

Web-Based Examination Results Release Information System For Cost Effective Strategies In Academic Institutions

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ABSTRACT: In past eras, a variety of results release approaches and systems have been proposed. And as technology keeps improving every day and night, numerous of them have been transformed from traditional paper to computerized and web-based format in recent years. Higher learning institutions with large number of students like Sokoine university of Agriculture face challenges in handling and releasing examination results leading to high cost and delay accessibility by students. Sokoine University of Agriculture and many other universities in East Africa particularly Tanzania have been using the computerized format of processing exams using Microsoft Excel which in turn leads to many complications and mostly notably excel formulas which are unknown to most of them. This paper proposes the web-based examination results release information system for cost effective strategies in East African academic institutions. It is urgent to come up with a solution that will cater short term demands of institutions like SUA and many others. Though, the proposed system involves only results releasing module but it's urgent for the institutions that have a significant financial constraints. The proposed system is able to display results for each student and is able to accept the results from the examination officers. The system is intended to make sure that each student gets his/her results on-line without any hassle. Since, the system is proposed for financial constraints institution; hence it is not suitable for long term solution. Instead, this is recommended to be used for temporary services only.

Keywords: ERRIS, information, examinations, results

1. INTRODUCTION

Advances in new information technology and the drastic growth of the Internet over the past decade have considerably changed the end-user computing environment. Therefore, it is appropriate to review the measures of user satisfaction with information systems technology, especially in a web-based environment, which accounts for a major component of the end-user computing environment (Xiao, 2002). Information and Communications Technology is one of the most potent forces in shaping the twenty-first century. Its revolutionary impact affects the way people live, learn and work and the way government interacts with civil society. The essence of the IT driven economic and social transformation is its power to help individuals and societies to use knowledge and ideas. Our vision of an information society is one that better enables people to fulfil their potential and realize their aspirations. To this end we must ensure that IT serves the mutually supportive goals of creating sustainable economic growth, enhancing the public welfare, and fostering social cohesion, and work to fully realize its potential to strengthen democracy, increase transparency and accountability in governance, promote human rights, enhance cultural diversity, and to foster international peace and stability. Meeting these goals and addressing emerging challenges will require effective national and international strategies (G8 Okinawa Charter on Global Information Society, 2000). The growth of the Internet, and in particular the World Wide Web, is already influencing the way science is taught and will undoubtedly do so to greater extent in the future. One important facet of this is the development of web-based assessment and testing systems (Bonham et al.; 2000). We describe a web-based system for the delivery and marking of multiple-choice questions. While other web systems exist that deliver such exams, those systems require either the manual mark-up of static exam questions, or generate different versions of an exam with limited variability. Such approaches result in exams that should only be

administered once to a specific student (Lister, R.; 2001) Development of Information and communication Technologies (ICT) creates opportunities for enhancing content delivery and accessibility in higher learning institutions. The use of Internet in East Africa, and in particular the World Wide Web, is already influencing the way science is taught and will undoubtedly do so to greater extent in the future. This has led to creation of the web based system whenever necessary. In past eras, a variety of results release approaches and systems have been proposed for virtual showing of the results. Virtual learning environments (VLEs) have recently become a viable education alternative. In this article, we defined the VLE concept and identified its main dimensions (Piccoli et al.; 2001). Many of the East African institutions are facing financial constraints to implement a web based system of releasing results which in turn result to cost-effective and timely dissemination and accessibility of examination results. Sokoine university of Agriculture has been strategizing on publishing the examination results on-line for a quite a while since 2005. Increase in the number of students enrolled each year triggered a high demand for cost effective and timely method for Releasing Examination Results. Due to fact that, most of the students are coming from all over the country. The results are released mostly during the holidays where they are far away from the university. Tanzania is a very large country consisting of about 945,203 km² of terrestrial land. It is not possible for a student to access his/her results until somebody else - nearby campus to access his/her results on behalf and inform via mobile. The results are displayed publicly on the notice board, this intrude the privacy of students results. The development of the telecommunications in Tanzania has fastened the deployment of ICT systems to the rural areas. This advancement has brought a great need to release results on-line. SUA has its own domain (www.suanet.ac.tz) that is connected to the Internet. SUA has decided to administer their examination processes

through computers. At first place, the need to display results on-line was strongly pushed forward to be implemented. Implementation of the examination results system may require a lot of subsystem like students registration, course registration and instructors registration system. These sub systems may require more time to develop the idea up to completion. This was the main problem that SUA experienced. It is urgent to come up with a solution that will cater short term demands of SUA and many other universities. Though, the proposed system involves only results releasing but it's urgent for the institutions that have a significant financial constraints. ERRIS becomes very important to three stakeholders of the system such as examination officers, administration and the students.

For Administration:

- Allow them to add/update examination officers
- Control all other features within the system
- Receive complaints whenever the system fails to achieve its intended objectives.

For Students:

- The system allows each student to view his or her exams online.
- The system allows a student to change his password for privacy.
- The system allows the students to post comments and chat with the administrator.

For Examination Officers:

- The system allows the exam officers to upload the results.
- The system allows the exam officers to update the results whenever necessary.

In such web based systems, the user and administrator are exposed to security issues as anyone can attempt to temper the system. In their paper (Li et al., 2005) presents a language-based approach to enforcing confidentiality and integrity of data in typical web based information systems. Such systems are usually implemented using a layered design in which data is stored in the database and accessed by using a web browser. The database management system (DBMS) provides a data query language (for example, SQL) to store, modify and extract information from databases. Application software connects to the DBMS via some programming language interface and submits *queries* as requests for information from the DBMS. The application software then processes the data and sends the computation results to the end-users, typically bundled as HTML. This paper focuses on a simple yet widely used design, where relational databases such as MySQL are used as the DBMS and web scripting languages such as PHP are used for developing application software. In practice, there are many security concerns for such systems. For example, an unsafe PHP script could use strings from untrusted inputs to compose SQL queries and then have the DBMS execute the query, which potentially allows an attacker to insert arbitrary commands in the SQL query. PHP scripts that access confidential data in the database must also release them only in permitted ways. For example, one might require that a password can

be compared against user inputs but cannot be printed to the web page verbatim, or that only the last several digits of a social security number or a credit card number should be displayed in the HTML output.

2. MATERIALS AND METHODS

2.1. Study Area

This study was carried out at SUA. It has involved directorate of Computer Centre under sponsorship of the Deputy vice chancellor (Academics). All the requirements were taken from the SUA departments and examination officers. This is quite necessary as the system had to be deployed for SUA and tested by SUA community.

2.2. Population and sample size of the study

Few samples were collected from the examination officers. Examination officers had to provide necessary materials to be used to develop the system. These materials were excel sheets that are used to display final results online. SUA has about 32 degree and non-degree programs that are provided. The programs have many students totally more than 2500s. The system is expected to have a very large visit especially the days when the exam results are released. So the sample size will significantly increase at those days.

2.3. Materials and computer languages used

ERRIS was developed basically using few materials:

- ❖ A working web server like Apache and php compiler to execute the codes created. Also mySQL database and phpmyadmin. These are quite necessary for deploying a web based systems.
- ❖ A working computer and internet connections. ERRIS needs to be tested within a computer that is using a web browser.

2.4. Methodology

The proposed system is the stand alone system that uses the Spiral Model as a system development methodology for development. The model reflects the underlying concept that each cycle involves a progression that address the same sequence of steps, for each portion of the product and for each of its levels of elaboration, from an overall concept of operation document down to the coding of each software. It combines the features of the prototyping model and the waterfall model. The spiral model introduces an evolutionary or iterative approach to systems development. The model is divided into four quadrants.

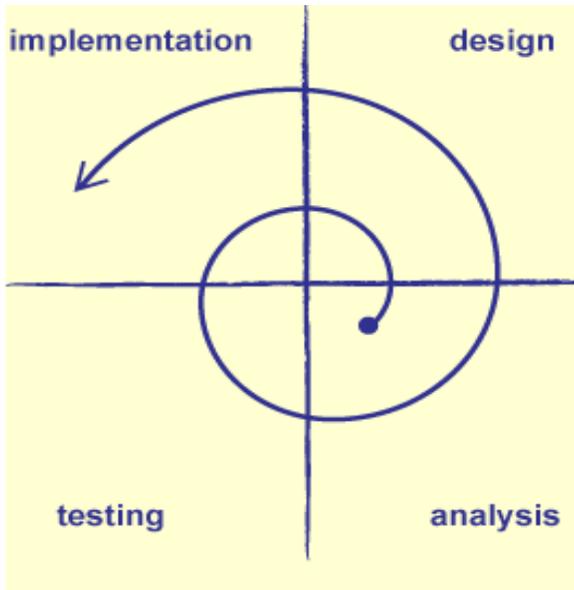


Figure 1: Spiral Model of ERRIS

Starting at the center, each turn around the spiral goes through several task regions:

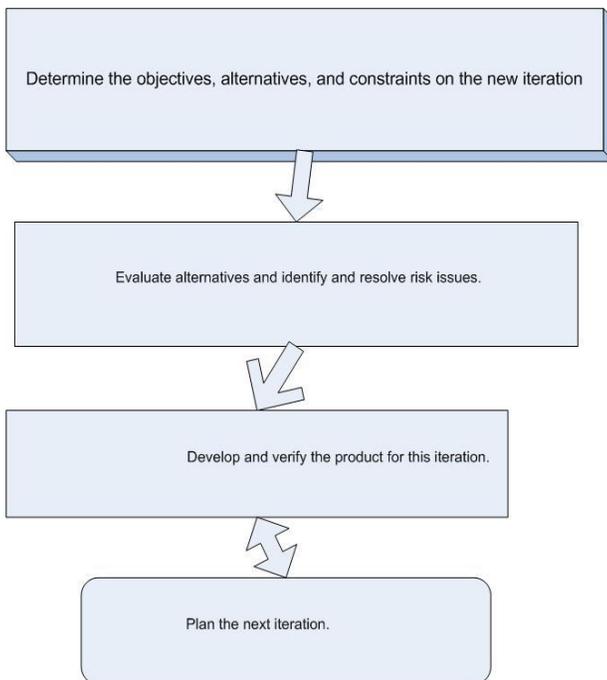


Figure 2: Spiral processes

2.4.1. System implementation

ERRIS is built using php5, JavaScript and mySQL. ERRIS is also built using AJAX technology, which is a group of interrelated web development techniques used for creating interactive web applications or rich Internet applications. With Ajax, web applications can retrieve data from the server asynchronously in the background without interfering with the display and behavior of the existing page. Data is retrieved using the AJAX which is implemented using remote scripting language JavaScript which is supported by all web browsers.

2.4.2. System testing and evaluation

The system was tested firstly by technical persons (software developers / software analysts' programmers) to assess its conformity with functional requirements as specified in requirements document. Furthermore, they evaluated the system by feeding some inputs and analysis of its output in order to check its validity. Furthermore, the ERRIS was tested in the application area of our case study in order to assess its impact in real environment. It was installed in computer centre web server and operated by its key stake holders. ERRIS accomplished its intended mission.

2.5. Software requirement specification (SRS)

SRS is the end deliverable of the analysis phase. The purpose of this section is to collect, analyze and define high-level needs and features of the *web based examination results release information system (ERRIS)*. It focuses on the capabilities needed by the different stakeholders, and the target users, and why these needs exist. The details of how the *web based examination results release information system (ERRIS)* fulfils these needs are detailed in the following software requirement specification documents.

3.5.1. Situation analysis

SUA needed a quick solution that shall cater displaying or releasing examination results online. It's quite necessary that these results are released online. The method was to build a system that caters the entire situation from registering the students' up to examination results. This solution might be very long and tedious consuming both man power and financial resources. Above all, its time consuming and might hinder the purpose of the university at the moment. This situation made the project to deliver ERRIS.

3.5.2. Stakeholder and user description

The *web based examination results release information system (ERRIS)* has three primary user groups and four stakeholder groups. The users are classified as student, examination officers and system administrator. In addition to these three groups, the University IT staff from Computer Centre and Department of Informatics will be the extra stakeholders as they will be tasked with maintaining the system. See the summary of stake holders below.

Table 1: System stake holder descriptions

Stake Holders	Represents	Roles
Student	All undergraduate and non-degree SUA students	This user is intended to view and follow his/her results online and report for any problem in case it happens
Examination Officers	These are people tasked after Dean of the faculty or director	This user is highly privileged to upload the examinations results online.
Administrator	Administrator is person who knows well how the system works	This is a super user and will be adding/deleting exam officers and the results if found incorrect.
IT Staff	Technical IT staff of the SUA	They are tasked to maintain system server and connection to the internet

2.6. Product perspective

ERRIS will need a web server and database in order to communicate with its users. Actually, context of the ERRIS involves mainly with connection between ERRIS in its servers and database to external users that are connected to the internet. See the diagram below.

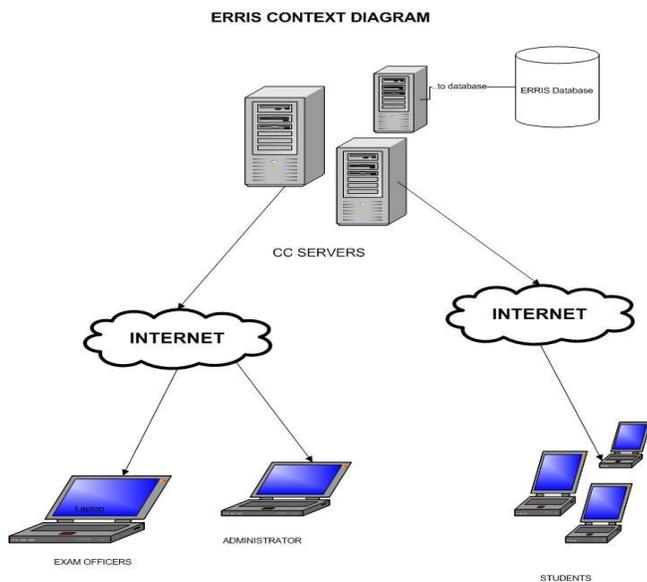


Figure 3: ERRIS Context Diagram

2.7. Use case elicitation

Use case describes interaction between the User, user device (User browser) and the server. ERRIS House has typical relationships between its actors and use cases.

Table 2: System actors descriptions

Actor	Description
Administrator	This is the most privileged user who can login into server of the database Roles; <ol style="list-style-type: none"> 1. Login into server 2. Starts the system 3. Stops the system. 4. Generally executes all the roles of the user 5. Can add new administrators and users 6. Can login remotely 7. Can change the commands to the circuit 8. Can view all reports in sessions and events
Student	This is the registered user to use the system using the internet enabled PC. <ol style="list-style-type: none"> 1. View results 2. login
Exam Officer	This is the registered user to use the system using the internet enabled PC. <ol style="list-style-type: none"> 1. Can upload the results 2. Can update the uploaded results

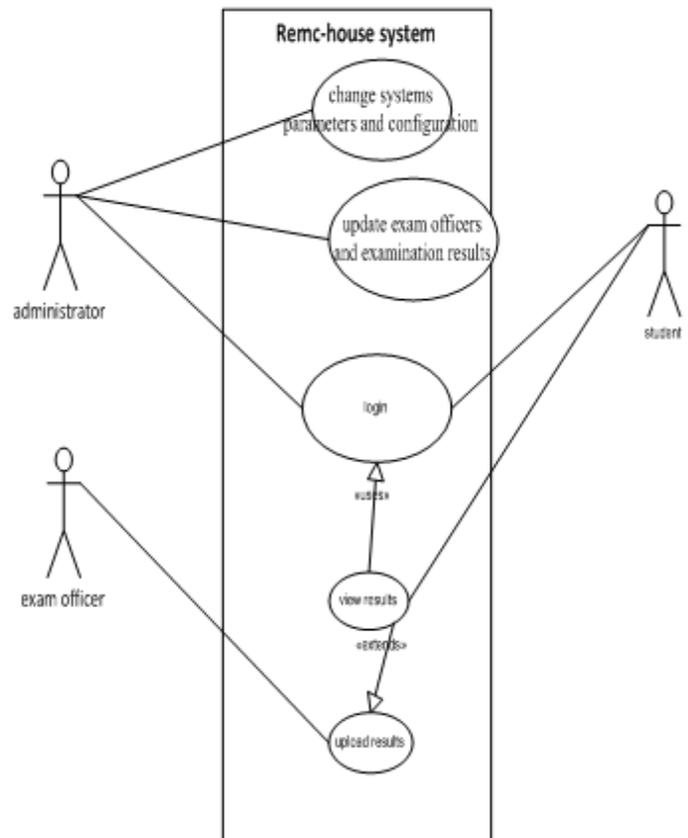


Figure 4: ERRIS Usecase

2.8. Product features

2.8.1. Connect to the ERRIS::SF01

Description

The user is connected to the internet and tries to login

Stimulus/Response Sequences

Preconditions:

- User knows that he/she is connected to the internet
- User has opened the ERRIS system and sees the login screen in front of him/her

Post-conditions:

If the user provides right username and password then he/she will be sent to the home page

If the user provides wrong password/username then he/she will be told to rewrite the password/username

Abnormal Paths:

If the user has not seen the login screen or errors where produced with white background then he/she should report the case immediately

2.8.2. Setting sessions in the ERRIS::SF02

Description

The user has successful login and sees the home option and clicked the change password URL.

Stimulus/Response Sequences

Preconditions:

- User knows that he/she is connected to the internet
- User has opened the ERRIS system and sees the change password screen in front of him/her
- System knows that the user had a successfully login

Post-conditions:

The system sets usernames and status of the user.

Functional Requirements

Specializes: SF01

2.8.3. Changing password in the ERRIS::SF03

Description

The user has successful login and sees the home option and clicked the change password URL.

Stimulus/Response Sequences

Preconditions:

- User knows that he/she is connected to the internet
- User has opened the ERRIS system and sees the change password screen in front of him/her

Post-conditions:

If the user provides right old and new password then he/she will change the password else no any change will occur.

Functional Requirements

Specializes: SF02

2.8.4. Logging out in the ERRIS::SF04

Description

The user has successful login and sees the home option and clicked the logout URL.

Stimulus/Response Sequences

Preconditions:

- User knows that he/she is connected to the internet
- User has opened the ERRIS system and sees the change password screen in front of him/her.

Post-conditions:

The system shall destroy all the sessions and goes to index page.

Functional Requirements

Specializes: SF02

2.8.5. View results in the ERRIS::SF05

Description

The user has successful login and sees the home option and clicked the view results URL.

Stimulus/Response Sequences

Preconditions:

- User knows that he/she is connected to the internet
- User has opened the ERRIS system and sees the change password screen in front of him/her
- The system has set recognized user as student

Post-conditions:

The user shall see the available uploaded results

Functional Requirements

Specializes: SF02

2.8.6. View specific results in the ERRIS::SF06

Description

The user has successful login and sees the home option and clicked the view results URL. Also the student has chosen specific designated results.

Stimulus/Response Sequences

Preconditions:

- User knows that he/she is connected to the internet
- User has opened the ERRIS system and sees the change password screen in front of him/her
- The system has set recognized user as student

Post-conditions:

The user shall see the available specific uploaded results

Functional Requirements

Specializes: SF02; SF05

2.8.7. Post comments to the administrator::SF07

Description

The user has successful login and sees the home option and clicked the post comments URL.

Stimulus/Response Sequences

Preconditions:

- User knows that he/she is connected to the internet
- User has opened the ERRIS system and sees the change comments screen in front of him/her
- The system has set recognized user as student or exam officer

Post-conditions:

The user shall see the comments from the administrator and a place to update comments.

Functional Requirements

Specializes: SF02

2.8.8. See uploaded results::SF08

Description

The user has successful login and sees the home option and clicked the see uploaded results URL.

Stimulus/Response Sequences

Preconditions:

- User knows that he/she is connected to the internet

- User has opened the ERRIS system and sees the change password screen in front of him/her
- The system has set recognized user as administrator or exam officer

Post-conditions:

The user shall see the designated uploaded results.

Functional Requirements

Specializes: SF02

2.8.9. Upload the Results::SF09

Description

The user has successful login and sees the home option and clicked the upload results URL.

Stimulus/Response Sequences

Preconditions:

- User knows that he/she is connected to the internet
- User has opened the ERRIS system and sees the change password screen in front of him/her
- The system has set recognized user as exam officer

Post-conditions:

The user shall see the upload results screen and be able to upload.

Functional Requirements

Specializes: SF02

2.8.10. Import Results information::SF10

Description

The user has clicked the upload results button.

Stimulus/Response Sequences

Preconditions:

- User knows that he/she is connected to the internet
- User has opened the ERRIS system and sees the change password screen in front of him/her
- The system has set recognized user as exam officer
- The user has uploaded the results from SF09.

Post-conditions:

The user shall see the upload results screen (Import messages). If successfully then green text should be seen else red text which describes the specific problem encountered.

Functional Requirements

Specializes: SF09

2.8.11. View the uploaded results::SF11

Description

The user has clicked the upload results button.

Stimulus/Response Sequences

Preconditions:

- User knows that he/she is connected to the internet
- User has opened the ERRIS system and sees the change password screen in front of him/her
- SF10 was successfully
- The system has set recognized user as exam officer
- The user has uploaded the results from SF09.

Post-conditions:

The user shall see the uploaded results screen in table form and be allowed to confirm.

Functional Requirements

Specializes: SF10

2.8.12. Adding/Removing an Exam officer::SF12

Description

The administrator has clicked the add exam officers url.

Stimulus/Response Sequences

Preconditions:

- Admin knows that he/she is connected to the internet
- Admin has opened the ERRIS system and sees the change password screen in front of him/her
- The system has set recognized user as administrator

Post-conditions:

If successfully remove or add the exam officer then green text should be seen else red text which describes the specific problem encountered.

Functional Requirements

Specializes: SF02

2.8.13. Post comments to the users::SF13

Description

The admin has successful login and sees the home option and clicked the post comments URL.

Stimulus/Response Sequences

Preconditions:

- Admin knows that he/she is connected to the internet
- Admin has opened the ERRIS system and sees the post comments screen in front of him/her
- The system has set recognized user as administrator

Post-conditions:

The admin shall see the comments from all users (students and exam officer) and a place to update comments.

Functional Requirements

Specializes: SF02

2.9. System analysis and design

2.9.1. UML entity relationship diagram

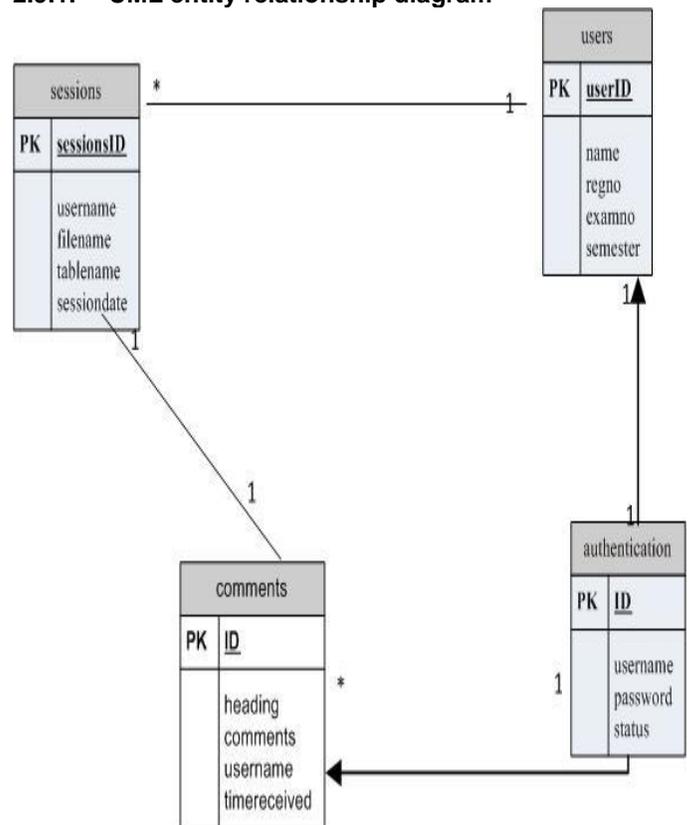


Figure 5: Entity Relationship Diagram

2.9.2. UML Sequence diagram

The sequence diagram is used primarily to show the interactions between objects in the sequential order that those interactions occur. One of the primary uses of sequence diagrams is in the transition from requirements expressed as use cases to the next and more formal level of refinement. Use cases are often refined into one or more sequence diagrams.

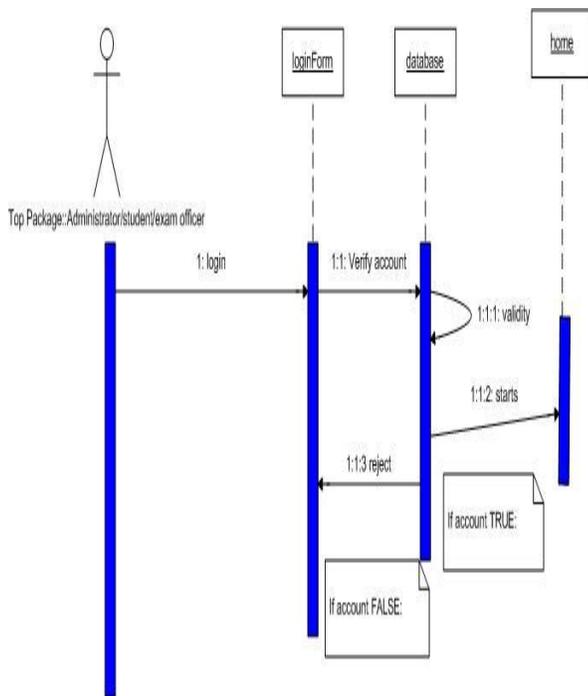


Figure 6: Scenario: Sequence diagram for login into administrative page

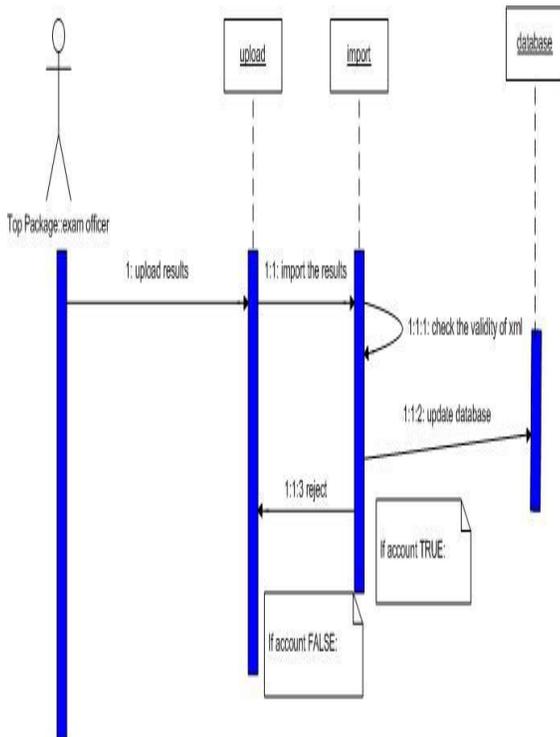


Figure 7: Scenario-Uploading results by Examination Officer

2.9.3. System files upload algorithm

ERRIS has its technique to upload files. The evaluation on how to upload file is based on research carried by the authors. The system is intended to accept extensible mark-up language files as it's based to upload the files. The flowchart Figure 8 below summarizes the process. This

system manipulates xml-excel files created from the excel sheets and enters in mySQL database dynamically while creating excess information for use in the information system.

Why xml files? Xml file is the extensible markup language so it can be created from vast number of binary files like excels or word etc.

Since technology grows very fast and the creation of the new technology might hinder the present technology then it's a perfect time to use backward compatible technologies like xml sheets. The system is well compatible with latest technology. Most of the old technologies are also compatible but some few features might not be compatible. This doesn't mean it's not working but some of its features need more advanced technologies. Before uploading there should steps to upload the files;

1. The examination officer should first change the processed exams to the specific format. This is new template that will strictly be followed by the examination officer to create the upload file. The first row should contain the headings only.
2. The examination officer after having that template should make sure that all the subjects are written with only their names.
3. The first three fields should be arranged as usual. That is name of the student, regno and examno. This will help the system to create the database passwords etc.
4. The system accepts results in term wise. Semester 1 or semester 1 probation results etc.
5. The system will have to check some of these fields before it accepts uploading the file.
6. The file name should be unique so that it gets to be saved in the system. Please write a name e.g. inf212 or bvm912probation. That is a unique name. The file is checked to avoid uploading the same file to the system and cause memory junks.
7. The system will bring out some of the errors if the file has problems or otherwise.
8. Please make sure you observe and follow the procedures carefully to avoid unnecessary mistakes.
9. If the system has accepted your file it will give out the message and show you a link to follow to check the results you have uploaded. Note that the system will have a special request in case you have released that the file you have uploaded is the junk. Hence, you may opt for its deletion.

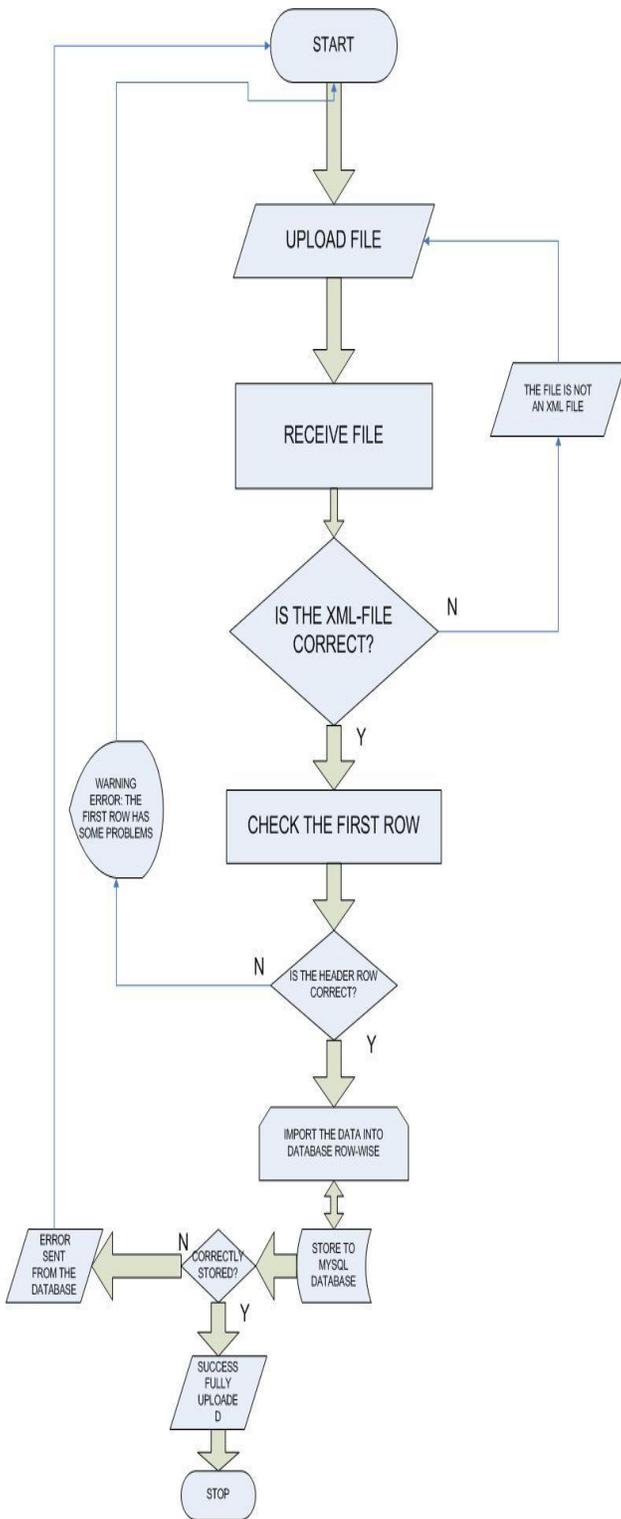


Figure 8: Flowchart of the ERRIS Algorithm to upload files

3. RESULTS AND DISCUSSIONS

The implementation phase resulted into a prototype of the web-based ERRIS This section provides the procedures to be followed by the users of the system (The students, the staff and administrator) in order to access/upload the information from the system. Before you get access to the system the system will require you to enter your username

and password. After you have entered correct username and password, the system will direct you to the specific page where you can choose the option that corresponds to the service you want the system to do for you. Make sure you remember correctly your username and password.

3.1. Registration of users

1. The students are registered automatically by the system when the uploading is done
2. The staffs are registered manually and they are given username and password by the system administrator.

3.2. To get access to the ERRIS

1. Open the modern browser (Mozilla Firefox 4, Internet explorer 9, Google chrome 16, opera or any browser running on the working machine) by right click and choose open or by double clicking it.
2. The home page of the Examination Release Results System will appear.
3. In the ERRIS login page opened, enter your username and password to get access to the ERRIS

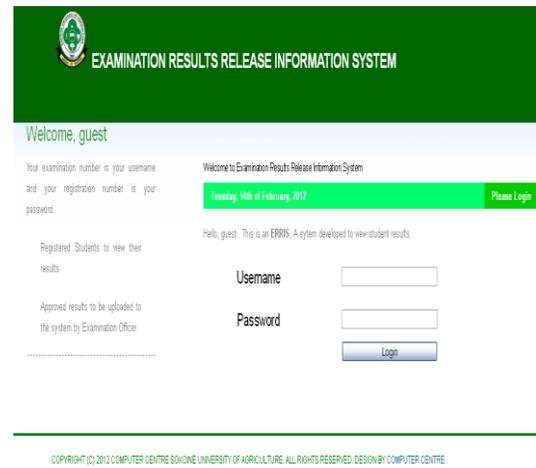


Figure 9: Login screen

3.2.1. Students

ERRIS allows the students to perform the following operations

- ❖ To access their examination results
- ❖ To change their password
- ❖ To post comments to the system

After login process as a student, the system will connect to the student page with the following links;

- [Examination results](#)
- [Post comments to the administrator](#)
- [Change password](#)
- [Logout](#)

To access examination results just click the link "**Examination results**", your results will be displayed.

To change the password

- ❖ Click the link “**Change password**”
- ❖ The following “**change password screen**” will open.

Click **CHANGE** to confirm

- ❖ When you have done and you want to quit from the page click **Logout**

3.2.2. The uploader (Examination officer or staff)

ERRIS allows the staff (uploader) to perform the following operations

- a) The examination officer to upload the examination results
- b) The examination officer to change their passwords
- c) The Examination Officer may post comments to the administrator

The following are the procedures to be followed in order to upload the examination results to the system.

- a) Enter your username and password (that were provided by the administrator) and click **login** button to get access to the system.
- b) From the excel sheet of examination results, select the records of the first student to the last student ignoring the heading of the excel sheet then copy and paste them to the given template and confirm the consistency by passing through it.
- c) Go to save button and choose save as other format then select XML spreadsheet 2003
- d) From the pop-message click yes to choose the first option which leave out any incompatible feature.
- e) Click **upload results** link in the examination officer interface from the page opened after login process
- f) From the “**upload screen**” click **browse** button to search for a file you want to upload. If you have saved the file in the external storage (flash disk, CDs or any) insert the disk first in the computer and then click **browse**.
- g) Fill the required information like course program, semester, year and others.
- h) When you find the file, select it by clicking it until the path of the file appear on the space that correspond to “**Browse**” in the upload screen. Make sure that the file is an XML file.
- i) Click **upload** button to upload the file. If the file is not in XML format, the system will complain then follow the instructions provided.
- j) A message appears stating that “*the file was uploaded successful*”. Click OK to confirm.
- k) This option will provide you with the confirm button or discard “*if the file is NOT okay. Please click here to delete it*”. Make sure the upcoming page gives a line to confirm that you have successfully deleted the file.
- l) If the procedures above were done successfully, the file will be successful uploaded.

3.2.3. The Administrator

The ERRIS administrator will be able to

- a) To view all the exam officers and update their names or adding new ones

- b) To view all the exams that have been added to the system
- c) To answer all the comments sent from the users

a) To view all the exam officers and update their names or adding new ones

The administrator will be able to see the available examination officers of the system. He will be able to add them, delete the existing ones or update their names.



Figure 10: Administrator view the exam officers

b) To view all the exams results that have been added to the system

The ERRIS administrator will be able to see the exams results that have been uploaded to the system. These results can only be deleted by admin or the up-loader of the file.

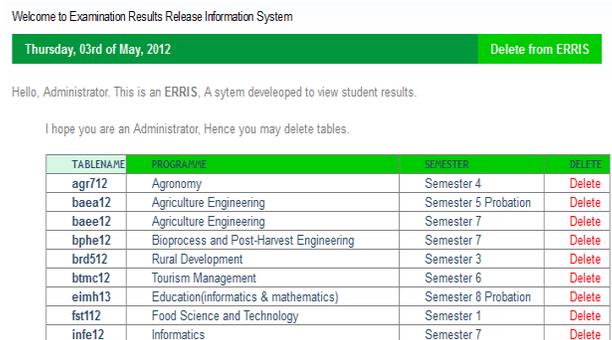


Figure 11: Administrator viewing the uploaded results

c) To answer all the comments sent from the users

The ERRIS administrator will be responsible to view and answer the questions. No any other user will see the comments sent to the admin except the sender and administrator only. The red text when clicked will delete the comment/user/results.

3.3. System Testing

This is the last stage of the system development. In this step, the system was tested to identify errors as well as

make corrections in case of any error before it has reached to the users.

Table 3 : System testing Summary

S/n	Testing Step	Expected outcome	Pass/Fail	User Comments
1	Login: Enter username and password and click enter or sign in	Allow user to sign in into the system either successful or by prompting the user in case unsuccessfully	PASS	The functionality is OK
2	Upload results: Login as exam officer and click left URL written as upload results.	Allow exam officer to upload the results as required. If successful give out the necessary messages else prompt the user for its failure	PASS	The functionality is OK
3	View Results: Login as a student and click left URL written as view results	Show the user to see the uploaded results of own work.	PASS	The functionality is OK
4	Change the password	Allow the user to enter old password and new password and confirm it. If successfully prompt the user else do otherwise by prompt with error messages.	PASS	The functionality is OK
5	Post comments to the admin or vice versa	Allow user and administrator to communicate in case of complaint or anything else. This shall allow chatting dynamically	PASS	The functionality is OK
6	Removing Comments or exam officer: Choose either of the two and click either delete or remove	This will reload the table with the comment or exam officer deleted	PASS	The functionality is OK

4. CONCLUSIONS AND RECOMMENDATION

4.1. User Requirements Remarks

The system has covered all the requirements as evaluated in Software specifications document. These requirements have originated from the project objectives. This has satisfied/met the requirement for displaying the results online.

4.2. System effectiveness

This system is relative good especially in producing reports of its sessions, admin sessions and upload sessions. The system can effectively upload the results through the internet with any problem. The system works very well even in a very slow internet connection. This system is quite very good to deploy in east African countries where internet is very slow and the bandwidth is very limited.

4.3. Learn-ability

Can the admin accomplish the set of tasks made to the system?

YES, since the system is very simple and easy to use.

The system is based in well-organized forms and modules. Every task could be twisted to its desirability. The admin can control the system. Simply, it takes very short time to learn the system functionalities and starting exploring them.

Can the user (Student or Exam Officer) accomplish the set of tasks made to the system?

YES, since the system is very simple and easy to use.

The system is based in well-organized forms and modules. Every task could be twisted to its desirability. The student/exam officer can control the system. It does not need any knowledge of computing to be able to use ERRIS online. Simply, it takes very short time to learn the system functionalities and starting exploring them.

4.4. Recommendations

The system has met all its specified objectives. Also its implementation has provided alternatives for accomplishing these objectives. The system can't be installed directly to the server before evaluating client's needs. Actually, this system act like a model to the actual system to any institution. Through this development I have realised several ways to integrate technology using quite a lot of technologies leading to a challenging work while being very resourceful. It's quite necessary to add new technologies like jQuery, html5 and more. The characteristics of the proposed web based monitoring and evaluation system which make it more effective, elegance, efficacy, ethical and efficient (i.e. 5Es of usability testing) from existing manual examinations system are as follows:

- It provides a better interface and attractive environment to user.
- It provides an efficient security to the system and data storage of different projects.
- The database is flexible.
- It is easily understandable and reliable.
- It gives an early warning alert to project which are not performing as well those who excel in fulfilling the project goal.

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