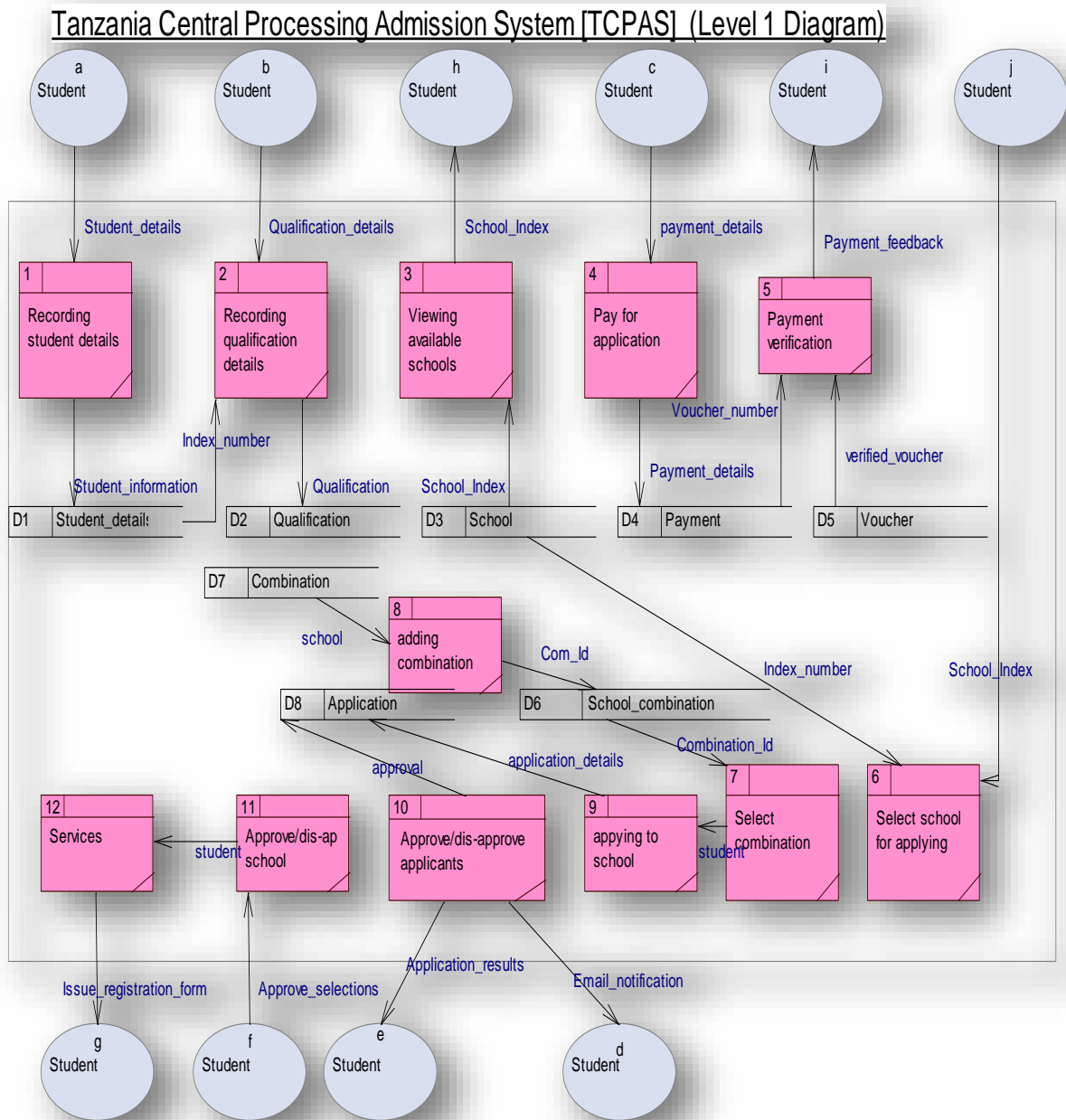
Figure 8: Data Flow Diagram (DFD)-level one of TCPAS.

(v) Database Description

This part is going to describe data structures of a proposed web-based application (TCPAS), which store the organized information in the database. In this case, TCPAS consist of multiple tables, each include several different fields of records and allow users to access, update, and search information based on the relationship of data stored in different tables. Table 1 shows the Structural Query Language (SQL) used in formulating the designed data tables or storage employed throughout the designing of a proposed software solution.

Table 1: Table structure of the designed database.

N<u>o</u>	Table Structure	Coding Standard
1	Table structure for table `apply`	CREATE TABLE IF NOT EXISTS `apply` (`id` int (200) NOT NULL AUTO_INCREMENT, `index_number` varchar (200) NOT NULL, `index_numb` varchar (200) NOT NULL, `request` varchar (200) NOT NULL, `status` int (200) NOT NULL, PRIMARY KEY (`id`)) ENGINE=InnoDB DEFAULT CHARSET=latin1 AUTO_INCREMENT=15 ;
2	Table structure for table `category`	CREATE TABLE IF NOT EXISTS `category` (`id` int (200) NOT NULL AUTO_INCREMENT, `index_number` varchar (200) NOT NULL, `comb` varchar 200) NOT NULL, `number` int (200) NOT NULL, PRIMARY KEY (`id`)) ENGINE=InnoDB DEFAULT CHARSET=latin1 AUTO_INCREMENT=39 ;
3	Table structure for table `combination`	CREATE TABLE IF NOT EXISTS `combination` (`id` int (200) NOT NULL, `comb_name` varchar (200) NOT NULL, PRIMARY KEY (`id`)) ENGINE=InnoDB DEFAULT CHARSET=latin1;
4	Table structure for table `log`	CREATE TABLE IF NOT EXISTS `log` (`id` int (200) NOT NULL AUTO_INCREMENT, `username` varchar (200) NOT NULL, `password` varchar (200) NOT NULL, PRIMARY KEY (`id`)) ENGINE=InnoDB DEFAULT CHARSET=latin1 AUTO_INCREMENT=2 ;
5	Table structure for table `qualification`	CREATE TABLE IF NOT EXISTS `qualification` (`id` int (200) NOT NULL AUTO_INCREMENT, `index_numb` varchar (200) NOT NULL, `cv` varchar (200) NOT NULL, PRIMARY KEY (`id`)) ENGINE=InnoDB DEFAULT CHARSET=latin1 AUTO_INCREMENT=55 ;
6	Table structure for table `school_combination`	CREATE TABLE IF NOT EXISTS `school_combination` (`id` int (200) NOT NULL, `index_number` varchar (200) NOT NULL) ENGINE=InnoDB DEFAULT CHARSET=latin1;

3.4.3 Physical Design

Physical database design is the technical activity in the development process of the database, which describe on how the system operate in a physical environment. During the physical design activity, requirements from the logical design were implemented using; HTML5 (Hyper

Text Make up Language) that used to offer the structure and layout of a Web document by employing a form of tags and attributes. Also, CSS3 (Cascading Style Sheet) was used to describe the presentation of Web pages, including layout, fonts, colors, menus and navigations. Most considerate, CSS3 used to allow TCPAS to be compatible with varieties of devices, corresponding to large screens, small screens, or printers. Therefore, CSS3 was employed in the implementation of TCPAS tools because, is independent of HTML and can be implemented with any XML-based markup language. PHP (Hypertext Pre Processor) was used because, is a widely-used open source general-purpose scripting language that is particularly suited for web development and can be embedded into HTML. And lastly, JS (JavaScript) used because, it provides a well interactive message or notifications to users, like a warning, congratulation, confirmation and error message, compared to different programming language that are compatible with PHP, like JQuery. Moreover, Xampp Server used during development and preliminary test of the system. Because, Xampp server consists PHP as language and MySQL as a database server. More significantly, MySQL used because, has a number of objects which were used to create tables, forms and allows queries to be done and produce reports.

CHAPTER FOUR

RESULTS AND DISCUSSION

This section is dedicated to showing how the survey results confirm and quantify the administration challenges for current admission procedures; and shows how the new designed software solution (TCPAS) will meet the requirements of ideal admission system for A-Level private schools.

4.1 How to Reach Geographically Scattered Applicants?

Table 2 shows the survey results on applicant's residence. The results show that, about 37% of applicants in Kilimanjaro Region-Tanzania are from outside the region of Kilimanjaro, but the majority of them face challenges on awareness about the existence of A-Level private schools. Due to the fact that, most of the A-Level private schools in Kilimanjaro use regional media like Radio and TV (Example: Kilimanjaro-FM) for advertisement, which in turn cost money, as well as airtime slot for advertisement, the admission process is expensive for some of the schools. Furthermore, media adverts are not broadcasted countrywide, thus access to geographically scattered applicants remain to be a significant challenge.

Table 2: Shows applicants residences in relation to school location in Kilimanjaro Region.

Variables	Frequency	Percentage
Applicants from Kilimanjaro Region	95	63
Applicants from outside Kilimanjaro Region	55	37
Total	**150**	**100**

The designed TCPAS software tool (Web-mobile) deploys a direct communication link to both A-Level private schools, and applicants scattered geographically across all regions in Tanzania via a web browser and through (http://www.tcpas.ac.tz). Also, it provides an equitable access for applicants to send admission requests to schools through their computers and Smartphones. This way the TCPAS achieves the requirement of A-Level private schools reaching applicants scattered geographically.
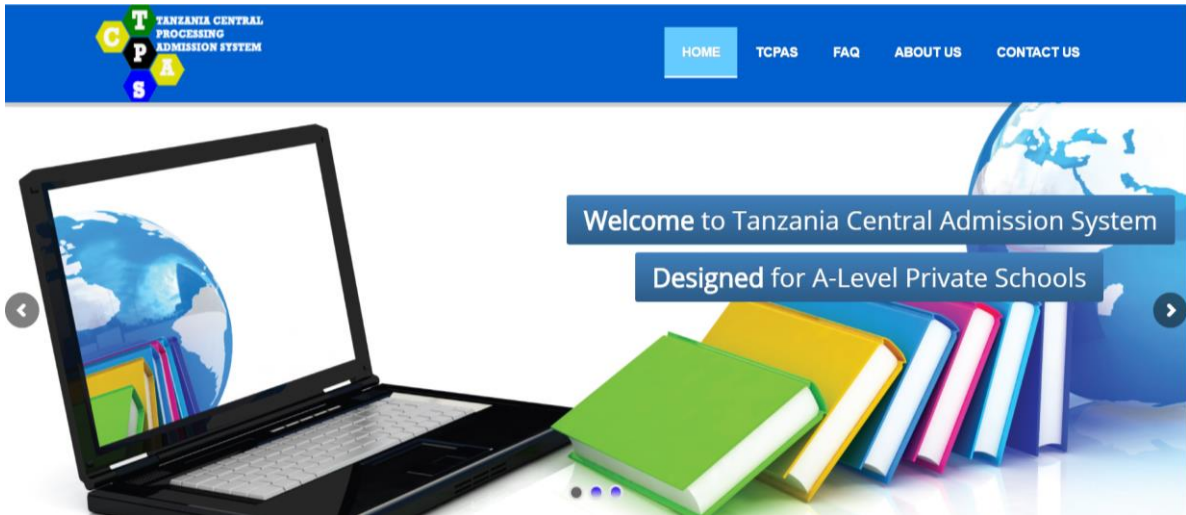
Figure 9: Web-portal interface for the TCPAS.

4.2 How to Encourage Centralized Data Handling Capability?

During the analysis of survey data, as shown in Fig. 10, it was realized that the current procedure for admission into A-Level private schools is fully decentralized, which causes further delay in commencing new academic years and makes it harder for applicants to make final decisions for their studies (about where, when and which subjects they can fit). Each school has its own rules and procedures to monitor and control their admission processes. There is a lack of central board to set standards for admission into A-Level private schools. Consequently, the majority of A-Level private schools in Kilimanjaro Region take a month or more than a month to process all admission requests per academic year.
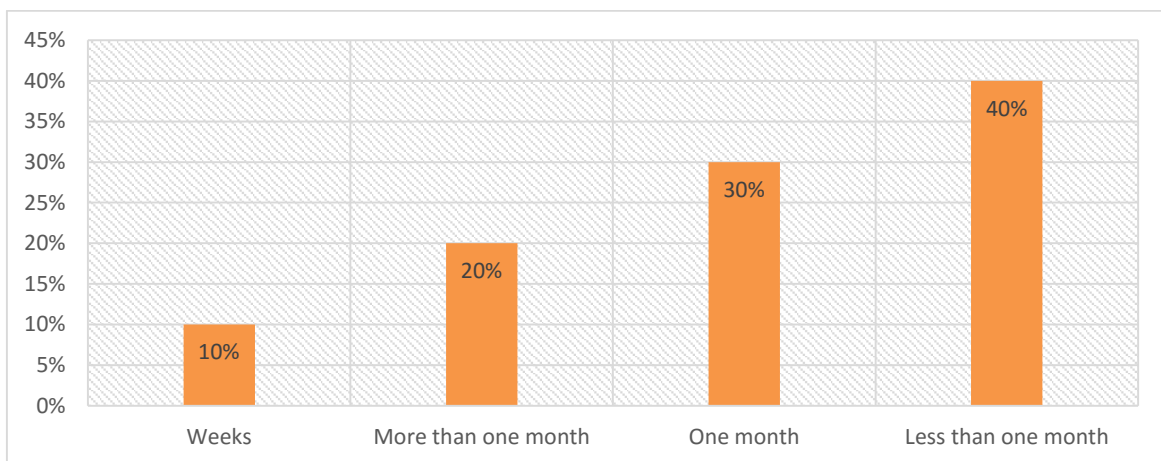
Figure 10: Delay caused by manual admission procedures.

The designed application tool (TCPAS) is confirmed to transfer data in a smooth way for all candidates and schools registered in the system; which handles the data in a centralized way.

The details of each A-Level private school in Tanzania including school name, location or physical address, academic performance (its position in the national Exams), school services and school vacancies, are also provided in a Web-portal interface of the TCPAS based on zones (Coast, Central, Northern, Western, Southern and Lake Zone in Tanzania). This way it makes it easier for applicants to locate and spot those schools and services offered by schools.
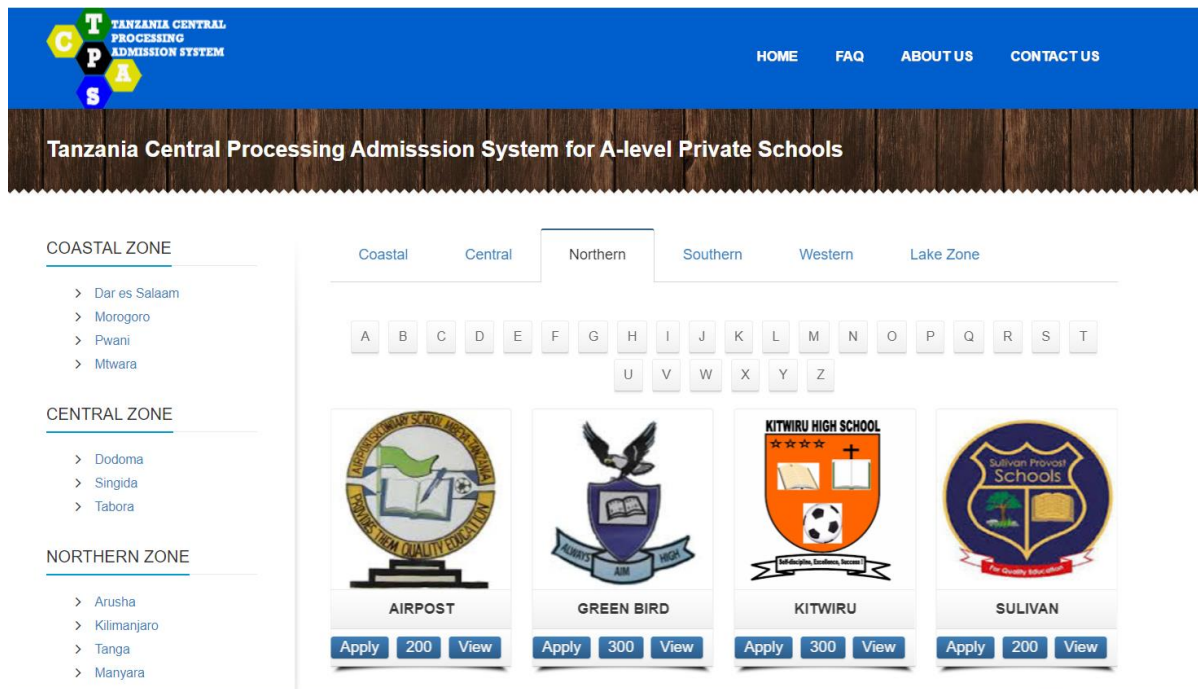
Figure 11: Sample list of A-Level private schools in Tanzania grouped in zones.

4.3 How to Ensure Control over Forgery of Certificates during Application?

Survey results in Fig. 12 shows that, unlike for public A-Level schools, 87% of A-Level private schools in Kilimanjaro Region have no central regulatory board to guide and govern the entire admissions process, which leads to inconsistency and difficulties during verification of certificates. Because of this, once candidates are admitted, schools are required to upload the selected candidates into the system for TCU'S and NACTE'S approval. As a result, while waiting for TCU'S and NACTE'S approval, most A-Level private schools in Kilimanjaro Region are usually late in commencing new academic years. Notable is that, only 13% of A-Level private schools in Kilimanjaro Region use their own boards as a shield to mask, control and maintain fairness and transparent admission processes.
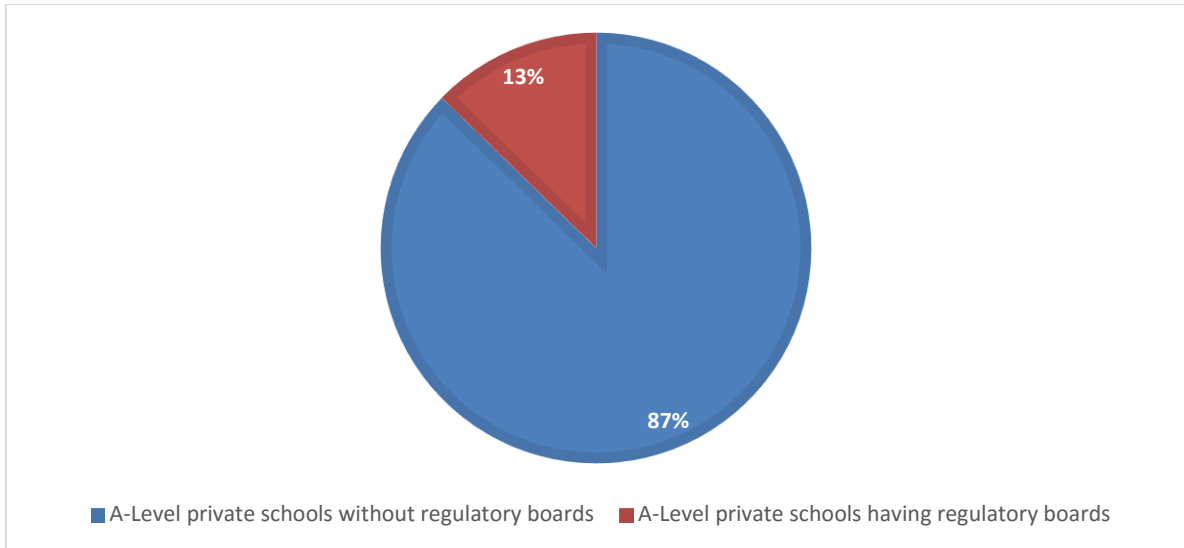
Figure 12: Availability and applicability of regulatory board for current admission procedures.

On the designed software tool, printed or scanned copies of certificates will no longer be required during admission into A-Level private schools in Tanzania. Instead, candidates will only be required to provide the Index Number for their Certificates of Secondary Education Examination (CSEE). The verification will be done by the system automatically through an Application Programming Interface (API) to the NECTA database integrated within the TCPAS.

Figure 13: Interface for verification of applicant details.

4.4 How to Reduce the Cost of the Admission Process?

Survey results in Fig. 14 confirm that, despite of the contribution of A-Level private schools to high level learning and the existence of these two systems for admission in Tanzania (NACTE

and TCU); still procedures for admission into A-Level private schools are handled manually (94%), which consumes much time, up to 3 months and in the average costs of US$22, for each applicant from different regions in Tanzania during the entire processes of admission. This makes the application procedures to be annoying and costly.
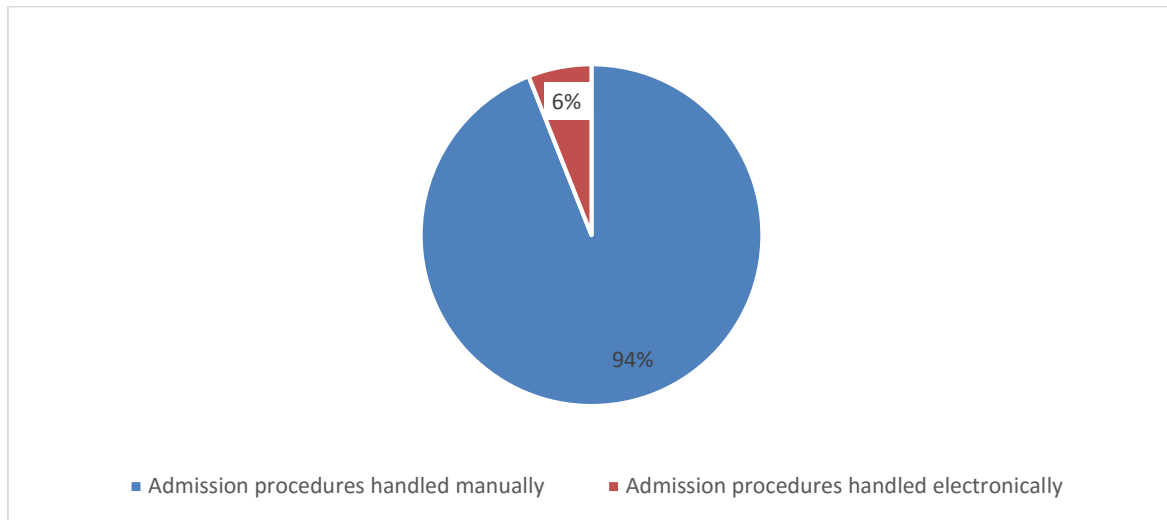
Figure 14: Shows how current admission procedures in A-Level private schools are handled.

The TCPAS software tool is designed to permit applicants to pay an equivalent of only US$2.6 as an application fee and capable of doing multiple admissions based on his/her choice. Alternatively, all payments will be made electronically through mobile (Tigo-Pesa, Mpesa, etc.) or banking financial services. Also, the system will provide weekly notifications in regards to admission progress. Thus, such application tool will make the entire admission procedures far easier and less costly.
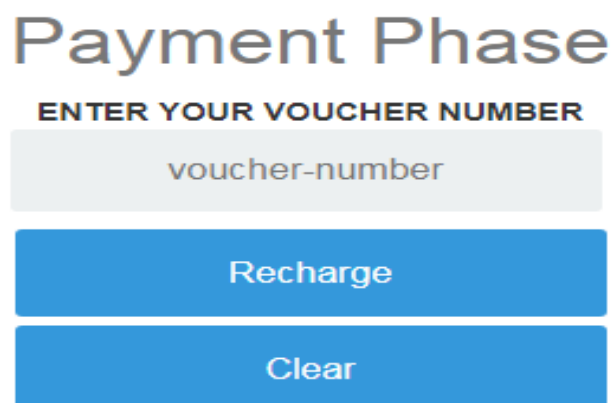
Figure 15: Presents interface for applicants to pay for admission application.

The above user interface deals with Online Transaction Processing (OLTP) that let user to provide a voucher number to the system (that is; a secret code issued by the system electronically through a mobile message to applicants), in order to confirm the status of paid the entrance fee. If the status is ok, and the transaction code is valid, then an applicant is going to be allowed to continue with an application, as shown in the Fig. 16.

Figure 16: Student application interface.

4.5 Fairness of the Admission Process

Survey results in Table 3, evidence indicate that, there exist major challenges like gender inequity, scarce resources, underdevelopment, and the quest for advancement in science and technology in A-Level private schools in Kilimanjaro Region. In this respect, there was need to use a fair method of selection at the time of admission, to ensure an equitable distribution of the available vacancies during the time of admission processes.

Table 3: The level of fairness of current admission procedures in A-Level private schools.

Variables	Frequency	Percentage
Response rate based on unfair admissions	103	69
Response rate based on fair admissions	47	31
Total	**150**	**100**

Therefore, the designed software tool will not require any centralized board to sit periodically and make decisions on the applicant's requests for admission into A-Level private schools. Rather, the system will allow applicants to apply directly to schools, and automatically the system will make decisions based on criteria for admitting students specific to that particular school on its own. In the case a student is accepted by multiple schools, the system will permit the student to accept and confirm the most preferred school to pursue his/her studies.
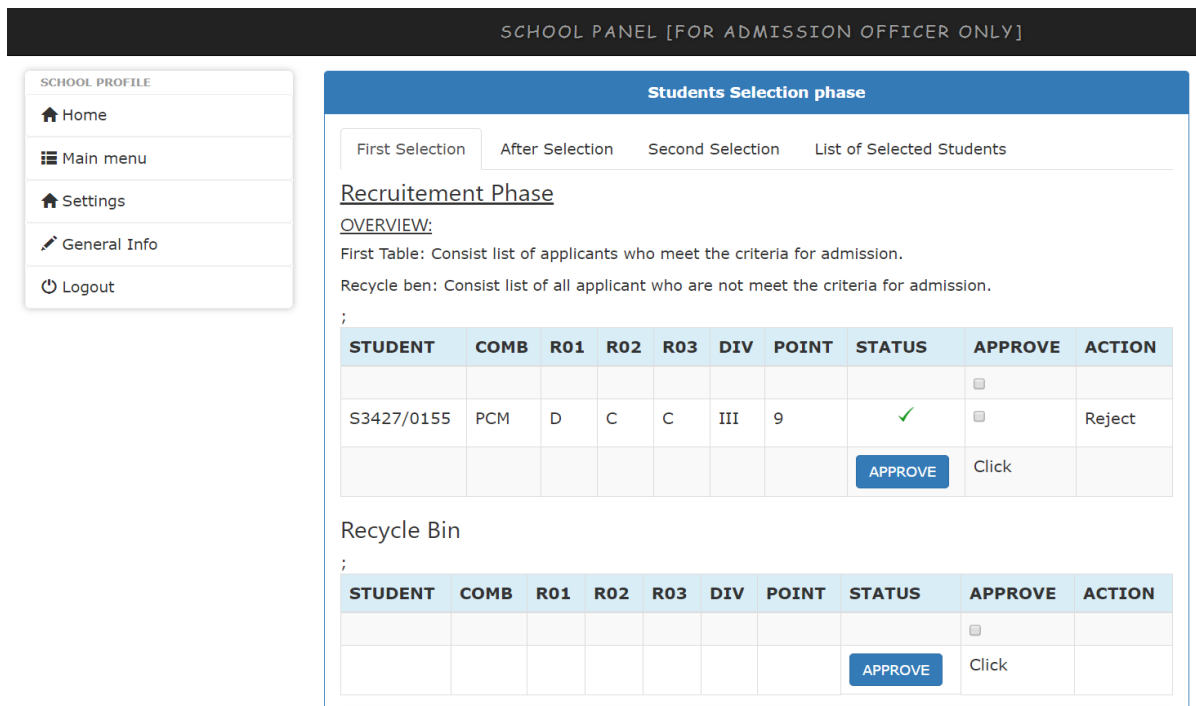
Figure 17: Decision and recruitment interface for a school.

4.6 How to Save Admission Vacancies?

Survey results in Table 4 show that, in the absence of a centralized system to monitor and control admissions in A-Level private schools, one applicant physically collects forms from various schools and lodges multiple applications. In the sense that, it may lead one applicant to be admitted into more than one school, and eventually pick one vacancy and still abandon some of the vacancies from other schools. Consequently, this study shows that 78% of A-Level private schools in Kilimanjaro Region deliver a number of candidates that are below their expectations.

Table 4: Delivering candidates' expectation rate for A-Level private schools.

Variables	Frequency	Percentage
Advanced Level (A-Level) private schools that deliver a number of candidates that are below their expectations	117	78
Advanced Level (A-Level) private schools that deliver a number of candidates that are within/above their expectations	33	22
Total	**150**	**100**

The Designed TCPAS software tool uses bi-directional (to and fro) approaches in the sense that: firstly, an applicant will be allowed to perform multiple admission requests; and later on may receive multiple acknowledgements from more than one school. And finally, the applicant will be permitted to acknowledge and send acceptance only to one school, thereby leaving vacancies to others. By doing so, TCPAS meets the requirement of controlling and managing multiple admissions and saving admission vacancies for A-Level private schools in Tanzania.
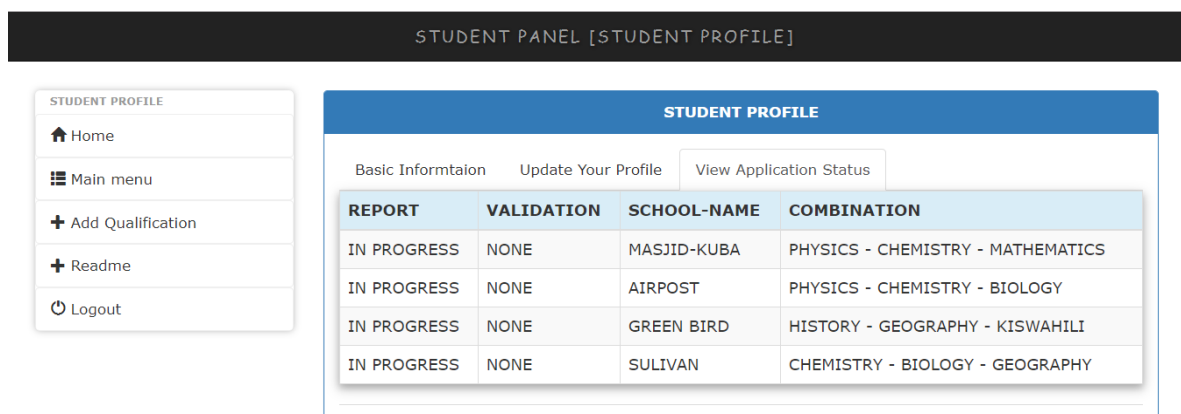
Figure 18: TCPAS response when an applicant performs multiple admissions.

The above user interface shows an instance where an applicant made multiple applications, and still waiting for acknowledgement feedback from the respective schools. Parallel to that, Fig.19 shows on how an applicant is permitted to acknowledge and send acceptance solely to at least one school, thereby leaving admission space to others.

STUDENT PROFILE

- 🏠 Home
- ☰ Main menu
- ➕ Add Qualification
- ➕ Readme
- ⏻ Logout

STUDENT PROFILE

Basic Informtaion | Update Your Profile | View Application Status

REPORT	VALIDATION	SCHOOL-NAME	COMBINATION
SELECTED	ACCEPT	MASJID-KUBA	PHYSICS - CHEMISTRY - MATHEMATICS
SELECTED	ACCEPT	AIRPOST	PHYSICS - CHEMISTRY - BIOLOGY
NOT SELECTED	WAIT	GREEN BIRD	HISTORY - GEOGRAPHY - KISWAHILI
IN PROGRESS	NONE	SULIVAN	CHEMISTRY - BIOLOGY - GEOGRAPHY

Figure 19: TCPAS response after schools accept or reject toward applicant requests.

4.7 How to Encourage the Use of Paperless Admission?

Apparently, the survey results in Fig. 20 shows that 51% of admissions of students in A-Level private schools is done manually with ink and paper, which is very slow, less accurate, difficult to complete as well as time and effort consuming. Although 30%, 16% and 3% of A-Level private schools in Kilimanjaro Region, respectively, also use methods like Postal Office, Phone Calls, and Electronic Mail, these methods still are not effective and efficient to reduce the use of ink and paper admissions. For this reason, there is a need to have a tool to control and manage the use of paper to print admissions and enhance the enrollment of qualified students into A-Level education.

Method	Percentage
Electronic Mail	3%
Physically	51%
Phone calls	16%
Postal Office	30%
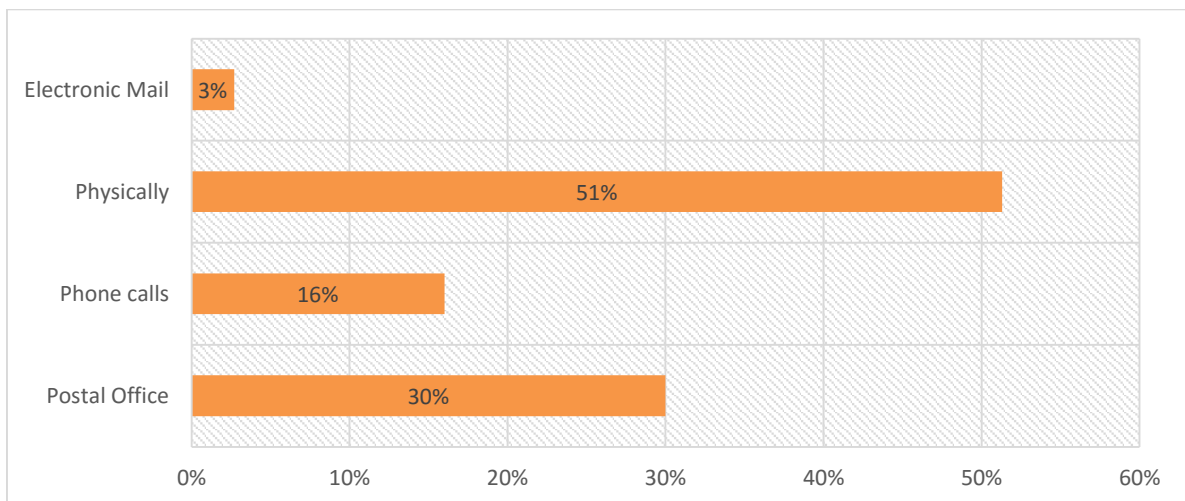
Figure 20: The current methods for admission processing in A-Level private schools.

With the developed TCPAS software tool, applicants no longer need to collect and fill physical forms. Instead, they will perform the applications through a web portal and answer all the

required queries, at the same time it will send notifications to applicants using mobile phone messages. Consequently, it will control and manage the use of paper to print admissions; that is a paperless admission procedures.
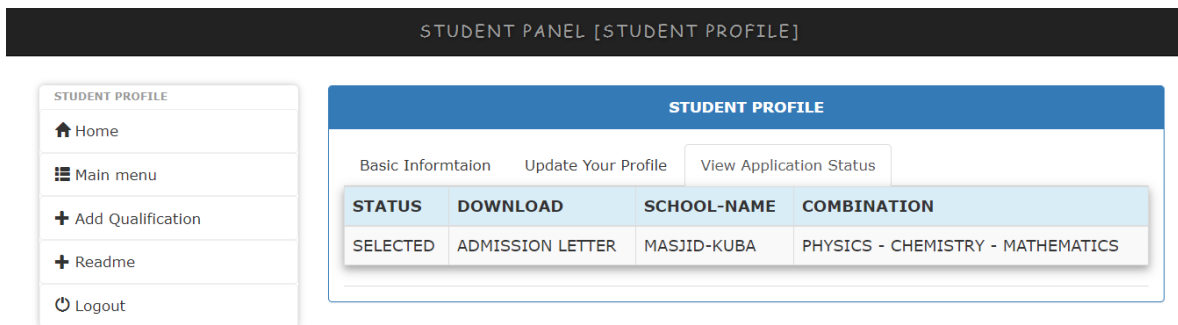
Figure 21: Acknowledgement feedback to applicant profile.

The above user interface presents the list of all applicants selected by the respective school, and then the system (TCPAS) will allow schools to process, extract, and export a copy of that particular list in the form of the PDF format, as shown in Fig. 22.
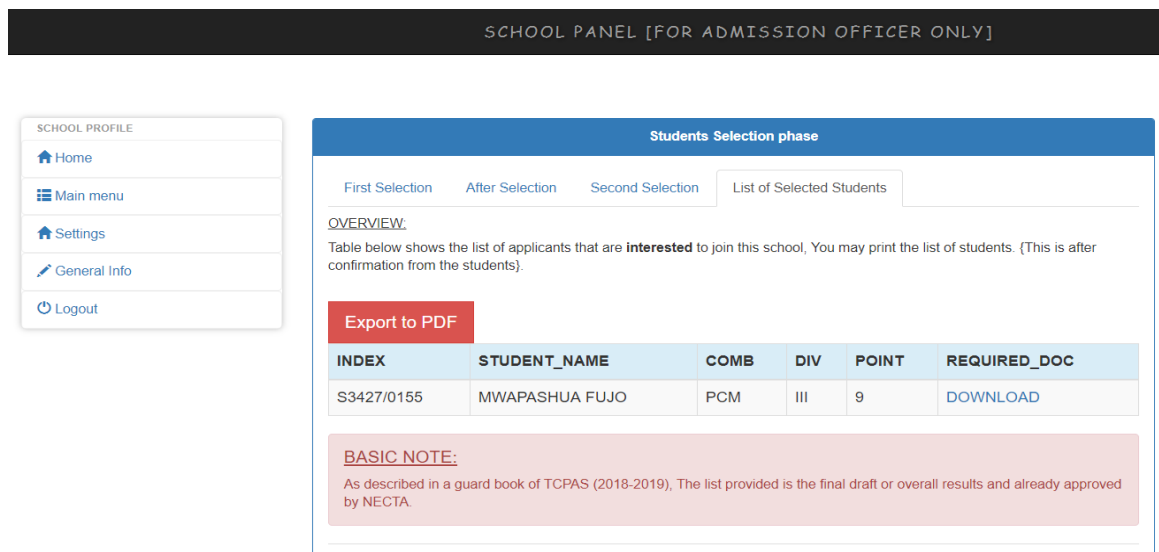
Figure 22: Interface for schools to generate reports showing the list of selected student.

4.8 System Testing, Validation and Maintenance

This section is going to describe any design tactics that do not have sweeping architectural implications (meaning they would not significantly affect the overall organization of the system and its high-level structures), but which nonetheless affect the details of the interface and/or implementation of various aspects of the system. Such tactics are.

4.8.1 System Testing

System test is performed on the entire system in the context of a Functional Requirement Specification and/or a System Requirement Specification. System testing, tests not only the design, but also the behavior and even the believed expectation of the customer. It also intended to test up to and beyond the bounds defined in the software /hardware requirements specification (s).

(i) Unit Testing

During this step, different test cases are designed and implemented in order to test the correctness of each class in the designed software solution (TCPAS). As shown in the test cases Table 5.

Table 5: Presents test cases.

Features	Cases	Status
Server communication	Check if connection is established or not	Ok
User registration	Check if input information is correct or not	Ok
User login	Check if users are authorized users or not	Ok
School approves	Check if schools are validated or not	Ok
Student application	Check if students are not exceeding application limit	Ok
Student payment	Check if student pay required admission fee or not	Ok
Student update application	Check if student changes are perceived or not	Ok
Search for applicants	Check if what user search is available or not	Ok
Send confirmation messages	Check if confirmation messages are successfully or not	Ok
Print list of applicants	Check if information is printed successfully	Ok

(ii) User Validation Testing

A total of 100 entries was collected through questionnaires, and all entries retrieved as correctly filled were subsequently used in the analysis. The 100 entries were clustered into two groups of system users. The first group involved a sample of school staffs: in which 50 admissions officers were selected. And in the last group, a sample of applicants was considered; in which 50 pre-college students were selected randomly from the study sample. The distributed survey

questionnaires had only soft-copy questions, and were administered by using the Open Data Kit (ODK) software. Participants answered a different survey questions, responding by Agree, Disagree or Neutral.

The analysis of the result in Table 6, confirms and quantify that, the designed software solution works according to software specification and strongly agreed with its implementations. A Minority of them were not satisfied on the operational and functionalities of the designed solution (TCPAS).

Table 6: Survey results for user validation testing.

Validation criteria	Respondent	Agree	Disagree	Neutral
Awareness on admission system usage	Applicants and schools	60%	25%	15%
TCPAS is affordable to use?	Applicants and schools	80%	10%	10%
TCPAS encourage paperless admission?	Applicants and schools	72%	18%	10%
TCPAS save admission vacancies?	Applicants and schools	49%	11%	40%
TCPAS reach many applicants?	Applicants and schools	68%	12%	20%
TCPAS has centralized data handling capability?	Schools	55%	5%	40%
TCPAS is fair and transparent?	Applicants and schools	89%	11%	-
TCPAS control forgery of certificates?	Schools	75%	25%	-
More functionalities are needed?	Applicants and schools	13%	87%	-
TCPAS will be potential to applicants?	Applicants	82%	18%	-
TCPAS will be potential for schools?	Schools	87%	13%	-

(iii) Acceptance Testing

The survey results indicate that, 80% of applicants and 65% of A-Level private schools in Kilimanjaro Region, Tanzania verify positively on the TCPAS application tool. Apparently the designed software solution has 30 registered schools ready for receiving admission requests from applicants scatted geographically in Tanzania. For this reason, TCPAS confirmed to meet requirements specified by customers.

User Acceptance Level

65%

80%

■ Applicants   ■ Schools   ■   ■
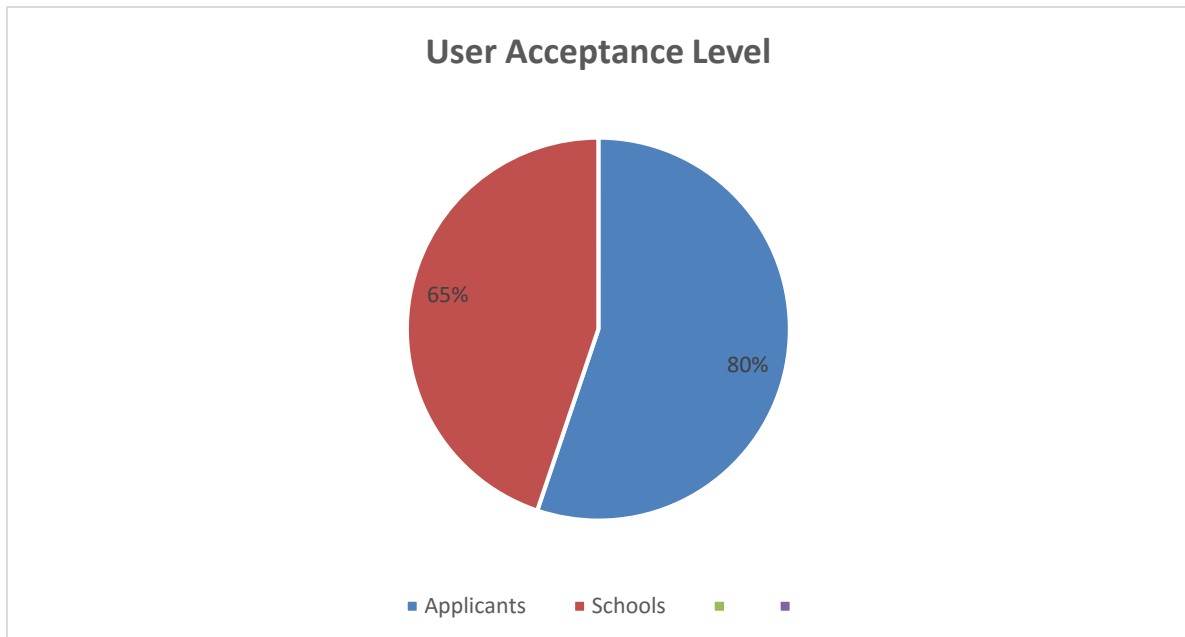
Figure 23: User acceptance level.

(iv) Compatibility Testing

The compatibility of the designed software tool was performed in ten different web browsers including (Chrome, Mozilla Firefox, UC-Browser, Internet Explorer, Opera Mini, Safari, Chromium, Vivaldi, Brave and Microsoft Edge). Also four different platforms were used. The analysis shows that, the system performs well, and scores 75%, 80% and 55% in computer, mobile phone and iPod.
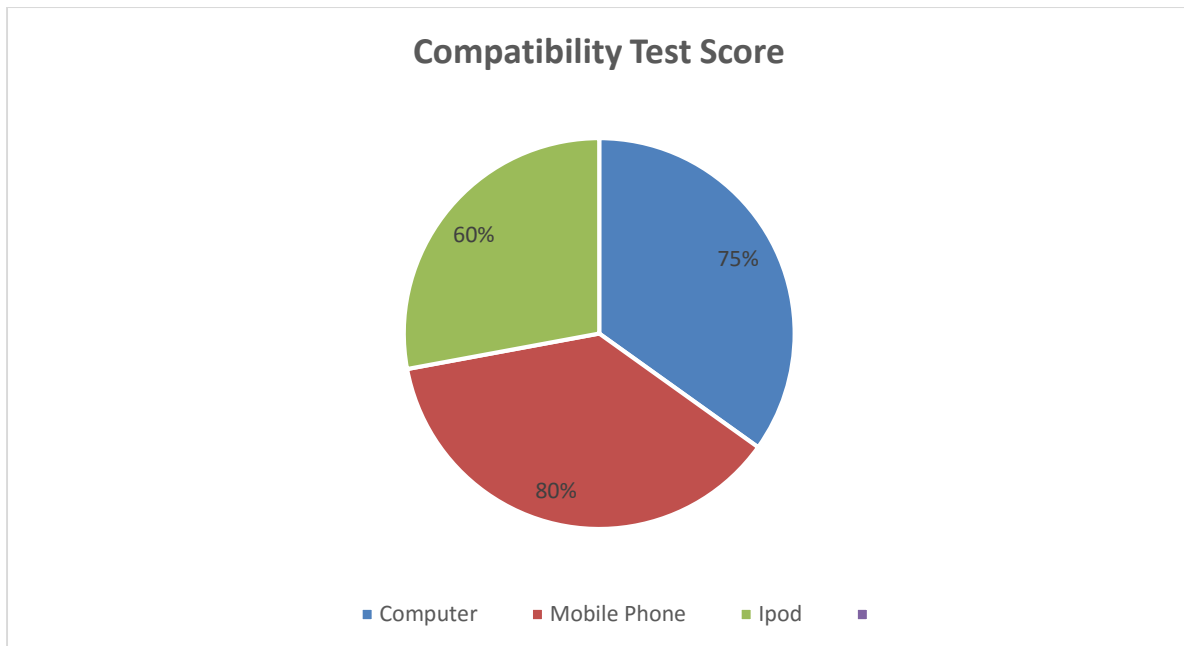
Figure 24: Compatibility test score.

(v) Integration Testing

Tanzania Central Processing Admission System database was integrated to NECTA application thought API provision connectivity. Apparently, with a TCPAS software tool, printed or scanned copies of certificates will no longer be required. Instead, candidates will only be required to provide the Index Number for their Certificates of Secondary Education Examination (CSEE). The verification will be done by the system automatically.

(vi) Performance Testing

This testing applied in order to understand the application or website scalability, or to benchmark the performance in an environment of third party products such as servers and middleware for potential purchase. This sort of testing is particularly useful to identify performance bottleneck in high use applications. Performance testing generally involves an automated test suite as this allows easy simulation of a variety of normal, peak and exceptional load conditions. Therefore, the designed solution scores 70% in Google speed insight tool.

4.8.2 System Maintenance

Once the product has been completed, it is handled by the client. System maintenance is important in any software development in order to fulfill the desired functionalities for a certain

department or organization. Also, our system will undergo several maintenances with regard to the customer needs until it deteriorates.

4.8.3 Version History

This provides information on how the development and distribution of the test cases, up to the final point of approval, was controlled and tracked.

Table 7: Shows version history.

Version #	Implemented by	Revision date	Approved by	Approval date	Reasons
1.0	Admin	09-July-18	-	16-July-18	Testing-System functionalities
2.0	Applicants	17-July-18	Admin	24-July-18	Testing-User functionalities
3.0	Schools	25-July-18	Admin	02-Aug-18	Testing-User functionalities

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

Admissions in A-Level private schools in Tanzania are currently decentralized and handled manually. As a result, applicants have to identify the schools, physically collect application forms and fill the forms manually. In the process, often applicants get confused while filling the application forms and face difficulties in choosing where to pursue their A-Level studies. The newly designed admission system (TCPAS) has the capability to reduce the stress of applicants while filling the application forms. In one click, the TCPAS system will provide possible A-Level private schools and subjects an applicant can get admissions. Furthermore, using the new CAS system probably applicants will get admission in the first round and if not, the system will offer the second round. Also, admission cost in terms of time and money will be reduced. Lastly, despite of the actual fact that, this study focusing on and attempting to address the challenges facing the current admission procedures in A-Level private schools in Tanzania. But still this study leaves an ample room for others to contribute their technological innovation in a pre-college education in Tanzania, by adding another module in this designed software solution (TCPAS) which will enhancing in the area of monitoring and managing academic progress for both public and private schools.

5.2 Recommendations

It is recommended that the Government should construct supportive policy that will promote and encourage all private schools as well as public A-Level schools to deploy the TCPAS application tool, as a means of saving resources in terms of time and money, and enhancing performance of the entire process of admission into A-Level schools in Tanzania.

REFERENCES

Bailey, T. (2014). The role and functions of higher education councils and commissions in Africa: A case study of the Tanzania Commission for Universities.

Hafalir, I. E. and Kübler, D. (2014). College Admissions with Entrance Exams : Centralized versus Decentralized ∗, 1–46.

Hare, H. (2007). Survey of ICT and Education in Africa: Tanzania Country Report, (July), 1–9. Retrieved from www.infodev.org.

Internationalization of Education. (2015). United Kingdom The British education system described and compared with. The Britihe Education System Described and Compared with Dutch System, 3(5), 40.

Judith, B. and Asein, E. (2007). Joint Admissions and Matriculation Board.

Kapinga, O. (2016). Assessment of School Facilities and Resources in the Context of Fee Free Basic Education in Tanzania, 1–11.

Mahundu, F. G. (2016). e-Governance: A Case Study of the Central Admission System in Tanzania. *Electronic Journal of Information Systems in Developing Countries*, *76*(6), 1–11.

Mangindaan, M. C., Elley, W. B., Medicine, T. C., OECD, Paper, P., Stacey, K., … Notodiputro, K. A. (2013). Tanzania The Tanzanian education system described and system. *Far Eastern Survey*, *33*(4), 1–16. https://doi.org/10.1016/0145-9228(79)90001-3.

Ministry of Education. (2016). Annual Education Statistics 2014.

National Bureau of Standard. (2017). 2012 Population and Housing Census Population Distribution by Administrative areas. *NBS Ministry of Finance*, 177-180.

TCU. (2014). Tanzania Commission for Universities: Revised Admissions Guidebook for Higher Education Institutions in Tanzania, 246. https://doi.org/10.1017/CBO97811074 153 24.004.

TCU. (2017). *Tanzania Commission for Universities Undergraduate Admission Guidebook for Higher Education Institutions in Tanzania for Applicants with Form Six and RPL Qualifications*.

UNDP. (2014). United Nations Development Program Country : Tanzania Project Title : Reducing Land Degradation on the Highlands of Kilimanjaro Region. *United Nations Development Program*, 1–67.

Wabwoba, F. and Mwakondo, F. M. (2011). Students selection for university course admission at the joint admissions board (Kenya) using trained neural networks. *Journal of Information Technology Education*, *10*(1), 333–347.

Zhang, H. (2009). An Analysis of The Chinese College Admission System.

Appendix 1: Research Timeline

This section provides estimated timeline for carrying out research activities, throughout the entire period of research (2017 to 2018). The chart below gives the name of each activity, it starts and finish date with the bar line besides indicating the milestone of individual activity.
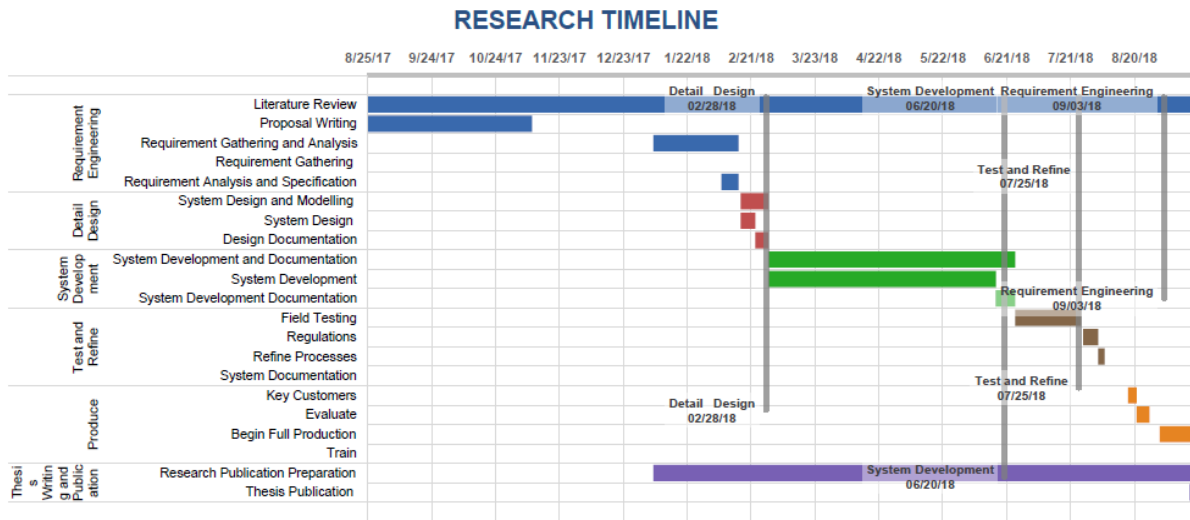
Figure 25: Research timeline.

Appendix 2: Timeline Description

CATEGORY	TASK	START	END	COLOR	Start	Blue	Red	Green	Brown	Orange	Purple
Project Start	08/25/17				columns used to create the chart						
Requirement Engineering	Literature Review	08/25/17	09/15/18	Blue	8/25/17	387	0	0	0	0	0
	Proposal Writing	08/25/17	11/09/17	Blue	8/25/17	77	0	0	0	0	0
	Requirement Gathering and Analysis	01/06/18	02/14/18	Blue	1/6/18	40	0	0	0	0	0
	Requirement Gathering	01/06/18	01/20/18								
	Requirement Analysis and Specification	02/07/18	02/14/18	Blue	2/7/18	8	0	0	0	0	0
Detail Design	System Design and Modelling	02/16/18	02/28/18	Red	2/16/18	0	13	0	0	0	0
	System Design	02/16/18	02/22/18	Red	2/16/18	0	7	0	0	0	0
	Design Documentation	02/23/18	02/28/18	Red	2/23/18	0	6	0	0	0	0
System Development	System Development and Documentation	03/01/18	06/24/18	Green	3/1/18	0	0	116	0	0	0
	System Development	03/01/18	06/15/18	Green	3/1/18	0	0	107	0	0	0
	System Development Documentation	06/16/18	06/24/18	Green	6/16/18	0	0	9	0	0	0
Test and Refine	Field Testing	06/25/18	07/25/18	Brown	6/25/18	0	0	0	31	0	0
	Regulations	07/27/18	08/02/18	Brown	7/27/18	0	0	0	7	0	0
	Refine Processes	08/03/18	08/05/18	Brown	8/3/18	0	0	0	3	0	0
	System Documentation	08/06/18	08/16/18								
Produce	Key Customers	08/17/18	08/20/18	Orange	8/17/18	0	0	0	0	4	0
	Evaluate	08/21/18	08/26/18	Orange	8/21/18	0	0	0	0	6	0
	Begin Full Production	08/27/18	08/31/18	Orange	9/1/18	0	0	0	0	15	0
	Train	09/01/18	09/15/18								
Thesis Writing and Publication	Research Publication Preparation	01/06/18	09/15/18	Purple	1/6/18	0	0	0	0	0	253
	Thesis Publication	09/15/18	01/15/19	Purple	9/15/18	0	0	0	0	0	123

MILESTONE	DATE	Margin Bottom	Margin Top
Requirement Engineering	09/03/18	50%	95%
Detail Design	02/28/18	25%	95%
System Development	06/20/18	10%	95%
Test and Refine	07/25/18	30%	95%

Figure 26: Research timeline description.

Appendix 3: Research Budget

Table 8: Research budget.

This section provides an estimated budget for carrying out research activities, throughout the entire period of research (2017 to 2018).

	AMOUNT TO STUDEN	AMOUNT TO SUPERVISOR	OVERALL COST			
	$4,165.24	**$289.41**	**$4,454.65**			
ACTIVITIY	**INPUT DESCRIPTION**	**UNIT OF MEASURE**	**COST EACH**	**NUMBER OF UNIT**	**AMOUNT TO STUDENT**	**AMOUNT TO SUPERVISOR**
Requirement Engineering						
Data Collection	Per diem for student	Day	$31.17	14	$436.38	
	Per diem for supervisor	Day	$31.17	1		$31.17
	Local Transport charge for student	For 7 Districts				
	Same	Trip(5-schools out of7)	$4.45	5	$22.25	
	Mwanga	Trip(5-schools out of7)	$4.45	5	$22.25	
	Rombo	Trip(3-schools out of3)	$4.45	3	$13.35	
	Siha	Trip(1-school out of1)	$8.91	1	$8.91	
	Hai	Trip(1-schools out of1)	$8.91	1	$8.91	
	Moshi Town	Trip(4-schools out of8)	$8.91	4	$35.64	
	Moshi Villages	Trip(7-schools out of11)	$8.91	7	$62.37	
	Local Transport charge for supervisor	Trip	$22.27	5		$111.35

	Return Bus Ticket for supervisor	Day	$22.27	7		$155.89
	Return Bus Ticket for student	Day	$44.54	7	$311.78	
Subtotal				60	$921.84	$298.41
Design and Development						
Tools and Facilities	Laptop (Lenovo, Ci7 8GB Ram 1TB)	1	$500.46	1	$500.46	
	Camera For graphic Design (EOS 7D EF-S 18-135mm IS lens)+Stand	1	$200.90	1	$200.90	
	Wireless Router for Internet connection(Vodafone Pocket Router R207z)	1	$53.37	1	$53.37	
	Application Programming Interface (API) from NECTA for Results provision charges	One Year	$44.47	1 Year	$44.47	
	SMS Services Monthly payment	500SMS	$0.22	2500	$550.00	
Subtotal				2505	$1,349.20	
Test and Implementation	Smartphone for testing Compatibility(iPhone 6)	1	$200.00	1	$200.00	
	Printer-Scanner-Copy for report(Epson l-220 Multi-function printer)	1	$150.45	1	$150.45	
	Hosting Monthly Payment(Gold Package Host in Tanzania)-10GB	Per Month	$200.12	1	$200.12	

	WEB SPACE, 100GB MONTHLY BANDWITH, UNLIMITED EMAIL ACCOUNTS AND DOMAIN NAME INCLUDED					
	Return Bus Ticket for student (FOR FIELD TESTING)	1	$22.24	5	$217.91	
	Per diem(FOR FIELD TESTING)	1	$31.13	7	$217.91	
Subtotal				16	$986.59	
Publication	Paper		$177.89	2	$177.89	
	Conference		$579.36	1	$579.36	
	Dissertation Printing and Binding		$150.36	1	$150.36	
Subtotal				4	$907.61	
Requirement Engineering					$921.84	$289.41
Design and Development					$1,349.20	
Test and Implementation					$986.59	
Publication					$907.61	
Total					$4,165.24	$289.41
Overall Total						$4,454.65

Appendix 4: Questionnaire

Overview

This questionnaire consists of two sections which are section A and B. Question in section A answered by A-Level students or Parents, questions in section B answered by admission Officers of A-Level private schools. Put a tick against the right option for questions with multiple answers and fill in the blanks provided with short answers.

SECTION A

STUDENT INFORMATIONS

PARTICULARS	OPTIONS	ANSWERS
Student Name		
Gender		
Class	Form:	
Resident of State		
Sponsors		
Parent's work		
Parent's income		

Are you a resident of a region/zone in which your school is located? Yes ☐   No ☐

How far is your school from home? (Circle one answer)

1. Less than 50 miles 2. 51 to 100 miles 3. 101 to 300 miles 4. 301 to 500 miles 5. More than 500 miles

Which of the following describe the best type of high school you attended? (Circle one answer)

1. Public 2. Independent 3.Religious Affiliated 4.Other Not Independent, Not Religious Affiliated

SCHOOL INFRASTRUCTURES

	Not Used	Poor/Fair	Good	Very Good	Excellent
School website					
Electronic communication					
Computer lab					

C01: What were the most significant factors in your decision to apply in private schools? **(Check the correct answers below).**

Chance to be with students from different background	⬡	Number of students enrolled at the school	⬡
Ease of getting home	⬡	Size of academic classes	⬡

Regardless of your answers to the prior question, you may provide detailed description below.

....

....

C02: What were the sources of information that made you aware to apply in private schools? **(Check the correct answers below).**

Social network sites	⬡	School tour	⬡
Graduate school forum	⬡	Online school admission	⬡

Regardless of your answers to the prior question, you may provide detailed description below.

....

....

C03: What are the ways of admission used in A-Level private schools? **(Check for correct answers below).**

Manually performed	⬡	With database system	⬡
Electronically with mobile base application	⬡	mobile base application with paper submission	⬡
Electronically with web-portal	⬡	Electronically with web-portal with paper submission	⬡

Regardless of your answers to the prior question, you may provide detailed description below.

....

....

C04: How is the current admission procedures into A-Level private schools handled? **(Check the correct answers below).**

Centralized data handling	⬡	Central board governs by Government	⬡
Decentralized data handling	⬡	Central board governs by private schools	⬡
No Central board	⬡		⬡

Regardless of your answers to the prior question, you may provide detailed description below.

……

………………………………………………………

C05: Which of the following are the major drawbacks for the current admission procedures in A-Level private schools? **(Check the correct answers below).**

How to save admission vacancy	☐	Centralized data handling	☐
How to reduce the cost of the admission process	☐	How to reach geographically scattered applicants	☐

Regardless of your answers to the prior question, you may provide detailed description below.

……

………………………………………………………………………………

C06: What were the current ways used by A-Level private schools to send feedback of acceptance or rejection to the applicants? **(Check the correct answers below).**

Electronic mail	☐	Mobile messages	☐
Postal Office	☐	Physically	☐
Phone call	☐		

Regardless of your answers to the prior question, you may fill in blanks provided below.

……

………………………………………………………………………………

C07: How long it takes to receive feedback from schools after the admission processes? **(Check the correct answers below).**

A week	☐	A month	☐
Less than a month	☐	More than a month	☐

Regardless of your answers to the prior question, you may provide detailed description below.

……

………………………………………………………………………………

C08: There is any contribution of having centralized software/web-portal to govern the entire system of admission into A-Level private schools? **(Check the correct answers below).**

Save admission vacancy	☐	Centralized data handling	☐
Reduce the cost of the admission process	☐	Reaching geographically scattered applicants	☐
Encourage use of paperless admission	☐	Control over forgery of certificates	☐
Gender equality/Fair	☐		

Regardless of your answers to the prior question, you may provide detailed description below.

………

………………………………………………………………………………………………

C09: What is your comment on the current admission processes/systems? **(Check the correct answers below):**

Stable	☐	Unstable	☐
Weak	☐	Strong	☐

You're Recommendation.

………

………………………………………………………………………………………………...

SECTION B

SCHOOL INFORMATIONS

PARTICULARS	OPTIONS	ANSWERS
School Name		
Centre Number		
School Location/Zone	Form:	
High School Type	Religion, Seminary	
School Fees		

SERVICES OFFERED BY SCHOOL

Day's Only	☐	Accommodations Only	☐
Boarding Only	☐	Meals Only	☐
Day and Boarding	☐	Accommodations and Meals	☐

SCHOOL BASED ON

Science Subjects	☐	Art subjects	☐

C01: What are the admission criteria for applying to be approved in A-Level private schools? Consider your school as an example.

For Science subjects	For Art subjects

SCHOOL ADMISSION VACANCY

For Science Subjects	☐	For Art subjects	☐
Total number of vacancies	☐		

SCHOOL APPLICATION FREQUENCY FOR 2016-2018

For Science Subjects	☐	For Art Subjects	☐
Total number of applicant's	☐		

SCHOOL ICT INFRASTRUCTURES

	Available	Not Available
Computer lab		
Electronic communication with the school		
School website		
Student Information System		
Electronic Admission system		

C02: What are the sources of information used by A-Level private schools to provide awareness to the geographically scattered applicants'? Consider your school as an example **(Check the correct answers below).**

Contact with graduate of the school	☐	TV/Radio Advertisements	☐
Magazines and brochure's	☐	Trade fairs	☐
School website	☐	Parents or relatives	☐

Regardless of your answers to the prior question, you may provide detailed description below.

……

………………………………………………………………………………………………

C03: What are the ways of admission that currently used by applicants to request A-Level private schools? Consider your school as an example **(Check the correct answers below).**

Manually performed	☐	With database system	☐
Electronically with mobile base application	☐	mobile base application with paper submission	☐
Electronically with web-portal	☐	Electronically with web-portal with paper submission	☐

Regardless of your answers to the prior question, you may provide detailed description below.
……
………………………………………………………………………………………

C04: How is the current admission procedures handled in A-Level private schools? Consider your school as an example **(Check the correct answers below).**

Centralized data handling	☐	Central board governs by Government	☐
Decentralized data handling	☐	Central board governs by private schools	☐
No Central board	☐		☐

Regardless of your answers to the prior question, you may provide detailed description below.
……
………………………………………………………………………………………

C05: Which of the following are the major drawbacks to current admission procedures in A-Level private schools? Consider your school as an example **(Check the correct answers below).**

How to save admission vacancy	☐	Centralized data handling	☐
How to reduce the cost of the admission process	☐	How to reach geographically scattered applicants	☐
How to encourage use of paperless admission	☐	How to ensure control over forgery of certificates	☐
How to handle gender equality	☐		

Regardless of your answers to the prior question, you may provide detailed description below.
……
………………………………………………………………………………………

C06: What are the ways used by A-Level private schools to send feedback of acceptance or rejection to applicants? Consider your school as an example **(Check the correct answers below).**

Electronic mail	☐	Mobile messages	☐
Postal Office	☐	Physically	☐
Phone call	☐		

Regardless of your answers to the prior question, you may fill in blanks provided below.

……
………………………………………………………………………………………….

C07: How long applicant takes to receive feedback from A-Level private schools after the entire admission processes? Consider your school as an example **(Check the correct answers below).**

A week	☐	A month	☐
Less than a month	☐	More than a month	☐

Regardless of your answers to the prior question, you may provide detailed description below.

……
………………………………………………………………………………………

C08: There is any contribution of having centralized software to govern the entire system of admission in A-Level private schools? Consider your school as an example **(Check the correct answers below).**

Save admission vacancy	☐	Centralized data handling	☐
Reduce the cost of the admission process	☐	Reaching geographically scattered applicants	☐

Regardless of your answers to the prior question, you may provide detailed description below.

……
………………………………………………………………………………………

C09: What is your comment on the current admission processes/systems in A-Level private schools? Consider your school as an example **(Check the correct answers below).**

Stable	☐	Unstable	☐
Weak	☐	Strong	☐

RESEARCH OUTPUTS

(i) PUBLISHED PAPER

Research Article

Web-based admission system for advanced level, private schools: case of Kilimanjaro region, Tanzania

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Abstract

This paper takes a look at the various challenges facing admission procedures for advanced level (A-Level) private schools case of Kilimanjaro region in Tanzania. Questionnaires were distributed to gather data from potential users of a new proposed admission system; namely: parents, A-Level students and school staffs, to find out procedures likewise the challenges being faced in the course of carrying out admission procedures and their level of satisfaction of the existing admission system. Thereafter, the analysis of the survey results confirms and quantify that 93.5% of admissions into A-Level private schools are performed manually by ink and paper. This manual system has its major problems which include difficulty in locating an appropriate school and subjects an applicant can get admissions, wastage of time, and loss of forms and mutilation of forms throughout the entire method for admission. Consequently, this paper reports on an on-going research work to design and implement a Tanzania central processing admission system (TCPAS) that has the outstanding changes towards maintenance of admission costs, control forgery over entry qualifications, encourage the use of paperless admission, ability to reach several geographically scattered candidates and enhancing centralized data handling capability.

Keywords

Admission system, A-Level private schools, CSEE, NECTA, TCPAS, Web portal.

1. Introduction

Globally, millions of students seek for admission during the last year of their pre-college education to graduate schools, colleges or universities. Of concern is that, the admission approaches differ from country to country, and typically from institution to institution [1].

In developed countries (e.g. the United Kingdom, France, etc.), the admission into tertiary institutions, universities, colleges, and schools are centralized. In the sense that, colleges or schools receive applications through a web portal, and applicants are not required to collect and fill the physical forms; rather they would only visit the admission website of a particular school or college, and all eligibility criteria are mentioned on the site [2]. Such admission systems include, common application in the United States of America. Joint University Programmed Admission System in Hong Kong (JUPAS). University College Admission System in China (CUCAS), and the Universities and Colleges Admission Service (UCAS) in the United Kingdom [3]. Such admission systems adopted as a means of saving resources time and money to both applicants and colleges, and harmonizes the turnaround time during the admission process [4]. However, there were unsolved difficulties like, a way to handle multiple admissions and save admission vacancies, centralized data handling capability, ability to achieve many geographically scattered candidates, and the way to make sure management over forgery of entry certificates throughout the application [5].

Additionally, in China, like in most developed countries, there are government boards or agencies which harmonize the admission process by offering admission exams to applicants. This has caused students to invest a lot of time and effort to prepare for such exams. However, candidates perform differently on these exams, which do not necessarily reflect their real abilities. As a result, the colleges might end up enrolling unqualified candidates. Therefore, this makes the application procedure very tiresome, being costly, less fair and even less considerate [3].

A case in point, in developing countries, it is desirable to have fair and transparent student admissions system in both public and private universities, colleges and schools. Same challenges like scarce resources, underdevelopment, gender inequality and the quest after advancement in science and technology, as causal factors; has led to the requirement to use a fair and transparent method of selection for admission to both ordinary, advanced and tertiary institutions, to make sure there is equal distribution of available admission vacancies or spaces for candidates aspiring to join Higher Educational Institutions (HEIs) as well as pre-colleges institutions [6].

For instance, in Nigeria the researchers have been making every effort to develop intelligent decision support systems that may facilitate in university admission procedures [7]. But currently the admission approach into both pre-colleges and tertiary institutions are decentralized. In the sense that, every university, college and school has a power to make decisions on their admission independently [8]. Such admission approach characterized by multiple admissions, uniformity in the admission processes, being costly, inconsistency, inaccuracy, difficulties in setting admission standards and following admission procedures. As a result, one candidate can receive offers of admission from more than one institution or college, and admitted to more than one college and abandon some of the vacancies. For this reason, most of admission seeker for pre-college and university education in Nigeria, show desperation in their efforts to achieve admissions into the highly limited available admission vacancies [9].

Parallel to the developing countries, admission process into public and private universities in Uganda is done by two systems: A Joint Admissions Board (JAB) that is governed by the government for public universities and direct admissions for private universities. This board (JAB) periodically sits to a make decision of candidate requests and select qualified applicants whom it assigns to different public universities and different disciplines. However, during such admission procedure, there is a lack of fairness and transparency. For private universities and university college applicants physically collect the application forms themselves, which in turns cost in terms of time and money.

In contrast, in Tanzania the establishment of web-based admission system is one of the greatest innovations for monitoring and controlling quality for admission into technical and tertiary education. Additionally, has become potential for evaluating the applicant's quality, standard of entry requirements, and control the widening access to higher educational institutions [10]. Thus, the government of Tanzania in 2010 control the operations of

admission into higher and technical educational institutions through a Centralized Admission System (CAS), which was under the supervision of two regulatory boards named National Council for Technical Education (NACTE) in collaboration with the Tanzania Commission for Universities (TCU) [11]. In 2017 the government of Tanzania revoked the admission process through TCU. Apparently, each institution can process admission independently, thereafter all institutions are required to upload the selected candidates into the system for TCU to approve, to make sure that all selected candidates approved by their institutions satisfy TCU and NACTE minimum entry requirements for each programme [12].

Furthermore, Tanzania is one among the few countries that follows a 7-4-2-3 system of education. That is; primary schooling takes seven years, followed by four years of Ordinary Level (O-Level) education, two years of Advanced Level (A-Level), and three years of the first degree for higher educational institutions [13]. Reports from the ministry of education in Tanzania in 2017 indicate that, over 35% of candidates join into technical and higher educational institutions for each academic year are from A-Level private schools [14]. Despite of contribution of A-Level private schools into higher level learning institutions and the existence of these two systems for admission (TCU and NACTE), but to date the enrolment of students in A-Level private schools is done manually by ink and papers which is difficult to perform, inconsistency, less accurate and very difficult to complete the entire admission process. Such manual admission systems are considered unfair and not transparent [15]. In dealing with these challenges a centralized web-based solution has been proposed, namely; Tanzania Central Processing Admission System (TCPAS), to resolve the identified admission challenges. Therefore, this paper reports on an ongoing research work to design and implement a TCPAS software tool for A-Level education in Tanzania, case of private schools in Kilimanjaro region.

The rest of the paper is organized as follows: Section two presents a collection of tools and techniques that are guiding the reported study. Section three presents the software requirements and design consideration of the proposed software solution. Section four present's survey data and discussion on how the designed software solution has potential to mitigate the challenges facing current admission procedures into A-Level education in Tanzania, case of private schools in Kilimanjaro region. Section five has a conclusion and recommendation.

2. Materials and methods

Kilimanjaro as one among the five administrative regions that has a high number of A-Level private schools compared to other regions in Tanzania, was selected as a study area for the reported study. This is due to colonialism impacts, demographic factors and religious activities. Thus, 64% of A-Level private schools in Kilimanjaro region are owned by religious institutions exclusively. Additionally, most of these schools are well invested in ICTs infrastructures (that is; computers and internet connectivity are already integrated as a medium of instruction) [15]. Kilimanjaro has a population of 1,640,087. Also, it is bordered by Tanga region, Arusha region, Manyara region and with Kenya in the eastern zone, as shown in figure 1 [16].
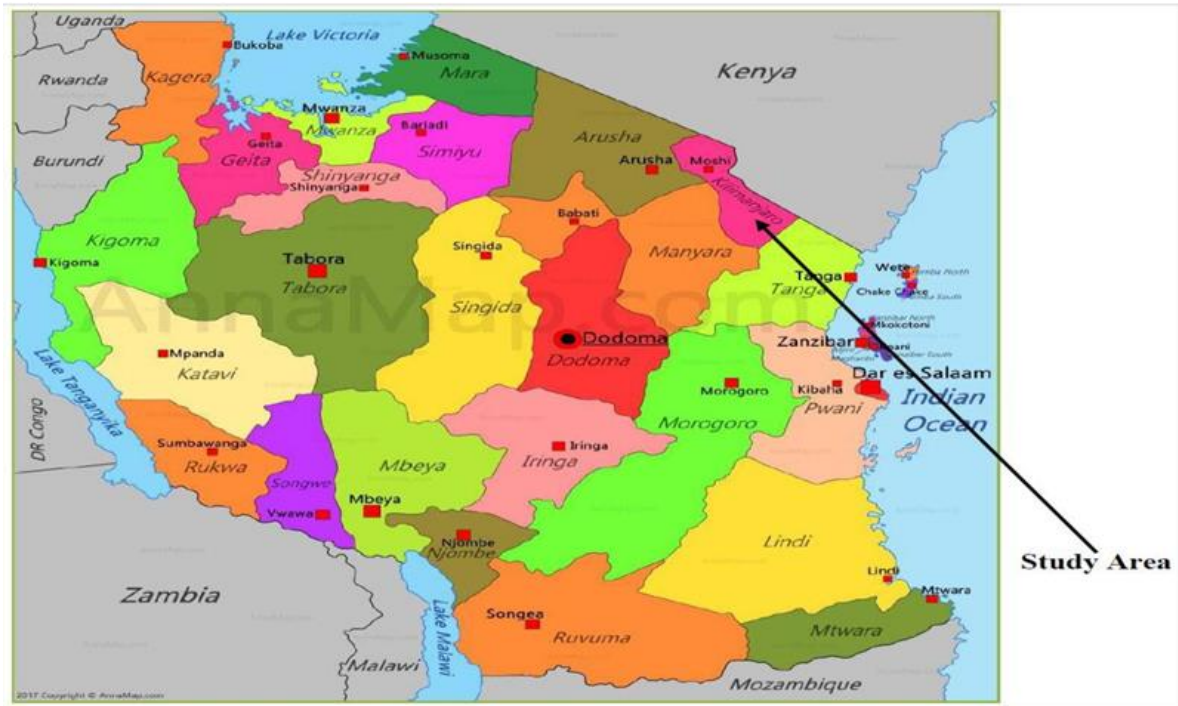
Figure 1: A map of Tanzania showing the Kilimanjaro region as a study area.

This research was adopted a case study approach. The 150 voluntary respondents or participants were selected as a study sample, and clustered into three groups, namely: parents, A-Level students and school staffs. During the month of February 2018, at the beginning of week 1 to week 4, questionnaires were distributed to collect data from the households, in which 25 houses which were expected to have at least one candidate were selected; followed by school staffs: in which 25 school admissions officers were selected. At the end of the week 3, the last group of students was considered; in which 100 A-Level students were selected randomly from the study sample. For this study, the distributed survey questionnaires were administered by using the Open Data Kit (ODK) software, and it had both hardcopy and softcopy questions. During the end of week 4 the collected statistical data were analyzed and virtualized by using SPSS software. Thereafter, we started to extract the software requirements and design consideration of the proposed software solution (TCPAS) based on the collected and analyzed survey data.

A flowchart in figure 2, presents workflow or processes that illustrate the procedures used to guide this study. Flowchart was used as results of, it's terribly representative and precise throughout analysis, design and documentation of the research findings. In figure 2, an arrowhead or a flow line: shows the process order of operation; means a line returning from one symbol and pointing at another. A Diamond box: represents a decision; means a condition, and its operation is mainly being true or false. And the rectangle presents a process; means a set of operation that should be performed to complete the overall milestone in this study.
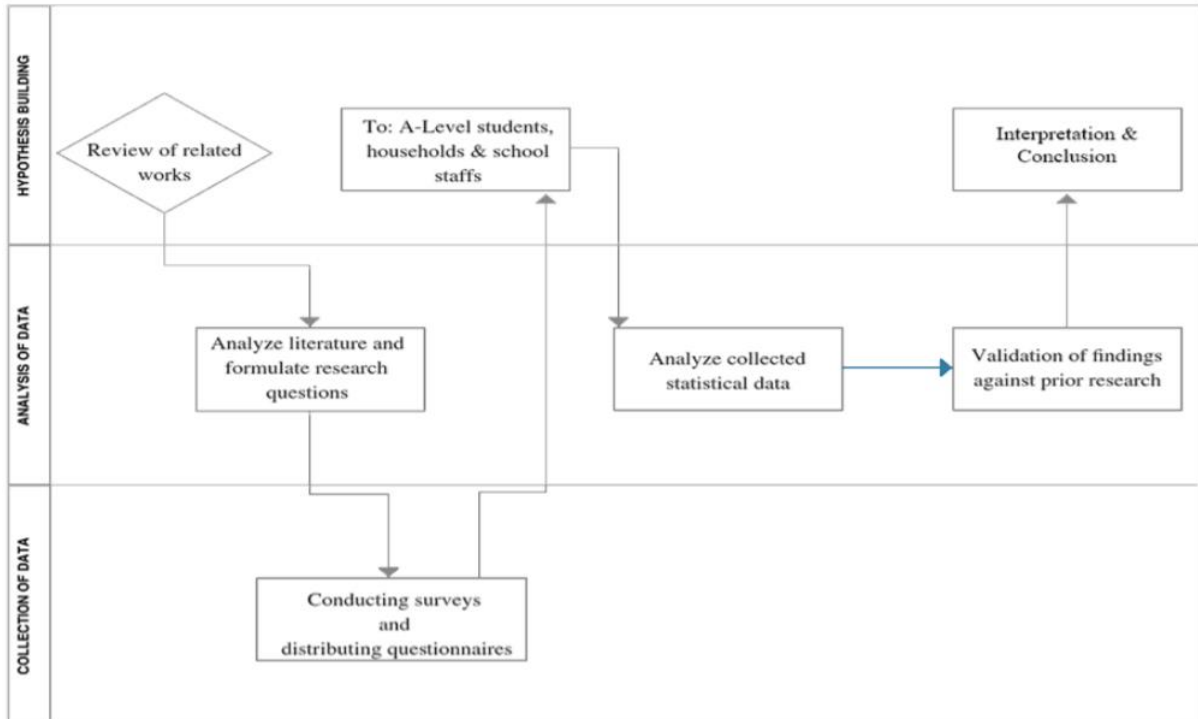
3. Requirements specification and design consideration

The main objective of this study is to develop a Tanzania Central Processing Admission System (TCPAS) for A-Level private schools, to replace the existing manual admission system. To achieve the main objective of the study, an ideal TCPAS software solution should meet the following user requirements: -

The software must provide a means of representing, accessing and handling the admission information/data in a centralized way.

The software should allow applicants to apply directly to schools, then the system should make decisions based on criteria for admitting students specific to that particular school on its own.

The software should allow schools to set admission criteria. Also, should provide an interface or panel for applicants to file their applications.

The software must provide a means for controlling and managing multiple admissions and saving admission vacancies. The applicants should be given a slot/limit number of admissions. As well, the admission procedure should support two-way interaction (to-and-fro) approaches.

The software should allow applicants to perform the applications through a web portal and answer all the required queries by using mobile phone messages. Also, it should be compatible with both web-mobile platforms, and integrated with Unstructured Supplementary Service Data (USSD) for mobile messages technology.

The software must provide a means of providing an equitable access for applicants scattered geographically by using their computers and smartphones.

The software should make sure that, printed or scanned copies of applicants' entry certificates will no longer be required during the admission process. An applicant should be required to submit the index number of their Certificates of Secondary Education Examination (CSEE). Also, all verification of applicants' entry certificates should be done through an Application Programming Interface (API) to the National Examinations Council of Tanzania (NECTA) database which must be integrated within the TCPAS.

The software should allow all payments for admission processing to be made electronically through mobile (Tigo-Pesa, Mpesa, etc.) or banking financial services.

The software should set a mechanism that will provide weekly or rapid notifications on the progress status of admission processing. Also, it should permit each applicant to provide valid Email or phone number for notification.

The software should allow an applicant to make multiple applications for admission at affordable prices; International Telecommunication Union (ITU) recommends a monthly affordability of less than 5% of monthly income [17]. In the case of Tanzania, basic salary per month is US$78. The 5% of this amount is approximately US$3.9, which translates into US$0.13 per day. It is considered that the admission processing fees per applicant should not exceed this amount.

4. Results and discussion

This section is dedicated to showing how the survey results confirm and quantify the challenges for current admission procedures into A-Level private schools; and shows how the new designed software solution (TCPAS) will meet the requirements of an ideal proposed admission system for A-Level private schools. The first part shows the framework of the designed web-based solution, then followed by analysis and discussion of survey results.

A framework in figure 3, shows a diagrammatic representation of a proposed software solution model to a given admission problem. Thereby used to analyze the user necessities, design the model of the system, and managing a designed software system in numerous fields; means from requirements analysis up to the system testing and maintenance. Step 1, 2 and 3: shows on how applicants will be capable of sending and receiving admission feedback through computer or smartphone via an internet connection. Step 4 shows how applicant requests are going to be stored in a centralized database. Step 6 shows how schools organized in zones, for this case it is straightforward for applicant to locate or spot an appropriate school and subjects that he/she can get admission. Lastly, with the assistance of internet connection in step 5, all schools will be able to receive applicants' requests and send acknowledgement feedback of acceptance or rejection back to the applicants.
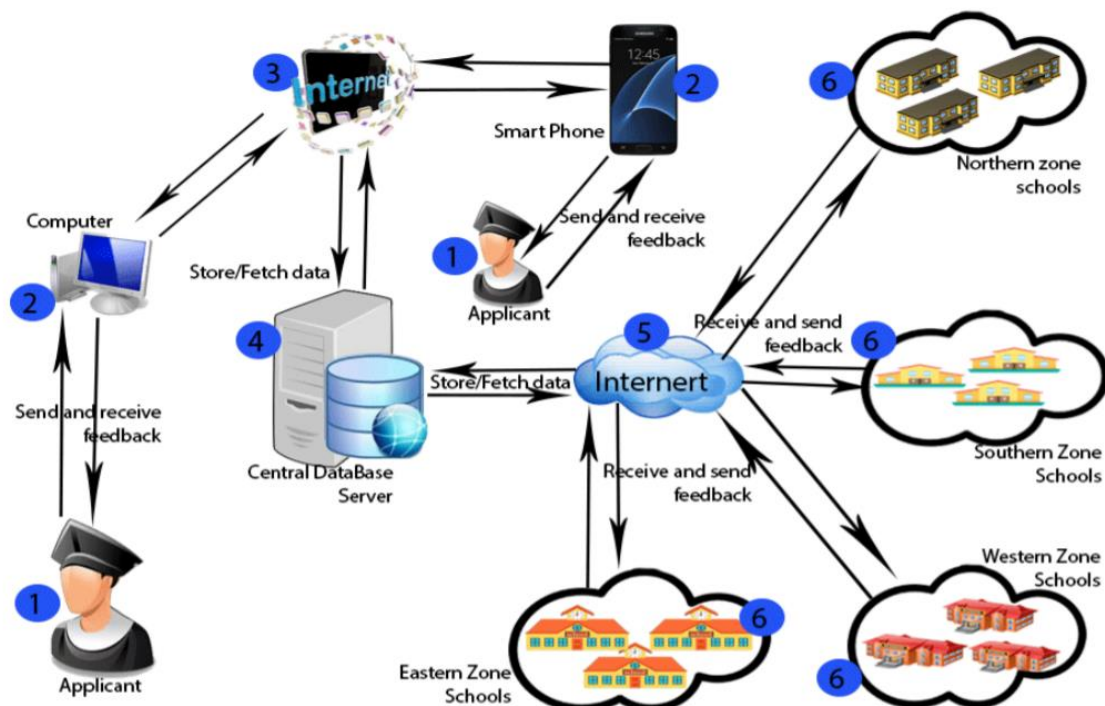

Figure 3: Framework of the designed software tool (TCPAS).

### 4.1 How to reach many geographically scattered applicants?

During the analysis of survey results in table 1, the study confirms that still there is less awareness of the existence of A-Level private schools in Tanzania. Also, this study quantifies that, about 37% of applicants in Kilimanjaro Region-Tanzania are from outside the region of Kilimanjaro, but the most of them face challenges on awareness concerning the existence of A-Level private schools. For this reason, most of the A-Level private schools in Tanzania use regional media like radio and television to provide awareness to applicants scattered geographically, which in turn cost money, as well as an airtime slot for advertisement. Of concern is that, these media adverts don't seem to be scattered countrywide, therefore access to geographically scattered candidates stay to be a major challenge.

Table 1: Applicants' residence in relation to school location in Kilimanjaro region.

		Frequency	Percentage
Variables	Applicants from Kilimanjaro region	95	63
	Applicants from outside Kilimanjaro regions	55	37
	Total	**150**	**100**

To mitigate this challenge, the new designed software solution (TCPAS) will provide direct open access for candidates to send application requests for admission to schools, through their computers and smartphones in their geographical position. To achieve this, TCPAS provides a direct portal to both A-Level private schools, and applicants scattered geographically via a web browser and through (http://www.tcpas.ac.tz). For this approach, the TCPAS achieves the requirement of A-Level private schools reaching many candidates scattered geographically.

The user interface in figure 4, shows a designed web portal to A-Level private schools and applicants scattered geographically. Through this Application Programming Interface (API) users are able to access admission contents concerning A-Level private schools in Tanzania, through a web link, via computer or smartphone.
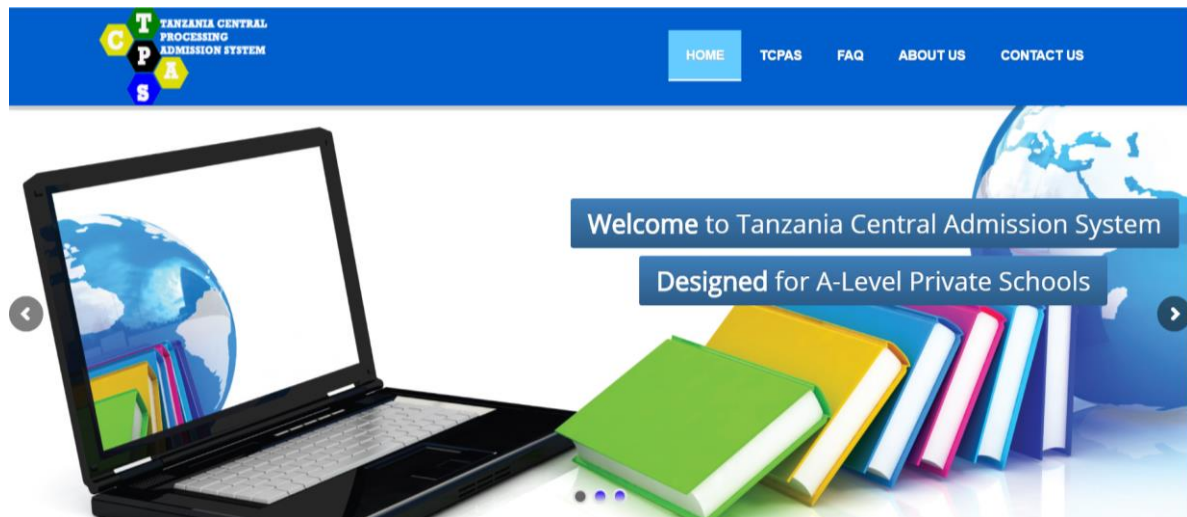
Figure 4: Web-portal interface for the TCPAS (http://www.tcpas.ac.tz).

4.2 How to encourage centralized data handling capability?

Through the analysis of survey results in figure 5, it was revealed that the admission procedures in A-Level private schools are totally decentralized. These admission approaches, left school with the mandate to process the admissions requests on their own. In this case, it was further realized that most of A-Level private schools in Kilimanjaro region take a month (30%) or more than a month (20%) to process the applications, and to send feedback of acceptance or rejection back to the applicants. Therefore, these admission procedures cause further

delay in commencing new academic years and makes it harder for applicants to make decisions about where, when and which subjects they can fit in.
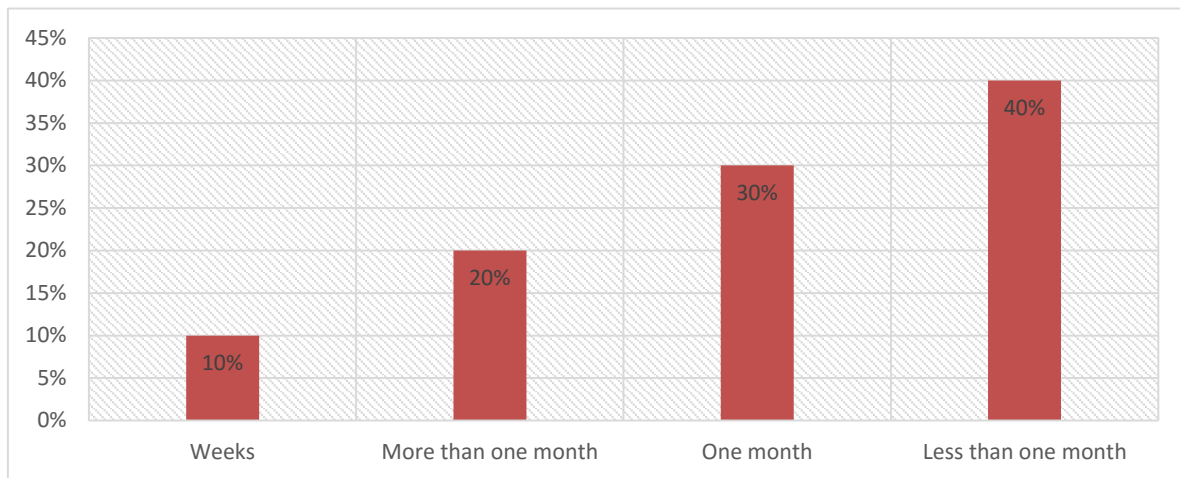

Figure 5: Delay caused by manual admission procedures into A-Level private schools in Tanzania.

To mitigate this challenge, the new designed software solution (TCPAS) will retrieve, process and handles the admission data in a centralized way. Also TCPAS will provide detailed information about schools registered in the system, including school name, location or physical address, school-position in the national exams, school services and school admission vacancies. For this reason, the TCPAS achieves the requirement of A-Level private schools to handle admission data in a centralized database, and make easy way in which applicants can spot all possible A-Level private schools and subjects that they can get admissions.

The user interface in figure 6, presents list of A-Level private schools organized in zones. The left panel, presents access links of all regions in Tanzania that have at least one A-Level private schools. Then, within the middle panel, it includes navigation tabs that contain a list of schools delineate by school logo, offered admission vacancy, link for applying and also the link for applicant to look at additional details concerning school services, and acquire admission supported his/her preferences.
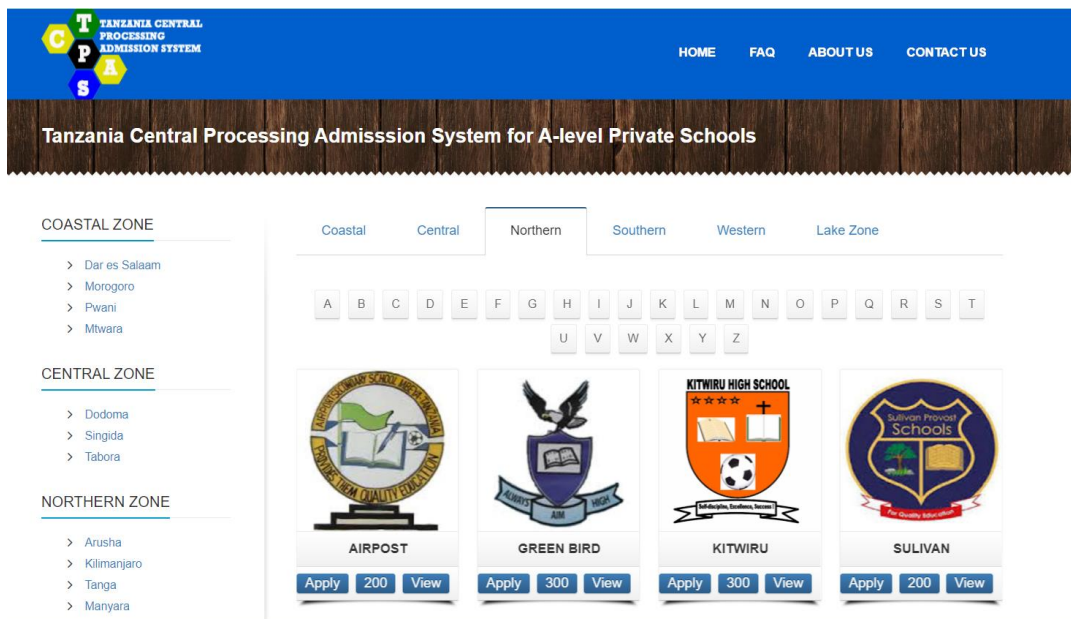

Figure 6: Sample list of A-Level private schools in Tanzania grouped in zones.

4.3 How to ensure control over forgery of certificates during application?

From the analysis of survey results in figure 7, the survey data show that 87% of A-Level private schools in Kilimanjaro region face some difficulties during verification of certificates, due to lack of education regulatory board to evaluate the applicants' quality before being admitted into A-Level private schools. In such a process, there is a lack of fairness and transparency during the admission processes. Notable is that, only 13% of A-Level private schools in Kilimanjaro region use their own education boards to manage, control and maintain fairness and transparent throughout the process of admissions.
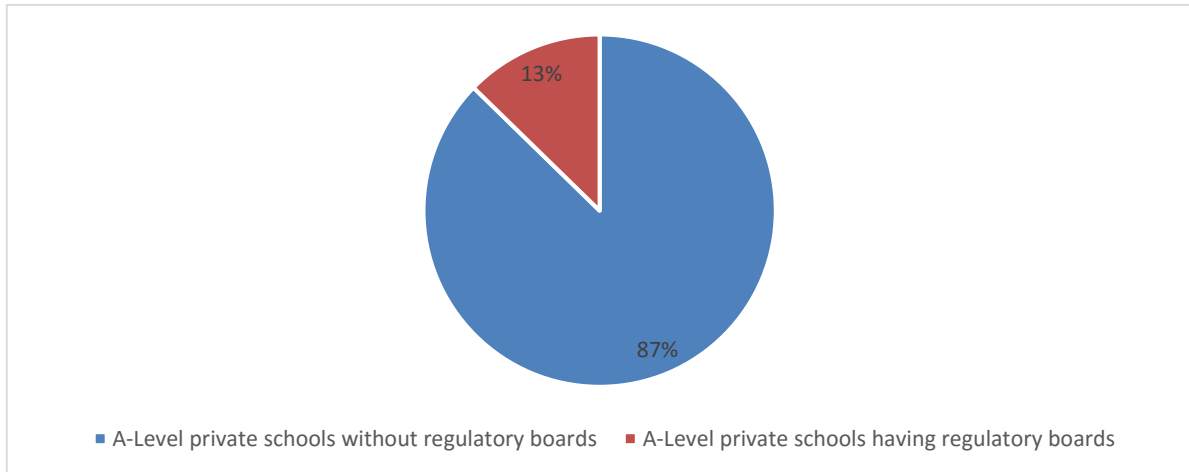
Figure 7: Availability and applicability of regulatory board for current admission procedures into A-Level private schools in Tanzania.

To mitigate this challenge, in the designed software solution (TCPAS) candidates will only be required to provide the index number for their Certificates of Secondary Education Examination (CSEE). In such a process, no printed or scanned copies of certificates will be required. Additionally, all processing of entry certificates will be performed by the system automatically through an Application Programming Interface (API), that query applicants' results from National Examinations Council of Tanzania (NECTA) database integrated within the TCPAS. For this approach, the TCPAS achieves the requirement of A-Level private schools, that is; to ensure there is management and control of forgery of entry certificates during the application process.

Figure 8, shows how the designed system will fetch applicant details (including personal information and examination results) from National Examinations Council of Tanzania (NECTA) database integrated within the TCPAS. A second user input field in figure 8, also presents how an applicant is going to be allowed to provide an email address, so as to receive verification link and be able to confirm that he/she is a legible candidate.

Figure 8: Interface for verification of applicant details.

64

4.4 How to reduce the cost of admission process?

In this study it was confirmed from the survey results in figure 9 that, 35% of applicants registered for each academic year in higher educational institutions are from A-Level private schools. But, still 94% of admission procedures in A-Level private schools are performed manually. Such admission approaches consume much effort and time, up to 3 months, and in the average costs of US$22 for each applicant throughout the whole processes of admission. This makes the application procedures to be expensive and annoying.
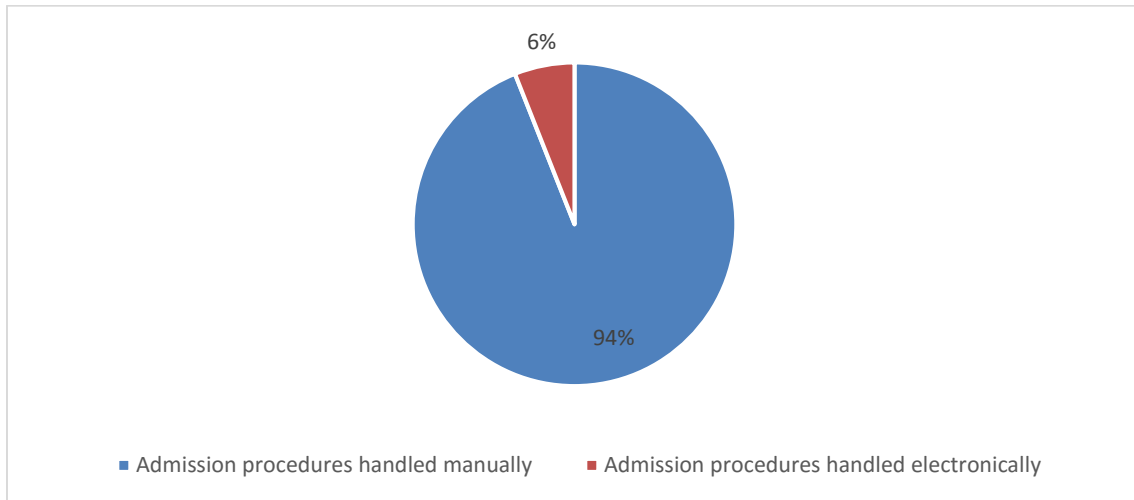

Figure 9: Shows how current admission procedures in A-Level private schools are handled.

Therefore, within the new designed software solution (TCPAS) there is a remarkable change regarding to the cost of admission. Applicants are permitted to pay an equivalent of US$2.6 as an application fee, and capable of doing multiple admissions based on his/her choice. Alternatively, all payment methods will be performed electronically through mobile (Airtel-Money, Z-Pesa, Tigo-Pesa, Mpesa, etc.) or banking financial services. By doing so, the TCPAS achieves the needs of applicants, because suggest admission fee is affordable and not exceeded the recommended amount by the International Telecommunication Union (ITU) that is; US$3.9.

The user interface in figure 10, shows a panel where an applicant is going to provide a voucher number, after he/she pay for admission through mobile payments (such as: Airtel-Money, Z-Pesa, Tigo-Pesa, Mpesa, etc.) or banking financial services, and issued voucher number to his/her mobile phone. After this payment verification, the applicant will be allowed to proceed to the next stage for admission processes, as shown in figure 11 and 12.
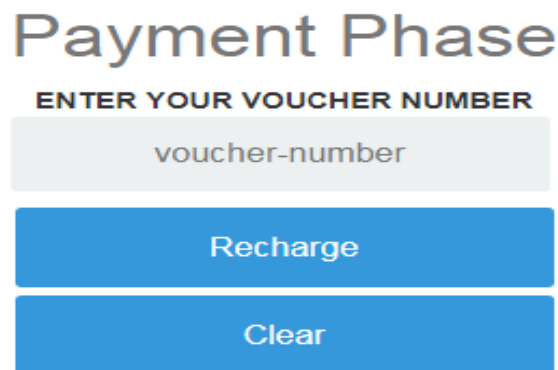

Figure 10: Presents interface for applicants to pay for admission application.

4.5 How to save admission vacancies?

Survey data in table 2 confirm that, one of the major challenges for admission procedures into A-Level private schools in Tanzania, is in the absence of education boards or centralized system to manage, control and monitor the admissions procedure. Thus, 78% of A-Level private schools in Kilimanjaro region deliver a number of candidates that are below their expectations. This is often because of the undeniable fact that, applicant physically collects forms from various schools and lodges multiple applications and abandon a number of the vacancies. As a result, some applicants will not be able to apply to several schools, and others would be admitted to more than one school.

Table 2: Delivering candidates' expectation rate for A-Level private schools.

Variables	Frequency	Percentage
A-Level private schools that deliver a number of candidates that are below their expectations	117	78
A-Level private schools that deliver a number of candidates that are within/above their expectations	33	22
Total	**150**	**100**

Therefore, the new designed software solution (TCPAS) comes out with an ideal approach with aim to handle multiple admissions and save admission spaces. Thus, the new designed solution uses bi-directional (to and fro) approaches in the sense that: phase one, an applicant will be allowed to perform multiple admission requests; and later on may receive multiple acknowledgements from more than one school. Eventually, in phase two, an applicant will be permitted to acknowledge and send acceptance solely to one school, thereby leaving vacancies to others. For this approach, TCPAS attain the need of handling multiple admissions and saving admission vacancies.
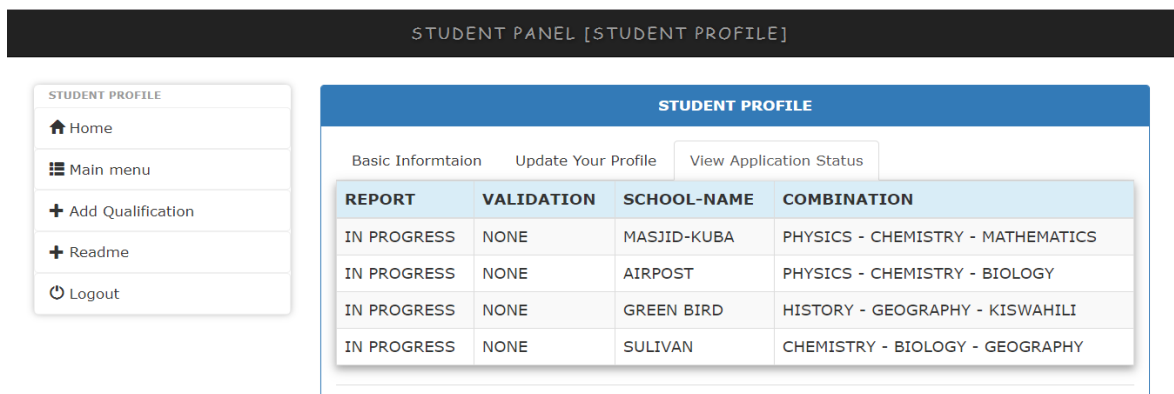
Figure 11: TCPAS response when an applicant performs multiple admissions.

The user interface in figure 11, shows an instance where an applicant made multiple applications, and still waiting for acknowledgement feedback from the respective schools. Parallel to that, figure 12 shows on how an applicant is permitted to acknowledge and send acceptance solely to one school, thereby leaving admission vacancies to others.

Figure 12: TCPAS response after schools accept or reject toward applicant requests.

4.6 How to encourage the use of paperless admission?

Survey results in figure 13 show that only 30%, 16% and 3% of A-Level private schools in Kilimanjaro-Tanzania, respectively, use methods like postal office, phone calls, and electronic mail, these strategies still doesn't seem to be effective and economical to cut back the utilization of ink and paper admissions. Consequently, the rest of the school's admissions in A-Level private schools are performed manually, that in turns cost in terms of time and money. Additionally, such admission method is extremely slow, less accurate, difficult to complete likewise as effort consuming.
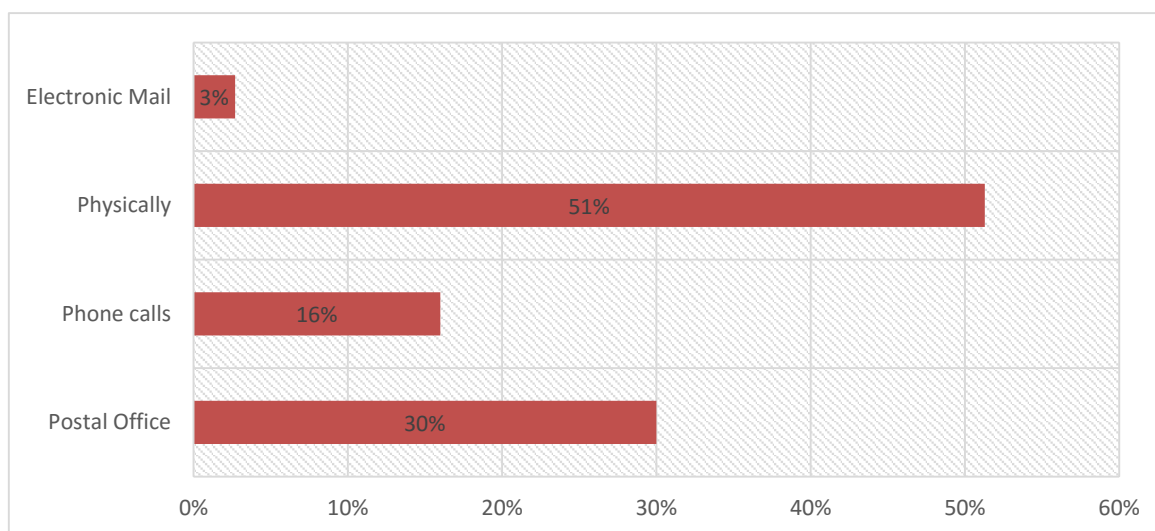
Figure 13: The current methods for admission processing in A-Level private schools in Tanzania.

Therefore, in the new designed software solution (TCPAS) there'll be no need for applicants to collect physical forms for admission and fill it. Instead, all procedures for admission are going to be handled electronically through a web portal, and the system can automatize applicant's requests, answer all the desired query or requests, and eventually it will send notifications to applicants using mobile phone messages and electronic mail for all computers and mobile users. Thus, TCPAS meet the necessity of managing and controlling the paper to print admissions. Additionally, all admission reports are going to be provided in terms of PDF format, as shown in figure 14.

Figure 14: Interface for schools to generate reports showing the list of selected students.

5. Conclusion and recommendation

The survey data from this study clearly confirm and quantify that many problems are still militating against the admission system into A-Level private schools in Tanzania. Despite of the contribution of private schools and the existence of these two systems (TCU and NACTE) in Tanzania, to date all the work at the time of admission in A-Level private schools are performed manually that is; on paper based, which is very slow and consuming much effort and time. Additionally, this manual system has its essential problems which include difficulty in locating an appropriate school and subjects an applicant can get admissions, wastage of time, and loss of forms and mutilation of forms throughout the whole process for admission. Therefore, this paper reports on an ongoing research work to design and implement a Tanzania Central Processing Admission System (TCPAS) that has the capabilities to deal with the admission challenges into A-Level private schools in Tanzania. This new system is going to solve the myriad of admission problems in the manual era. Thus, it is recommended that the government of Tanzania should construct a supportive policy which will promote and encourage all private schools, moreover public A-Level schools to deploy the TCPAS application tool, as a means of saving resources time and money, and enhancing performance of enrolment of students in A-Level schools in Tanzania.

Conflicts of interest

The authors have no conflicts of interest to declare.

References

[1]   R. M. Helms, "University Admission Worldwide," no. 15, pp. 1689–1699, 2008.

[2]   J. Ochwa-Echel, "Private Universities in Uganda: Issues and Challenges," *Int. J. Educ. Soc. Sci. www.ijessnet.com*, vol. 3, no. 3, pp. 7–18, 2016.

[3]   H. Zhang, "An Analysis of The Chinese College Admission System," no. 1, 2009, pp. 1–161.

[4]   C. Mirji, V. Deshpande, S. Walunj, and A. Ambavane, "E-Admission System," vol. 16, no. 2, pp. 1–3, 2014.

[5]   S. A. Adepoju, "Challenges of Students Online Registration System in Nigeria: A case of Federal University of Technology Minna," *J. Technol. Res.*, vol. 5, no. 1, pp. 196–203, 2010.

[6]   F. G. Mahundu, "E-governance: A sociological case study of the central admission system in Tanzania," *Electron. J. Inf. Syst. Dev. Ctries.*, vol. 76, no. 1, pp. 1–11, 2016.

[7]   M. M. Audu and A. M. Farouq, "An Admission Decision Support System for Au th or re pa d re," *Int. J. Comput. Appl. (0975 - 8887)*, vol. 133, no. February, pp. 1–6, 2016.

[8]   S. O. Emaikwu, "Assessment of the Impact of Students' Mode of Admission into University and their Academic Achievement in Nigeria," vol. 1, no. 3, 2012.

[9]   S. Hall and B. P. Kanyip, "Admission Crisis In Nigerian Universities : The Challenges Youth And Parents Face In Seeking Admission," 2013.

[10]   Tanzania Development Support [TDS], "Education System in Tanzania," 2013. [Online]. Available: http://tdsnfp.org/wp-content/uploads/2013/06/Education-system-in-Tanzania-.pdf. [Accessed: 27-Jan-2018].

[11]   TCU, "Tanzania Commission for Universities: Revised Admissions Guidebook for Higher Education Institutions in Tanzania," 2014. [Online]. Available: https://www.jamiiforums.com/attachments/201314admission-pdf.95819/. [Accessed: 07-Feb-2018].

[12]   Y. M. Istoroyekti and S. S. M. Hum, "Issues Challenging Universities: A Case of Tanzanian Higher Education," *Ahmad Dahlan J. English Stud.*, vol. 3, no. 1, pp. 51–62, 2016.

[13]   Ministry of Education [MoE], "the United Republic of Tanzania," 2015. [Online]. Available: http://planipolis.iiep.unesco.org/sites/planipolis/files/ressources/tanzania_sedp_2010_2015.pdf. [Accessed: 20-Feb-2018].

[14]   Ministry of Education [MoE], "The United Republic of Tanzania-The Ministry of Education and Vocational Training Strategy- 2007 / 08 to 2010 / 11 Dar es Salaam September 2007," 2010. [Online]. Available: http://planipolis.iiep.unesco.org/sites/planipolis/files/ressources/tanzania_sedp_2010_2015.pdf. [Accessed: 20-Feb-2018].

[15]   H. Hare, "Survey of ICT and Education in Africa: Tanzania Country Report," no. July, pp. 1–9, 2007.

[16]   National Bureau of Standard, "2012 Population and Housing Census Population Distribution by Administrative areas," *NBS Minist. Financ.*, p. 177,180, 2013.

[17]   UN-OHRLLS, "Achieving universal and affordable Internet in the least developed countries," 2018. [Online]. Available: http://unohrlls.org/custom-content/uploads/2018/01/D-LDC-ICTLDC-2018-PDF-E.pdf. [Accessed: 05-Mar-2018].

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Journal of Information Systems Engineering & Management

Centralized Admission System for Advanced Level Private Schools: Case of Kilimanjaro Region, Tanzania

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Abstract

Globally, it is desirable to have fair and transparent student admissions into both public and private universities, colleges and schools. A case in point, in Tanzania 35% of students enrolled each year in higher level learning institutions and technical education are from Advanced Level (A-level) private schools. Of concern is that, this paper confirms and quantify that 93.5% of admissions into A-level schools were performed on paper based. Such admissions were characterized by multiple admissions, being costly, inconsistency, inaccuracy, and difficulties in following admission procedures. On the other hand, existing manual admission systems were considered unfair and not transparent. To mitigate these challenges a centralized web-based solution named Tanzania Central Processing Admission System (TCPAS) has been conceptualized to resolve the identified admission challenges. This paper presents on an ongoing research work aimed to address the challenges facing the current admission procedures in A-Level private schools in Tanzania. The proposed TCPAS is designed to be a web-mobile solution. The TCPAS tool is intended to reduce admission costs by reducing turnaround time for entire admission processes; encourage the use of paperless admission; control forgery over entry qualifications (certificates) during the admission process; has a centralized data handling capability; saves admission vacancies; and reach many geographically scattered applicants. Moreover, questionnaires were used to gather requirements from 150 respondents from the case study (Kilimanjaro region).

Keywords: Central Admission System (CAS), Web Portal, A-Level Private Schools, Admission System, National Examinations Council of Tanzania (NECTA), Certificate of Secondary Education Examination (CSEE).

INTRODUCTION

Throughout the world, millions of students apply for admission to graduate schools, colleges or universities during the last year of their pre-college education. Normally the admission approaches differ from country to country (Hafalir & Kübler, 2014). For instance, in Nigeria, the processes for admission into tertiary institutions are decentralized in the sense that each university or college has an equal chance to decide on their admission independently. Such decentralization is known to cause problems in terms of setting standards, uniformity in the admission processes and multiple admissions. As a result, it is possible for one candidate to receive offers of admission from more than one institution or college. This has been proved to be costly in terms of time and money. While some applicants will not be able to apply to many colleges, also others would be admitted to more than one college and abandon some of the vacancies. Therefore, this makes the application procedures, even less fair and less considerate (Judith & Asein, 2007).

In contrast, in 2010 to 2011 the government Tanzania directed higher and technical education institutions to enroll students through a Centralized Admission System (CAS), which was under the supervision of National Council for Technical Education (NACTE) in collaboration with the Tanzania Commission for Universities (TCU). Unfortunately, both of these two boards were focused only on the tertiary education level (TCU, 2014). However, in 2017 the government of Tanzania revoked the admission processes through TCU. Currently, institutions can process the admissions on their own. TCU and NACTE only foresee admission processes and set the criteria for enrolment to different programs. Once candidates admitted, institutions were required to upload the selected candidates into the system for TCU to approve. Therefore, Tanzania has gone back to the previous system of admission, which is very costly. However, the previous decentralized/institutionalized admission system encourages institutions to work hard for good reputation (TCU, 2017).

Apparently, it has been reported that over 35% of students enrolled each year in higher level learning and technical education in Tanzania are from A-Level private schools. And the number of A-Level private schools is increasing by 2%, each year (Mangindaan et al., 2013). However, the enrolment of students to A-Level private schools is done on paper based which is difficult to perform, less accurate and very slow to complete the overall admission process (Ministry of Education, 2016).

This paper presents on an ongoing research work aimed to address the challenges facing the current admission procedures in A-Level private schools in Tanzania. The proposed solution is a software-based Centralized Admission System named Tanzania Central Processing Admission System (TCPAS) that has the capabilities to control and manage the performance and enrolment of students to A-Level private schools. The rest of the paper is organized as follows: Section 2 presents a review of related studies in the literature review. Section 3 concentrates on a set of principles, tools, and techniques that have guided the reported study. Section 4 presents the discussion of results as revealed from the analysis of survey data in this study. Section 5 has the conclusion and future work.

RELATED WORKS

Students' Admission Systems in Developed Countries

Globally, there are different admission systems that evaluate the applicant's quality before being admitted into schools or colleges and control the widening access to higher education. But, there were are unsolved difficulties like, how to save admission vacancies (applicant cannot be approved to join more than one school or college at once), centralized data handling capability, how to reduce the cost of admission processes (through reduction of turnaround time for entire admissions process), how to reach many geographical scattered applicants, how to encourage use of paperless admission, and how to ensure control over forgery of entry certificates during applications (Mahundu, 2016). Such admission systems that face named challenges include University College Admission System in China (CUCAS). Joint University Programmed Admission System in Hong Kong (JUPAS). Universities and Colleges Admission Service (UCAS) in the United Kingdom. And the Common Application in the United States of America (Zhang, 2009).

For instance, the CUCAS is one among the unique college admission system in the world due to its functionality. It consists of two stages. Stage one is a standard exam called the National College Entrance Examination, and stage two is the recruitment procedure which starts soon after exam results are released. Such admission procedure has caused students to invest a lot of time and effort to prepare for such exams. Conversely,

this admission procedure is very difficult and frustrating (Zhang, 2009). For this reason, it has been agreed that the answer to this challenge is to have automated Centralized Admission System (CAS) (Mahundu, 2016).

Students' Admission Systems in Developing Countries

In developing countries, the introduction of a CAS is one of the greatest initiatives for monitoring and controlling quality for admission into tertiary education. Additionally, it is very important to provide a transparent and fair admission procedure for candidates aspiring to join Higher Education Institutions (HEIs). Some drawbacks like scarce resources, underdevelopment, gender inequality and the quest for advancement in science and technology, has led to the need to use a fair method of selection for admission, to ensure an equitable distribution of the available spaces in Ordinary, Advanced and Tertiary institutions (Bailey, 2014).

For instance, admission into public universities in Kenya is done by the government exclusively through a body popularly known as the Joint Admissions Board (JAB). This board sits periodically to select qualified students whom it assigns to different disciplines and to different public universities and university colleges. However, in such a process, there is a lack of fairness and transparency during the admission processes (Wabwoba & Mwakondo, 2011).

Similarly, in Tanzania, TCU and NACTE as education regulatory boards jointly established a CAS that become operational in 2010 (TCU, 2014). The TCU and NACTE admission systems were to assist applicants to deploy and retrieve their applications through a web-mobile application (TCU, 2014). However, it remained a challenge to have TCU provide a fair and transparent admission process that provides equal opportunity for all candidates regardless of their background and gain admission to a course appropriate to their proficiency and ambitions. Consequently, the government of Tanzania decided that there is no easy way to improve the current admission procedure than to invent a new software tool. This discussion left institutions with the mandate to process the admissions on their own. Instead, TCU and NACTE now only guide the admission processes as well as monitor the criteria for enrolment in various colleges and universities (TCU, 2017).

Parallel to the TCU/NACTE system, applications for admissions to Ordinary Level (O-Level) and A-Level secondary (pre-college) education in Tanzania is processed by two systems: A Central Regulatory Board that is governed by the government for public schools and direct applications for private schools. The Central Regulatory Board provides forms for O-Level students to select the schools of their choice for their A-Level studies. However, the only listed schools in the forms are public schools (Mangindaan et al., 2013). Private schools' applicants have to identify a school and physically collect the application forms themselves. Then, they were required to take the forms back to the specific school's administration. After processing the application, the respective school sends feedback of acceptance or rejection back to the applicant. This makes the application procedures very tiresome and costly. Additionally, less awareness of the existence of private schools and cost to a school are the major drawbacks of the current admission procedures (Kapinga, 2016). Therefore, the study proposes development of centralized web-mobile solution to enhance the performance of admission processes and resolve admission challenges facing the current admission procedures in A-Level private schools in Tanzania.

METHODOLOGY

Case study

Kilimanjaro region one of the 31 administrative regions of Tanzania, was selected as a study area for the reported study. Kilimanjaro has a population of 1,640,087 (National Bureau of Standard, 2013). The region is

located on the slopes of a temporarily inactive volcano of Mount Kilimanjaro, the biggest mountain in Africa. Also, it is bordered by Tanga Region in the south, with Kenya in the east and north, with Arusha Region in the west, and to the southwest of the Manyara Region (UNDP, 2014).The reason for selecting the Kilimanjaro Region as a case study is due to colonialism impacts, demographic factors and religious activities as causal factors resulting in having more A-Level private schools (pre-college schools) compared to other regions in Tanzania. Likewise, historically, 68% of Kilimanjaro parents strive for the best learning environment for their children. Moreover, most of the private schools have proven to have the best quality A-Level education (Ministry of Education, 2016).

Sampling strategy

As revealed from the reported literature, it was considered necessary to confirm and quantify the unsolved admission challenges and its impacts on current procedures for admission into A-Level private schools in Tanzania. To achieve that, during the month of February 2018, the authors made every effort to reach all relevant users of the current admission systems in A-level private schools in Tanzania; namely: parents, pre-college students and school staffs, to ensure that credible data are collected for the success of the study. However, data were collected from 150 respondents through the use of questionnaire method and all entries retrieved as correctly filled were subsequently used in the analysis.

Nevertheless, it is recommended that, in order to determine the margin of error in the number of sample size range in between 150 to 250, the sample entries should be divided into three units (Mangindaan et al., 2013). Thus, the 150 sample entries were clustered into three groups of system users. In the first group, a sample of households was considered, in which 25 houses which were expected to have at least one applicant were selected. Second group involved a sample of school staffs: in which 25 admissions officers were selected. And in the last group, a sample of students was considered; in which 100 pre-college students were selected randomly from the study sample in order to reach the targeted group. The motive of getting 100 pre-college students rather than 50 entries, is because, a confidence level of pre-college students confirmed to be close to less to 95%. Therefore, so as to cut back the possibility of creating a wrong conclusion regarding the population from the sample estimate, this study most well-liked to double the present entries, that's 50 to 100 entries. Thereafter the remained sample was divided equally to both school admission officers and households by 25 entries for every cluster. These three groups of samples were used to harmonize the chance of selection among the system users and giving them equal opportunity to participate in the study.

Data collection methods

Questionnaires were used to collect data from the parents who were sending their children to A-Level private schools than public schools. Also, used for selected A-Level students who have already interacted with current admission procedures and gained admissions in A-level private schools. In the third group, school admission officers who demonstrated to be familiar with all procedures and methods of processing students' admission requests for A-Level private schools were consulted and interviewed. A questionnaire was selected for this research because it is a reliable and quick method to gather information from multiple respondents in an efficient and timely manner. Again, this study was no exception and questionnaires were a quick and effective approach for the researcher to reach multiple respondents at interval within several weeks.

Methods for data analysis

The distributed survey questionnaires had both hard-copy, and soft-copy structured questions which were administered by using the Open Data Kit (ODK) software. Thereafter, the collected statistical data (both quantitative and qualitative data) were analyzed with the intention of; firstly, to identify the applicant's residence in relation to the school location, to measure the delay caused by manual admission procedures, to assess availability and applicability of regulatory board for current admission procedures, and to know how current admission procedures in A-Level private schools are handled, to measure the level of fairness of current admission procedures in A-Level private schools, to measure delivering candidates' expectation rate for A-Level private schools, and finally to assess the current methods for admission processing in A-Level private schools. In these cases, SPSS software as statistical package was used for analyses, because, SPSS provides the simplest and standard virtualization of tables and charts (pie charts and histogram) compared to alternative statistical packages like R, Excel and SAS. For instance, in Excel each and every calculation needs manually entering a formula, leaving ample room for error. Parallel to that, R and SAS it is tricky to learn, depending on programming background.

RESULTS AND DISCUSSION

This section discusses the challenges of the current manual admission systems as revealed from the analysis of survey data collected by using questionnaires, and its consequences on the current admission procedures in A-Level private schools in Tanzania.

Do the present manual admission systems reach to several candidates scattered geographically?

Table 1 shows the survey results on applicants' residences. The results show that, about 37% of applicants in Kilimanjaro Region, Tanzania are from outside the region of Kilimanjaro, but the majority of them face challenges on awareness about the existence of A-Level private schools. Due to the fact that, most of the A-Level private schools in Kilimanjaro use regional media like Radio and TV (Example: Kilimanjaro-FM) for the advertisement, which in turn cost money, as well as an airtime slot for advertisement. This admission process is expensive for some of the schools. Furthermore, media adverts are not broadcasted countrywide, thus access to geographical scattered applicants remains to be a significant challenge.

Table 1: present applicants residences in relation to the school location in Kilimanjaro Region.

		Frequency	Percentage
Variables	Applicants from Kilimanjaro Region	95	63
	Applicants from outside Kilimanjaro Regions	55	37
	Total	**150**	**100**

Do the present manual admission systems guarantee on centralized data handling capability?

During the analysis of survey data, it was realized that the current procedures for admission into A-Level private schools is fully decentralized, which causes further delay in commencing new academic years and makes it hard for applicants to make final decisions for their studies (about where, when and which subjects they can fit in). Each school has its own rules and procedures to monitor and control their admission processes. Also, there is a lack of central board to set standards for admission into A-Level private schools. Consequently, the majority of

A-Level private schools in Kilimanjaro region take a month or more than a month to process all admission requests per academic year.
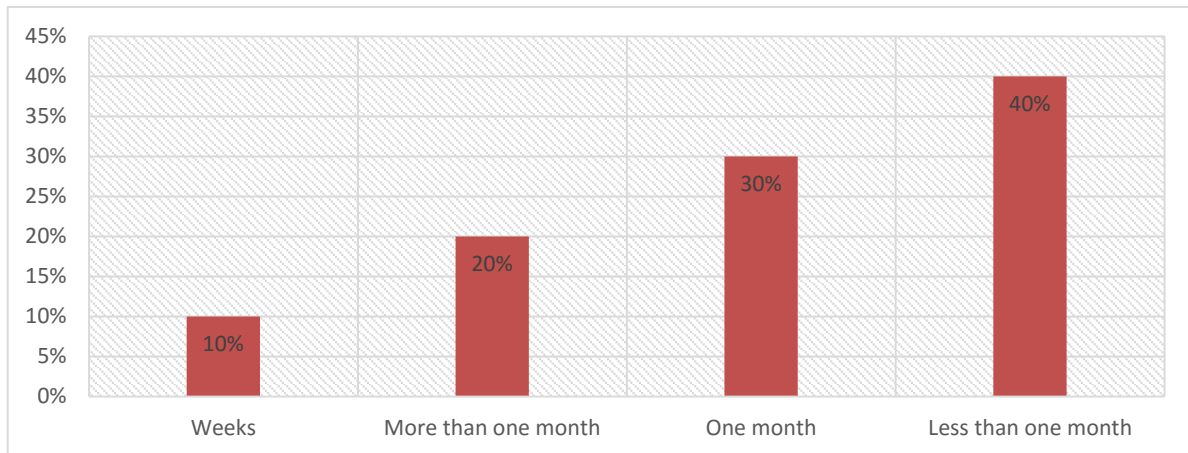
Figure 1: present the delay caused by current manual admission procedures in A-Level private schools in Kilimanjaro Region, Tanzania.

**Do the current manual admission systems ensure management over forgery of entry certificates throughout application?**

Survey results in Figure 2 show that, 87% of A-Level private schools in Kilimanjaro region have no central regulatory board to guide and govern the entire admissions process, which leads to inconsistency and difficulties during verification of entry qualifications (certificates). Because of this, once the candidates admitted, schools were required to upload the selected candidates into the system for TCU and NACTE approval. As a result, while waiting for TCU and NACTE approval, most A-Level private schools in Kilimanjaro region were delayed in commencing new academic years. Moreover, only 13% of A-Level private schools in Kilimanjaro region use their own boards as a shield to mask, control and maintain fairness and transparent admission processes.
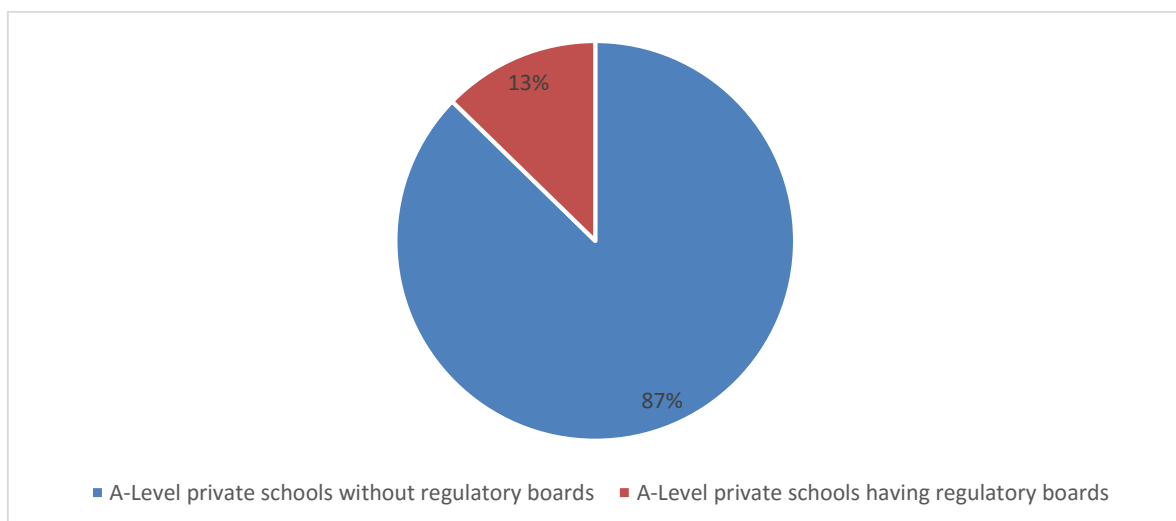
Figure 2: present availability and applicability of regulatory board for current manual admission procedures in A-Level private schools in Kilimanjaro Region, Tanzania.

Does the current admission procedures in A-Level private schools costly?

Survey results in Figure 3 confirm that, despite of the contribution of A-Level private schools to higher level learning and the existence of these two systems for admission in Tanzania (NACTE and TCU); still procedures for admission into A-Level private schools are handled on paper based (94%), which consumes much time, up to 3 months and in the average costs of US$22, for each applicant from different regions in Tanzania during the entire processes of admission. This makes the application procedures to be frustrating and costly.
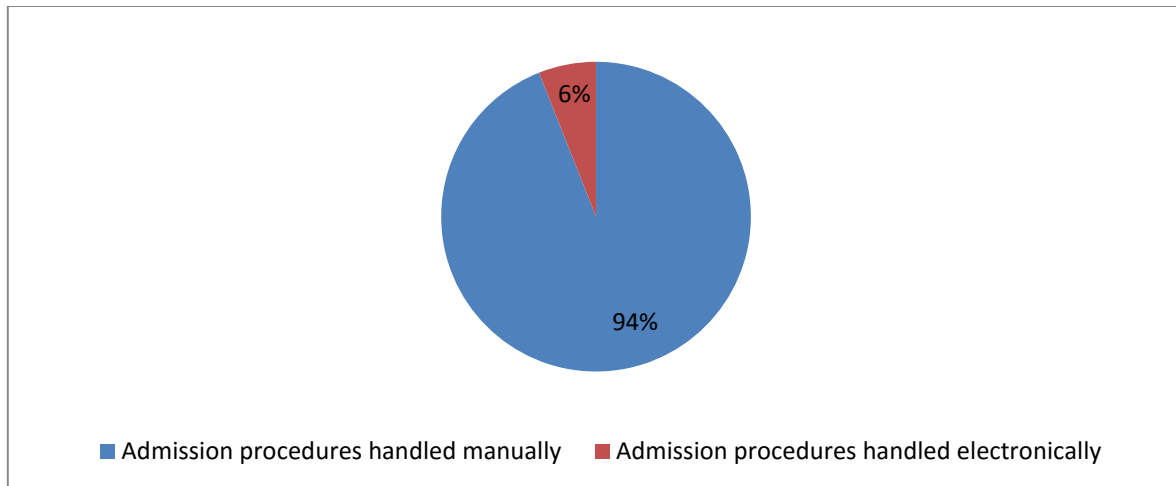
Figure 3: Shows how current manual admission procedures in A-Level private schools in Kilimanjaro Region, Tanzania are handled.

How about fairness of the current admission procedures in A-Level private schools?

From the Survey results in Table 2, the study revealed that, 69% of respondents agreed that the current admission systems are unfair and not transparent, because there exist major challenges like gender inequity, scarce resources, underdevelopment, and the quest for advancement in science and technology and religious barriers in A-Level private schools in Kilimanjaro region. In this respect, there is no way than use a fair method of selection at the time of admission, to ensure an equitable distribution of the available vacancies during the time of admission processes.

Table 2: present the level of fairness of current manual admission procedures in A-Level private schools in Kilimanjaro Region, Tanzania.

		Frequency	**Percentage**
Variables	Response rate based on unfair admission	103	69
	Response rate based on fair admission	47	31
	Total	**150**	**100**

Do the current admission procedures in A-Level Private schools handle admission vacancies?

Survey results in Table 3 show that, in the absence of a centralized system to monitor and control admissions in A-Level private schools, one applicant physically collects forms from various schools and lodges multiple applications. In the sense that, it may lead one applicant to be admitted into more than one school, and eventually pick one vacancy and still abandon some of the vacancies from other schools. Consequently, this study
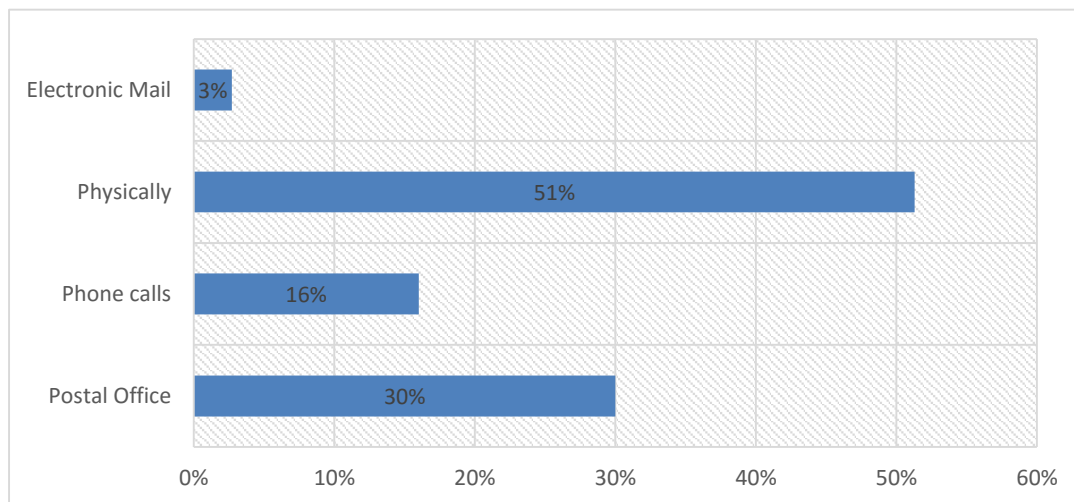
shows that 78% of A-Level private schools in Kilimanjaro Region deliver a number of candidates that are below their expectations.

Table 3: present the delivering candidates' expectation rate for A-Level private schools in Kilimanjaro Region, Tanzania.

Variables	Frequency	Percentage
A-level private schools that deliver a number of candidates that are below their expectations	117	78
A-level private schools that deliver a number of candidates that are within/above their expectations	33	22
Total	**150**	**100**

Do the present admission procedures in A-Level private schools encourage on the use of paperless admission?

Apparently, the survey results in Figure 4 show that 51% of admissions of students in A-Level private schools are done on paper based which is very slow, less accurate, difficult to complete as well as time and effort consuming. Although, 30%, 16% and 3% of A-Level private schools in Kilimanjaro region, respectively, also use methods like postal office, phone calls, and electronic mail. These methods still are not effective and efficient to reduce the use of paper based admissions. For this reason, there is a need to have a tool to control and manage the use of paper to print admissions and enhance the enrolment of qualified students into A-Level private schools in Tanzania.

Figure 4: present the current methods for admission processing in A-Level private schools in Kilimanjaro Region in Tanzania.

DESIGNED SOLUTION

The designed TCPAS is going to be a client-server based system, which will consist of the following interfaces: user interface and server-side interface that are linked together via an internet connection. For this reason, initially an applicant will be able to send admission requests by either his/her computer or smart-phone

through a web-based application, or web-mobile application (as shown in step 1 and 2 of Figure 3). Then in (step 3 to 4) all applicant requests will be stored within the centralized database server with the help of internet connection between the client and server-side. Then, the server will send these requests to several schools for processing (either in location 5, 6, 7 or 8), depending on school location or zone. After the schools receive the applicant queries, instantly will process it, store and send acknowledgement feedback of acceptance/rejection back to the centralized database server (step 4). Thereafter, the server will allocate these notifications of acceptance/rejection to the respective applicants through mobile phone messages, E-mail and applicant profile, through a web portal (as shown in step 3,2 and 1). Therefore, it is necessary to conclude that, the designed software solution uses bi-directional approaches, that means support two-way interaction (to-and-fro/forward-and-backward) approaches.
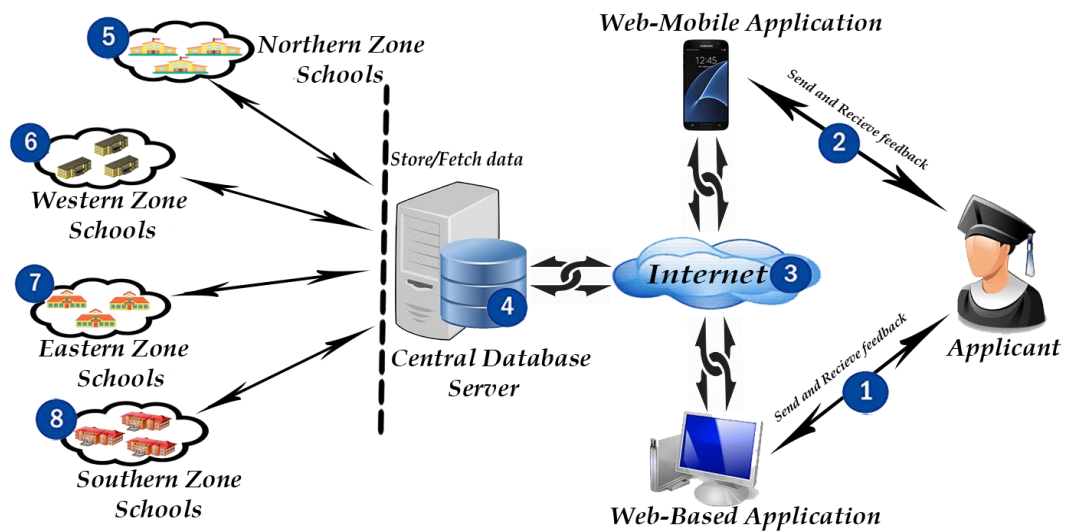
Figure 5: present framework of the designed software tool (TCPAS).

Requirements specification of the designed software solution (TCPAS)

As far as this study is concerned below mentioned are the requirements extracted from the analysis of survey data as revealed in this study.

a) The designed software solution must provide a mechanism to reach to several candidates scattered geographically.

b) The designed software solution should handle the admission information in a centralized approach.

c) The designed software solution should provide means of controlling, monitoring and tracking forgery of entry qualifications throughout the admission process.

d) The designed software solution should diminish the cost of admission; mainly should make the admission cost affordable and acceptable to all users/applicants.

e) The designed software solution should manage multiple admissions.

f) The designed software solution should control and maintain fairness and transparency throughout the admission process.

g) The designed software solution should provide a means of handling and managing admission vacancies.

h) The designed software solution should promote on the use of paperless admission.

Contributions of the designed software solution (TCPAS)

The designed TCPAS software tool (Web-mobile) will deploy a direct communication link to both A-Level private schools, and applicants scattered geographically across all regions in Tanzania via a web browser. Also, it will provide equitable access for applicants to send admission requests to schools through their computers and smartphones in their geographical position. This way the TCPAS achieves will the requirement of A-Level private schools reaching applicants scattered geographically.

Also, the designed application tool (TCPAS) will help to transfer data in a smooth way for all candidates and schools registered in the system; which handles the data in a centralized way. The details of each A-Level private school in Tanzania including school name, location or physical address, academic performance (its position in the national Exams), school services and school vacancies will be provided in a Web-portal interface of the TCPAS based on zones (Northern, Western, Eastern and Southern Zone in Tanzania). This way it makes it easier for applicants to locate and spot those schools and services offered by schools.

Nonetheless, in the designed software tool (TCPAS), printed or scanned copies of certificates will no longer be required during admission in A-Level private schools in Tanzania. Instead, candidates will only be required to provide the index number for their Certificates of Secondary Education Examination (CSEE). The verification will be done by the system automatically through an Application Programming Interface (API) to the NECTA database integrated within the TCPAS.

Additionally, the designed TCPAS software tool will enable applicants to pay US$2.6 as an application fee, and capable of doing multiple admissions based on his/her choice at affordable prices. Alternatively, all payments will be made electronically through mobile (Tigo-Pesa, Mpesa, etc.) or banking financial services. International Telecommunication Union (ITU) recommends a monthly affordability of less than 5% of monthly income (UN-OHRLLS, 2018). In the case of Tanzania, basic salary per month is US$78. The 5% of this amount is approximately US$3.9, which translates into US$0.13 per day. It is considered that the admission processing fees per applicant should not exceed this amount (US$3.9). Additionally, the designed system will provide weekly notifications in regards to admission progress. Thus, such application tool will make the entire admission procedures far easier and less costly.

Furthermore, the designed TCPAS software tool will use bi-directional (to and fro) approaches in the sense that: firstly, an applicant will be allowed to perform multiple admissions requests; and later on may receive multiple acknowledgements from more than one school. And finally, the applicant will be permitted to acknowledge and send acceptance only to one school, thereby leaving vacancies to others. By doing so, TCPAS will meet the requirement of controlling and managing multiple admissions and saving admission vacancies for A-Level private schools in Tanzania.

Finally, with the designed TCPAS software tool, applicants will no longer need to collect and fill physical forms. Instead, they will perform the applications through a web portal and answer all the required queries, at the same time it will send notifications to applicants using mobile phone messages and Electronic Mail for all computers and mobile users. Consequently, it will control and manage the use of paper to print admissions; that is a paperless admission procedure.

Limitations of the designed software solution (TCPAS)

Security concerns: in a developing country like Tanzania where quest for advancement in science and technology still becomes a challenge. Thus, it makes easier for application systems to be breached and users'

information to be manipulated. A case in point of centralized admission systems, failures of the server due to an attack may disrupt the entire system for admission and cost universities, colleges or schools in terms of confidentiality, integrity and availability of applicants' information.

Performance concerns: In any centralized systems all users' information is handled in a centralized way. Thus, access to resources available in a centralized server is very competitive. For this reason, without an alternative Domain Name System (DNS) and using a cloud technology, unintentional system failures or server crashes will become major drawbacks.

CONCLUSION AND FUTURE WORK

Nevertheless, it is revealed that, 94% of admissions into A-Level private schools in Tanzania are currently decentralized and 51% are handled on paper based. As a result, applicants have to identify the schools, physically collect application forms and fill the forms manually. In the process, often applicants get confused while filling the application forms and face difficulties in choosing where to pursue their A-Level studies. The newly designed admission system (TCPAS) will have the capability to reduce the stress of applicants while filling the application forms. In one click, the TCPAS system will provide possible A-Level private schools and subjects an applicant can get admissions. Furthermore, using the new CAS system, probably applicants will get admission in the first round and if not, the system will offer the second round. Moreover, admission cost in terms of time and money will be reduced.

The future work will involve full development and implementation of the proposed software solution (TCPAS) which will involve the use of Hyper Text Makeup Language (HTML), Cascading Style Sheets (CSS), Hypertext Preprocessor (PHP), JavaScript and MySQL database. Parallel to that, the MD5 encryption algorithm will be used, because MD5 is compatible with MySQL and use a hash function to produce a 128-bit hash value of securities of critical users' information; mainly password. Thereafter, the designed solution will undergoes unit testing, integration testing, system testing and acceptance testing so as to evaluate the system in compliance with the specified requirements.

Lastly, despite of the actual fact that, this study focusing on and attempting to address the challenges facing the current manual admission procedures in A-Level private schools in Tanzania. But still this study leaves an ample room for others to contribute their technological innovation in a pre-college education in Tanzania, by adding another module in this designed software solution (TCPAS) which will enhance and facilitate in the area of monitoring and managing academic progress for both public and private schools.

REFERENCES

Bailey, T. (2014). The role and functions of higher education councils and commissions in Africa: A case study of the Tanzania Commission for Universities.

Hafalir, I. E., & Kübler, D. (2014). College Admissions with Entrance Exams : Centralized versus Decentralized * , 1–46.

Judith, B., & Asein, E. (2007). Joint Admissions And Matriculation Board.

Kapinga, O. (2016). Assessment of School Facilities and Resources in the Context of Fee Free Basic Education in Tanzania, 1–11.

Mahundu, F. G. (2016). e-Governance: A Case Study of the Central Admission System in Tanzania. Electronic Journal of Information Systems in Developing Countries, 76(6), 1–11.

Mangindaan, M. C., Elley, W. B., Medicine, T. C., OECD, Paper, P., Stacey, K., … Notodiputro, K. A. (2013). Tanzania The Tanzanian education system described and system. Far Eastern Survey, 33(4), 1–16. https://doi.org/10.1016/0145-9228(79)90001-3

Ministry of Education. (2016). Annual Education Statistics 2014.

National Bureau of Standard. (2017). 2012 Population and Housing Census Population Distribution by Administrative areas. NBS Ministry of Finance, 177,180.

TCU. (2014). Tanzania Commission for Universities: Revised Admissions Guidebook for Higher Education Institutions in Tanzania, 246. https://doi.org/10.1017/CBO9781107415324.004

TCU. (2017). Tanzania Commission for Universities Undergraduate Admission Guidebook for Higher Education Institutions in Tanzania for Applicants with Form Six and RPL Qualifications.

UN-OHRLLS. (2018). Achieving universal and affordable Internet in the least developed countries. Retrieved from http://unohrlls.org/custom-content/uploads/2018/01/D-LDC-ICTLDC-2018-PDF-E.pdf

UNDP. (2014). United Nations Development Program Country : Tanzania Project Title : Reducing Land Degradation on the Highlands of Kilimanjaro Region. United Nations Development Program, 1–67.

Wabwoba, F., & Mwakondo, F. M. (2011). Students selection for university course admission at the joint admissions board (Kenya) using trained neural networks. Journal of Information Technology Education, 10(1), 333–347.

Zhang, H. (2009). An Analysis of The Chinese College Admission System.

BIBLIOGRAPGY

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(iii)   POSTER PRESENTATION

Centralized Admission System for Advanced Level Private Schools: Case of Kilimanjaro Region Tanzania

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ABSTRACT

This study takes a look at the various challenges facing admission procedures for advanced level (A-Level) private schools case of Kilimanjaro region in Tanzania. Questionnaires were distributed to gather data from potential users of a new proposed admission system; namely: parents, A-Level students and school staffs, to find out procedures likewise the challenges being faced in the course of carrying out admission procedures and their level of satisfaction of the existing admission system. Thereafter, the analysis of the survey results confirms and quantify that 93.5% of admissions into A-Level private schools are performed manually by ink and paper. This manual system has its major problems which include difficulty in locating an appropriate school and subjects an applicant can get admissions, wastage of time, and loss of forms and mutilation of forms throughout the entire method for admission. Consequently, this study reports on research work to design and implement a Tanzania central processing admission system (TCPAS) that has the outstanding changes towards maintenance of admission costs, control forgery over entry qualifications, encourage the use of paperless admission, ability to reach several geographically scattered candidates and enhancing centralized data handling capability.

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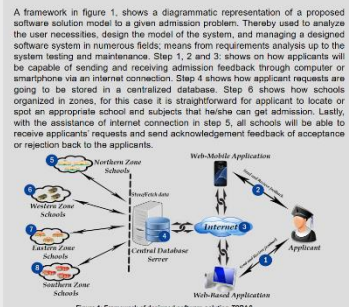Website: http://www.tcpas.ac.tz

INTRODUCTION

Globally, it is desirable to have fair and transparent student admissions into both public and private universities, colleges and schools. A case in point, in Tanzania 35% of students enrolled each year in higher level learning institutions and technical education are from Advanced Level (A-level) private schools [1]. Of concern is that, this study confirms and quantify that 93.5% of admissions into A-level schools were performed on paper based [2]. Such admissions were characterized by multiple admissions, being costly, inconsistency, inaccuracy, and difficulties in following admission procedures [4]. On the other hand, existing manual admission systems were considered unfair and not transparent. To mitigate these challenges a centralized web-based solution named Tanzania Central Processing Admission System (TCPAS) has been conceptualized to resolve the identified admission challenges. This study presents on research work aimed to address the challenges facing the current admission procedures in A-Level private schools in Tanzania. The proposed TCPAS is designed to be a web-mobile solution. The TCPAS tool is intended to reduce admission costs by reducing turnaround time for entire admission processes; encourage the use of paperless admission; control forgery over entry qualifications (certificates) during the admission process; has a centralized data handling capability; saves admission vacancies; and reach many geographically scattered applicants. Moreover, questionnaires were used to gather requirements from 150 respondents from the case study (Kilimanjaro region).

METHODS AND MATERIALS

Kilimanjaro as one among the five administrative regions that has a high number of A-Level private schools compared to other regions in Tanzania, was selected as a study area for the reported study. This is due to colonialism impacts, demographic factors and religious activities [3]. Thus, 64% of A-Level private schools in Kilimanjaro region are owned by religious institutions exclusively. Additionally, most of these schools are well invested in ICTs infrastructures (that is; computers and internet connectivity are already integrated as a medium of instruction) [2]. Kilimanjaro has a population of 1,640,087. Also, it is bordered by Tanga region, Arusha region, Manyara region and with Kenya in the eastern zone [1].

This research was adopted a case study approach. The 150 voluntary respondents or participants were selected as a study sample, and clustered into three groups, namely: parents, A-Level students and school staffs. During the month of February 2018, at the beginning of week 1 to week 4, questionnaires were distributed to collect data from the households, in which 25 houses which were expected to have at least one candidate were selected; followed by school staffs: in which 25 school admissions officers were selected. At the end of the week 3, the last group of students was considered; in which 100 A-Level students were selected randomly from the study sample. For this study, the distributed survey questionnaires were administered by using the Open Data Kit (ODK) software, and it had both hardcopy and softcopy questions. During the end of week 4 the collected statistical data were analyzed and virtualized by using SPSS software. Thereafter, we started to extract the software requirements and design consideration of the proposed software solution (TCPAS) based on the collected and analyzed survey data.

RESULTS

A framework in figure 1, shows a diagrammatic representation of a proposed software solution model to a given admission problem. Thereby used to analyze the user necessities, design the model of the system, and managing a designed software system in numerous fields; means from requirements analysis up to the system testing and maintenance. Step 1, 2 and 3: shows on how applicants will be capable of sending and receiving admission feedback through computer or smartphone via an internet connection. Step 4 shows how applicant requests are going to be stored in a centralized database. Step 6 shows how schools organized in zones, for this case it is straightforward for applicant to locate or spot an appropriate school and subjects that he/she can get admission. Lastly, with the assistance of internet connection in step 5, all schools will be able to receive applicants' requests and send acknowledgement feedback of acceptance or rejection back to the applicants.

Figure 1: Framework of designed software solution-TCPAS (http://www.tcpas.ac.tz)

RESULTS

This section discusses the challenges of the current manual admission systems as revealed from the analysis of survey data collected by using questionnaires, and its consequences on the current admission procedures in A-Level private schools in Tanzania. The following survey questions were asked.

1. Do the present manual admission systems reach to several candidates scattered geographically?
2. Do the present manual admission systems guarantee on centralized data handling capability?
3. Do the current manual admission systems ensure management over forgery of entry certificates throughout application?
4. Does the current admission procedures in A-Level private schools costly?
5. How about fairness of the current admission procedures in A-Level private schools?
6. Do the current admission procedures in A-Level Private schools handle admission vacancies?
7. Do the present admission procedures in A-Level private schools encourage on the use of paperless admission?

Figure 2: Web-portal interface for the TCPAS (http://www.tcpas.ac.tz).

Figure 3: Sample list of A-Level private schools in Tanzania grouped in zones.

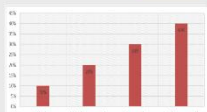Figure 4: Interface for school to generate reports of selected students.

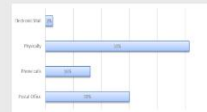Figure 5: Delay caused by manual admission procedures in Tanzania.

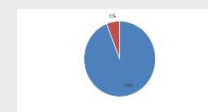Figure 6: The current methods for admission processing in Tanzania.

Figure 7: Shows how current admission procedures in A-Level are handled.

DISCUSSION

➤ Through the analysis of survey results in figure 5, it was revealed that the admission procedures in A-Level private schools are totally decentralized. These admission approaches, left school with the mandate to process the admissions requests on their own. In this case, it was further realized that most of A-Level private schools in Kilimanjaro region take a month (30%) or more than a month (20%) to process the applications, and to send feedback of acceptance or rejection back to the applicants. Therefore, these admission procedures cause further delay in commencing new academic years and makes it harder for applicants to make decisions about where, when and which subjects they can fit in.
➤ Survey results in figure 6 show that only 30%, 16% and 3% of A-Level private schools in Kilimanjaro-Tanzania, respectively, use methods like postal office, phone calls, and electronic mail, these strategies still doesn't seem to be effective and economical to cut back the utilization of ink and paper admissions. Consequently, the rest of the school's admissions in A-Level private schools are performed manually, that in turns cost in terms of time and money. Additionally, such admission method is extremely slow, less accurate, difficult to complete likewise as effort consuming.
➤ In this study it was confirmed from the survey results in figure 7 that, 35% of applicants registered for each academic year in higher educational institutions are from A-Level private schools. But, still 94% of admission procedures in A-Level private schools are performed manually. Such admission approaches consume much effort and time, up to 3 months, and in the average costs of US$22 for each applicant throughout the whole processes of admission. This makes the application procedures to be expensive and annoying.

CONCLUSIONS

The survey data from this study clearly confirm and quantify that many problems are still militating against the admission system in A-Level private schools in Tanzania. Despite of the contribution of private schools and the existence of these two systems (TOU and NACTE) in Tanzania, to date all the work at the time of admission in A-Level private schools are performed manually that is; on paper based, which is very slow and consuming much effort and time. Additionally, this manual system has its essential problems which include difficulty in locating an appropriate school and subjects an applicant can get admissions, wastage of time, loss of forms and mutilation of forms throughout the whole process for admission.

REFERENCES

[1] H. Zhang, "An Analysis of The Chinese College Admission System," no. 1, 2009, pp. 1–161.
[2] C. Mirji, V. Deshpande, S. Walunj, and A. Ambavane, "E-Admission System," vol. 18, no. 2, pp. 1–3, 2014.
[3] S. A. Adepoju, "Challenges of Students Online Registration System in Nigeria: A case of Federal University of Technology Minna," J. Technol. Res., vol. 5, no. 1, pp. 196–203, 2010.
[4] F. G. Mahundu, "E-governance: A sociological case study of the central admission system in Tanzania," Electron. J. Inf. Syst. Dev. Ctries., vol. 76, no. 1, pp. 1–11, 2016.