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MAKERERE UNIVERSITY BUSINESS SCHOOL

DEVELOPING AN INTERGRATED DIGITAL LEARNING PLATFORM FOR LEARNERS IN NORTHERN DISTRICTS OF UGANDA.

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**A project proposal submitted to the Faculty of Computing and Informatics of Makerere
University Business School in Partial fulfillment for the Award of Bachelor of Business
Computing of Makerere**

November, 2025

DECLARATION

We, the undersigned, declare that to the best of our knowledge, this proposal is our original piece of work, and has never been published and or submitted for any award in any University or Higher Institution of Learning.

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APPROVAL

This project proposal has been submitted with my approval as supervisor and my signature is here appended

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INTRODUCTION

1.1 Project Background

Education is one of the strongest foundations for economic growth and social progress. In Uganda many students in rural communities still struggle to perform well in National Examinations. Their performance is affected by several longstanding challenges, including limited access to learning materials, lack of qualified teachers and school environments that do not support study. The 2023 report by Uganda National Examinations Board (UNEB) shows that most rural schools recorded pass rates below 40%, which are far behind their urban counterparts. This has left many students unable to qualify for higher levels of education (Monitor,2023). Districts such as Yumbe, adjumani, madi-okollo repeatedly show low performance levels.

According to the 2024 National Assessment progress in Education (NAPE), clearly shows these findings. It highlights the gaps between urban and rural learners, showing that urban students achieved a proficiency rate of 74.3%, compared to the 48.5% for learners in rural areas (UNEB,2024). These differences result from school conditions and availability of resources that affect the students pass rates.

The main reason for this challenge is the nature of infrastructure in rural schools. Many schools in Northern Uganda still lack permanent classrooms, desks, functioning libraries and enough reading materials (text books). Teachers also work under difficult circumstances, and more than 2000 teaching positions are left unfilled. This shortage leaves to overcrowded classes and limited teacher-learner interaction. Gender differences also increase the problem. While about 75% of boys in rural areas remain in school, only 55% do, mainly because of cultural pressures, early marriages and gender-based violence.

Even though the government and other partners have introduced programs such as the Teacher Development and Management (TDM) initiative and promoted the use of technology in schools, the effects of these efforts has remained limited. Limited funding and limited teacher salaries affect the sustainability of these changes. In 2020, the Education sector received only 8.48% of the National Budget making it difficult to improve learning conditions national wide.

Even with different interventions like Universal Secondary Education (USE), rural students still face problems like limited text books, limited exam preparation support and very low access to

digital learning platforms. As technology becomes central to education globally, Northern Uganda has an opportunity to reduce these gaps by adopting appropriate digital solutions. A digital platform that offers study materials, past papers and mentorship can support learners who lack physical learning resources.

1.2 Problem Statement

High failure rates in rural Uganda continue limiting learners' chances of progressing to higher education and securing better employment opportunities which have in turn increased the existing cycles of poverty. Different factors contribute to these challenges, which include limited access to learning materials, limited trained teachers, and weak career guidance structures. Many rural learners also struggle to find reliable revision resources, which makes it difficult for them to adequately prepare for National Examinations. The National Planning Authority (2023) notes that internet penetration in rural areas is about 30%, a percentage that makes conventional e-learning approaches difficult to implement effectively (NPA, website). In contrast students in Urban areas benefit more from digital learning tools and platforms, which expands the gap between the two groups. As a result, many rural area learners remain left out of technology supported education initiative. This study therefore seeks to understand/ explore the guiding question;

“How can a digital learning platform help to reduce the failure rates among rural students in Uganda”

By designing and assessing a digital learning system, the research aims to offer a practical and sustainable solution for unserved communities. The platform will provide learners with free study resources, mentorship support, and access to past examination papers, with the goal of improving academic performance for students in rural Uganda.

1.3 Main objective

The main goal of this study is to;

Develop an Integrated Digital Learning Platform for Learners in Northern Uganda

1.3.1 Research Objectives

This study aims:

1. Examine the existing interventions in learning systems currently used in northern Uganda

2. Identify the requirements for an effective digital learning platform for learners in Northern Uganda
3. Design and develop a digital platform tailored to the needs of learners in the region
4. Test and evaluate and implement the developed platform in real learning environments in Northern Uganda.

1.4 Justification of the Study

This study is important because of the following reason;

For the researcher (student), it provides an opportunity to apply theoretical knowledge in a real-world setting, develop practical research skills, and contribute to addressing genuine challenges affecting learners in northern Uganda.

School, the study strengthens the institutions' role in community development by supporting innovative, technology solutions that help reduce education inequalities.

For policy makers, it offers evidence-based insights and recommendations that can guide policies that aim at improving digital education and reducing academic failure rates in northern districts.

1.5 Scope of the Study Geographical Focus:

Geographical Focus: this study will mainly focus on rural districts in Uganda, specifically yumbe, madi-okollo, terego and others. These districts were selected based on existing UNEB reports and other reliable resources that highlight their low education performance.

Education levels; the research will look at failure rates at both primary and secondary school levels. These two stages are important because they show the most important gaps in academic performance. The analysis will rely on data published by UNEB and other official sources.

Timeframe:

The study will consider education data from the last 5 years to identify performance trends and evaluate the effects of recent interventions. The research will be carried out with data from 2020 to 2025.

1.6 Project assumptions

Effectiveness of Proposed Interventions

The study assumes that interventions such as improved teacher training, access to learning materials, and better school infrastructure will contribute positively to reducing failure rates in rural areas

Willingness of Respondents to Participate

It is assumed that students, teachers, school administrators, and policymakers will be willing to provide honest and accurate responses during surveys and interviews

Availability of Reliable Data

The study assumes that data from UNEB, Ministry of Education and other education bodies will be accessible, reliable and up to date to support meaningful analysis.

SECTION TWO

LITERATURE REVIEW

2.1 Digital Learning Platforms

Digital learning platforms are online systems created to deliver education information. Assessment and learner support in clear and assessable ways. Anderson and Rivera (2022) explain that these platforms extend classroom by offering flexible, learner focused experiences. Many of them include features like online quizzes, discussion forums and digital libraries. These features are valuable in areas with low resources because they help widen access to quality learning materials.

In Uganda, several digital learning platforms have been tested, though they have mixed levels of success. The Kolibri initiative, implemented by UNICEF and Airtel in refugee-hosting districts, showed that curriculum-aligned content can be delivered through zero-rated, whitelisted networks, meaning students could access learning materials without data costs (UNICEF, 2023). Other models, like the RACHEL hubs, rely on local servers to provide offline digital libraries in schools with poor internet access (UNESCO, 2023). These examples prove that digital systems can help close resource gaps by offering exam-focused materials, self-paced learning, and mentorship opportunities.

2.2 Problems Students Face in Accessing Content

Despite the potential of digital platforms, many rural learners in Uganda still face challenges. UNEB (2024) shows that rural learners perform lower in national exams, with proficiency rates of only 48.5% compared to 74.3% in urban centers. The major reason is that rural learners mostly lack text books, revision materials and access to education guidance.

Limited internet access remains one of the biggest barriers. The National Planning Authority (2023) shows that about 30% of households in rural areas have reliable internet connectivity. Low device ownership and inconsistent electricity supply further reduce the chances of accessing the digital content (UNESCO, 2023). Gender differences also increase the problem, as only 55% of girls in rural areas reach upper primary compared to 75% of boys, with early marriages, domestic roles, and cultural norms restricting participation, Ministry of Gender Labour and Social Development (MGLSD, 2022)

2.3 Existing Interventions in Northern Uganda

A number of initiatives have been put in place to improve digital learning in the region. The Kolibri program provided zero-rated access to curriculum-aligned content and recorded improvements in learner engagement where it was used (UNICEF, 2023). Yiya AirScience, which was introduced during the COVID-19 lockdown, used radio lessons and USSD codes to deliver science content to learners without smartphones which demonstrated the power of simple, low-tech solutions (Yiya, 2021). MTN Uganda also set up ICT hubs and mobile labs to support digital literacy in rural schools (MTN Uganda, 2022).

Offline-first solutions, such as RACHEL hubs, allowed schools without internet to use preloaded digital libraries (UNESCO, 2023). However, many of these interventions were so much funded and lacked sustainability plans. According to Policy Commons (2023), most of them failed to scale because they were not aligned into long-term district education programs.

2.4 Requirements for an Integrated Digital Learning Platform

Literature identifies different key requirements for developing an effective digital learning platform for rural areas.

Offline-first design, Learners must be able to access content without relying on continuous internet access. Both Kolibri and RACHEL demonstrated the effectiveness of this approach (UNESCO, 2023).

Exam-focused content, Access to past papers, model answers, and practice tests is important, as UNEB (2024) links these resources to improved performance in final exams.

Mentorship and learner support, Weekly SMS-based support, such as that used by Yiya Air Science, helped maintain learner engagement even in low-resource settings (Yiya, 2021).

Teacher support and training, Teachers must be trained to effectively use and promote the platform. UNICEF (2023) found that teacher involvement significantly improved Kolibri usage.

Gender and inclusion considerations, Interventions should address barriers faced by girls. MGLSD (2022) stresses the importance of flexible learning schedules, mentorship opportunities, and safe learning environments.

2.5 Conclusion

Literature shows that while digital platforms have demonstrated success in improving access to education, learners in Northern Uganda face persistent barriers such as limited internet, lack of devices, and gender disparities. Interventions such as Kolibri, Yiya AirScience, and RACHEL illustrate what is possible but also reveal sustainability and scalability gaps. Key requirements for the proposed integrated platform include offline-first design, exam-focused content, mentorship, teacher support, and gender inclusion.

Blending these insights with the study's objectives, the literature review demonstrates that there is both a clear need and an evidence-based pathway for developing, testing, and implementing a sustainable digital learning system for learners in Northern Uganda.

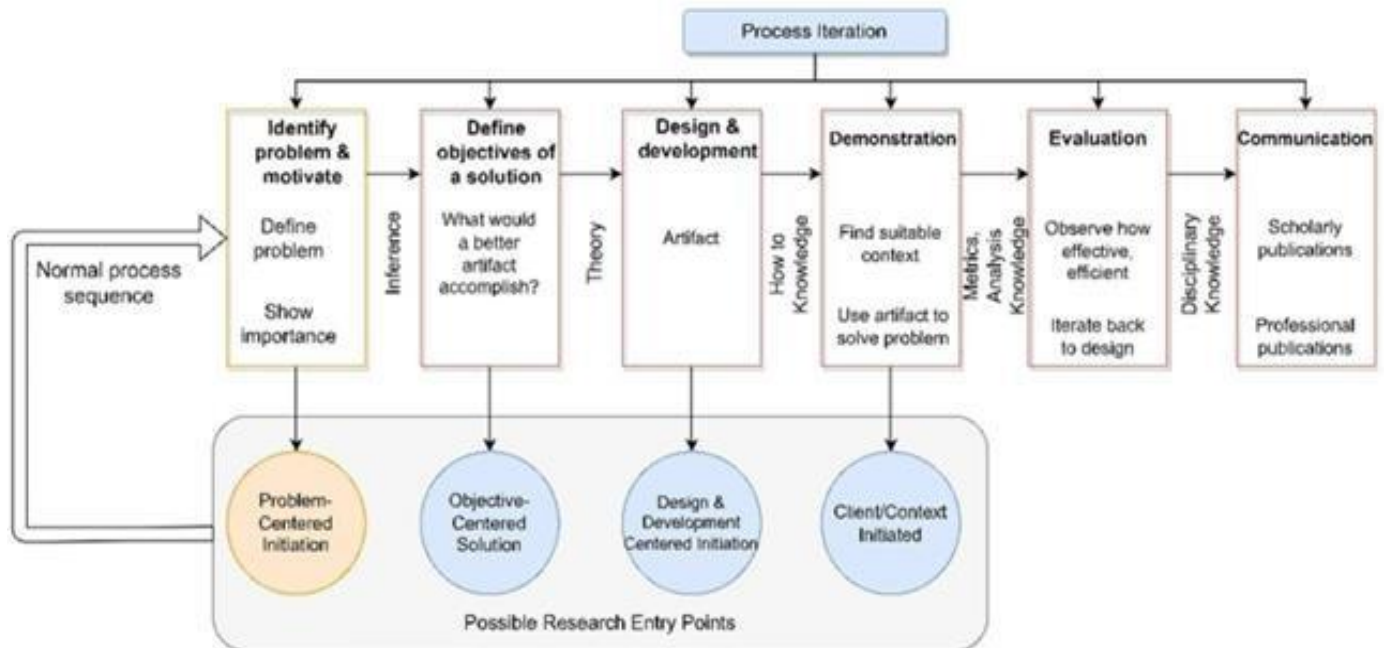
SECTION THREE

RESEARCH METHODOLOGY

3.0 Research Design

This study adopts the design science research methodology, it focuses on the design, development and evaluation of artifacts intended to solve identified real world problems (Hevner et al., 2004). In the context of this research, the artifact will be an integrated digital learning platform for learners in districts of yumbe, kween, madio kollo, nabilakuk, terego, ntoroko and bukwo. This aims to address the causes of academic failure by proposing structured interventions tailored to the unique educational challenges in these areas. Design Science Research is chosen because it not only seeks to understand a problem but also contributes a viable, implementable solution that can be evaluated in real world contexts.

Illustration of the design science research process diagram



Stage one: Problem Identification

This stage involves clearly recognizing and articulating the research problem. This will be achieved through use of different problem definition techniques to identify the factors/problems that leads to the low performance rates in the selected rural districts in Uganda. These will include focus group discussions and interviews from selected school administrators and some students; questionnaires will also be given to students from the selected schools. From these, key pressing issues will be identified and an integrated digital learning platform will be developed.

Stage two: Definition of objectives for the solution

In this stage, clear objectives for the project will be defined and stated. Major objectives for the study have been identified and these include analyzing the existing challenges affecting education in selected rural districts, reviewing literature relating to the education advancement platforms and the other related digital systems, designing and developing an integrated digital learning platform for the learners.

Stage three: Design and Development of the artifact

This stage aims to design logical of the system and later on develop a prototype for the digital learning platform. The prototype will incorporate the key features of the system like access to free

learning resources, learning tutorials and downloadable question banks which are also accessed offline.

Stage four: Demonstration

The prototype will be demonstrated in the selected schools through case studies or simulation workshops. These demonstrations aim to show how the prototype can be applied in real world setting to support students and learners, teachers and administrators.

Stage five: Evaluation

Once the prototype is developed, it will be rigorously evaluated through usability testing, performance assessments, and security reviews. This stage involves collecting feedback from a learners, teachers and administrators to ensure that the system meets both functional and operational requirements.

Example: A pilot rollout in selected schools and surveys, will help in determining if the platform successfully creates an impact on the student's overall education journey.

Stage six: Communication

This stage involves documenting the development process, evaluating outcomes, and presenting the findings to both academic and the other relevant stakeholders. This ensures that the project's contributions are clearly articulated and that lessons learned can inform future deployments in similar educational environments.

3.1 Target Population and Sample

The study targets stake holders directly affected by or involved in the education process. These include students and learners from primary six to senior four, teachers and school administrators, district education officers and school management committee members. Each group brings a unique perspective on the causes of academic failure, making them valuable contributors to both problem identification and solution design.

3.2 Sampling Technique

This study will use a combination of stratified sampling and purposive sampling to ensure both representativeness and depth in participant selection (Creswell, 2014).

3.2.1 Stratified sampling

Stratified sampling will be used to segment the study population across hierarchical levels, beginning with districts and narrowing down to schools and students. This approach ensures that all relevant subgroups are included and comparability is maintained across units (Yin, 2017).

District Stratification: The seven rural districts (yumbe, kween, madi okollo, nabilakuk, terego, ntoroko and bukwo) represent distinct strata based on geographic, socio-economic, and educational characteristics. Two districts will be randomly selected from the seven. These will serve as representative case contexts for deeper analysis and artifact demonstration.

School Stratification: Within the selected districts, schools will be further stratified into government and private categories. Two schools from each district (one government, one private) will be randomly selected, giving a total of four schools. Within each school, students will be stratified by class level (P6 to S4). A random sample of students will be selected from each class to ensure representation across upper primary and lower secondary education levels.

3.2.2 Purposive Sampling

While stratified sampling ensures breadth, purposive sampling will be applied to identify key informants who possess critical knowledge relevant to the study objectives (Creswell, 2014).

These include:

1. Teachers who handle core subjects in the sampled classes.
2. Head teachers and school administrators who oversee school operations.
3. District Education Officers (DEOs) with oversight of education policy and implementation in the respective districts.
4. Parents and guardians of selected students to provide insight into home-based learning challenges.

3.3 Sources of Project Data

The study will rely on both primary and secondary sources of data. These sources will provide both diagnostic insight and input for artifact design, testing, and evaluation. The following subsections outline the sources and methods of obtaining this data.

Primary Data

Primary data will be collected directly from respondents through field-based research in the selected rural districts. The following sources and methods will be used:

Structured questionnaires will be administered to students to capture challenges in learning, access to materials, and digital exposure.

Semi-structured interviews and focused group discussions will be conducted with subject teachers to understand teaching strategies, curriculum coverage, and performance challenges.

In-depth interviews will be conducted with DEOs to obtain data on policy enforcement, district-level performance metrics, and intervention gaps.

Secondary Data

Secondary data will be obtained from existing literature, organizational records, and government databases. These will support background understanding, context validation, and triangulation of primary data. The following sources and approaches will be used:

Uganda National Examinations Board (UNEBC) Reports, Accessed through UNEBC's official website and district education offices.

School Records, Official performance records, teacher deployment lists, and student attendance logs will be requested directly from the selected schools' administrators.

Ministry of Education and Sports Documents, Policy reports and statistical abstracts will be sourced from the Ministry's online portal and public libraries.

3.4 System Analysis and Design Approaches

System Analysis and Design Approaches refer to the various structured methods or strategies used by system developers to understand, model, and build information systems that effectively address user and organizational needs. These approaches guide how analysts investigate existing problems, gather requirements, design logical models, and eventually create efficient and reliable systems. Each approach provides specific techniques, models, and procedures to ensure that the development process is organized, accurate, and aligned with project objectives.

System Analysis focuses on understanding the existing system, identifying its problems, and determining the functional and non-functional requirements of the new system, it involves

studying data flow, user needs, and organizational processes to define what the system should accomplish. The main goal of system analysis is to identify and document requirements clearly before designing begins.

System Design, on the other hand, involves transforming the analyzed requirements into a blueprint or plan that specifies how the new system will operate. It defines the system's architecture, data structures, interfaces, and algorithms. The goal of system design is to translate user requirements into a structured solution that can be implemented effectively.

Different methodologies have been developed to guide the process of analyzing and designing systems. The major approaches include;

3.4.1 STRUCTURED SYSTEM ANALYSIS AND DESIGN (SSAD)

Structured Systems Analysis and Design (SSAD) is a classic method used during system development, known for its step-by-step and well-organized nature. It relies on tools like Data Flow Diagrams (DFDs) to show how information moves from one point to another within the system, and Entity Relationship Diagrams (ERDs) to map out how different data items relate to each other. With this approach, a system is broken down into smaller sections, making it easier to understand, document, update, and maintain. SSAD is commonly applied in settings where accuracy, uniformity, and thorough documentation are required before any development work starts.

During the analysis stage, SSAD outlines the key inputs the system receives, the major processes that take place, and the outputs produced. When it reaches the design stage, the method turns this analysis into a clear plan that guides implementation. This includes designing the user interface, organizing how data will be stored in the database, and showing how information will flow within the system. The method ensures that every component is understood and planned out long before actual coding begins.

3.4.2 OBJECT-ORIENTED ANALYSIS AND DESIGN (OOAD)

Object-Oriented Analysis and Design (OOAD) looks at a system in terms of objects that represent real-life items or concepts. Each object carries both the data it holds and the actions it can perform. To represent these ideas, OOAD uses different UML diagrams, including class diagrams, sequence

diagrams, and use-case diagrams. One of the major strengths of this approach is that it encourages reusability, scalability, and clear organization of system components, which makes it a good fit for systems that may grow or change over time.

During the analysis stage, OOAD focuses on identifying the key objects in the system and describing what each one is responsible for. When it moves into the design stage, the focus changes to understanding how these objects interact and support one another to meet the system's needs. Even though OOAD offers a lot of flexibility and matches well with object-oriented programming languages, it also requires a strong understanding of object-oriented concepts. This level of abstraction can make it challenging for small student projects or for teams that are still new to these principles.

3.4.3 ADOPTED APPROACH STRUCTURED SYSTEM ANALYSIS AND DESIGN (SSAD)

The Structured System Analysis and Design (SSAD) method divides system development into a series of ordered stages, each building on the previous one. It pays close attention to analysing the problem thoroughly, documenting what the system must do, and planning how information and processes will be organized. This approach fits well with a project like the integrated digital learning platform, where it is important to understand the needs of different users, manage how information moves through the system, and maintain a high level of accuracy.

Justification for Adopting SSAD

SSAD was selected for this study because it offers a clear way of working through system requirements. It helps the break complex educational activities into smaller, understandable parts and map how information flows among students, school administrators, and policy makers. This makes it easier to design a stable and dependable platform. The structured nature of SSAD also works well in environments with many different users, limited technology resources, and mixed levels of digital experience, conditions that closely match the situation in Northern Uganda.

3.4.4 STEPS IN SSAD FOR DEVELOPING THE DIGITAL LEARNING PLATFORM

1. Feasibility and Requirement Analysis

This stage focuses on whether the platform can realistically be developed and used in the intended environment. It also involves collecting detailed information from the main stakeholders students, and policy makers. The data is gathered through questionnaires, interviews, observation, and reviewing existing documents to understand what the platform should achieve.

2. System Specification

After gathering requirements, they are organized into a clear document that explains what the system must do. At this point, Data Flow Diagrams (DFDs) are prepared to show how learning materials, student data, feedback, and other information will move within the platform.

3. Logical and Physical Design

The logical design uses tools like DFDs and Entity–Relationship Diagrams (ERDs) to outline the major processes and how data elements relate to one another. Once the logical structure is clear, it is translated into physical components such as database tables, user interface layouts, and decisions on which platforms or technologies will be used.

4. System Development and Testing

With the design in place, the digital learning platform is developed. This includes creating features for study content, mentorship support, revision materials, and past exam papers. After development, the system is tested thoroughly to confirm that it works properly, is easy to use, and performs well under different conditions.

5. Deployment, Evaluation, and Maintenance

The completed platform is introduced in selected pilot schools across the Northern region. Stakeholders receive training on how to use it, and the research team monitors its performance and user adoption. Feedback from users is then used to refine the system, fix issues, and carry out ongoing maintenance so that the platform continues to support learners effectively.

3.5 Data collection Techniques

In SSAD, data collection ensures the system is designed based on accurate requirements and real stakeholder needs. For the Integrated Digital Learning Platform, data will be gathered from students and other stake holders using the following techniques:

Questionnaires: these are structured tools with closed and open-ended questions which will be used to collect standardized data from students, teachers, and parents. They will help in gathering quantifiable insights on access to learning materials and resources, learning challenges, and academic performance.

Interviews: Semi-structured interviews will be conducted with head teachers, district education officers, and selected teachers. This will allow for in-depth exploration of expert opinions, educational challenges, and system expectations.

Focus Group Discussions (FGDs): these include guided discussions which will be held with small groups of students to explore views and shared experiences regarding teaching methods, study environments, and learning barriers.

Document Review: Existing records such as academic performance reports, education policies, and school documents will be analyzed to understand trends and the entire education background.

3.6 Design Techniques

In line with the Structured System Analysis and Design (SSAD) approach, the development of the Integrated Digital Learning Platform will utilize formal design techniques to model system processes and data structures. The techniques selected are Data Flow Diagrams (DFDs) and Entity-Relationship Diagrams (ERDs), which are essential for representing processes, user interactions, and database design within SSAD.

Data Flow Diagrams (DFDs)

DFDs will define the system's functional processes by illustrating how information flows between different components of the platform. For this system, DFDs will show how students and policy makers interact with features such as accessing learning resources, submitting feedback, tracking academic performance, and participating in mentorship programs. This modeling aligns with

SSAD's emphasis on clearly defining functional processes before moving to physical system design.

Entity Relationship Diagrams (ERDs)

ERDs will model the database structure of the system, identifying key data entities (e.g. student's courses, performance records), their attributes, and relationships. Within SSAD, ERDs ensure data integrity, minimize redundancy, and support efficient storage and retrieval, which is critical for managing learning resources, user information, and performance tracking. This structural modeling supports the logical design step in SSAD and informs the subsequent physical design and implementation.

Together, DFDs and ERDs provide a comprehensive functional and structural blueprint of the digital learning platform, ensuring all processes and data relationships are clearly defined, consistent, and aligned with the SSAD methodology. They facilitate a systematic, organized approach to developing a reliable and scalable system tailored to the needs of students and policy makers in Northern Uganda

3.7 SYSTEM DEVELOPMENT LIFECYCLE APPROACH

The Software Development Life Cycle (SDLC) is a structured methodology used to plan, design, develop, test, deploy, and maintain software systems. It ensures the system meets user requirements, operates efficiently, and can be maintained over time.

For this project, the Prototyping Model of SDLC will be adopted. This involves creating an initial working version (prototype) of the digital learning platform, which is refined iteratively based on feedback from students and policy makers.

The SDLC phases under prototyping include:

1. Requirement Gathering, collect information from students and policy makers to identify functional and non-functional requirements for the platform.
2. Prototype Design, develop a preliminary model using structured diagrams such as DFDs and ERDs to outline system processes and data structures.
3. Prototype Development, Build the initial working version of the platform with core features like access to learning resources, performance tracking, and mentorship support.

4. Evaluation and Feedback, Test the prototype with stakeholders, gather feedback, and identify areas for improvement.
5. Refinement and Implementation, Revise the prototype iteratively until the system meets requirements, then deploy the final version for real use

3.8 Project Constraints

1. Technology Adoption rates, resistance from users especially those unfamiliar with digital tools and those having low levels of digital literacy could challenge the overall implementation of the system.
2. Resource Limitations: lack of adequate hardware resources, reliable internet connectivity, and financial resources may affect the development and implementation of the system
3. Stakeholder Engagement: the effectiveness of the project deliverables depends on the levels of cooperation from the different stakeholders, therefore the delay in one activity like data collection can affect the overall goal of implementing the system in the set period

3.9 Ethical considerations

1. **Informed Consent:** Consent will be obtained from participants prior to participation in surveys, interviews, or focus discussion groups. They'll also be informed about the project objectives in collecting data from them and for what purpose the data will be used for.
2. **Confidentiality:** Measures will be taken to ensure that all personal and professional data collected during the research process is securely stored and not accessed by unauthorized personals.
3. **No harm to participants:** the study will ensure that participants are not exposed to any form of physical, emotional or psychological harm.

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Quality of Education in Uganda and its Challenges

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