

**iLearnCentral: A CLOUD-BASED LEARNING CENTER
PLATFORM WITH MOBILE TECHNOLOGY**

A Research/Capstone Proposal
Presented to the Faculty of the
College of Computer Studies, University of Cebu

In Partial Fulfillment of the Requirements
for the degree Bachelor of Science in Information Technology

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Above all, the Almighty Father, the source of infinite wisdom, strength, and goodness. To God be the glory!

The Researchers

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DEDICATION

This project is lovingly dedicated to our respective parents, who have been our constant source of inspiration. They have given us the drive and discipline to tackle a task with enthusiasm and determination. Without their love and support, this project would not have been possible.

To our advisers and professors who genuinely helped us to finish this work,

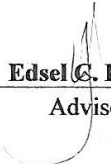
And above all,


To our beloved God Almighty who never surrendered to shed us His love, grace and wisdom to accomplish this study that, somehow in the very near future, may contribute to help those who will use and appreciate it.

APPROVAL SHEET


This Research/Capstone Project Study titled **iLearnCentral: A CLOUD-BASED LEARNING CENTER PLATFORM WITH MOBILE TECHNOLOGY** prepared and submitted by Jephunneh C. Mabini, Rhea Shane M. Chiong, and Cristian G. Paragoso has been examined and is recommended for approval and acceptance.


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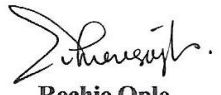

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CHAPTER I

INTRODUCTION

In this era, mobile phone has become fashionable to the public because it is very handy. With the availability of mobile phones, multiple issues have been solved and the bulk of the information is kept online. Initially, when mobile phones first came out, they were only useful for communicating; now they are of multiple usages. Moreover, mobile phones have become the colossal point of attention for individuals and businesses alike, courtesy of the various incredible features and opportunities that they offer (Chatterjee, 2014).

One of the markets or businesses needing to take advantage of mobile solutions is the learning centers. Due to the high turnabout of educators in these centers, the total process takes a lot of time. iLearnCentral helps solve this predicament. It is a mobile application (app) that helps ease the whole experience of learning centers from hiring and profiling of educators to scheduling and enrolment.

Rationale of the Study

Insufficient use of Information Technology (IT) is one of the significant reasons that slowed the growth of small and medium-sized enterprises (SMEs) in Asia (Yoshino, 2016). However, outsourcing IT services for SMEs is now a trend for business solutions. Outsourcing IT services can help SMEs by having lower cost, focus on core operations, and IT resources similar to the large establishment (Gluck, n.d.).

Most learning centers are SMEs and would gain an advantage if they would utilize outsourcing of IT. The core operations of learning centers involve manual procedures, and automation by IT can ease the processes. Having the ability to do work conveniently and efficiently by using IT gives the learning center a competitive edge.

It is vital for learning centers to select the best and most qualified educators for their students because they play an important role in building a child's success in their first years of school. Educators do more than facilitate arts and crafts projects throughout the day. They provide structure and help children grow in their reading and writing skills, teach science and help children understand themselves (Hudson, 2017).

There is a multitude of reasons why educators in the Philippines are quitting their jobs. The attrition rate has steadily increased and according to Ingersoll and Smith (2003), educators' attrition rate has serious consequence in the workplace and students. Although attrition rate is

inevitable, learning centers need to hire new educators swiftly without affecting the children's progress. The faster and easier the process, the better the service.

The researchers use these problems as the basis to create a project that addresses these issues. The researchers are taking advantage of the growth of mobile technology and mobile computing and create the app iLearnCentral. iLearnCentral helps learning centers lessen the administrative burdens and offer an alternative solution for the attrition rate of educators.

Objective of the Study

The study aims to develop a cloud-based learning center platform with mobile technology for administrative staff, educators, parents, and students.

To achieve this aim, the specific objectives are:

1. to gather data on the issues encountered by small and medium learning centers;
2. to determine the mechanism for a recommendation system; and
3. to define a notification scheme.

Scope and Limitations

The development of the mobile and web app of this project study focuses on learning centers and educators within the Philippines. Features of the app are pre-defined for only the common problems across different types of learning centers. The apps have three different intelligences available. The apps compare the job-seeking educators' profile and details on every job hiring position and suggest the qualified potential hire to the learning centers depending on the pre-set requirements and qualifications of the job hiring position. On the other hand, job-seeking educators get a list of potential job career vacancy recommendations through the app. They can also search manually for institutions, hirings, or job vacancies they want to employ.

Another intelligent feature of the app is the scheduling and optimizing of classes and activity schedules for the learning centers and employed educators.

Lastly, the apps suggest classes to students and parents basing on their interests and recent searches.

The apps also have an enrolment management system to help students and parents process enrolment online. The mobile app is designed to operate on a system with an Android version of 5.0 and above and with an internet connection, while the web app is designed to run on Mozilla Firefox, Google Chrome, Microsoft Edge, and Safari browsers.

Unlike company-specific software that is developed to manage their specific needs, iLearnCentral cannot provide learning center-specific features for different types of learning centers. The app cannot help with the hiring of other staff members of learning centers as well, and the functionalities of the mobile app are limited offline.

Significance of the Study

The implementation of the system changes the methods and processes that the learning centers and educators are accustomed to and the outcome of the study is beneficial to the following:

Learning Centers. They can have an automated system for the common operational processes and the hiring process of educators is simpler.

Educators. They can have a new platform to search for jobs easily. For educators that are already connected with a learning center, they can effortlessly manage their work schedules.

Parents. They are able to pay online for their children's tuition fees, and monitor their children's school status online.

Students. They get the best educator available to help them learn.

Researchers. In order to increase the personal knowledge of problem solving and improving their coordination, teamwork and programming skills.

Future Researchers. The ideas presented may be used as reference data in conducting new researches. The outcome of the study is beneficial to them as a cross-reference. This study may be one of the bases where a new theory in learning arises.

Flow of the Study

Flow of the study shows the inputs and the selection of the processes to be included on the study.

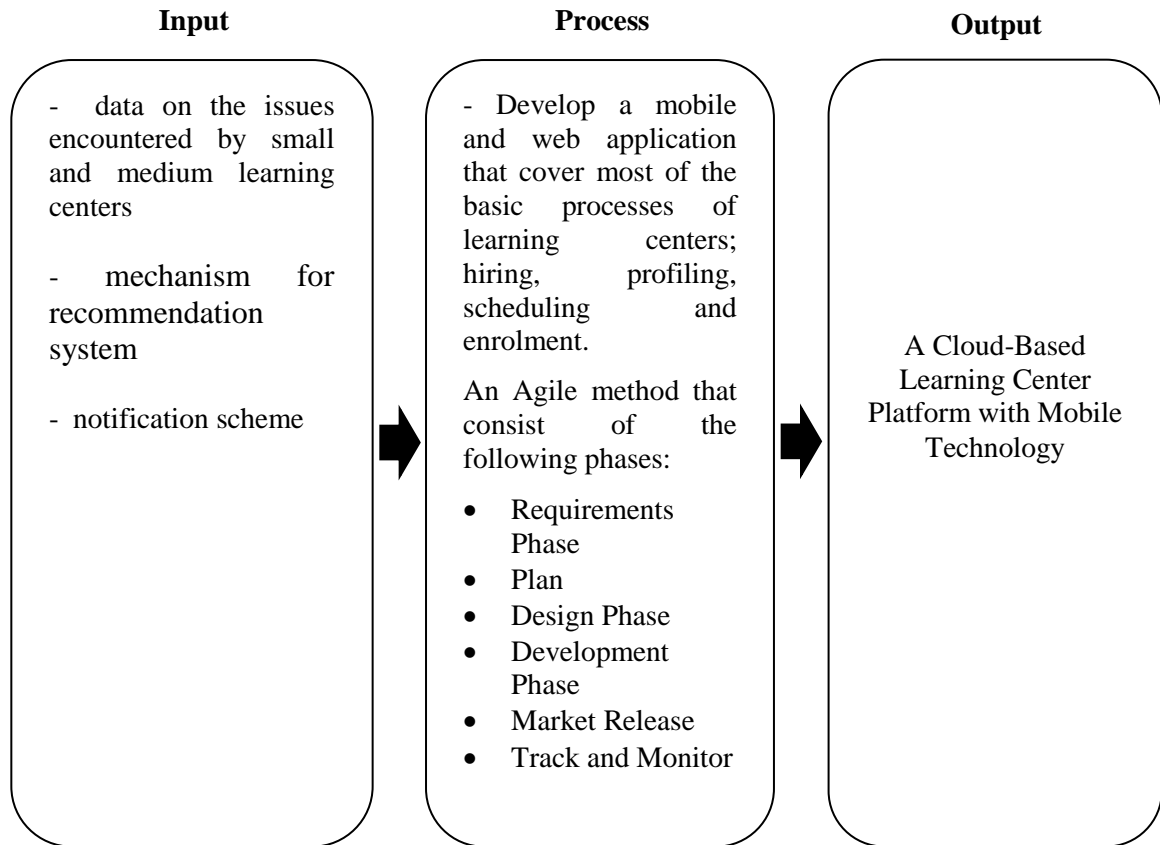


Figure 1: **Flow of the Study**

Figure 1 shows the flow of the study. The flow is divided into three parts. Firstly, an input is the requirement needed for the application. Secondly, process is the development of the application. Finally, an output is produced out of the input and process.

The inputs are gathering of information about the issues encountered by learning centers and determining a solution.

The process of the study implements the use of a Software Development Life Cycle methodology, which is the Agile Model. It is composed of 5 phases which include Requirement Phase, Design Phase, Development Phase, Market Release, Track and Monitor Phase.

The output of the study is a mobile and web application that would automate learning centers' processes and assist educators entitled as "iLearnCentral: A Cloud-Based Learning Center Platform with Mobile Technology".

Definition of Terms

The following definitions have terms with meanings in the context of usage in the study. Some of the terms operate only to this study by providing more clarity.

Class. Periodic or sporadic meetings of enrolled students and educators to have lessons.

Class Session. A single instance of a class with a specific schedule.

Cloud-Based Platform. A software that provides services or resources via the internet from a provider's server.

Course. The term for the study of a subject or program offered by learning centers.

Educators. They are the teaching staff of the learning center and the people seeking for a teaching job.

Issues encountered by small and medium learning centers. These are the problems encountered by the learning center's operations, the educator's class management and job seeking, and other problems regarding the parents and students.

Learning Centers. Are the SMEs that provides learning services. It could be academic, language, music and arts, etc.

CHAPTER II

REVIEW OF RELATED LITERATURE AND STUDIES

The literature and studies cited in this chapter tackle the different concepts, understanding, and ideas, generalizations or conclusions and different developments related to study from the past up to the present which serve as the researchers' guide in developing the project. Those that were also included in this chapter help in familiarizing information that are relevant and similar to the present study.

Related Literature

In the Philippines, case study by the United Nations Educational, Scientific and Cultural Organization (UNESCO) shows that an increasing number of school-age Filipinos are out of school. A huge percentage of Filipino children and youth aged 6 to 17 years are not attending school. In 2003, there were a total of 5.18 million out-of-school youth (1.84 million out-of-school children aged 6 to 11 years old, and 3.94 million young people aged 12 to 15) in the country according to the Department of Education (DepEd). In fact, the government estimates that "one in six school-age children in the country is being deprived of education and the number is rising steadily. These numbers have been backed up by a recent Australian Council for Educational Research (ACER) report that highlights the importance of preschool education in the Philippines. The first report of the study, released in May 2016, examined the results of the first of four assessment rounds, which measured the cognitive, social and emotional, and oral language skills of children at the commencement of their first year of school.

The report revealed that students who attended a preschool program performed better across all three domains than those who did not. Accordingly, even in general terms, without collecting and analyzing data on the duration or type of preschool program attended, it appears that attending preschool makes a positive difference within the sample. This supports current interventions and the government's policy related to investing in early years education.

All these reports show that there is a need of updating and innovating Philippine Learning Center processes as it is vital to the growth and foundation of children. Learning Centers can turn to iLearnCentral to achieve this in a lesser amount of time.

There have been a few books published that pinpoint the significance of educators' qualification in early childhood education. Sheridan et al. (2009) stated in her book "Professional

Development in Early Childhood Programs: Process Issues and Research Needs” that the knowledge, skills, and practices of early childhood educators are important factors in determining how much a young child learns and how prepared that child is for entry into school. Early childhood educators are being asked to have deeper understandings of child development and early education issues; to provide richer educational experiences for all children, including those who are vulnerable and disadvantaged; to engage children of varying abilities and backgrounds; to connect with a diverse array of families; and to do so with greater demands for accountability and, in some cases, fewer resources, than ever before. The importance of understanding the qualities of early childhood educators that contribute to optimal child learning and they are to meet certain educational qualifications and receive professional development to enhance their abilities to support young children's learning. Indeed, the professional development of practicing early childhood educators is considered critical to the quality of experiences afforded to children (Martinez-Beck & Zaslow, 2006).

In the face of increased attention to early childhood professional development in the practice and policy communities, there is a concomitant need for empirical efforts to examine what works for whom, within which contexts, and at what cost (Welch-Ross et al., 2006). Research on early childhood professional development must go beyond basic questions that address caregiver characteristics and their associations with attributes of knowledge, skill, or practice. Rather, establishing a scientific endeavor of early childhood professional development requires building a body of theories and evidence about not only its forms but also its and proximal and distal outcomes. The early childhood field is at a place where professional development practice and craft knowledge require a larger and firmer platform of theoretical and empirical expertise in order to guide planning and implementation of the ambitious kinds of school and child care reforms that are demanded in the current era of services expansion and accountability. Indeed, the field is acquiring a body of findings of the effects of various forms, levels, and organizations of professional development on early childhood educators' knowledge bases and skillsets. However, we need to know more about the dynamic and transactional teaching and learning processes underlying these effects as they function in real-world early childhood settings. For example, we need findings documenting personal theories of change, supportive relationships among participants, and practitioner acceptance/resistance to change. We are even farther behind in building a solid body of empirical information on the indirect but essential influence of professional development on child and family outcomes. The number of children going to preschool and the number of licensed educators has proportionally increased.

This gives Learning Centers the liberty of selecting the best available educator basing on their underlying professional development – skills, behaviors, and qualifications.

Additionally, some studies have focused on the efficiency and simplification of the hiring process of employees in bigger companies. The foundation of a high-impact workforce relies on the quality employees, but successful teams cannot be built by antiquated recruiting processes. Talent acquisition professionals are constantly in search of better ways to hire as the demand for talented individuals goes up and pressures on recruiting teams simmer. More than half of talent acquisition leaders say the hardest part of recruitment is identifying the right candidates from a large applicant pool and, unfortunately, that's because many of them are doing so by hand. Companies are looking for more efficient ways to modernize and streamline recruiting efforts. As the hiring process has evolved from newspaper ads to job boards to social recruiting, the next wave of this industry is recruiting automation. Just as salespeople and marketers have benefited from software-enabled automation in recent years, recruiters are increasingly turning to automated mechanisms for hiring the best talent, and the industry is responding accordingly.

Buckley et al. (2004) did some study on the advancement of human resource systems. Presently, these systems are being modified so they can be administered using various forms of computer technology. These technological advances are being driven primarily by strong demands from human resource professionals for enhancements in speed, effectiveness, and cost containment. This case study presents results obtained by an educational publisher from the use of an automated recruiting and screening system. The system allowed for recruiting and the automated administration of professionally developed, job-related questions aimed at deciphering whether an applicant meets the job requirements. The analyses showed conservative savings due to reduced employee turnover, reduced staffing costs, and increased hiring-process efficiencies. The current system coupled with the addition of planned enhancements should increase future hiring efficiency, employee quality, and resulting financial savings.

In May 2018, Reija Oksanen, a faculty member of the University of Tampere, also did a study on the transformation and impact of the use of technology in recruiting practices. The use of technology in recruiting practices is constantly becoming more and more routine amongst organizations. Recruiting as a whole has experienced a major change with new technologies providing quick, effective and cost-efficient ways of finding potential employees. Among these new technologies are big data and Artificial Intelligence (AI). Organizations have been collecting massive amounts of data, and now they are able to derive real value from big data and AI. The research data was collected during the spring of 2018 by interviewing weight recruitment

professionals who work among recruitment on a daily basis. Data was studied with qualitative methods by analyzing, coding and identifying themes. As the aim of this study was to widen knowledge about the phenomenon of new technology-based recruitment methods the findings of this study appeared broad and diverse, highlighting the novelty of the phenomenon as opinions of the interviewees varied greatly. Three phases where AI can be of short-lived recruitment process were identified: practical organizing, pre-screening applications, and candidate communication. The benefits and disadvantages of AI in recruitment aroused much discussion and opinions among the interviewees. Numerous opportunities and risks were identified when utilizing new technologies in recruiting. Among other things, accelerating the recruitment process, automation of routine tasks and increasing objectivity were seen as opportunities. The risk of discrimination, data distortion, and invasion of privacy were considered as risks, among others.

Related Studies

In July 2018, three students of the University of San Carlos (USC) – Patrick Dave Woogue, Cris Lawrence Adrian Militante, and Gabriel Andrew Pineda – won the grand prize for their online tutorial system at the 14th Smart Wireless Engineering Education Program (SWEEP) Innovation and Excellence Awards for their mobile application Eryl. The application leverages on a mobile platform that allows users to act as student-tutors to those having difficulty with their lessons, thus stimulating collaborative learning within the school. It is a mobile online tutorial system that enables students to join online classes or organize one and it also let them select from a teacher pool and negotiate for a schedule and fee.

OrangeApps, a school management application, has been officially released in 2014 by then 19-year old Gian Javelona. It has since become a huge technology company that builds products that focuses on solving problems in education. Schools of every size use the platform to manage their entire operations from admission, payments, grading, scheduling and a whole lot more giving them time to focus more on providing better education. The app comes with multiple features for teachers, students, admins and parents. However, it is designed for large schools and universities.

Schoology was designed by three Washington University students - Jeremy Reid, Ryan wang and Alex Trinidad and has been released since August 2009. It is a cloud-based platform which was originally developed for sharing notes. Today, Schoology provides teachers the tools

needed to manage and oversee an online classroom activity for K-12 and higher education institutions.

iEduCentre has focused on the comfort of business owners and administrators for schools and tuition centers. Before the days of the digital revolution, these organizations are saddled with bundles of administrative burdens, endless paperwork and shelves crammed with files. In 2011, Aquarius Soft launched iEduCentre and had since benefited more than hundred over clients in Singapore. After refining the system along the way through rounds of consultations with our clients, we are proud to introduce a total of more than 40 modules, each inter-facing well with one another to create a highly comprehensive, user-friendly and stable system for all our customers.

SpellWizards is an engaging educational program designed specifically to help children learn spelling, while having fun along the way. It has been designed for children aged 4-11 in order to improve their spelling, and enhance their computer knowledge and typing skills. Accessible online as a web app, SpellWizards is an effective support tool which can be used by schools, teachers and parents looking to encourage and engage children to learn through play, with the added benefit of being able to track their progress online.

Comparative Matrix

The comparative matrix shows the different studies that are related to the proposal. It shows its differences and is used by the proponents as basis to create and innovate the features of iLearnCentral.

Table 1

COMPARATIVE MATRIX

Related Studies	Features	Limitations	Platform Details
Name: Eryl URL: None Year: July 2018	- allows users to become students and tutors - allows to negotiate on a teacher pool	- not fully released	- None
Name: OrangeApps URL: https://orangeapps.ph/	- admin, teacher, student and parents monitoring and	-intended for huge schools and universities	- Web, Android, iOS

Year: 2014 Proponents: Gian Javelona	management system		
Name: Schoology URL: https://www.schoology.com/ Year: 2009 Proponents:	- for K-12 school and higher education institutions - automated grading system - calendars and messaging	- educator-centric app	- Web, Android, iOS
Name: iEduCentre URL: https://www.ieducentre.com/ Year: 2011	- CRM & scheduling - attendance tracking, fee automation - student, parent and portals human resource & payroll	- only available in the US	- Web
Name: SpellWizards URL: https://spellwizards.co.uk/ Year: Unknown	- spelling assistant for children aged 4 to 11	- only for learning to spell	- Web

CHAPTER III

RESEARCH METHODOLOGY

Each section discusses the approach to be used for the analysis and other technical specifications to help reinforce the proposal. It also includes diagrams, designs features techniques, and materials for implementing "iLearnCentral: A Cloud-Based Learning Center Platform with Mobile Technology" to fulfill the study's goals requirement.

Software Engineering Methodology

iLearnCentral's development study uses the agile approach as the project framework for software engineering. Agile software development defines an approach to software development under which requirements and ideas progress through the collaborative effort of cross-functional self-organizing teams.

One of the benefits of the agile approach that suits this study is collaboration and open interactions with designers, advisers, and collaborators based on their feedback and any changes that occur throughout the development. It promotes flexible planning, structural growth, first conveyance, ongoing transition, and facilitates rapid and adaptable response to change.

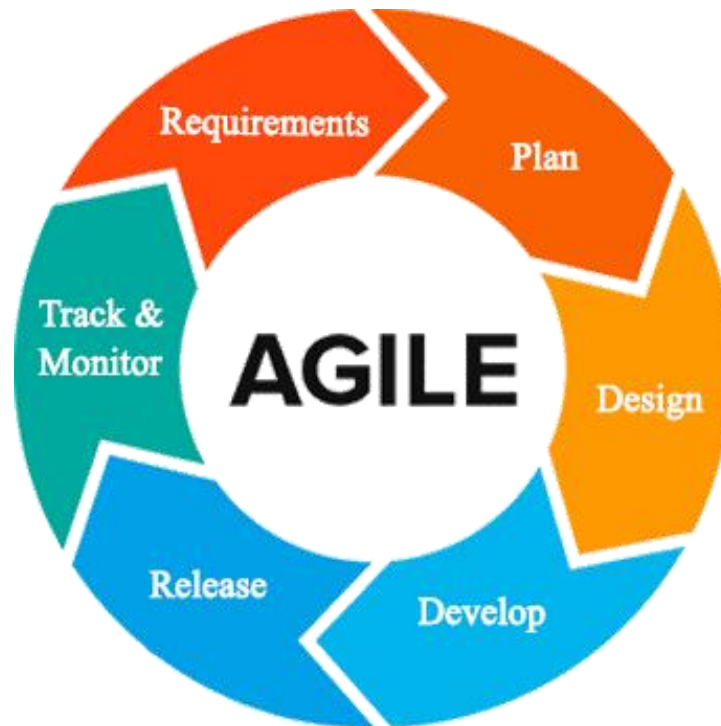


Figure 2: Agile Development Methodology

Figure 2 shows the representation of the framework lifecycle in an agile development methodology. The agile process requires less preparation, and the activities split into small increments. The agile process is for short-term projects with a team effort that meets the life cycle of software development (Sharma, 2012). By using customer feedback to agree on ideas, iteratively improves software. This approach provides opportunities for assessing the path throughout the development lifecycle. This performs by generic workflows, such as sprints or cycles to the end of which teams deliver a material increment that is potentially transmittable. This approach focuses on the replication of abbreviated work cycles and the functional yields of the product.

The developers do the following phases of the Agile Methodology:

Requirement Analysis. Defines the requirements for the iteration based on the product backlog, sprint backlog, customer and stakeholder feedback.

The gathered system features are from research conducted and interviews with industry experts in the related fields. The User Interface (UI) designer and the programmer define the code specifications needed to fulfill the requirements of the project. The technical writer then takes note of changes and checks the document with all team members present. The database designer verifies if the features are compatible with the materials. The project manager reports the improvements made by the team to the team's adviser.

Initially, the team members make the primary manuscript and background researches on learning centers, educators, and job-seekers to lay out the things to do. In every iteration, the team members assigned to work on the obstacles analyze the issues and come up with a possible solution. They consult on resolutions with the other members. At the end of each day, the team members report on their progress.

Plan Phase. Phase of preparation involves creating a set of plans that helped guide the team through the phases of project implementation and closure. The plans produced during this process help developers manage time, cost, performance, change, risk, and issues to ensure the project is delivered on time and within budget by the developers.

The team determines schedules, preparations, and plans of actions to handle changes during the iteration. In every sprint cycle, the organizations made are directed towards the fulfillment of its intentions. Itemized priorities and time constraints are the focus of budget allocation by the project manager. The team establishes communication routes for questions and issues that may arise.

Design Phase. The specifications evaluated and defined by the designers are used in the design phase to make design choices using various diagrams. The UI designer assigned creates the user interface. The programmer and database designer must describe the device element interface mechanism. The project manager monitors the progress of the members' tasks. From the selected sprint backlog, the team determines which designs to tackle from the manuscript. There is a parallel development of mobile and web applications.

Development Phase. This step requires testing usability and reliability for all aspects of the product. The software testing checks if it meets all the specifications set out in the evaluation of requirements and if it handles the information correctly.

The developers check the software, analyze it, and identify the issues and update or modify it beyond the steps or requirements that were set up. Until deployment, all parts of the operation underwent a continuum of individual evaluation through different testing methods to ensure its efficacy and efficiency.

Release. Before releasing it to the market, developers carried out several activities to test the application. It allows the system to work within each operation of the deployment phase with tolerable performance and specific processes. Using the guidance given in the deployment document, developers then installed the application in the server environment.

Track and Monitor. This phase happens after the program is sent out to the customers/clients in this process. Developers maintain tracking, monitoring, and providing IT support services to include system and software updates and enhancements if appropriate. Feedback gathered from monitoring generates a list of improvements and bug fixes for the next iteration.

Another sprint cycle happens at the end of the previous. A sprint review with all members determines the set of activities for the next iteration. It includes adjustments from leftover unfinished tasks, additional features requested, and feedback from monitoring.

Planning/Conception-Initiation Phase

The planning phase discusses the high-level decisions on why a project is valuable and what the requirements are. It helps the researchers keep track of assigned tasks, meeting deadlines, the progress of each requirement, and the budget for project work plans.

Business Model Canvas

The Business Model Canvas is a visual representation, commonly used by strategic managers, of existing and emerging business models.

Table 2

BUSINESS MODEL CANVAS

Key Partners	Key Activities	Value Proposition	Relationships	Customer Segment
-Learning centers -Educators currently teaching in learning centers -Job seeking educators	-Design and develop an intelligent school management software geared towards the needs of learning centers, educators, students	- System can be used by any type of learning center - System could automate basic operations of administration with integrated artificial intelligence -Recommend job vacancies to educators. - Assist employed educators in classes - Market learning center services and recommend courses to student	- Customer service hotlines - User Feedback - Email	- Learning center administration - Educators in learning centers - Students in learning centers - Educators seeking employment
	Key Resources		Channels	
	- Web domain and host - Developers - UI/UX designers - Researchers		- On-location Visits - Company Website - Social Media Marketing - Word of mouth	
Cost Structures		Revenue Streams		
- Customer acquisition costs - Research and Development - Marketing and Advertising - Hosting, Operations and Maintenance		- Subscription based on feature packages - Ad Revenue from free or trial users		

Table 2 illustrates the system's Business Model Canvas. The Business Model Canvas is essential in building a flourishing business market. It gives concrete ideas to the researchers about

the target market of the project and the cost of developing it. The Value Proposition shows the importance it gives to the public. Channels are a way for the group to interact simultaneously with customers and investors to sell the program. Customer relationships ensure that the entities involved are supporting our business relationship. Revenue streams demonstrates how we can earn revenue from the services provided.

Program Workflow

Defining, managing, automating and optimizing business processes is a software workflow. Progressions of measures (tasks, events, interactions) involving a cycle of work, involving two or more individuals, and generating or adding value to the activities of the organization.

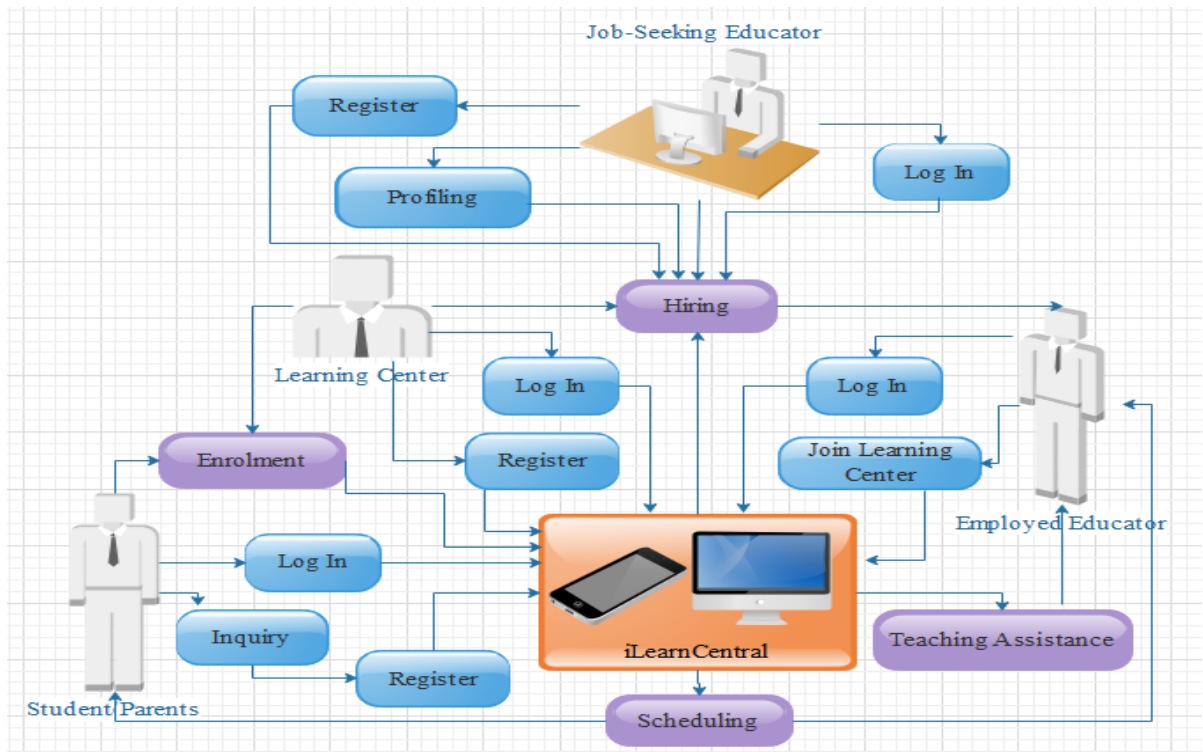


Figure 3: User Activity Program Workflow

Figure 3 shows the program workflow for general user activities. The administrative account creation and authentication starts with the registration of learning centers to the system. Job seekers register for an account to build their profile resume. The hiring module involves the learning center and job-seeking educator which could produce an employed educator. Only learning center and employed educator accounts can log in to most of the functionalities of iLearnCentral. Interested students/parents can inquire by creating a free account and browse

through services offered by learning centers. Enrolment would involve input from both learning center and the student/parent. The scheduling is processed by iLearnCentral to produce calendars and notification to the employed educator and student/parent.

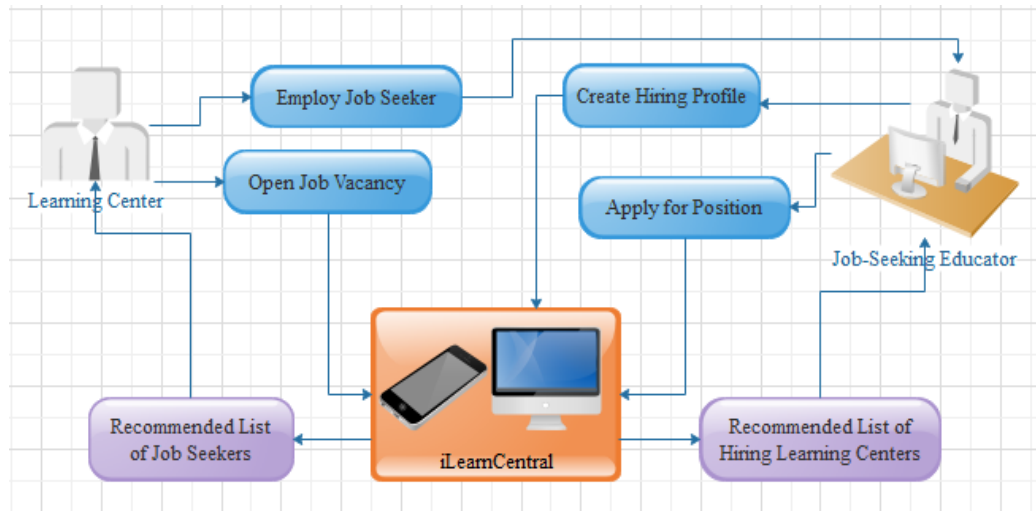


Figure 4: **Hiring Module Program Workflow**

Figure 4 details the hiring module from Figure 3. Job-seeking educators build their hiring profile or resume. After which the system processes their qualifications and determine a list of hiring learning centers from open job vacancies on which they apply for. They can also browse through other job vacancies available. On the other hand, learning centers receive recommended list of job-seeking profiles which fit their requirements.

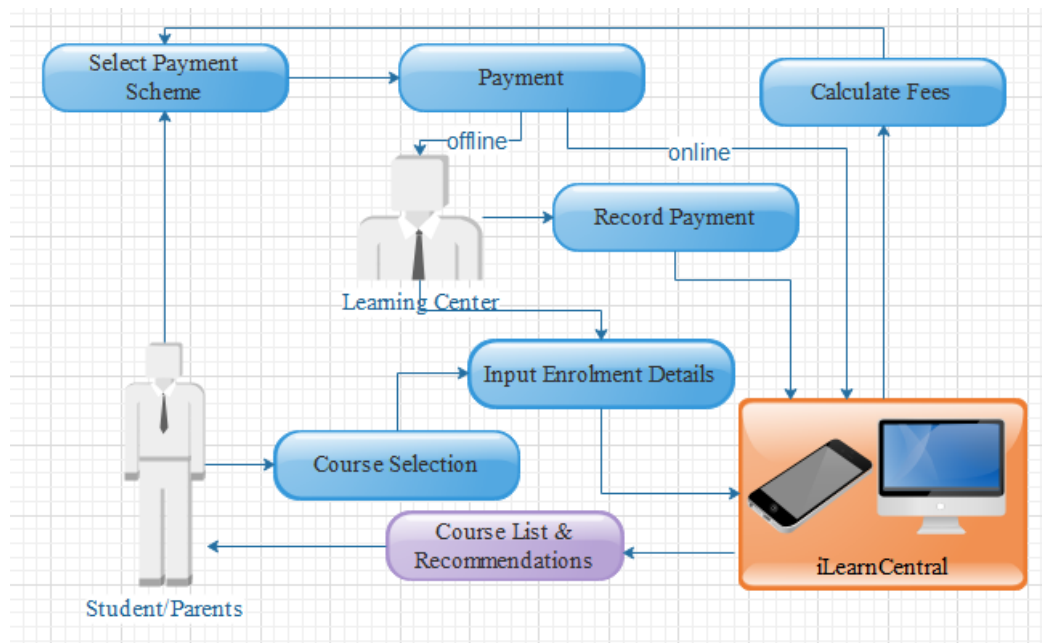


Figure 5: **Enrolment Module Program Workflow**

Figure 5 shows the program workflow for the enrolment module. The student or parent sees a list of courses from the system provided by the chosen learning center. With the selected course/s, they can process enrolment by providing the required information. The system calculates fees needed with the student/parent choosing methods of payment. Offline payment goes directly to the learning center, who would then record the transaction. Paying online is an option using various methods of online payments.

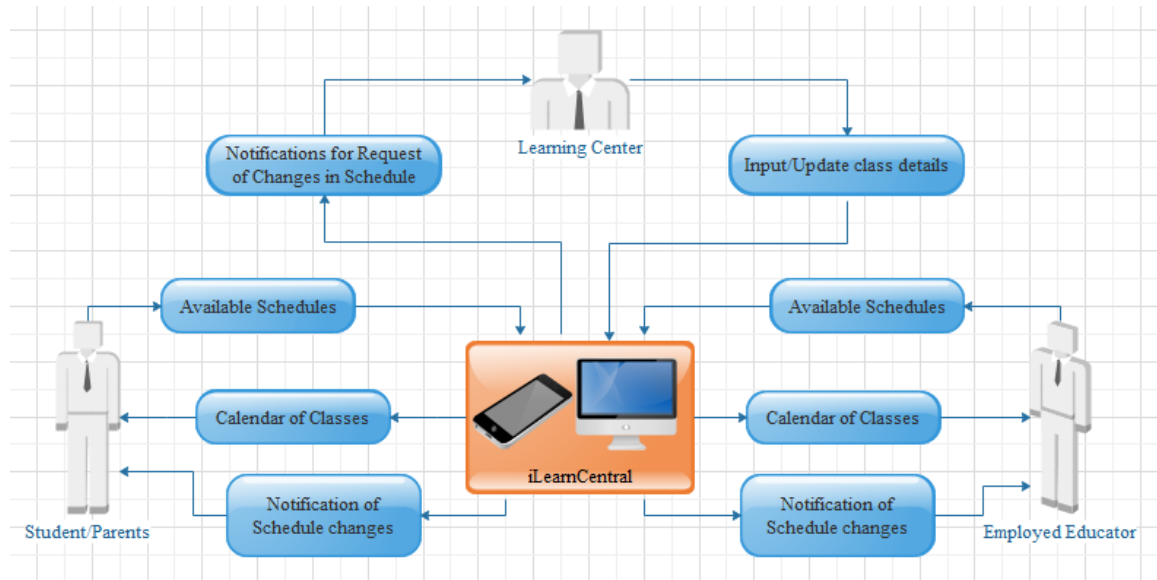


Figure 6: **Scheduling Module Program Workflow**

Figure 6 shows the workflow for the scheduling module. The administrative staff would input class details for scheduling. The students and educators have time available when they can have a class. Schedules depend on matches with classes and educator's open loads. There should be a consideration for the classrooms available and the learning center's open business hours. Any changes to the schedule automatically adjusts schedules and notify all persons involved.

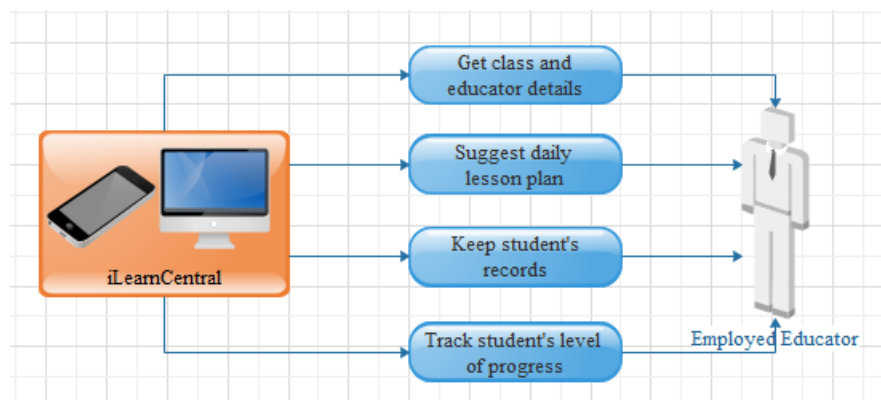


Figure 7: **Teaching Assistance Module Program Workflow**

Figure 7 shows the program workflow for the teaching assistance module. It involves assisting educators with their day to day activities, including lesson plans, record keeping, and tracking student's progression.

Validation Board (Stages 1 and 2)

Table 3 shows the different problems that our customers encountered. It also shows the solution to the problem being solved by the researcher. Table 3 also contains the most risky assumption, the methods and the criteria for success, the results and the decision, as well as the learning.

Table 3

VALIDATION BOARD

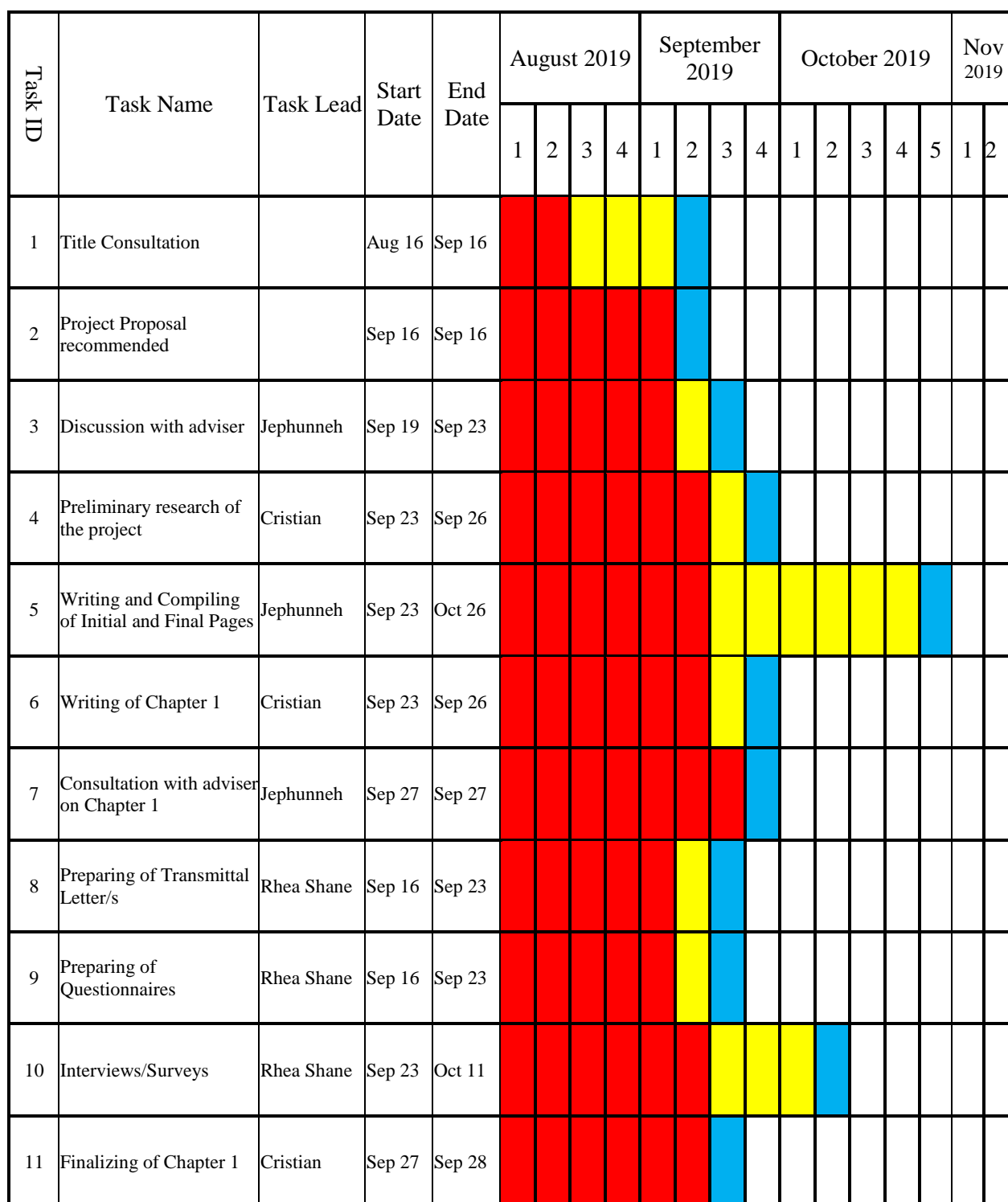
Experiments	1	2	3
Customer	Learning Center Administration	Employed Educator	Job-Seeking Educators
Problem	Learning centers using manual transactions to support common management processes i.e. hiring, enrolment, and scheduling	Variation of lessons for different students handled, maintaining schedules, and keeping records	High turnover of educators in learning centers leading to constant demand amidst particular qualifications.
Solution	A dynamic learning center management system supporting different types of learning centers, i.e. day care, music, language studies	Adding a module for educators employed by a center to keep track of lessons, update schedules, and integrate records to the system.	Data pool of job-seeking educators sifted and recommended to fit learning centers' particular needs and vice versa.
Riskiest Assumption	Learning Center have no IT support	Learning center provide resources i.e. internet connectivity to employees	Educators uses the system to look for employment in learning centers
Method and Success Criteria	60% of the respondents agree to use the system	60% of the respondents agree to use the system	60% of the respondents agree to use the system

Gantt Chart

The Gantt chart shows the scheduled work or activity completion in specific time frames in relation to the amount planned for the specified periods. The chart serves as a guide for the advocates to decide how long a project takes, classify the resources needed, and schedule the order of task completion performed by the researchers.

Table 4

GANTT CHART



incomplete, yellow means that the activity is still on the way, and blue means that the activity is already finished.

Functional Decomposition Diagram

The functional decomposition diagram demonstrates the operative relationship between the various components of the project into critical modules to clearly illustrate and simplify various activities.

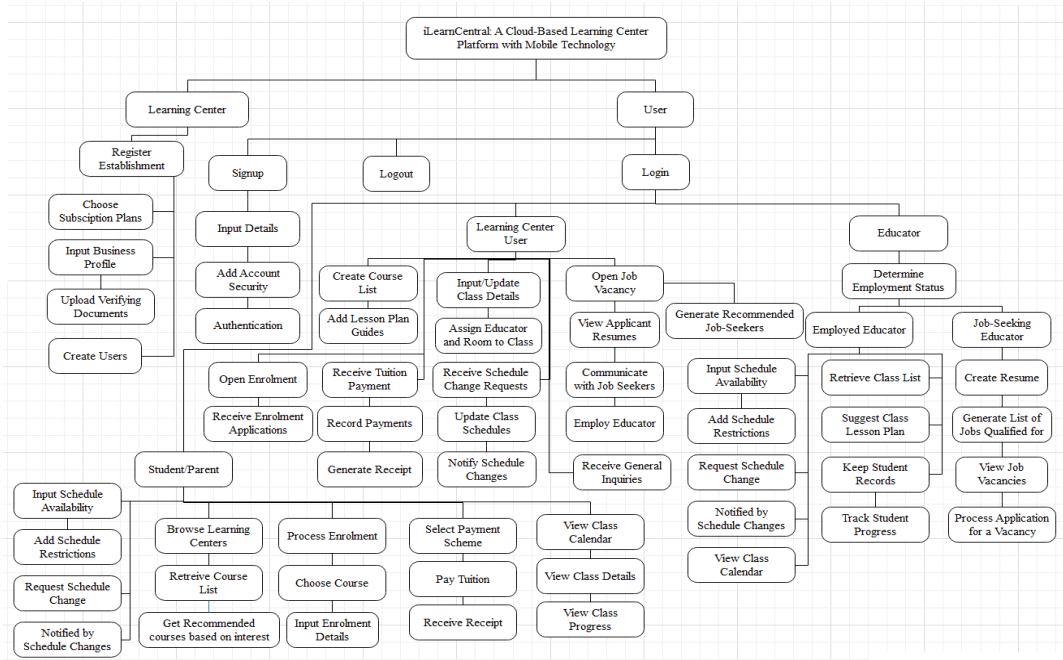


Figure 8: **Functional Decomposition Diagram**

Figure 8 shows the functional decomposition diagram of the system. It contains the five modules to complete and sub-functions for each module concerning the user type needing the functionality.

Analysis / Design Phase

The stage of analysis includes the concept of the specifications needed to accomplish the method. Each step determines the problem to be solved by the customer.

Use Case Diagram

Use case diagram shows the graphic representation of the mechanism of iLearnCentral and potential sequences of interactions between systems and users in a specific environment related to a specific target.

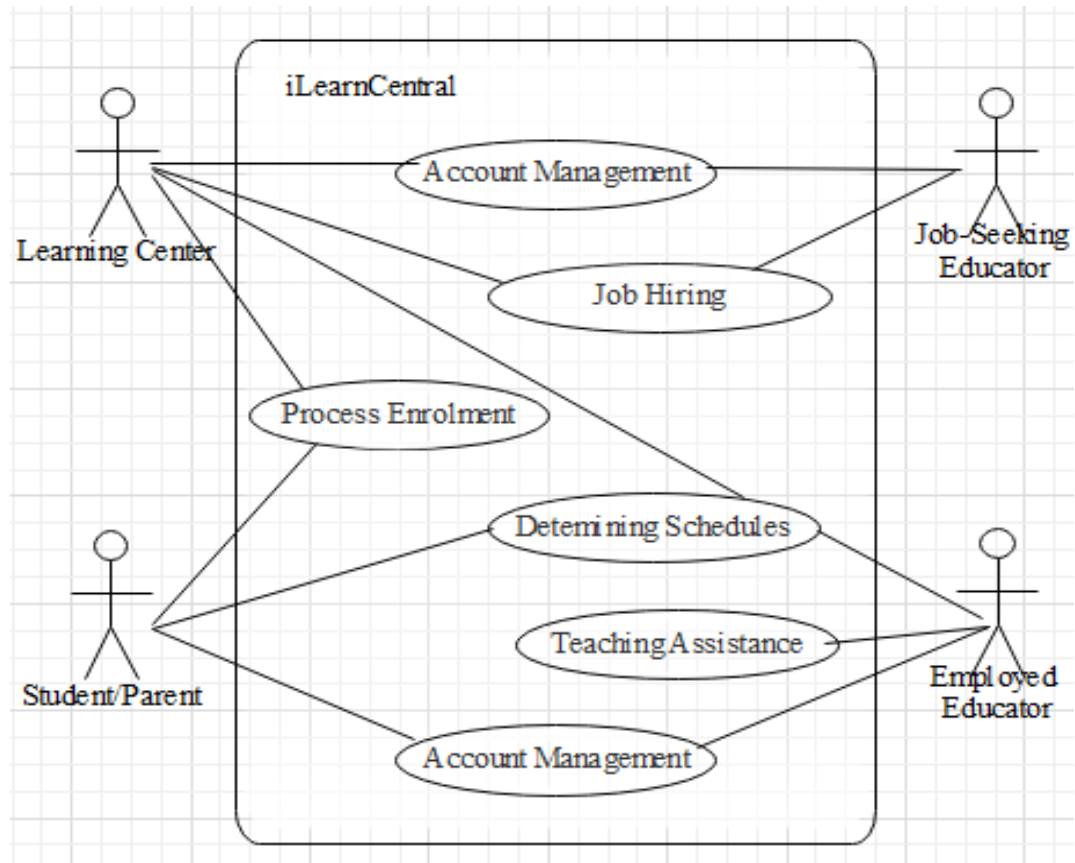


Figure 9: Use Case Diagram

Figure 9 shows the use case diagram for iLearnCentral. It shows the outside view of the system and the requirements needed. It identifies the system's influencing external and internal factors and their interactions.

The learning center is a factor in most of the internal modules. Account management involves all actors with varying degrees of complexity for each actor. Job hiring only concerns with the learning center and the job-seeking applicant. Enrolment processing is between the learning center and the students/parents. Determining schedules need the interaction between the learning center, student/parent, and assigned educator. Lastly, teaching assistance is a module for employed educators to utilize.

Storyboard

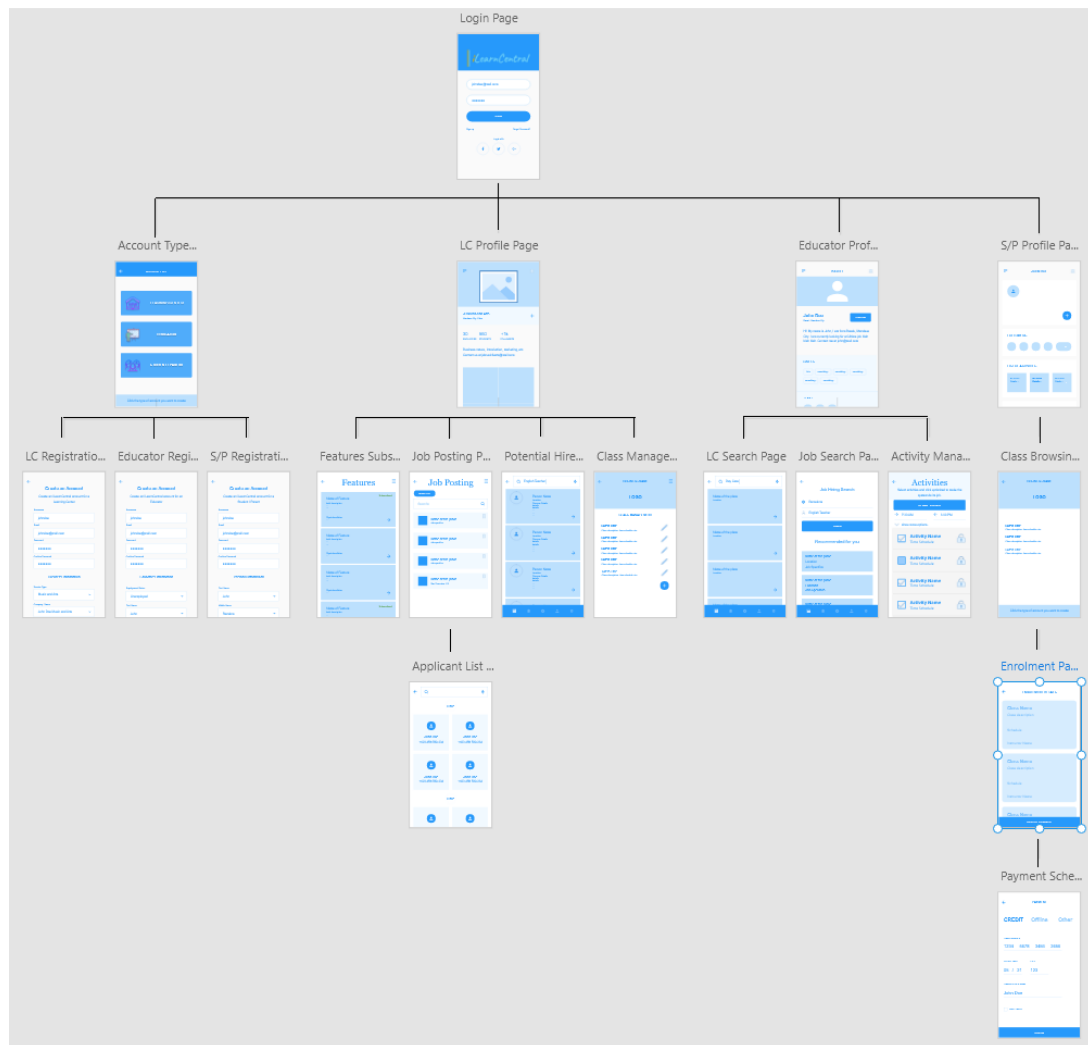


Figure 10: **iLearnCentral Storyboard**

Figure 10 shows the graphical representation of the usage of the app. New users have the option to register as a Learning Center, Educator or Student/Parent and each type of registered user has their own designated profile pages and features.

Learning Centers are able to check their subscriptions, post new jobs, search and hire educator and manage classes. Educators are also able to search for learning centers and jobs, and manage their activities or classes. Lastly, Students/Parents can search for available classes that interest them, view enrolled classes and pay classes on multiple options.

User Interface Diagram

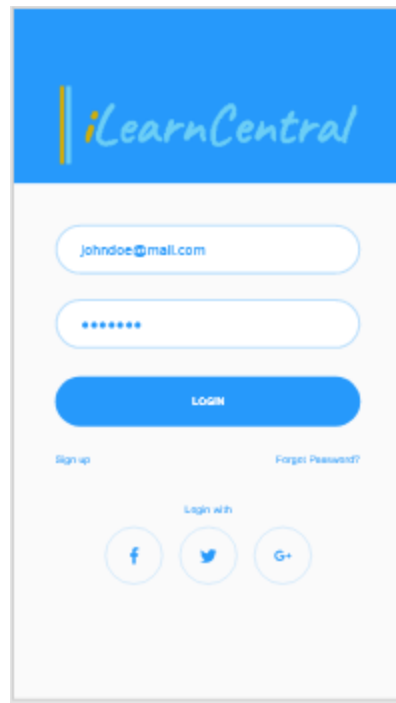


Figure 11: **Login Page**

Figure 11 shows the Login Page. The user can enter their credentials to login. This page also provides links to the registration page and forgot password support page.

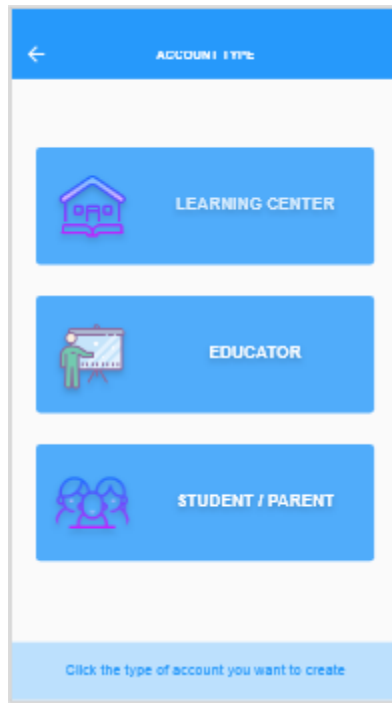


Figure 12: **Account Type Selection Page**

There are three type of users – educator, student/parent and learning center. Users can select the type of account they would like to create.

Figure 13: **Sign up Page**

Figure 13 shows the different pages for each of the user sign up types. The sign up page for learning centers is different from the educator and student/parent because the sign up for learning centers require them to specify the type of learning center that they have. The pages show required information for the registration (e.g. First Name, Middle Name, Last Name, Username and Password). Once filled out, users can click on 'Register' button to complete the registration or to cancel by clicking the 'Cancel' button.

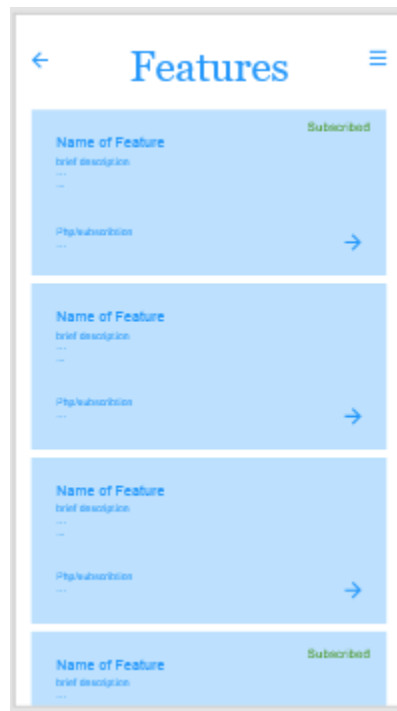


Figure 14: **Feature Subscription Page**

Figure 14 shows the pre-defined features the app offers. After logging in, users select features on this page and install them as an add-on. A feature is either free or subscription-based.

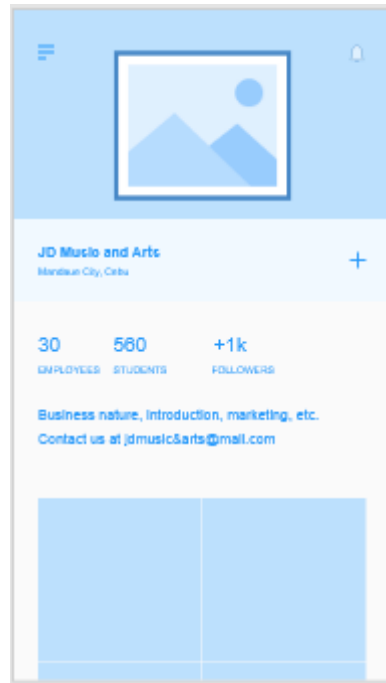


Figure 15: **Learning Center Profile Page**

Figure 15 shows the profile of a learning center. This includes the number of employees, students, followers and contact information.

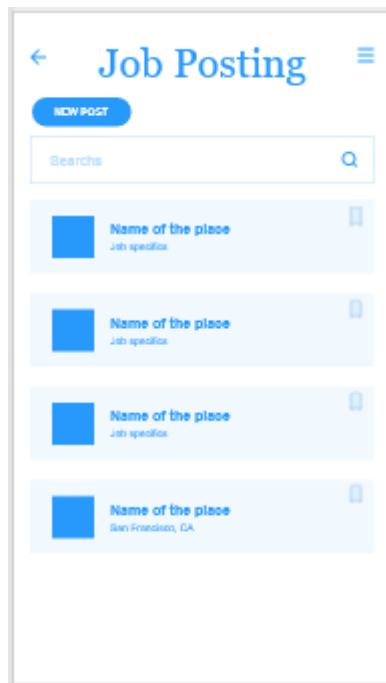


Figure 16: **Job Posting Page**

Figure 16 shows the jobs posted by a learning center. Learning centers also have the option to add new job posting by clicking on the 'New Post' button.

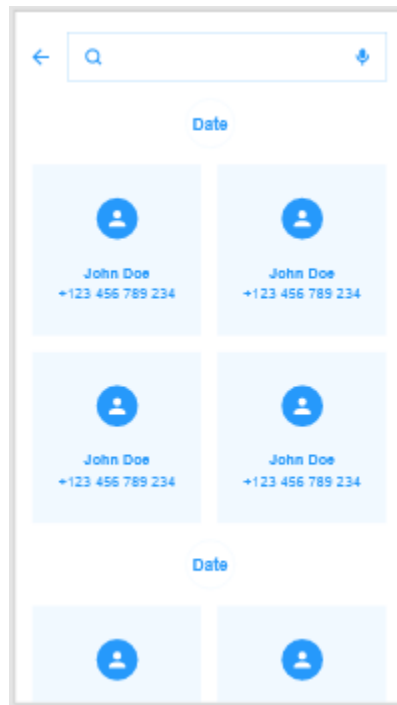


Figure 17: **Applicants List Page**

Figure 17 shows the list of applicants on a posted job. Learning centers have the option to select and hire the educator of their choice.

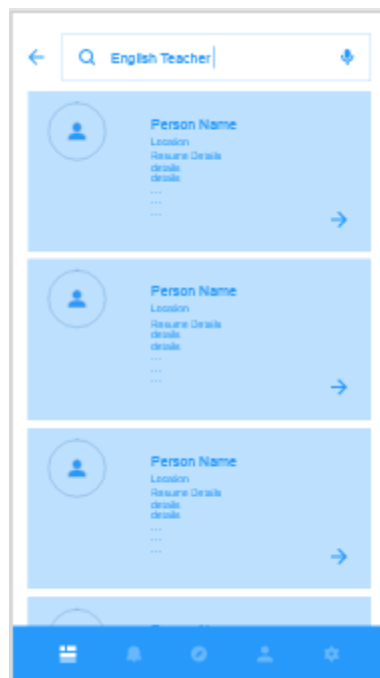


Figure 18: **Potential Hire Search Page**

Figure 18 shows the list of the best applicants determined by the app. Learning centers can search for available educators by use of keywords. Through its Machine Learning, it is able to suggest qualified educators to the posted jobs.

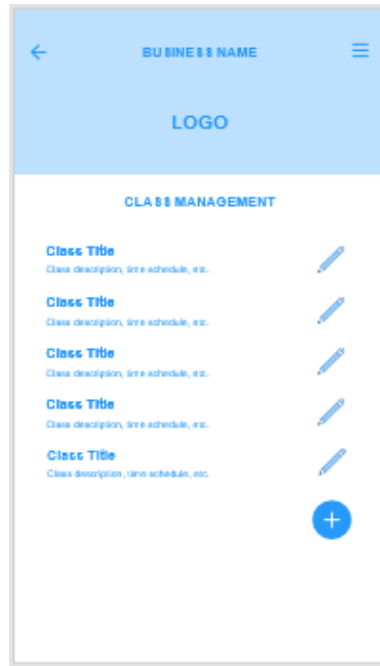


Figure 19: **Class Management Page**

From the Class Management Page, learning centers are able to view all its offered classes. They are also able to add new classes and schedules.

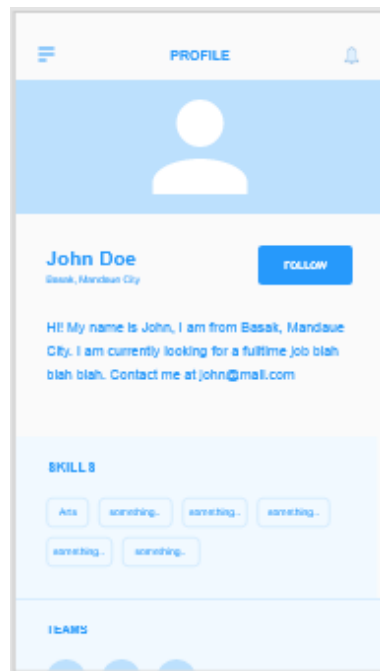


Figure 20: **Educator's Profile Page**

After registration, they can edit/modify their profile by adding a short description of themselves, skills, etc. from the Educator's Profile Page. This page also shows whether or not an educator is currently employed to specific learning center/s.

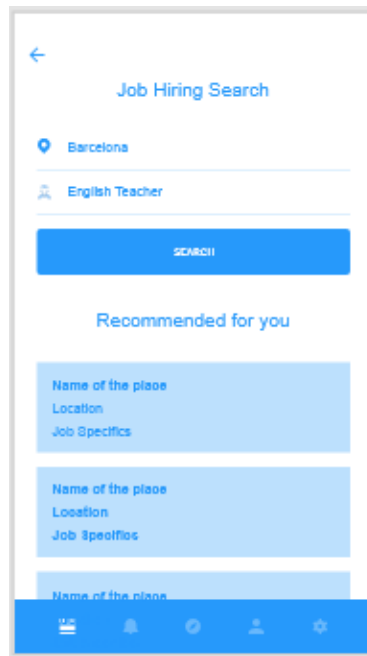


Figure 21: **Job Search Page**

The Job Search Page allows educators to look for posted jobs within their location. They can specify a job search by using keywords. There is a list of recommendations which educators can view and apply.

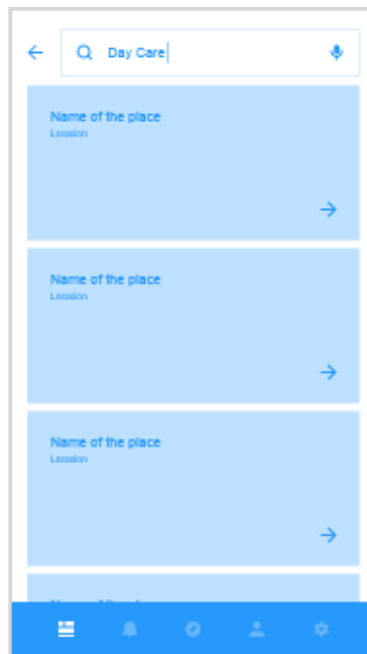


Figure 22: **Learning Center Search Page**

Learning Center Search page allows educators to search for specific type of learning centers.

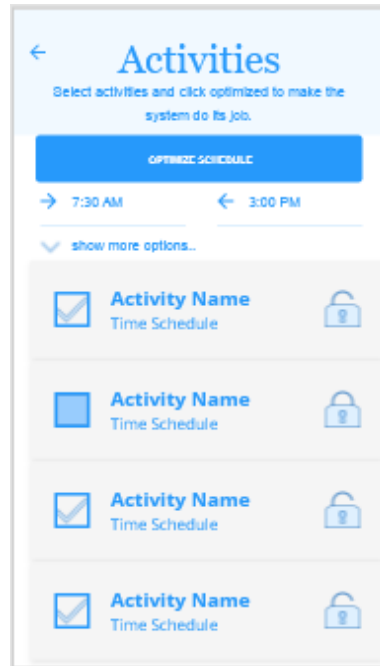


Figure 23: **Activity Management Page**

The Activity Manage Page allows educators to monitor, administer classes and specify activities for the day. This ensures that there is no overlapping of tasks or classes and educators are on top of their schedules.

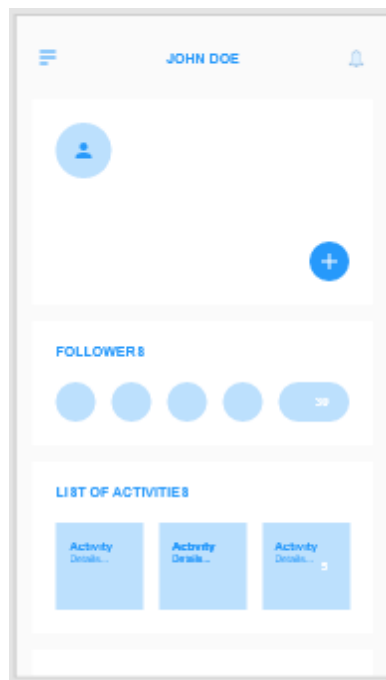


Figure 24: **Student/Parent Profile Page**

The Student/Parent Profile Page mainly shows the classes/activities and basic information about the user.



Figure 25: **Class Browsing Page**

In figure 25, students/parents are able to search for classes and schedules from the Class Browsing Page.

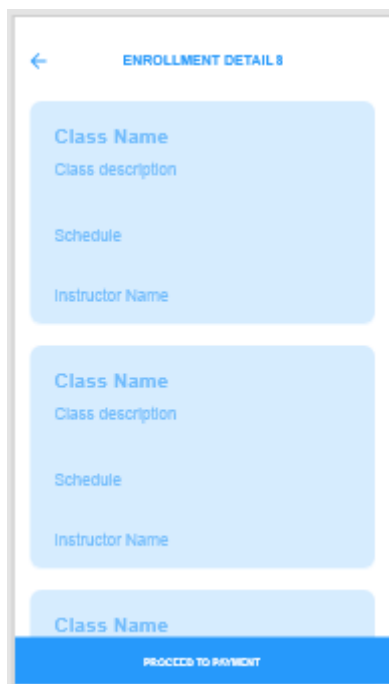


Figure 26: **Enrolment Page**

The Enrolment Page is a digitized form where students process the enrolment of the classes they selected.

Figure 27: **Payment Scheme Page**

The Payment Scheme Page shows the multiple options for students/parents to pay their classes.

Database Design

The database to use is NoSQL due to the advantages it provides with data volume, velocity, and variety. It allows for better adaptability to changes in schema when using agile development. It is scalable and accessible to multitudes of users, which is necessary to a cloud-based system.

This section shows the designed NoSQL schema. The designing process follows the Query Driven Design that optimizes access instead of storage. It is by no means the final structure of the schema as changes may arise during the development process.

A document-oriented database, one of the main categories of NoSQL databases, is a computer program designed to store, retrieve, and handle document-oriented information, also known as semi-structured data. It is inherently a subclass of the key-value store and relies on an internal structure in the document to extract metadata that the database engine uses for further

optimization. The current list of features in the documents presented in this section are basic details and more can be added or altered depending on the progress during development phase.

Table 5

USER DOCUMENT

User	
PK	username
	password
	emailAddress
	accountType
	securityQuestions []
	question
	answer
	accountStatus

Table 5 is the document database design for all user accounts. The collection of users is solely for account management. Depending on the type of account type, the system proceeds differently. The security questions are the means to provide validation in the event of resetting or retrieving forgotten passwords.

Table 6

LEARNING CENTER DOCUMENT

LearningCenter	
PK	centerID
	accounts []
FK	username
	accessLevel
	status
	businessName
	serviceType
	businessAddress
	buildingNo
	buildingName
	streetName
	subdivision
	barangay
	district
	city

	province
	country
	zipCode
	contactEmail
	contactNumber []
	companyWebsite
	operatingDays []
	openingTime
	closingTime
	coursesOffered []
	subscriptionType
	subscriptionEndDate

Table 6 is the document database design for learning center entities. It records the information about learning centers, including data on identity, operating hours, and subscription to the system. The address is necessary to have segmented documentation for easier processing by the recommendation system in the hiring module.

Table 7

EDUCATOR DOCUMENT

Educator	
PK	educatorID
FK	username
	name
	firstName
	middleName
	lastName
	extension
	birthday
	employmentStatus
FK	centerID
	position
	address []
	houseNo
	streetName
	subdivision
	barangay
	district
	city
	province

	country
	zipCode
	currentAddress
	email
	phoneNo
	gender
	maritalStatus
	religion
	citizenship

Table 7 is the document database design for educator entities. It holds the primary information of an educator and represents both employed or job-seeking educators. The employment status and accompanying centerID determines the state of an educator.

Table 8

RESUME DOCUMENT

Resume	
PK	resumeID
FK	educatorID
	careerObjective
	educationalHistory []
	educationLevel
	schoolName
	schoolAddress
	course
	major
	yearStart
	yearEnd
	graduated
	employmentHistory []
	companyName
	companyAddress
	position
	dateStart
	dateEnd
	skills []
	qualities []
	interests []
	awards []
	references []

	referenceName
	affiliation
	position
	contactInfo

Table 8 is the document database design for resume entries. It represents the accompanying resume of an educator account and provides the usual information about a job seeker.

Table 9

STUDENT DOCUMENT

Student	
PK	studentID
FK	username
	name
	firstName
	middleName
	lastName
	extension
	birthday
	address []
	houseNo
	streetName
	subdivision
	barangay
	district
	city
	province
	country
	zipCode
	currentAddress
	email
	phoneNo
	gender
	maritalStatus
	religion
	citizenship
FK	centerID
	enrolmentStatus
	enrolmentHistory []

Table 9 is the document database design for student entities. Parents and students get one account in our system as they do not have a difference in functionalities directed to them. The expectation is for parents to handle the account for minor students. The document also contains the enrolment history of the student.

Table 10

JOB VACANCY DOCUMENT

JobVacancy	
PK	vacancyID
FK	centerID
	status
	position
	jobDescription
	jobType
	educationalRequirements
	educationalLevel
	degrees []
	majors []
	minimumUnits
	qualifications []
	skills []
	incentives []
	responsibilities []
	requirements []
	applicationMethod []

Table 10 is the document database design for job vacancy events. The job vacancy has to be made by a learning center. It has data on the position to be filled and all pertinent information required to qualify a job-seeker to the job.

Table 11

JOB APPLICATION DOCUMENT

Job Application	
PK	jobApplicationID
FK	educatorID
FK	vacancyID
	applicationDate
	applicationStatus
	preferredMethod
	message

Table 11 is the document database design for job application events. A job application happens when a job seeker applies for an available job vacancy. The learning center receives a list of recommended applicants as well as job-seekers who manually applied.

Table 12

COURSE DOCUMENT

Course	
PK	courseID
FK	centerID
	courseName
	courseDescription
	tuition

Table 12 is the document database design for course entities. The courses are services offered by a learning center and the basis for enrolment and classes.

Table 13

ENROLMENT DOCUMENT

Enrolment	
PK	enrolmentID
FK	centerID
FK	studentID
	enrolmentDate
	dateClassStart
	dateClassEnds
	noOfHours
	enrolmentStatus

Table 13 is the document database design for enrolment events. Details of an enrolment process are stored here. Information about the learning center and student involved retrieves from their document store via foreign keys.

Table 14

PAYMENT DOCUMENT

Payment	
PK	paymentID
FK	enrolmentID

	tuition
	additionalFees
	balance
	payments []
	paymentDate
	amount
	paymentMethod
	validated
	status

Table 14 is the document database design for a payment plan. An entry of the payment document is a counterpart of an enrolment. It records the progress of payments made, be it one-time full payment or each staggering pay. The record also contains the details of the fees needed.

Table 15

CLASS SESSION DOCUMENT

ClassSession	
PK	classSessionID
FK	courseID
FK	enrolmentID
FK	educatorID
	date
	timeStart
	timeEnd
	roomNo

Table 15 is the document database design for a class session. Class sessions contain details of meetups between students and educators. Learning centers are tasked to set up the classes.

Table 16

SCHEDULE REQUEST DOCUMENT

ScheduleRequest	
PK	scheduleRequestID
	restrictionType
FK	educatorID
FK	studentID
FK	centerID
FK	classSessionID

	scheduleDate
	timeStart
	timeEnd

Table 16 is the document database design for schedule requests. The requests are days and times a student or educator scheduled to open or restrict and help the scheduling module determine when to place classes.

Table 17

LESSON PLAN DOCUMENT

LessonPlan	
PK	lessonID
FK	courseID
	topic
	overview
	objective []
	materials []
	activities []
	procedures []

Table 17 is the document database design for lesson plans. It contains the different sections in building lesson plans. An educator may add multiple instances of each part. Lesson plans are reusable and shareable across educators within the learning center.

Table 18

STUDENT RECORD DOCUMENT

StudentRecord	
PK	studentRecordID
FK	enrolmentID
	lessonPlansCovered []
	classSession []
FK	classSessionID
	remarks
	studentScores []
	testTitle
	score
	perfectscore
	testDate

Table 18 is the document database design for student records. It means to keep track of student progress and data. It links to lesson plans and histories of sessions attended. It records test scores, if available.

Entity-Relationship Diagram

The entity-relationship diagram graphically demonstrates the interactions of entities, activities, events, and relationships across all modules of the system.

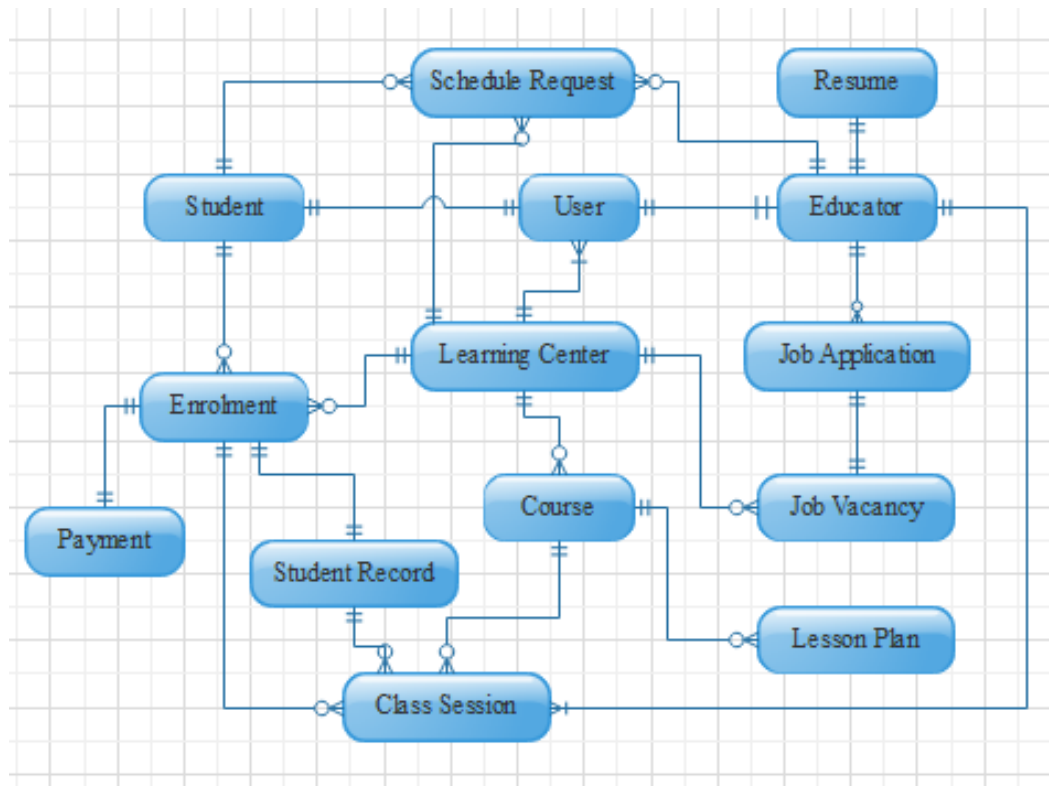


Figure 28: **Entity Relationship Diagram**

Figure 28 shows the entity-relationship diagram of iLearnCentral's database. The user is an entity that holds account management information used for login, password recovery, registration, and verification. Multiple user accounts are within a learning center with different access levels, while one user account per student and educator. The account management module handles user accounts.

The resume, job application, and job vacancy are document stores for profiling and hiring. Each educator is allowed to have one and only one resume. Meanwhile, learning centers can make multiple job vacancies for which educators can apply.

The enrolment module utilizes the course list and creates enrolment entries with payment instances. A single payment instance records the information for an enrolment's payment scheme and progress of installments.

The schedule request is the basis for scheduling classes. Class scheduling depends on the restrictions from students, educators, and learning centers. A student has classes from an enrolled course with many sessions assigned to one or different educators.

The teaching assistance involves the lesson plan and student record documents. The lesson plan segregates by course, while student records by enrolment.

Data Dictionary

The data dictionary describes the types of data, properties and field sizes shown in the tables in the previous section. The tables below are data dictionaries for each table in the database.

Table 19

DATABASE DATA DICTIONARY

Table	Key Name	Data Type	Field Size	Null	Description
User	username	varchar	20	not null	the name the user uses to login
User	password	varchar	20	not null	value used to verify the identity of a user
User	emailAddress	varchar	30	not null	valid email address for account verification
User	accountType	varchar	20	not null	determines the user account designation
User	securityQuestions	list		not null	array of security questions used for validating user identity
User	question	varchar	50	not null	single security question
User	answer	varchar	20	not null	answer to a security question
User	accountStatus	varchar	20	not null	the state of the user if they are validated, etc.
Learning Center	centerID	long	20	not null	primary key for learning center document
Learning Center	accounts	list		not null	array of user accounts in a learning center entry
Learning Center	username	varchar	20	not null	foreign key for the name user uses to login

Learning Center	accessLevel	varchar	10	not null	access levels to determine how a user can use the learning center's features
Learning Center	status	varchar	10	not null	status of a user account in learning center
Learning Center	businessName	varchar	100	not null	complete business name of a learning center
Learning Center	serviceType	varchar	50	not null	type of service provided by learning center
Learning Center	businessAddress				address of business
Learning Center	buildingNo	varchar	10	null	building number part of the address
Learning Center	buildingName	varchar	20	null	building name part of the address
Learning Center	streetName	varchar	20	null	streetName part of the address
Learning Center	subdivision	varchar	20	null	subdivision part of the address
Learning Center	barangay	varchar	20	not null	barangay part of the address
Learning Center	district	varchar	10	null	district part of the address
Learning Center	city	varchar	20	not null	city part of the address
Learning Center	province	varchar	20	not null	province part of the address
Learning Center	country	varchar	20	not null	country part of the address
Learning Center	zipCode	int	4	not null	zip code part of the address
Learning Center	contactEmail	varchar	30	not null	official learning center email address
Learning Center	contactNumber	varchar	20	not null	contact numbers for learning center
Learning Center	companyWebsite	varchar	30	null	website to visit and learn more about learning center
Learning Center	operatingDays	list		not null	days the learning center is open
Learning Center	openingTime	time		not null	time the learning center opens
Learning Center	closingTime	time		not null	time the learning center closes
Learning Center	coursesOffered	list			list of courses offered by the learning center
Learning Center	subscriptionType	varchar	10	not null	determines the current subscription
Learning Center	subscriptionEndDate	date		null	date when a subscription ends and reverts to limited

Educator	educatorID	long	20	not null	primary key for educator
Educator	username	varchar	20	not null	foreign key for name of user used to log in
Educator	name				name of educator
Educator	firstName	varchar	50	not null	first name of person
Educator	middleName	varchar	20	null	middle name of person
Educator	lastName	varchar	20	not null	last name of person
Educator	extension	varchar	10	null	extensions to name such as Sr., Jr., III, IV, etc.
Educator	birthday	date		not null	birthdate of educator
Educator	address	list			addresses of an educator
Educator	houseNo	int	10	null	house number part of the address
Educator	streetName	varchar	20	null	street number part of the address
Educator	subdivision	varchar	20	null	subdivision part of the address
Educator	district	varchar	10	null	district part of the address
Educator	city	varchar	20	not null	city part of the address
Educator	province	varchar	20	not null	province part of the address
Educator	country	varchar	20	not null	country part of the address
Educator	zipCode	int	4	not null	zip code part of the address
Educator	currentAddress	boolean		not null	tag determining if the address is the current one
Educator	email	varchar	30	not null	email address of educator
Educator	phoneNo	varchar	15	not null	contact no of educator
Educator	gender	char	1	not null	gender of educator (F, M)
Educator	maritalStatus	varchar	10	not null	marital status of an educator
Educator	religion	varchar	30	null	religion of the educator
Educator	citizenship	varchar	30	null	citizenship of the educator
Educator	employmentStatus	varchar	10	not null	status of employment in respect to learning centers in the system
Educator	centerID	int	10	null	foreign key for centerID employing this educator
Educator	position	varchar	20	null	position for employed educators in a learning center
Resume	resumeID	long	20	not null	primary key for resume document
Resume	educatorID	long	20	not null	foreign key to distinguish the owner of resume document
Resume	careerObjective	varchar	500	null	short description for career

					objectives in a resume
Resume	educationalHistory	list			list of educational history of an educator
Resume	educationLevel	varchar	20	not null	determines the level of education i.e. elementary, college
Resume	schoolName	varchar	100	not null	school name of previous education
Resume	schoolAddress	varchar	300	not null	address of the school
Resume	course	varchar	100	null	course taken
Resume	major	varchar	50	null	major taken during the course
Resume	yearStart	int	4	not null	starting year in this school
Resume	yearEnd	int	4	not null	ending year in this school
Resume	graduated	boolean		not null	true if graduated, false if undergraduate
Resume	employmentHistory	list			list of employment history of an educator
Resume	companyName	varchar	100	not null	name of previous company
Resume	companyAddress	varchar	300	not null	address of previous company
Resume	position	varchar	100	not null	position or job description of previous company
Resume	dateStart	date		not null	date started with previous employment
Resume	dateEnd	date		not null	date ended with previous employment
Resume	skills	list		null	list of skills in a resume
Resume	qualities	list		null	list of qualities in a resume
Resume	interests	list		null	list of interests in a resume
Resume	awards	list		null	list of awards in a resume
Resume	references	list		null	list of references for individual
Resume	referenceName	varchar	50	not null	name of reference
Resume	affiliation	varchar	100	not null	company of the reference
Resume	position	varchar	50	not null	position of the reference in their company
Resume	contactInfo	varchar	30	not null	contact information of the reference
Student	studentID	long	20	not null	primary key for the student document
Student	username	varchar	20	not null	foreign key for name of user used to log in
Student	name				name of student
Student	firstName	varchar	50	not null	first name of person
Student	middleName	varchar	20	null	middle name of person

Student	lastName	varchar	20	not null	last name of person
Student	extension	varchar	10	null	extensions to name such as Sr., Jr., III, IV, etc.
Student	birthday	date		not null	birthdate of educator
Student	address	list			addresses of an educator
Student	houseNo	int	10	null	house number part of the address
Student	streetName	varchar	20	null	street number part of the address
Student	subdivision	varchar	20	null	subdivision part of the address
Student	district	varchar	10	null	district part of the address
Student	city	varchar	20	not null	city part of the address
Student	province	varchar	20	not null	province part of the address
Student	country	varchar	20	not null	country part of the address
Student	zipCode	int	4	not null	zip code part of the address
Student	currentAddress	boolean		not null	tag determining if the address is the current one
Student	email	varchar	30	not null	email address of educator
Student	phoneNo	varchar	15	not null	contact no of educator
Student	gender	char	1	not null	gender of educator (F, M)
Student	maritalStatus	varchar	10	not null	marital status of an educator
Student	religion	varchar	30	null	religion of the educator
Student	citizenship	varchar	30	null	citizenship of the educator
Student	centerID	int	10	null	centerID for the current learning center enrolled in
Student	enrolmentStatus	varchar	10	null	status of enrolment
Student	enrolmentHistory	list			list of enrolmentIDs, foreign key, of instances of enrolment made by the student
Job vacancy	vacancyID	long	20	not null	primary key for job vacancy entries
Job vacancy	centerID	long	20	not null	foreign key for Learning center creator of job vacancy
Job vacancy	status	varchar	10	not null	status of the job vacancy i.e. active, cancelled, filled
Job vacancy	position	varchar	30	not null	position to be filled
Job vacancy	jobDescription	varchar	400	null	description of the job position
Job vacancy	jobType	varchar	25	not null	type of job i.e. full-time, part-time, full-time or part-time

Job vacancy	educationalRequirements	list			requirements based on educational attainment
Job vacancy	educationalLevel	varchar	200	not null	educational attainment needed i.e. high school graduate, college level
Job vacancy	degrees	list		null	degrees earn from school i.e. bachelor of Secondary Education
Job vacancy	majors	list		null	major taken during from the degrees
Job vacancy	minimumUnits	int		null	minimum number of units required
Job vacancy	qualifications	list		not null	list of qualifications needed
Job vacancy	skills	list		null	list of skills needed
Job vacancy	incentives	list		null	list possible incentives to entice applicants
Job vacancy	responsibilities	list		null	list of possible responsibilities
Job vacancy	requirements	list		null	list of what requirements applicants need to give
Job vacancy	applicationMethod	varchar		null	list of ways to apply
Jobapplication	jobApplicationID	long	20	not null	primary key for job application
Jobapplication	educatorID	long	20	not null	foreign key to the educator making the job application
Jobapplication	vacancyID	long	20	not null	foreign key for the vacancy applied for
Jobapplication	applicationDate	date		not null	date the job was applied to
Jobapplication	applicationStatus	varchar		not null	status of the application i.e. pending, accepted, rejected
Jobapplication	preferredMethod	varchar		null	what way the application was done i.e. walk-in
Jobapplication	message	varchar	1000 0	null	optional message to the learning center
Course	courseID	long	20	not null	primary key for the course
Course	centerID	long	20	not null	foreign key for the center offering the course
Course	courseName	varchar	100	not null	name of course or class offered
Course	courseDescription	varchar	500	not null	description of the course or class offered
Course	courseType	varchar	30	null	if any, the course type
Course	tuition	float		null	tuition amount for a course
Enrolment	enrolmentID	long	20	not null	primary key for enrolment
Enrolment	centerID	long	20	not null	foreign key to which center

Enrolment	studentID	long	20	not null	foreign key to which student
Enrolment	courseID	long	20	not null	foreign key to course enrolled
Enrolment	enrolmentDate	date		not null	date enrolment occurred
Enrolment	dateClassStart	date		null	date for start of classes
Enrolment	dateClassEnds	date		null	date for end of classes
Enrolment	noOfHours	int	5	null	number of hours for the course
Enrolment	enrolmentStatus	varchar	20	not null	status of the enrolment
Payment	paymentID	long	20	not null	primary key for payment
Payment	enrolmentID	long	20	not null	foreign key for enrolment
Payment	tuition	float		not null	tuition amount
Payment	additionalFees	float		null	amount of additional fees
Payment	balance	float		not null	current balance
Payment	payments	list		null	list of payments made
Payment	paymentDate	date		not null	date a payment is made
Payment	amount	float		not null	amount, partial or full for payment
Payment	paymentMethod	varchar	40	not null	method the payment is made
Payment	validated	boolean		not null	validation for payment
Payment	status	varchar	20	not null	status of payment, complete or with balance
Class session	classSessionID	long	20	not null	primary key for the class instance
Class session	enrolmentID	long	20	not null	foreign key of the enrolment basis of the class
Class session	educatorID	long	20	null	educator assigned to the class
Class session	date	date		not null	the date of the class
Class session	timeStart	time		not null	the time the class start
Class session	timeEnd	time		not null	the time it should end
Class session	roomNo	varchar		not null	the room number assigned to the class
ScheduleRequest	scheduleRequestID	long		not null	primary key for schedule restriction request
ScheduleRequest	restrictionType	varchar	50	not null	type of restriction i.e. available, restricted
ScheduleRequest	educatorID	long	20	null	foreign key to educator requesting the schedule
ScheduleRequest	studentID	long	20	null	foreign key to student requesting the schedule
ScheduleRequest	centerID	long	20	not null	foreign key to learning center requested to

ScheduleRequest	classSessionID	long	20	null	foreign key for the specific class if necessary
ScheduleRequest	scheduleDate	date		not null	the date a schedule is requested
ScheduleRequest	timeStart	time		null	a possible start time of schedule request
ScheduleRequest	timeEnd	time		null	a possible end time of schedule request
Lesson Plan	lessonID	long	20	not null	primary key for lesson plan
Lesson Plan	courseID	long	20	not null	foreign key for learning center
Lesson Plan	topic	varchar	100	not null	topic of the lesson plan
Lesson Plan	overview	varchar	500	null	short description of the topic to plan for
Lesson Plan	objective	list		null	a list of objectives for the lesson plan
Lesson Plan	materials	list		null	a list of materials for the lesson plan
Lesson Plan	activities	list		null	a list of activities for the lesson plan
Lesson Plan	procedures	list		null	a list of procedures for the lesson plan
StudentRecord	studentRecordID	long	20	not null	primary key for student record
StudentRecord	enrolmentID	long	20	not null	foreign key to enrolment id associated with record
StudentRecord	lessonPlanCovered	list		null	the lesson plans tackled by the student
StudentRecord	classSession	list		null	the class sessions the student showed up to
StudentRecord	classSessionID	long	20	not null	foreign key to the class session ID
StudentRecord	remarks	varchar	500	null	remarks an educator can give to the student
StudentRecord	studentScores	list		null	possible scores for student when tests occur
StudentRecord	testTitle	varchar	200	not null	title for the test
StudentRecord	score	int	20	not null	score the student got
StudentRecord	perfectscore	int	20	not null	perfect score the student can get
StudentRecord	testDate	date		not null	date the score was taken

Table 19 displays the data dictionary of all documents in the database. It contains the description for each detail in the records. For some NoSQL servers, the Varchar data type may be String. To find the primary and foreign keys refer to the database design section.

Network Model

The model of the network shows how the system components communicate via the internet. The diagram shows that the user is able to check and monitor their account through application for possible breaches or errors.

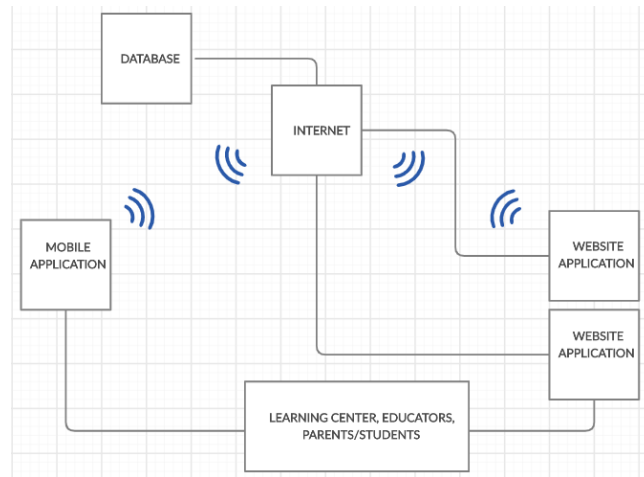


Figure 29: **Network Model**

Figure 29 shows the network model of the system. Internet is used for both web and mobile app to interact with the database.

Network Topology

The network topology illustrates how the system's component work in conjunction with the use of internet connection to access the user's access database.

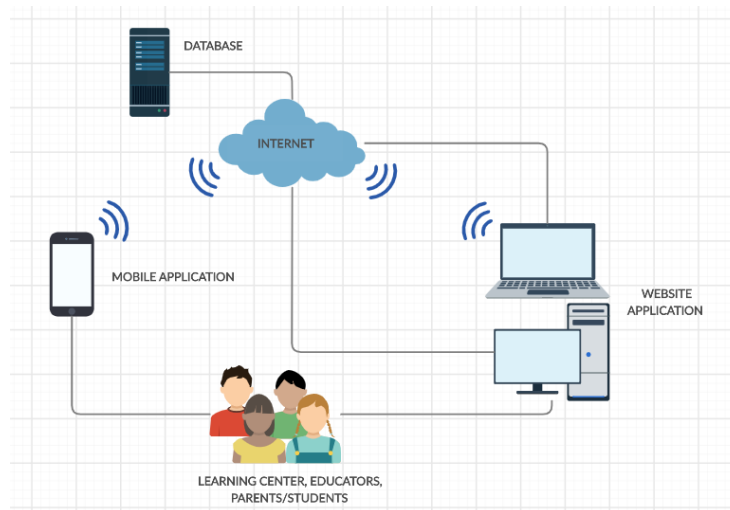


Figure 30: **Network Topology**

Figure 30 shows the network topology of the system. As shown the user can use both web and mobile app with the help of the internet. They can manage classes, check schedules, post and search jobs, etc.

Development/Construction/Build Phase

The Development Phase marks the end of the initial process segment and marks the beginning of development. This phase is intended to turn the prototyped system design in the Design Phase into a working system that meets all defined system requirements. Two elements are required to complete this phase successfully: 1) a complete set of design specifications and 2) proper processes, standards and tools.

Technology Stack Diagram

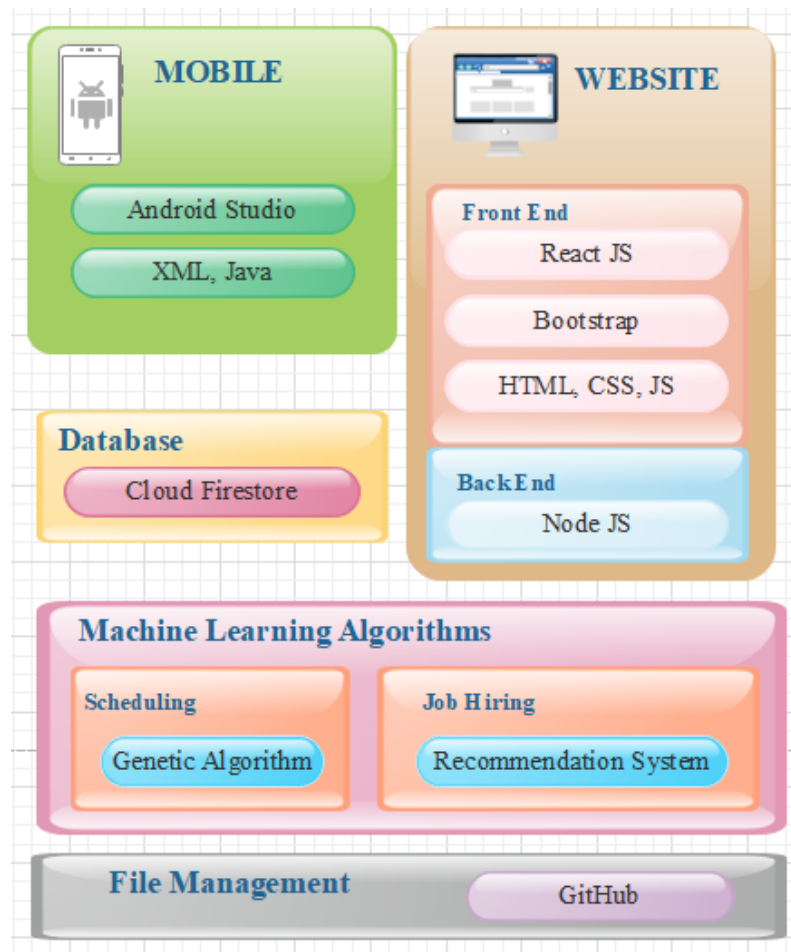


Figure 31: Technology Stack Diagram

Figure 31 shows the technology stack diagram representing the different technologies the project uses and the purpose for each specific language.

Android Studio is an integrated development environment for the Android operating system. It was built on JetBrains' IntelliJ IDEA software and designed for android development. It comprises both frontend and backend development by using XML and java.

XML, meaning eXtensible Markup Language, is a markup language built as a standard way to encode data in internet-based applications. Android uses it in creating layouts and components as Front End for typical applications.

Java is one of the languages used in android development. Java's mobile version is called Java ME. Many smartphones and tablets support it. The Java Platform Micro Edition (Java ME) provides a flexible, secure environment for building and running applications that target embedded and mobile devices. Java ME addresses the challenge of running applications on devices that are low on memory, display, and power available.

ReactJs is a JavaScript library that is declarative, powerful and scalable to create user interfaces. This allows complex UIs to be constructed from small and isolated pieces of code called "components."

Bootstrap is a free and open-source front end development platform for website and web app construction. The architecture for Bootstrap is based on HTML, CSS, and JavaScript (JS) to promote the development of responsive, first mobile sites and apps.

HTML, or HyperText Markup Language, is the standard markup language for creating Web pages. It describes the structure of a Web page. Consisting of a series of elements or tags, it tells the browser how to display content.

CSS, short for Cascading Style Sheets, a new feature introduced to HTML that provides more control over how pages present to both website developers and users.

JavaScript is a scripting language on the client-side. It means that the web browser of the client interprets the source code instead of the webserver. JavaScript functions can run without interacting with the server after a web page loads.

Node.js (Node) is an open-source framework for the server-side execution of JavaScript code. Node is useful for developing applications requiring a persistent connection between the browser and the server and is often used for real-time applications such as chat, news feeds, and web push notifications.

Cloud Firestore is a repository of NoSQL documents designed for automatic scaling, high performance, and ease of application development.

Genetic Algorithm is a search heuristic based on Charles Darwin's theory of natural evolution. The algorithm reflects the natural selection process in which the most suitable individuals are selected for reproduction to produce the next-generation offspring. It consists of five phases—initial population, fitness function, selection, crossover, and mutation.

Recommendation system is a group of machine learning algorithms that strives to predict user preferences and make suggestions that clients would be interested in. It has two approaches to making recommendations—collaborative filtering and content filtering. Collaborative filtering involves comparing the behavior of similar groups to predict what a user, with likely behaviors, would want. Meanwhile, content filtering is based on a description of the item and a profile of the user's preferences.

GitHub is a system used to store a project's source code and record any modifications to that code in its entire history. It allows developers to work more efficiently on a project by providing resources from different developers to manage potentially conflicting changes.

Software Specification

The software specification describes the functional requirements of the study. It includes the programming language, platform for development, management of the database, and machine learning algorithms.

The mobile development uses Android Studio IDE with Java being the back end programming language, and XML for front end builds. The mobile application is for Android devices. The development uses minimum API Level 21 to run with devices Android 5.0 Lollipop and higher. The researchers decided with the minimum API based on the worldwide Android version distribution, according to Holst (2019) and Protalinski (2019), where roughly 90% of devices running in Android have versions 5.0 and higher.

The website or web app development involves the use of Node Js for backend support. For the frontend, React js is the primary framework to create the components with Bootstrap providing design beautification. HTML, CSS, and Javascript are additional languages to use when necessitated. Sublime IDE is the preferred environment used to code the web app. However, collaborators may use other applications suitable for the purpose.

Genetic algorithm is the preferred machine learning algorithm to use for scheduling classes. Making of class schedules are NP-hard problems and does not have a definite correct answer, only an optimal one. The heuristic approach is usually enough for simple cases but with the complexity of the system. It is decided to go with a Genetic Algorithm for a better solution.

The hiring module makes use of Recommendation systems to efficiently suggest a list of qualified job seekers to a learning center with job vacancies and a list of job vacancies to a job seeker. Content-filtering is the initial approach to the small dataset until such time when collaborative filtering can add to the efficiency of the recommendations.

Cloud Firestore is the database of choice to support the project. Both mobile and web application connects to Firestore for all data. GitHub supports the collaboration of the members and allows them to code concurrently for more efficient and time-conscious development.

Program Specifications

Program specifications contain the list of algorithms needed for the system.

Table 20

SOFTWARE LIST OF MODULES

Programmer/s	Modules	Learning Center	Educator	Parent or Student
Jephunneh Rhea Shane Cristian	Account Management			
	1. Registration	*	*	*
	2. Authentication	*	*	*
	3. Login	*	*	*
	4. Profiling	*	*	
No. of Points (<i>1 point per module per user</i>)		1	1	1
Jephunneh Rhea Shane Cristian	Hiring Module			
	1. Hiring Profile/Resume		*	
	2. Job Searching		*	
	3. Job Posting	*		
	4. Job Suggestion		*	
	5. Hire Suggestion	*		
	6. Hiring	*		
No. of Points (<i>1 point per module per user</i>)		1	1	0
Jephunneh	Enrollment Module			

Rhea Shane Cristian	1. Input/Add Course Details	*		
	2. Search/Display Course List	*	*	*
	3. Course Selection			*
	4. Fee Calculation			*
	5. Enrolment Details and Processes			*
	6. Payment Scheme Selection			*
	7. Payment			*
	8. Record Payment	*		*
No. of Points (<i>1 point per module per user</i>)		1	1	1
Jephunneh Rhea Shane Cristian	Scheduling Module			
	1. Input Class Details	*		
	2. Update Class Details	*		
	3. Input Schedules	*		
	4. Schedule Request		*	*
	5. Update Schedules	*		
	6. Generate Calendar of Activities	*	*	*
	7. Notification of Changes	*	*	*
No. of Points (<i>1 point per module per user</i>)		1	1	1
Jephunneh Rhea Shane Cristian	Teaching Assistance Module			
	1. Retrieve Class Details		*	
	2. Suggest Daily Lesson Plan		*	
	3. Keep Student Records		*	
	4. Track Student Progress		*	
No. of Points (<i>1 point per module per user</i>)		0	1	0
Number of Modules per User (<i>equals total no. of points per user</i>)		4	5	3
Total Number of Modules		12		

Table 20 shows the comparison of the access level of each type of account. The table shows that multiple types of accounts or a specific type of account can access a module. It also shows the programmer/s assigned to develop per module.

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CURRICULUM VITAE

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CONTACT NUMBER : 09120752272



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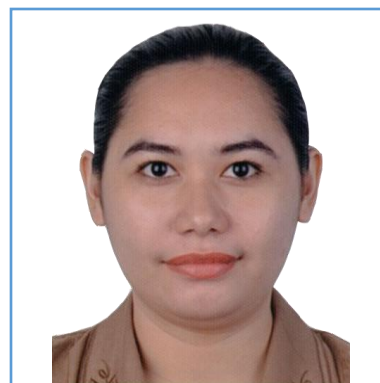
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School Year 1999 – 2005

Appendix A

Working Title Form



University of Cebu
College of Computer Studies
Cebu City

Research Working Title Approval Form

Name of Proponents:

1. Jephunneh C. Mabini	2. Rhea Shane M. Chiong
3. Cristian G. Paragoso	4.
5.	6.

Proposed Research Title:

iLearnCentral: A Cloud-Based Learning Center Platform with Mobile Technology

A good title has several characteristics:

1. Creates a positive impression and stimulates reader interest
2. Is retrievable in standard indexes and abstracts using appropriate key words [check applicable thesauri and classification schemes]
3. Uses current nomenclature of the field
4. Indicates subject and scope with some accuracy
5. Identifies key variables, both dependent and independent
6. Suggests a relationship between variables which supports the major hypothesis
7. Is limited to 15 to 20 substantive words
8. Does not include "study of", "analysis of" or similar constructions so that every word is absolutely necessary

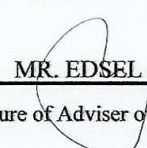
Date: 9/23/19Date: 9/23/19

Submitted by:

Noted and Approved by:


JEPHUNNEH C. MABINI


(Signature of Leader over printed name)


MR. EDSSEL PARAY

(Signature of Adviser over printed name)

Appendix B

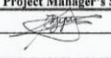
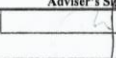
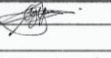
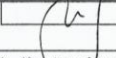

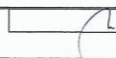

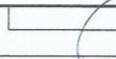
Consultation Log Form



University of Cebu
College of Computer Studies
Cebu City

Capstone 41 (Capstone Project 1) Consultation Logs Form

Capstone Project Title:	iLearnCentral: A Cloud-Based Learning Center Platform with Mobile Technology		
Name of Proponents:	Jephunneh C. Mabini Rhea Shane M. Chiong		
	Cristian G. Paragoso		
Group Name:	iMPaCt		

Consultations	Date and Time of Consultation	Project Manager's Signature	Adviser's Signature
1st Consultation should be within:	9/27/19 4:30 PM		
Chapter 1 must be completely delivered for adviser's evaluation	Remarks: The Objective of the Study needs additional details, appropriate terms, and rearrangement of the sub-objectives in chronological order. Use less-subjective terms in the Scope and Limitations, and write it in a narrative form. Reorder the Significance of the Study from most significant to least significant, and use less-subjective terms. Needs minor changes to the Flow of the Study, and the Definition of Terms must only include technical terms from the Objective of the Study.		
2nd Consultation should be within:	10/2/19 4:00 PM		
Chapter 1 and 2 must be completely delivered for adviser's evaluation	Remarks: The "Introduction" should focus more on customer segments. Remove "e" in the "Objectives of the Study" and some new minor changes. Remove the introduction in the "Scope and Limitations", remove some words, replace some terms, and transfer a specific limitation the scope of the study. Some terms need to be added to the Significance of the Study and Definition of Terms. Must have at least five Related Literature that are journal-based writings related to the research, and the Related Studies are 3 years below. Both should be arranged from international/national, to local. Comparative Matrix should contain a tabled format of the Related Studies to highlight the differences from the research.		
3rd Consultation should be within:	10/18/19 4:10 PM		
Chapter 1, 2 and 3 must be completely delivered for adviser's evaluation	Remarks: Needs to rephrase the inputs in the Flow of the Study figure. Specify the platform of each related studies in the Comparative Matrix. Specify the tasks, processes, and actions the teams will have on each phase of the Software Methodology. Review the cost structures of the Business Model Canvas.		
4th Consultation should be within:	11/06/19 1:30 PM		
Chapter 1, 2, 3 including initial and final pages must be completely delivered for adviser's evaluation	Remarks: The manuscript is already good. Only minor revisions for the Use Case Diagram and the Network Topology are needed. Also needs to make the Functional Decomposition Diagram to be more detailed.		

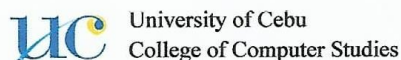
This is to certify that I have been regularly consulted by my advisees; have reviewed their system prototype as well as the required manuscript of the above-stated study. As their adviser, I therefore submit them ready for **Proposal Hearing** as the Chapter 1 through 3 and the pertinent parts of their manuscript are complete.

NOTE: Defense week: Nov. 6-9, 2019

Signed: MR. EDSSEL PARAY
(Signature of Adviser over printed name)

Appendix C

Censor's Certificate



October 24, 2019

CENSOR'S CERTIFICATE

This is to certify that the undersigned has reviewed and went through all the pages of the proposal project study/research manuscript titled: "iLearnCentral: A Cloud-Based Learning Center Platform with Mobile Technology" as against the set of structural rules that govern the composition of *sentences*, *phrases*, and *words* in the English language as well as the technical terms, syntax (format, etc.) and semantics appropriate for the Information and Computing fields.

Signed:

A handwritten signature in blue ink, appearing to read 'Rechie Ople'.

Mr. Rechie Ople

Grammarian

Conforme:

A handwritten signature in blue ink, appearing to read 'Jephunneh C. Mabini'.

Jephunneh C. Mabini

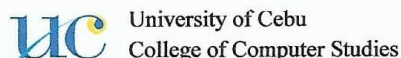
Project Manager

Noted:

A handwritten signature in blue ink, appearing to read 'Edsel Paray'.

Mr. Edsel Paray

Adviser



October 25, 2019

CENSOR'S CERTIFICATE

This is to certify that the undersigned has reviewed and went through all the pages of the proposal project study/research manuscript titled: "iLearnCentral: A Cloud-Based Learning Center Platform with Mobile Technology" as against the set of structural rules that govern the composition of *sentences*, *phrases*, and *words* in the English language as well as the technical terms, syntax (format, etc.) and semantics appropriate for the Information and Computing fields.

Signed:

A handwritten signature in blue ink, appearing to read 'Rechie Ople'.

Mr. Rechie Ople

Grammarian

Conforme:

A handwritten signature in blue ink, appearing to read 'Jephunneh C. Mabini'.

Jephunneh C. Mabini

Project Manager

Noted:

A handwritten signature in blue ink, appearing to read 'Edsel Paray'.

Mr. Edsel Paray

Adviser