* **Introduction: An explanation of the problem and the objectives of the project.**

1. Introduction

Niger state polytechnic, Zungeru is a tertiary institution with 2 colleges (college of Science and Technology (CST) and College of Administrative and Business Studies (CABS)) each college has 3 schools (Environmental studies (SES), Engineering Technology (SET), Administrative Studies (SAS), General Studies (SGS), Business Studies (SBS), and Natural and Applied Sciences (SNAS)) each school has various departments and about 35 programmes form 17 departments in total. Result computation starts from departmental level, the department collect the approved list of students and courses from the Academic Planning Unit, all exams scores are submitted to the departmental coordinators by various course lecturers, then the scores are computed against each student and the responding courses they offered. After computation the result is submitted to the exams and records unit in broad sheet format ready to be presented to the academic board, the broad sheet comprises analysis showing all courses offered, code, unit, grades, total, mean, standard deviation and percentage pass, it also include the result summary, showing total number of students in class, number of students that passed, number of students with Carry Over, Number of students absent with Excuse, and number of students advise to withdraw.

In view of the above new (automated) system will comprise of five user access role as:

* System manager: This user controls all user accounts, manage personal records of students and courses (add, update and view)
* Department Coordinator: This user manage student scores (import/input/add student exam scores, consider/edit/update) score and allocate courses to a staff in a specific department
* Student: This user will only have access to view their individual result as a whole or in in semester basis.
* Teaching staff: this user can import and view student exam scores of only course allocated to them by the departmental coordinator.
* Exams and Records: This user can only view student personal information, courses, and broad sheet result of all departments

All of the users listed above will have different view when given access to the system through a login page process.

1.1 Aim and Objectives

The aim of the project is to develop a web-based system as an automation to the existing manual process of computing students’ examination results in Niger state Polytechnic, as the existing system is prone to errors and waste of time and resources like paper. The objectives are as follows:

* Gather information about user needs of a Result Computation System
* Design a wireframe / prototype
* Develop and design a web application in PHP, using MySQL, HTML, CSS and JavaScript.
* To develop a web based system with five (5) user role each with different user view as describe above.
* To Keep track of up-to-date records of the entire students in polytechnic
* Support Registration, data upload, queries to the system, generate broad sheet report and student result analysis for academic board decisions making with user-friendly interfaces for easy interaction
* Test the application for any dysfunctionality

1.2. Organisation of the Report

In this report the development of online result computation system is firstly introduce (Section 2). Then the methodology is stated and justified (Section 3). In the next sections the parts of the methodology are analysed. The section 4 contains all the means that helped gathering the requirements.

Next, the initial design process is described and evaluated (section 5). Then the implementation of the product and the technologies which were used are analysed (section 6), as well as the testing results. After that, the final product is described (section 7) and evaluated (section 8).

Finally, we summarise the project and identify further directions it could take (Section).

* **Background: A (usually brief) review of relevant literature and products to establish the context of the project.**

2. Background

The use of computers systems to process information is imperative and desirable as it would enable computing of students progress, better access to students' records (personal, and courses), updating student records keeping track of passed and failed courses (performance). The support of storing course information (course codes, course title, course credit units and grade points for the purpose of computing GPA with automation is required.[3]

Creating and organizing information in a useful manner is known as data processing. (Udeze, 2017) Explain how the manual method of computing students result prompt to lots of errors in most tertiary institutions in Nigeria.

**2.1 Similar work/application**

It’s an important process to investigate a similar web application (result computation system) to achieve a successful design and implementation of an exclusive result computation system.

Base on the research it is obvious that majority of the product didn’t have the combination of student profile, result analysis, and broad sheet generation as whole. However, some of the system have the combination of two out of the three functionalities. Though, many only generate broad sheets, which is one of the major component of the system required by tertiary institutions. More also, only a few of them allow importation of scores from file e.g. excel (.csv) format. Finally, only few has more than two user access roles.

Two of these web applications will be briefly analysed bellow.

2.1.1 Result Computation System (RCS)

Result Computation System (RCS) is an automated platform used in managing result for all categories of students in a friendly and interactive manner. Nigerian tertiary institutions follows the trend in Information and Communication Technologies in transforming their record keeping and information management operations. RCS is currently an information systems that readily attracts the attention of many tertiary institutions in Nigeria. Most of the Students’ RCS are traditional and standalone which has few or basic elements of a standard RMS. Most of the students RMS are not web based and others do not integrate well with the other information system in the Universities.[1]

2.1.2. Student result analysis system

Student result analysis is an online application used to analyse, store and keep track of student data and compute the mark analysis process in an educational institution, it enable the view of individual student’s result, automated computation of results from various departments. The use of computation systems that has it capabilities beyond result computation which is not so much in use. Tertiary institutions today compute student result analysis manually which consume lots of time and effort. A system that does analysis of student result is required as it will aid decision-making and taking in tertiary institutions. [2]

In view of the above related work it is clear that the requirement to have an online Result computation system in Niger state Polytechnic, Zungeru, Nigeria is important. In the institution, Students result are computed every semester from the summation of CA and Exam score of each course taken by students, given each student grades, GP, CGPA and remark. This is presented as broadsheet with analysis. The computation of result is completely manual.

This project is to create a web-based Result Computation System that would allow teachers submit/input/import students Exam score, the system will compute the scores, generate a broadsheet and provide analysis of the results on a semester basis. The students would be able to view their result through their profiles.

This project will considered security as an utmost priority, providing a login form for authentication of users and registration form to register student and courses offered.

References

*1. Akpasam J. E., Simeon O., Afolayan J. J. (2017). Development of Students Result Management System: A case study of University of Uyo. Mathematical and Software Engineering, Vol. 3, No. 1, 26-42.*

*2. Ashwin M., Jugal P., Aditya M. (2018). Student Result Analysis System. International Research Journal of Engineering and Technology (IRJET), vol.5, e-ISSN: 2895 -0056*

*3. UDEZE, C. L., UMOREN, P. U., OHERI, H. E., & ATTAH H. H. (2017) Automated Students' Results Management Information System (SRMIS), Journal of Multidisciplinary Engineering Science and Technology (JMEST) Vol. 4, ISSN: 2458-9403,*

* **Requirements specification: A specification of the problem and an explanation of how the student arrived at this specification. An initial work schedule including an overall project plan with time-scales, deliverables and resources.**

3. Requirement Specification

Before any development can commence, it is important for any project to consider the requirements of the end users. This is to ensure the finished project will function the way users expect it to. Therefore, requirement specifications have been gathered from sources as will be described later in this chapter.

This phase of the project gives an explanation of how we arrived at the specifications, including problem specification, methods of gathering requirements, online review, wireframe & prototyping, evaluation of the prototype, implementation, and project plan.

3.1 A specification of the problem

With the current trend in technology, Niger state polytechnic as a tertiary institution should have an automated means of computing student results, to enable it meet certain educational standard and requirements, an automation is required to eliminates errors in computation and reduce miss-use of resources and bring ease.

Currently the school is operating a manual system, every department computes students result in different formats in an un-centralised manner, some departments uses format such as excel sheet while some are completely paper based.

In previous years, a partial automated system of result computation has been introduced by the school authority to various departments that was used as a standalone system to enable departmental coordinators enter exam scores in text file then use the command line environment to manipulate the text files to generate a computed result, the system was not friendly, requires memorising commands and it takes a lot of time to arrange the scores in a text file and does not support editing, it is developed using Fortran. Yet with the introduction of the so called automated system every operation still seems manual, errors recorded are even more compared to the use of excel files, which has led to many departmental coordinators to dump it. Even after result is generated still analysis is done manually, given inaccurate results. It take the coordinator so many days to compute a single class, they become stressed up and sometimes frustrated as so many time is required. This problems lead to delay in producing result for student and also delay in taking and making decision.

If this problems are not taking care of it would lead to an educational degradation and inconsistent result generated continuously, although many institutions have similar issues or problems but they have often used different methods to solve the problems, but I feel developing a web based system that will be used by all department in a centralised manner, enabling result computation, adding and editing student exams score, generating broad sheet result with analysis, allowing individual student see their result on time from the comfort of their homes and also enable timely decision taking and making will make more significant difference from the methods previously used.

Finally I decided to develop the proposed system based on the problem statements stated above, leading to the requirement stated below.

3.2. Gathering Requirements

In order to gather the requirements for the web application a heuristic evaluation was conducted on a similar web application.

Involving in the process of computing student results makes it easy to investigate the existing system and to obtain detailed about the application area to be designed. During our findings, several effective methods of information gathering, or data collection were employed which include: evaluation and inspection of relevant documents such as result broad sheet, raw score samples, and transcript formats

The data required for the development of the proposed system will be from primary and secondary sources, using a survey/questionnaire and searching from the internet.

With the detail idea on how the existing system work, most of the data/information required to build the proposed system is known and acquired through primary and secondary sources.

The data from primary source is the outcome of the prototype evaluation done by the participants and the secondary source include data about **NBTE grading system** available on internet for public view, **result broad sheet** and **result analysis format** all of which could be found online [See samples in appendix](file:///C:\wamp64\www\Compute\MSc%20Work\MSC_Project\appendixa). The data gathered is use to fulfil certain requirement in the development of the proposed system, most of the information from participants would be used for the purpose of:

1. **Motivation** (do the target audience want the proposed system),
2. **Usability** (Can the target audience work out how to use it?) and
3. **Content** (Does the target audience understand what the proposed system is about).

3.3. Online Review

An online review was done to understand how other similar systems work, to find out what is lacking and how the proposed system can be a better replacement of the existing system.

From the review an idea for creating a use and misuse case diagram representing the usage requirement and possible threats or attack to a system, this was helpful as it describes the flesh of the actual requirements. The focus of the research was mainly on the computation of scores to produce results with analysis and preventing possible threats. As an insider it was easy to get the major information’s required for the use and misuse case.

Another method used is an alternative to use case diagram known as Persona. Alan Coopera introduced Persona in 1998. Personas represent potential users of a particular product as a fictitious characters. It’s very beneficial in the design process, it help the designers to better focus and understand the user experience as they use the product.

ahttps://**en.wikipedia.org**/wiki/**Alan\_Cooper**

We choose to use persona because of it benefit and it’s more realistic; for instance, personas can describe multiple type of users, while actors are limited to a single user type. Equally we also uses the Use case and misuse case diagram to clearly understand and fetch out the possible attack on the functionalities of the system and preventive measures to the attacks. [refm]

Use and misuse case diagram and persona will be detailed discussed in the chapter below.

[refm]

[Copyright](http://www.ambysoft.com/licensing.html) 2003-2018 [Scott W. Ambler](http://www.ambysoft.com/scottAmbler.html)

http://www.agilemodeling.com/artifacts/personas.htm

3.2.3 Prototyping

Having known the requirements, wireframes were designed to lay out the functionalities and specific content on a page, it takes into account the needs of users and user journeys. It was an early approach in the development process to establish the basic structure of a page before adding the content and visual design.

Indigo Studio was used as a prototyping tool to develop a prototype that mimic the proposed system, the prototype was used for pre evaluation to collect information from users about the proposed system in other to better understand the required functionalities and better user experience.

Indigo Studio is an interaction design tool from Infragistics that enables you to explore and create functional, animated User Interface (UI) prototypes. The tool is aimed at designers who lack development skills and developers without or with few design resources, it’s an interaction design tool that lets you prototype user interfaces without writing code.

Indigo Studio makes it easy for anyone to rapidly design functional, animated UI prototypes that maximize usability and appeal. It promotes design process best practices and enables teams to stay focused on the end users and their stories.

3.2.4 Evaluation

Although the design of the prototype was based on the previous research, there was a need for some extra opinions about the decisions for the features, the layout and the colours. For that reason, a focus group conducted and the details of the process will be analysed below. Examples of the focus group questions can be found in the appendices (II).

The design of the prototype was based on information from an observation and direct involvement of the researcher/developer as he is part of the examination committee and an instructor in the polytechnic. It is needful to have an extra opinion as it was helpful and significance in the development process.

To answer the questions (will the target audience find satisfaction in the use of the proposed system, can they use it, and do they find ease in using it) leads to the design of the prototype for evaluation using survey question to be completed by participants recruited. The participant will fill the evaluation form responding to questions base on their experience and observation. Typically 9 to 10 participant were individually given time to interact with the prototype so as to express their opinions, thoughts and preferences about the proposed system with no negative influence through responding to the survey question in the evaluation form. Example of the evaluation question can be found in the appendices

Focus group is an alternative method that would require less time to enable approximately five participant respond to the evaluation questions and the result could be negatively inflicted as few individuals could possibly be introverts while others take control of the debate and impact the end result, or possibly even introduce bias. The researcher may also have trouble controlling participant’s discussions and managing process.

The responds to the evaluation questions were analysed using the **theme and explore** approach. Theme and explore is the process of selecting key quotations from each respondent illustrating the themes found. It was more like a literary analysis.

Theme and explore is good for smaller sample sizes and more complex subjects. It is particularly helpful when your respondents have different understandings of the same issue and you want to compare them.

To ensure a credible and useful evaluation result, the data were systematically analysed.

Content analysis is define in various ways, Stemler (2001) stated that it is a “systematic, replicable technique for compressing many words of text into fewer content categories based on explicit rules of coding”. Also, Holsti (1969) said that content analysis is “any technique for making inferences by objectively and systematically identifying specified characteristics of messages” (Lazar, Feng & Hochheiser).

The analysis starts with the end in mind (check of the top research questions), then use a cross tabulating to filter results, Interrogate the data, analyse the results then draw conclusions

Final Evaluate

The final evaluation of the web application was conducted using an online questionnaire targeted mostly to vegan users. The aim of the questions was to the questionnaire (see appendix III) was first revised and approved by the ethical committee of the University of Dundee. Then, it was transferred to an online survey tool – SurveyMonkey5 – in order to have the appropriate layout and administered to the participants. The questionnaire was open to participants for one week.

Moreover, the Nasa TLX questionnaire (see appendix IV) was used. The Nasa TLX was not targeted to vegans, as it was only used to measure the effort that the users put during the tasks that they had to complete.

3.2.5 Implementation

Two are the most popular methodologies for the web development; the Agile method and the Waterfall (Plan Driven). Both of them were studied in order to choose the most appropriate for the project. In a few words, Waterfall is a linear approach for the development, which means that there is a specific order of the procedure that they have to be strictly followed.

The two most popular methodologies for web development are agile method and Waterfall (Plan Driven). Both process are studied to enable us choose the most appropriate for the development of the proposed system.

Waterfall basically is a sequential model where software development is segregated into a sequence of predefined phases including feasibility, planning, design, build, test, production, and support. On the other hand, Agile development methodology follows a linear sequential approach while providing flexibility for changing project requirements, as they occur.

<https://blog.flatworldsolutions.com/10-differences-agile-waterfall-methodology/>

© 2019 Flatworld Solutions Pvt. Ltd. All Rights Reserved.

Agile principles arose in the 1990s, in part, to address perceived weaknesses of the traditional waterfall development process. Agile methodology has steadily gained credibility and adherence over the last two decades.

<https://www.informatica.com/services-and-training/glossary-of-terms/agile-methodology-definition.html#fbid=w-gCxvCHf2g>

© 2019 Informatica All Rights Reserved

In 2001, Agile codified several lightweight theories under one umbrella, which revolve around short, iterative changes and frequent builds in order to make the development process responsive and adaptive to changing requirements. Agile developers believe that making the customer/business happy is more important than executing a long range plan.

In view of the above differences between the two methodologies, we choose to implement the proposed system based on the agile method to fully leverage it advantages.

3.3 Project plan

The time management plan used in this project work is describe as shown a table with two columns, for tasks (activities) and time (duration) of each task. Some of the tasks that happen at the same time is noted next to the respective tasks.

|  |  |
| --- | --- |
| Activities | Time (Duration) |
| Defining the goals and collecting necessary information about the requirements | 2 weeks |
| Prepare records and apply for ethical approval | 3 weeks |
| Create wireframe and prototype for the web application | 1 week |
| Wait for the approval from ethics committee | 2 weeks |
| Planning the evaluation process   * Meet with participant (consent forms) * Ask them to respond to the evaluation questions, and observe them interact with the prototype | 2 weeks |
| Proposed database structure   * Draw an ER diagram * Set up a localhost server (Wamp server) * Use the ER diagram to define the database schema on the server | 1 week |
| Adopt a template (User interface design)   * Setting up GitHub * Refine the template to suit the proposed system | 1 week |
| Create personas  Create use case diagram | 1 week |
| Implementation using agile method   * Create the product backlog * Create first sprint backlog | 1 week |
| Start development (using PHP, HTML, CSS and JS)   * Test code * Create second sprint backlog | 1 week |
| Continue development and testing code   * Create 3rd sprint backlog | 1 week |
| Continue development and testing code   * Create 4th sprint backlog | 1 week |
| Final Sprint review and retrospective |  |
| Final evaluation of the developed system |  |
| Writing report | 12 weeks |

Figure 3. Project plan

* Design: This should include the design method, design process and outcome. Design decisions and trade-offs should be described e.g. when selecting algorithms, data structures and implementation environments or when designing for usability.

Design methods

Personas

Use and misuse case diagram

Requirements

Wireframe and Prototyping

Evaluation of the prototypes

Participants Interaction with the prototype

Responds and result

Database design

ER diagram

Design process

Agile process (Product backlog and Sprint backlogs)

Choice of programming language

Technology used

* Implementation and Testing: A description of production, testing and debugging. A demonstration that the specification has been satisfied.

Implementation and testing

Final product

* Evaluation: You should carry out formal user evaluations and report on them.

Evaluation of final product

* A description of the functionality and interfaces of the completed system.
* Appraisal: A critical appraisal of the project indicating the rationale for design/implementation decisions, lessons learnt during the course of the project and an evaluation (with hindsight) of the final product and the process of its production (including a review of the plan and any deviations from it). The project should be placed in a wider context and this could include the scientific, technical, commercial, social and ethical context.