Digitalizing clearance in higher education institutions

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Abstract

Students in higher education institutions are expected to participate in several important activities throughout their periods of study. Clearance is official authorization for students to proceed with their registration, downloading their results and applying for residence. The institution still use a semi traditional way for clearance since student have to go to finance officer for clearance, however the traditional way involves going to all concerned faculties and department filling in forms and submitting them back to the respective department. In the modern way student are not supposed to go there physically and stand in long queues rather visit the institutions page clear.

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Introduction

Clearance in institutions of higher education is the required process graduating students must go through to establish their qualification for graduation (Jonathan et al., 2019; Agbo-Ajala & Makinde, 2015). This process is used to check if students have satisfied all the necessary requirements for graduation and registration per the institutions guidelines. Currently, all students must pick up clearance forms and move to various offices to make sure they are not indebted or hold anything belonging to the university in order to eventually become a student of that institution, graduate and earn certificates. This process is burdensome and tiring as most educational institutions perform their clearance manually which is characterized by joining long queues at clearing offices and hence prevents students from fully participating in other academic activities during that period (Idachaba et al., 2015). There are instances of absenteeism from clearing officers that lead to a waste of time on the part of students as they sometimes have to visit the same office severally before finally getting cleared which then affects their studies. Scarce resources available are led into the acquisition and printing of clearance forms which then becomes an additional financial burden to such institutions and time consuming since students will stand in longing queues to print. Tracking of cleared students is also difficult as clearing officers have to manually verify from paper forms to achieve the clearance process

This study seek to minimize inconveniences and develop efficient and effective online clearances system which will be a digital platform that will help facilitates the online clearance from all the departments and faculties for both ongoing and final year students (graduating students) in the institution.to also reduce misuse manpower, errors, save time and reduce transport costs for students.

The goal of this research is to deliver to university management an acceptable, efficient, well-documented, current, and reliable online clearance application (Sowunmi et al., 2016), that will be a decision support system and facilitate the whole clearance process. This system will replace the traditional manual approach by allowing clearance officers to view students pending clearance requests or records of the student based on dormitory and tuition fee if, approve requests online at the same time allowing students to track their status, and receive necessary approvals online, thus reducing paperwork, time, and effort (Arefin et al., 2020) hence reducing absenteeism of students from classes which will lead to their poor perfomances in their assessments.

Problem statement

In the University of Eswatini (UNESWA) Campus, clearing of graduating students has always been a manual process. An effort has been made by the University to replace the existing manual process with an automated clearance system for graduating student but to this day clearance is still a manual process. It is evident that the registration is incapable to totally replace the manual process of online clearance system for student.

Since now we are in the technology era, clearance work has become more easier, fast and efficient. It is our duty or responsibility as information technology student to lead a way in institutions to implements online clearance since we understand that manual clearance has a number drawbacks to the management and students at large. Here are some of the limitations/drawbacks:

- Absence of personnel will make the whole process impossible since the students clearing cannot send another student to do it for him/her.
- Time consuming - the student has to take the forms to the Dean of students Affairs, university librarian, head of department and faculty administrator etc.
- Data integrity we may not guarantee the safety of the information as it might fall into wrong hands.
- Data redundancy and data loss
- Long queues because the number of student is high (7000 students at UNESWA) and its draining physically to process the clearance thing.

OBJECTIVES OF THE STUDY

The main objective of this project is to minimize time, labor, human error and manipulation during the specified period for financial clearance of students before registration. This is to be achieved through a development of an online clearance system for students and the university that will enable students to clear themselves by login into system using their credentials at their convenient time through their smartphones or laptops.

This project or study also aims to provide transparency, accessibility and enhances experience to all students with the clearance process. Basically this project aim to minimize all the negative effects or limitations brought by the manual clearance system in the institute of higher learning.

THE CHANGE THAT THE PROJECT SEEKS TO SOLVE

The main purpose of student clearance is to ensure that an individual has been screened and giving a person legal permission to be counted as a students of the university. The online clearance system is vital for stakeholders in several ways:

- **Streamlined processes**: A digitalized clearance system can automate and streamline various processes involved in student clearances. Traditional methods often rely on paper forms and manual tracking, which can be time consuming and prone to errors. By digitalizing these processes, the system can enable real time updates and reduce the administrative burden on staff.

- **Improved accuracy and reduced errors:** Manual data entry is susceptible to human error, which can lead to discrepancies in student records. A digitalized system minimizes these risks by using automated data validation techniques, ensuring that information entered is accurate and consistent. This leads to more reliable clearance statuses for students.

- **Enhanced accessibility:** With a digitalized system, students can access their clearance status from anywhere and anytime through an online portal or mobile application. This increase convenience for students who may not be able to visit campus offices during regular hours, thus improving overall user satisfaction.

- **Real time tracking and notifications:** The system can improve real time tracking of clearance statuses, allowing students to see what requirements they have completed and what remains outstanding. Automated notifications can alert students about deadlines or pending actions required for their clearance, helping them stay organized.

- **Centralized information management:** A digitalized clearance system centralizes all relevant information in one database, making it easier for administrative staff to manage records efficiently. This reduces the likehood of lost paperwork or miscommunication between departments regarding student clearances.

- **Data analytics and reporting:** The system can generate reports that provide insights into clearance trends, such as the number of students cleared each semester or common bottlenecks in the process. This data driven approach drives institutions to

identify areas for improvement and make informed decisions regarding resource allocation.

- **Increased transparency:** By proving students with access to their clearance information, the system fosters transparency in the process. Students are more likely to understand what is required of them and feel empowered to take responsibility for their own clearances.

- **Integration with other system:** A digitalized college clearance system can integrate with existing systems such as student information systems or Learning Management Systems. This integration ensures that all relevant data is synchronized across platforms, reducing redundancy and improving overall efficiency.

- **Scalibility:** All Universities grow in enrollment or expand their programs, a digitalized clearance system can easily scale to accommodate increased demand without significant changes to infrastructure or processes.

- **Enhanced security measures**: Digital systems often come equipped with advanced security features such as encryption and user authentication protocols that protect sensitive student information better than traditional paper based systems.

- **Cost efficiency:** Over time transitioning from a manual process to a digital one can lead to cost savings by reducing paper usage, and administrative labour costs associated with managing physical documents.

- **User training and support improvements:** Digital systems typically include user friendly interfaces that require ;less training compared to complex manual processing that involves multiple steps across departments.

Drawbacks of the proposed system

System downtime: technical glitches or server outrage can disrupt access to the system preventing users from completing their clearance process

Compatibility issues: If the users device browser is not compatible, he/she might face problems.

Users accessibility such as digital divide: not all users have access to Internet or digital devices, this can cause disparities in who uses the system.

Tech savviness: some users are less familiar to technology which then struggle to navigate the online system that lead to fustration and error.

Reduced human touch: the absence of face-to-face interaction can lead to a lack of personalized support, making it difficult for users to get immediate clarification issues.

Miscommunication: online communication can lead to misunderstanding or misinterpretations.

SOLUTIONS WE AIM TO OBTAIN

- **Online forms:** Students can fill out the clearance form online after logging in the proposed system. This will reduce the amount of paperwork and eliminate the need for students to stand in long ques which results to physical strain.
- **Automated approval process:** Once form is submitted, it is to be automatically routed to the appropriate people for approval. This will reduce the amount of time it takes for a student to be cleared.
- **Centralized database**: All the clearance information can be stored in a central database which is easier to track and manage.
- **E-mail notification**: Students can be notified by e-mail when their clearance is complete or has encountered problems (specified).

METHODOLOGY

In a system development project, researchers are required to follow a systematic approach for developing a software SDLC. The acronym SDLC stands for System Development Life Cycle, which is a systematic framework that is used guide the development of software systems. The SDLC has a series of phases that collectively define the entire system development process from planning stage to deployment stage, implementation, maintenance and testing. It ensures that all necessary steps are followed throughout the life cycle of the system which the help minimize project risks through forward planning so that the software can meet customers expectations in the production and beyond.

STAKEHOLDERS

- **Students:** Students are the primary users of the clearance system. They rely on the system to manage their clearances efficiently, ensuring they meet all requirements for graduation, course registration, and other academic activities. Their needs include easy access to their clearance status, notifications about pending items, and a user friendly interface.

- **Faculty members:** Faculty members play a crucial role in the clearance process as they often need to approve or verify student clearances related to course prerequisites or graduation requirements. They require access to the system for reviewing student progress and providing necessary approvals.

- **Administrative staff:** Administrative staff are responsible for managing the overall clearance process within the university. They utilize the system to track student clearances, generate reports, and ensure compliance with institutional policies. Their focus is on maintaining communication between students and faculties.

- **IT personnel:** IT personnel are responsible for developing, implementing, and digitalizing clearance system. They ensure that the system operates smoothly, is secure from unauthorized access, and integrates well with other institutional systems such as Student Information Systems or Learning Management Systems.

- **Management:** The management oversees the entire educational institutions operations, including academic policies related to clearances. They have an interest in ensuring that the clearance system aligns with institutional goals, enhances operational efficiency and improves student satisfaction.

- **Regulatory bodies (Government):** Regulatory bodies may include accreditation organizations or government education departments that set standards for educational institutions. They may require data from the clearance system to ensure compliance with educational regulations and standards.

- **Parents/Guardians:** While not direct users of the system, parents or guardians may be stakeholders interested in their children's academic progress and clearance statuses. They might seek information regarding their child's eligibility for graduation or participation in certain programs.

- **External Auditors**: External auditors may review the clearance process as part of financial audits or compliance checks within educational institutions. Their interest lies in ensuring that proper procedures are followed and that records are maintained regularly.

- **Alumni**: Alumni may have interest in accessing their past clearance records for employment verification or further education purposes. The system should provide a mechanism for alumni to retrieve this information securely.

- **System Vendors/Consultants:** If external vendors or consultants are involved in developing or implementing the digitalized clearance system, they become stakeholders

as well. Their role includes providing expertise during development phases and ongoing support after deployment.

CONTEXT THAT MAY AFFECT AND INFLUENCE THE PROJECT

- **The needs and expectations of the stakeholders**: If the stakeholders are not happy with the project, they may not be willing to support it i.e they may refuse to fund the project.
- **The resources available to the project:** If the project does not have enough resources, it may be difficult to complete on time or within budget.
- **The economic climate:** If the economy is in recession, it may be difficult to find funding for the project.
- **The technological landscape:** If the technology required or needed for the project is not yet available, it may be necessary to delay the project or to use alternative technologies.

REQUIREMENTS ELICITATION METHODS

Interviews

Interviews are one on one group discussions with stakeholders to gather detailed information about their needs, expectations, and experiences related to the clearance system. This is the most common technique used for requirement elicitation. Interview techniques should be used for building strong relationships between business analysts and stakeholders. In this technique, the interviewer directs the question to stakeholders to obtain information. One to one interview is the most commonly used technique.

If the interviewer has a predefined set of questions, then it's called a structured interview. If the interviewer is not having any particular format or any specific questions, then it's called an unstructured interview. For an effective interview, you can consider the 5 Why technique. When you get an answer to all your Whys then you are done with your interview process. Open-ended questions are used to provide detailed information. In this interviewee cannot say Yes or No only. Closed questions can be answered in Yes or No form and also for areas used to get confirmation on answers.

To do this we will need to do the following:

Identify stakeholders: determine who will provide valuable insights, such as students, faculty members, administrative staff and IT personnel.

Prepare questions: we develop a structures set of open ended questions that cover key areas such as user roles, current challenges in the clearance process, desired features, and usability concerns.

Conduct interviews: schedule and conduct interviews in a comfortable setting to encourage open communication. Record responses for later analysis.

Analyze responses: review and collect data to identify common themes, requirements, and potential gaps in the current systems.

Interview questions for different stakeholders:

Students

- What challenges do you currently face when completing your clearance process?
- What features would you find most helpful in a digital clearance system?
- Can you describe any past experiences where the clearance process was particularly frustrating and confusing?
- How do you often check your clearance status and through what means?

Faculty members

- What role do you play in the student clearance process, and how can it be improved?
- Are there any specific data or reports that you need access to regarding student clearances?
- How do you often communicate to students about their clearance requirements?
- What issues have you encounted with the current existing clearance system?
- In your opinion, what would make the clearance system more efficient for both faculty and students?

Administrative staff

- What are the key responsibilities of your role concerning student clearances?
- Can you identify ant bottlenecks in the current clearance process that could be addressed in a new system?
- How do you track and manage student clearances currently?
- What types of reports or analytics would be beneficial for monitoring clearances efficiently?
- How often do you communicate with faculty departments regarding student clearances, and what challenges arise during these interactions?

IT personnel

- What technical challenges have been faced worth the current clearance system?
- Are there specific technologies or platforms that should be considered for the new system?
- How do ensure data security and privacy with the current system?
- What support will be needed from IT during the implementation of the new system?
- Can you provide insights on integration capabilities with the existing systems?

System users (general)

- Have you used any digital systems for managing clearances before? If so, what did you like or dislike about them?
- What training or resources would help users feel more comfortable using a new digitalized system?
- How important is mobile access to the clearance system for users like yourself?
- Can you suggest any additional features that would enhance user experience in managing clearances?

Surveys and Questionnaires

For Survey/Questionnaire, a set of questions is given to stakeholders to quantify their thoughts. After collecting the responses from stakeholders, data is analyzed to identify the area of interest of stakeholders. Questions should be based on high priority risks. Questions should be direct and unambiguous. Once the survey is ready, notify the participants and remind them to participate.

Two types of questions can be used here:

1. Open-Ended: Respondent is given the freedom to provide answers in their own words rather than selecting from predefined responses. This is useful but at the same time, this is time- consuming as interpreting the responses is difficult.

2. Close Ended: It includes a predefined set of answers for all the questions and the respondent has to choose from those answers. Questions can be multiple choice or can be ranked from not important to very important.

Benefits:

- Easy to get data from a large audience.
- Less time is required for the participants to respond.
- You can get more accurate information as compared to interviews.

Drawback:

- All the Stakeholders might not participate in the surveys.
- Questions may not be clear to all the participants.
- Open-ended questions require more analysis.

System proposed design

The system design is divided into two portions. The students and administrator section

Surveys and questionnaires are structured tools used to collect quantitative data from a larger group of stakeholders. They can be distributed online or in paper format and are effective for gathering broad input on user preferences and priorities regarding the clearance system.

To do this we need do to the following:

Define objectives: clearly outline what information id needed from the survey (e.g. feature prioritization, user satisfaction with existing processes).

Design survey questions: create a mix of closed ended questions (multiple choice, like scale) and open ended questions to capture both quantitative metrics and qualitative feedback.

Distribute the survey: use online platforms such as Google forms to reach a wider audience efficiently. Ensure anonymity if necessary to encourage honest feedback.

Analyze data: compile responses using statistical methods for quantitative data while thematically analyzing qualitative feedback. Summarize finding to inform the SRS document.

Student questionnaire

Demographic information

1. What is your year of study? _____
2. What program are you enrolled in?_____

Clearance process experience

1. Have you previously gone through the clearance process? If yes, please describe your experience.

   _____

   _____

   _____

2. What challenges did you face during the clearance process?

   _____

   _____

   _____

3. How do you currently receive information about the clearance requirements?

   _____

System features

1. What features would you like to see in a digital clearance system?

   _____

   _____

2. How important is mobile access to the clearance system to you?

3. Would you prefer notifications via email or SMS regarding your clearance status?

Usability and support

1. How comfortable are you with using the online system for administrative tasks?

2. What kind of support would you expect if you encountered issues with the system?

3. Are there any accessibility features that would enhance your experience with the system?

Faculty Questionnaire

Role and responsibilities

1. What is your role within the college?
2. How do you often interact with student clearances?

Current process evaluation

1. Can you describe how you currently handle student clearances?

2. What difficulties do you encounter when processing clearances?

Desired features

1. What specific functionalities would assist you in managing student clearances more effectively?

2. Would integration with exiting systems be beneficial? If so, how?

Administrative questionnaire

Process management

1. Can you describe the current process for managing student clearances?

2. What are the bottlenecks or inefficiencies in the current process that need addressing?

Data management and security

1. What types of data is need to be collected and stored within new system?

2. How important is data security and privacy in managing student records? What measures do you think are necessary?

Compliance and reporting

1. Are there any regulatory requirements or institutional policies that must be adhered to in this system?

2. What reporting capabilities do you require from the new clearance system?

Data Flow Diagrams for the System

Context level Data Flow Diagram

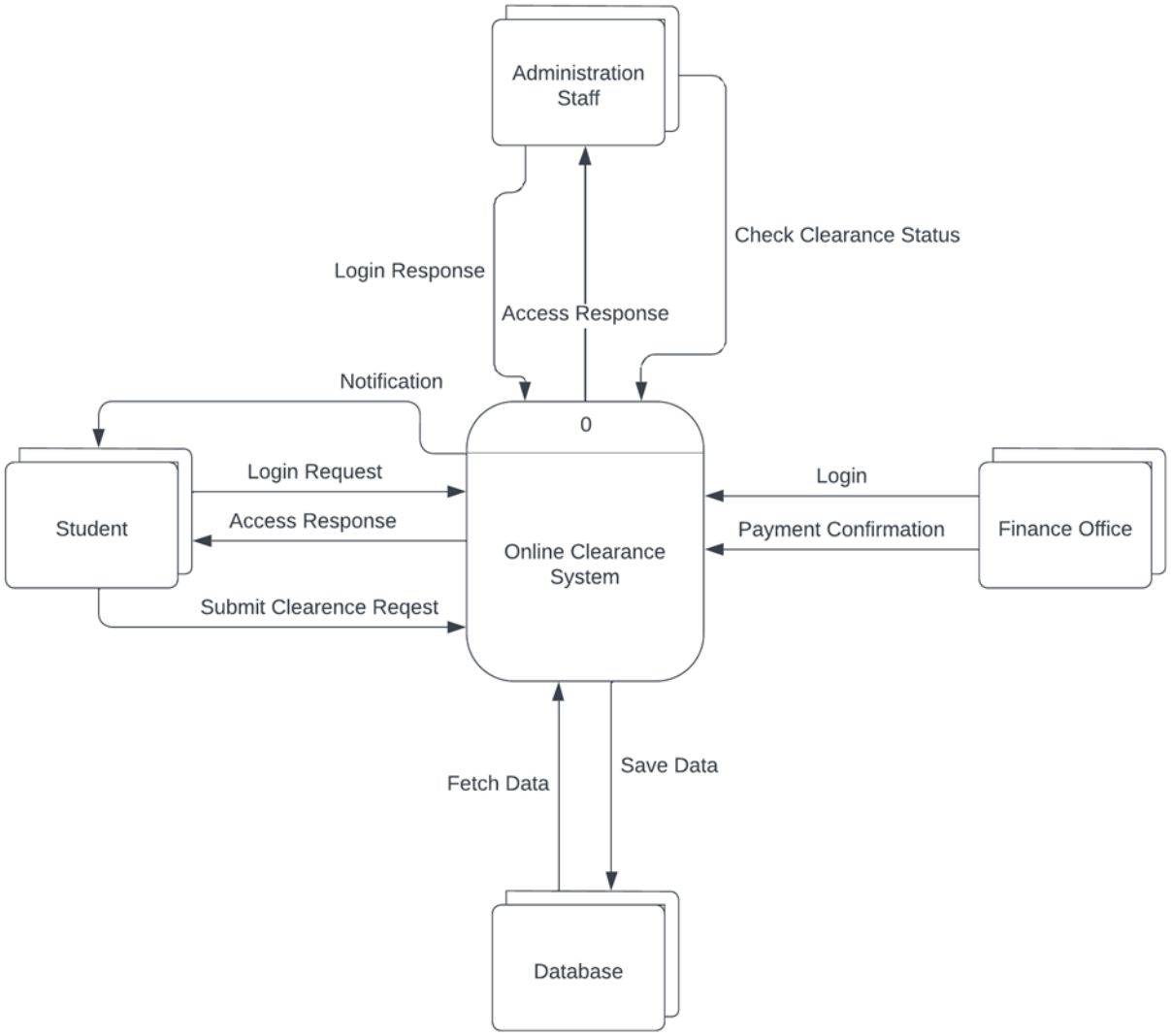

Figure 1. Context Level Diagram of the proposed online clearing system

Level 1 Data Flow Diagram

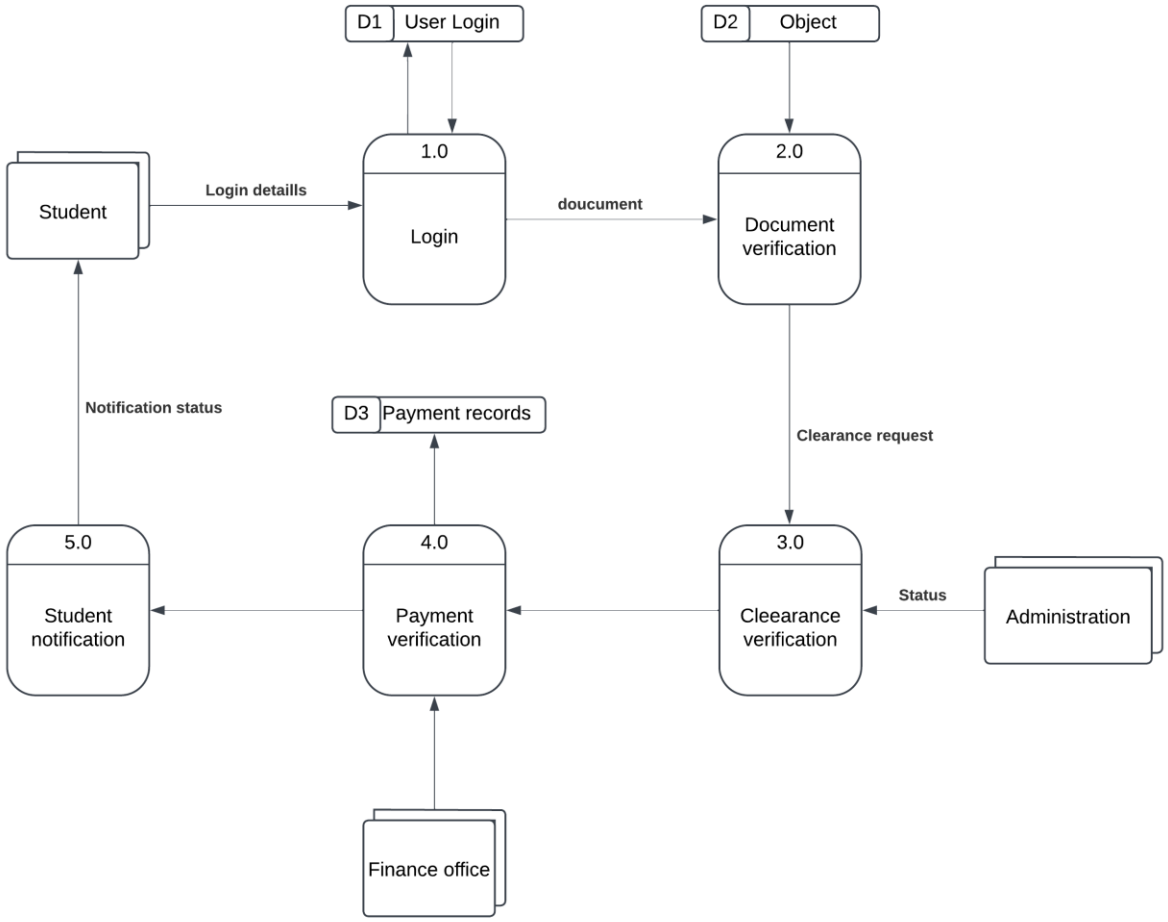

Figure 2. Level 1 Diagram of the proposed online clearing system

Level 2 Data Flow Diagram

Processes

- Verify documents
- Check financial status
- Update clearance status
- Notify student

Data store

- Document records
- Financial records
- Clearance status records

Data flows

- Administrative staff verify submitted documents
- Financial status checked against records
- Clearance status is updated based on verification
- Notification sent to students regarding clearance status

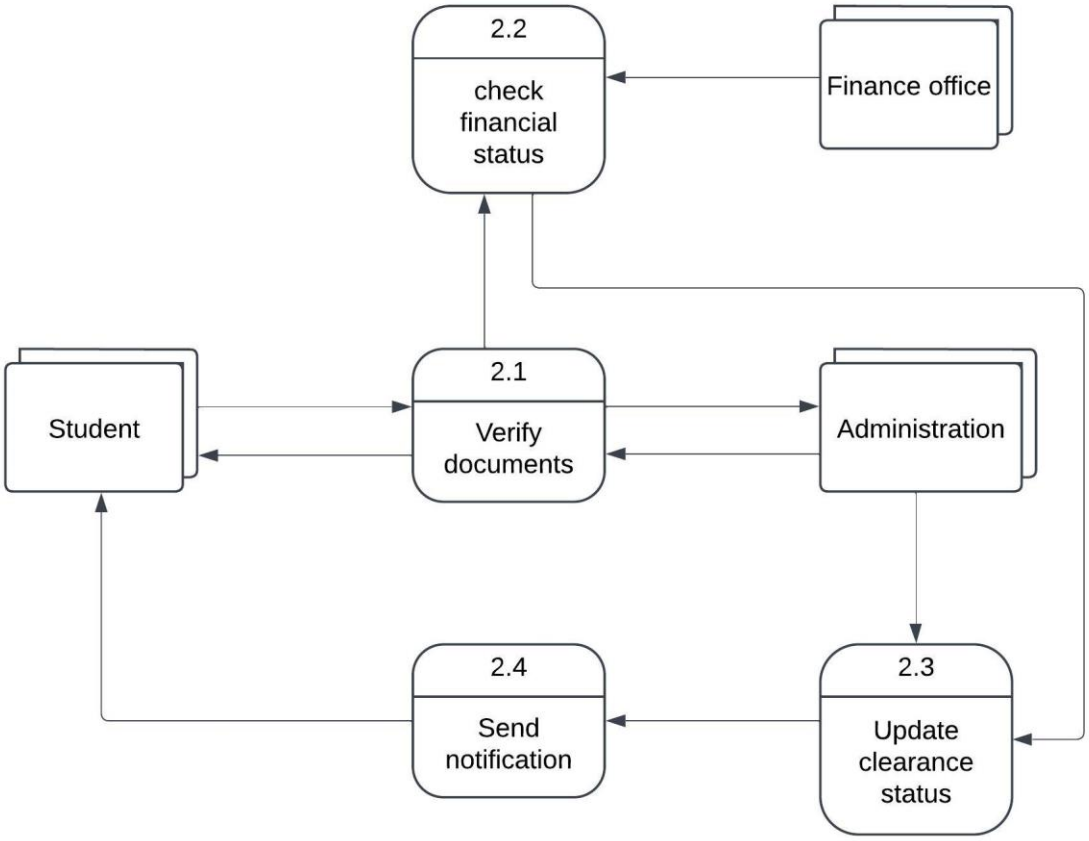

Figure 3. Level 2 Diagram of the proposed online clearing system

Data dictionary

Data element name	alias	description	Data type	length	format	source	destination	Validation rules
Student ID	SID	Unique identifier for a student	integer	10	N/A	Student Registration form	User Login, Document verification, Payment verification Clearance verification,, Database	Must be unique
Student Name	SName	Full name of Student	String	50	N/A	Student Registration Form	User Login, Document verification, Payment verification, Clearance verification, Database	Must not be unique
Login Credentials	LC	Username and password for student login	String	Variable	N/A	Student Input	User Login	Must meet password complexity requirements
Document Type	DocType	Type of document submitted	String	20	N/A	Student upload	Student verification	Must be valid document type
Document verification status	DVS	Status of document verification	String	20	N/A	Document verification	Clearance verification, student notification	Must be one of the predefined statuses
Payment amount	PAmount	Amount to be paid for clearance	currency	15.2	N/A	Finance office	Payment verification	Must be a positive amount
Payment confirmation	PC	Confirmation of payment from the finance	text	variable	N/A	Finance office	Payment verification	Must include payment reference and amount

		office						
Clearance status	CStatus	Overall clearance status	string	20	N/A	Clearance verification	Student notification, administration	Must be one of the predefined statuses
Financial status	FStatus	Status of the students financial clearance	string	20	N/A	Finance office	Check financial status, clearance verification	Must be one of the predefined statuses
Access response	AR	Response to the students access request	string	20	N/A	Clearance verification	student	Must be one of the predefined responses

Conclusion

The University of Eswatini currently uses laborious and manual clearance procedures, which this project aimed to replace. By offering improved performance, being more user-friendly, and being simple to use, among other things, this work represents an upgrade over previous systems. For all system users, the proposed solution offers quick, simple, and visible clearance activities. The system's services improve the environment that allows students and other users to stay calm and have faith in the clearing procedures. Therefore, the UNESWA Students Online Clearance System should be made available to other higher education institutions in order to ensure not just a quick and easy clearance procedure but also to cut down on operational expenses and downtime. To make it portable for all users, future improvements and works should incorporate mobile applications and/or USSD codes.

BIBLIOGRAPHY

1.Arefin, M.S., Choudhury, S.R., &Sharmin, R.(2020). Automation of clearance system: A case study of a public University in Bangladesh. In 2020 International Conference on Robotics, Electrical and signal processing techniques (ICREST) (pp.338-343). IEEE.

2.Idachaba, F.E., Mbeh, K.E., Oshin, O.I., Oni, O.O. (2015). Web portal applications: automated students clearance portal. In: Proceedings of the World Congress on Engineering, WCE 2015, London, U.K., 1-3 July 2015, vol.(2015).

3.Jonathan, Oluranti & Mirsa, Sanjay &Makinde, Funmilayo& Damaeviius, Robertas& Maskeliunas, Rytis & Castro, Marcelo.(2019).development of online clearance system for educational institutions

4.Sowunmi, O.Y., Mirsa, S., Farnandez-Sanz, L., Merodio, J.A.M(2016). A framework of Academic advice through Mobile Applications. In; Proceedings of the 25th international conference on information system development (ISD 2016, Poland)

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