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## PROPOSAL FOR AN INTEGRATED OFFLINE ONLINE E LEARNING SYSTEM LATEST.pdf

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# **MAKERERE UNIVERSITY BUSINESS SCHOOL**

## **DEVELOPMENT OF AN INTEGRATED OFFLINE-ONLINE E-LEARNING SYSTEM FOR KYAMBOGO UNIVERSITY**

**By**

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Makerere University Business School in Partial Fulfillment for the Award of the  
Degree of Bachelor of Business Computing of Makerere University**

**28<sup>th</sup> October, 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 or submitted for any award in any other University or Higher Institution of Learning

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## APPROVAL

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

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Makerere University Business School

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# 1. INTRODUCTION

## 1.1 Background Of The Study

This study will focus on Kyambogo University a public Ugandan Institution which was established in 2003 headed by Professor John Yakobo Okedi the Chancellor. The institution's mission is "To be a Center of Academic and Professional Excellence". The adoption of e-learning platforms in Kyambogo University has accelerated following the COVID-19 pandemic. However, Mayoka and Kyeyune (2012) found that e-learning adoption faces significant hurdles, notably "lack of resources, knowledge and resistance to change" (p.1). ). In addition, Kigundu and Matovu (2024) stated ``The challenges faced in distance learning in Uganda, such as limited access to technology and unreliable internet services, are common across many developing countries. Participants highlighted several challenges associated with adopting distance learning technologies in Uganda emphasizing issues primarily related to internet connectivity and the affordability and functionality of necessary devices'' (p. 7). Preliminary fieldwork at Kyambogo University revealed that most students depend on mobile data bundles, which are expensive and unstable. Lecturers report delays in receiving student submissions and low engagement in discussion forums. These findings will motivate this research to design a system that will work both online and offline.

This study therefore seeks to develop an integrated offline- online e-learning system to help overcome these barriers by enabling students to access learning materials, recorded classes and assignments offline with periodic synchronization when internet is available. The team will use projects such as the KITABOO (2024) which focuses on offline activity and automatic synchronization of learner progress like results and quizzes. The project aims to improve access, reduce data costs and increase engagement with class activities among students in Kyambogo University.

## 1.2 Problem Statement

The existing e-learning system at Kyambogo University assumes constant connectivity and consumes significant amounts of data, creating inequity for students who cannot afford frequent internet access. Olaniyan, Fakuade, Ruth & Balyejusa, 2024 noted that "Students from low-income households could not afford the cost of devices, internet access and

learning materials”. Ssewanyana & Busler(2020) noted “Many students face significant financial constraints due to the high cost of mobile data, which impedes equitable access to online learning resources..”(p.14). In addition, Kigundu and Matovu (2024) stated “The challenges faced in distance learning in Uganda, such as limited access to technology and unreliable internet services, are common across many developing countries. Participants highlighted several challenges associated with adopting distance learning technologies in Uganda emphasizing issues primarily related to internet connectivity and the affordability and functionality of necessary devices” (p. 7).

International Journal of CSR Research. (2024). Distance learning and challenges of technologies in Uganda. *International Journal of CSR Research, Volume(Issue)* highlights internet cost and instability as barriers, reinforcing the need for blended offline-online learning systems in Ugandan universities such as Kyambogo University. If these challenges remain unaddressed, students will continue to experience learning disruptions, widening educational inequities and negatively affecting academic outcomes. However, to mitigate these issues, this study proposes the development of an integrated offline-online e-learning platform capable of functioning without constant internet connectivity, employing secure data synchronization and optimized content delivery. This solution aims to increase accessibility, reduce data costs and improve student engagement thereby supporting equitable learning opportunities for Kyambogo University.

### 1.3 Purpose of the Study and Objectives

#### 1.3.1 Purpose

This project seeks to address key barriers in current e-learning platforms, such as unreliable internet connectivity, high data costs, and low engagement by developing an integrated offline-Online Progressive Web Application that enables students to access learning materials, complete assignments offline and synchronize data when internet connectivity is available. The research will assess the system’s usability, data efficiency and its impact on student learning outcomes and participation.



### 1.3.2 Project Objectives

- a) To assess the challenges faced by students and lecturers in the e-learning system at Kyambogo University.
- b) To design and develop an integrated offline-online e-learning system that synchronizes data when internet is available.
- c) To pilot the system and evaluate usability, data efficiency, and learning outcomes.
- d) To make e-learning at Kyambogo University very affordable and reliable to students and lecturers.

### 1.3.3 Project Scope Summary

#### Time Scope

The research activities are planned to take place between October and December 2025. During this period, we will conduct initial fieldwork, develop and design the system, carry out pilot testing, collect data, and perform a thorough evaluation of the results.

#### Geographical Scope

This study will be conducted at Kyambogo University because it represents diverse student populations therefore providing a comprehensive understanding of the challenges they are facing with e-learning.

#### Subject Scope

The project focuses on the development, implementation and evaluation of an integrated offline-online e-learning system tailored for students at Kyambogo University. It assesses technical, system design, usability, data synchronization and impacts on student

engagement and learning outcomes. The study involves students and lecturers as participants and excludes other stakeholder groups.

#### **1.4 The Significance of the study**

The project will solve the problem of unreliable internet connectivity, high data costs and low student engagement in Kyambogo University by developing an integrated offline-online e-learning system that will allow students to access learning materials, complete assignments, and participate in academic activities without constant internet access. The system will synchronize data when internet is available, significantly reducing data usage and enabling continuous study even in low-resource environments. This approach directly addresses the barriers of expensive and unstable mobile data that students currently face.

#### **The project team expects to gain:**

- Deep technical expertise in designing and implementing integrated offline-online Progressive Web Applications with data synchronization algorithms.
- Practical experience in addressing real-world challenges of e-learning deployment in resource-constrained settings.
- Project management and collaborative skills by coordinating with team members to come up with an integrated offline-online Progressive Web Application.
- An understanding of the impact of technology on learning outcomes and student engagement that can inform future research and development in educational technology.

**Kyambogo University will expect to gain:**

**Continuous learning:** The system will synchronize data when connection is available therefore students will continuously study even in low-resource environments.

**Cost Efficiency:** Reducing the need for online appearance will make e learning affordable therefore increasing the numbers of students engaging with e-learning students in Kyambogo University.

**Alignment with Strategic Goals:** The system supports Kyambogo University's strategic mission of expanding higher education access by adoption of new innovative methodologies and remote solutions.

**Improved student Engagement:** Accessibility of online resources both online and offline supports student participation and engagement.

**Capacity building:** Academic staff will gain practical experience in interacting with offline online systems improving future digital education initiatives.

## 2.0 LITERATURE REVIEW

This chapter reviews literature e-learning adoption, challenges and improvement with the creation of online-offline e-learning systems which solve the problem of digital inequity by synchronizing information when internet is available and therefore the data can be used when there is no internet connectivity.

### 2.1 Digital divide

The adoption of e learning systems has accelerated due to the Covid 19 pandemic, but it suffers a number of challenges, Mayoka and Kyeyune (2012) found that e-learning adoption faces significant hurdles, notably "lack of resources, knowledge and resistance to change" (p.1). The National Information Technology Authority -Uganda (2021) formerly identified the core challenges constraining the effective deployment of e-learning in Uganda such as inadequate digital infrastructure high cost of internet connectivity and low levels of digital literacy.

Fakuade, Ruth & Balyejusa, 2024 noted that "Students from low-income households could not afford the cost of devices, internet access, and learning materials. In addition, Kigundu and Matovu (2024) stated ``The challenges faced in distance learning in Uganda, such as limited access to technology and unreliable internet services, are common across many developing countries. Participants highlighted several challenges associated with adopting distance learning technologies in Uganda emphasizing issues primarily related to internet connectivity and the affordability and functionality of necessary devices" (p. 7). Furthermore, International Journal of CSR Research. (2024). Distance learning and challenges of technologies in Uganda. *International Journal of CSR Research, Volume(Issue)* highlights internet cost and instability as barriers, reinforcing the need for blended offline-online learning systems in Ugandan universities such as Kyambogo University. Namazzi and Ssempala (2012) stated "Learner engagement strategies are not yet fully embraced. Higher education institutions should expand internet

access, provide offline learning resources, train instructors in interactive e-learning strategies, and design learner-centered content."

Furthermore, Mpirirwe et al.(2021) found that "Access to reliable internet and adequate ICT infrastructure remains a significant barrier for most educational institutions, limiting the full potential of e-learning adoption.

## **2.2 Emergence of online-offline e learning systems**

Key models such as the DeLone, W.H, & McLean,E.R.(2016) Information systems success measurement are examined, focusing on system quality, information quality, and service quality dimensions. Mayer & Moreno's Cognitive Theory of Multimedia Learning is used to justify design decisions that minimize cognitive overload. However, `` To address the challenge of limited internet connectivity especially in rural areas, institutions should adopt offline- online learning solutions. This includes the development of learning Management systems that can synchronize content and assessment data when an internet connection is available after following students to access materials and complete work offline." National Information Technology Authority – Uganda (2021).

In addition, `` The Ministry shall promote the development and adoption of innovative low-bandwidth, and offline digital learning solutions to ensure resilient and inclusive education for all, regardless of geographical location or socioeconomic status." (p.21)

Ministry of Education and Sports (2022). The adoption of offline systems for example (Kitaboo, 2024) which emphasizes seamless offline activity tracking and automatic synchronization of learner progress, quiz results, and annotations once online, ensuring consistent and up-to-date data across devices for fluid offline-online transitions in learning experiences empowered our research. In addition, Moodle's official documentation explains data synchronization functionalities that keep course content, user accounts, grades, enrolments, and discussion forums consistent across platforms regardless of online or offline work by learners, enabling reliable tracking and reporting for educators [Moodle, n.d.].

Arokia IT provides custom offline-online data synchronization solutions designed to synchronize databases between devices without continuous internet connection, allowing updates in offline mode to sync when connection is restored, applicable to e-learning and more [Arokia IT, 2013].

## **2.3 Conclusion**

The reviewed literature establishes the need for integrated online offline e-learning solutions that are robust, affordable, and user-friendly in Kyambogo University. By addressing connectivity, cost and engagement barriers an integrated online-offline Progressive Web Application has the potential to enhance educational equity and academic success for university students.

### 3.0 RESEARCH METHODS

#### 3.1 Sampling Design.

A sample of 100 members will be randomly selected for the Study and Project and a sample size of 85 will be used according to Krejcie and Morgan, (1970). The simple random method of sampling will be used because it is easiest way to approach it and eliminates human bias.

#### 3.2 Study Population

**Table showing the study population: Students, Lecturers, System Administrators**

Category	Number of respondents	Sample size
Students	80	66
Lecturers	20	19
Total	100	85

### **3.2 Sources of Project Data.**

This project will use both primary and secondary sources of data to understand the challenges faced by university students and lecturers in accessing e-learning systems and to guide the design, development and evaluation of an integrated offline-online e-learning platform.

Primary data will be collected directly from students and lecturers using structured questionnaires and a sample of 85 university students and lecturers from Kyambogo University will be given these questionnaires.

Secondary data will be drawn from existing literature and institutional documents including Academic journals and conference papers addressing e-learning adoption, integrated offline-online e-learning solutions.

### **3.3 Requirement Elicitation.**

The research team will use questionnaires to collect the requirements needed for designing and developing the required e learning platform.

### **3.4 System Analysis and Design Approaches.**

System Design refers to designing and fully developing the system needed to solve the problem.

The project team will use an object-oriented design. This is because this design facilitates creation of classes that manage offline data storage, synchronization mechanisms, user interactions and security features as encapsulated units, this modular structure simplifies handling complex functionalities like offline caching, delta synchronization and real-time



in app support whereas a structured design approach is more linear and process driven which doesn't support agile adaptations to change during development.

### 3.5 Design Techniques

- **System Architecture:** A three-tier architecture will be used, including a client layer (Progressive Web App for offline content access), an application layer (backend services with Django), and a data layer (local SQLite on client devices).
- **Use Case Diagrams:** These will map key interactions between users (students, lecturers) and system features such as content access, assignment submission, and synchronization.
- **Prototypes:** Interactive prototypes will be used to test usability and accessibility, especially offline functionalities.

### 3.6 Anticipated Project Constraints

- Limited Access to Up-to-Date Literature and Data:** There may be challenges in obtaining recent and locally relevant data on e-learning and offline technology in Uganda. To address this, the team will utilize online academic databases, institutional repositories, and reach out to local experts to gather as much current information as possible.
- Software and Tool Availability Restrictions:** Access to the latest proprietary software for system design and development might be limited. The team plans to rely on open-source and widely supported tools such as React, Django, SQLite, and Figma for design and development to overcome this.
- Technical Skills Gaps:** The team may face limitations in advanced programming or offline synchronization techniques. To mitigate this, members will participate in online

courses, workshops, and seek mentorship from experienced developers to ensure high-quality system implementation.

### 3.7 Timeline & Milestones

Phase	Key Activities	Timeline	Milestones
<b>Phase 1: Planning &amp; Research</b>	Literature review, stakeholder meetings, requirement elicitation	Month 1	Completion of detailed requirements report
<b>Phase 2: System Design</b>	Development of UML diagrams, wireframes, system architecture design	Month 2	Approval of system design and interface mockups
<b>Phase 3: Prototype Development</b>	Coding offline PWA, backend services, database setup	Month 3-4	Working prototype with core offline features
<b>Phase 4: Pilot Testing</b>	Deployment with selected students and lecturers.	Month 5	User feedback report and bug fixes completed
<b>Phase 5: Evaluation &amp; Refinement</b>	System improvements, final testing and preparing final documentation	Month 6	Final system deployed

### Disclosure and Declaration Statement

The project team intends to use generative AI tools under the direct guidance of the assigned supervisor. AI will be utilized to assist in literature review, drafting

documentation, and generating code snippets where applicable. All AI-assisted outputs will be reviewed and validated by the team to maintain academic integrity.

The team commits to adhering to all research and academic ethical standards, including proper citation and original work verification. Any use of AI will be fully transparent and supplementary to the team's efforts.

There are no known conflicts of interest related to this project. The system and study are being developed solely for the benefit of university students and staff and do not involve family or business interests of team members.

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