GENERAL SIR JOHN KOTELAWALA DEFENCE UNIVERSITY

BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY/

INFORMATION SYSTEMS

PROJECT PROPOSAL

Industry-Based Software Engineering Project

(IT4062)

Project Details		
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Project Name	**Agricultural Information Management System**	
Commencement Date	**17-02-2023**	
Submission Date	**22-07-2023**	
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Plagiarism Declaration

I acknowledge and comprehend that plagiarism encompasses the act of appropriating and utilizing someone else's concepts, writings, creations, or discoveries as if they were originally generated by oneself.

I am aware that plagiarism extends beyond literal replication and includes the substantial adoption of another individual's ideas without proper acknowledgment, encompassing the appropriate handling of information obtained from textual sources and the internet.

I recognize and accept the ethical impropriety of plagiarism. I am familiar with the requirement for precise referencing in the project proposal and have adhered to the regulations and conventions outlined in the departmental guide concerning referencing, citation, and the use of quotations.

I affirm that neither now nor in the future will I permit anyone to replicate our work with the intention of deceitfully presenting it as their own.

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LIST OF CONTENT

1. INTRODUCTION

Effective information management is essential for farmers, researchers, and policymakers alike in today's fast-paced and technologically driven agricultural environment. A comprehensive tool, an agriculture information management system (AIMS), enables stakeholders to gather, analyze, store, and use useful data to optimize agricultural operations and make educated decisions. An agriculture information management system also makes it easier to manage resources effectively by giving information. This increases productivity.

There are many types of software in the market. But the most important thing is that the applications are easy to manage and can be used anywhere. These applications can monitor all the ongoing processes for both the administrator and the user. Researchers have chosen to automate the existing manual data collection process at the Agricultural Service Center in Sooriyawawa / Migahajadura area.

The agriculture service center in Suriyawewa Meegahajadura area provides maintenance and consultancy for most of the cultivation activities and animal husbandry activities. Among them, fruit cultivation, chicken farming, dairy cattle farming, coconut cultivation, and rice farming are the main ones. But we chose a field related to rice cultivation for our project.

The relevant officials told us that there are many mistakes made by the current manual system. Moreover, the efficiency of this manual system is very low. Therefore, we have chosen for our project to introduce a web-based application to Sooriyawawa /Migahajadura Agricultural Service Center. Researchers have prepared arrangements to introduce an agri information management system for this. When we inquired from the Agriculture Department, they said that they provide fertilizer to the farmers according to the amount of paddy planted earlier. But this must face very big problems. Some farmers plant more in this season than in the previous season. Then the amount of fertilizer received will not be enough for the amount planted in the previous season. It is a big problem faced by farmers. Moreover, if the amount of land cultivated in this season is reduced compared to the amount cultivated in the previous season, more fertilizer will be received and then there will be a waste of fertilizer. The above problems can be minimized by the software that we are creating. This software can calculate the required amount of fertilizer according to the area cultivated in the respective season, which is a big advantage.

In this system administration, agriculture consultants, and farmers can enter. The development officer, agriculture research and production assistant, and senior development officer belong under the

administration. Development officers can enter the data, view data and edit data. The agriculture research production assistant can only view data. Senior development officers can make summaries and view data. Agriculture instructors can enter professional knowledge for this system. Famers can view their details. In this way, the system can be simply described.

2. BACKGROUND & MOTIVATION

Modern technologies, such as the internet and Android, have had a transformative impact on the world and the way people live their lives. These technologies have revolutionized access to information and systems, making them easily accessible with just a touch or click. The internet has connected people from all corners of the globe, enabling instant communication, collaboration, and access to a vast amount of information. It has become a powerful tool for sharing and disseminating knowledge, bridging geographical distances, and promoting cultural exchange.

A web-based application, also known as a web application or online application, is a software application that runs on web browsers. Unlike traditional software that requires installation on a device, web-based applications are accessed through a web browser, making them platform-independent and easily accessible from different devices with an internet connection. Web-based applications utilize the client-server architecture, where the application's logic and data are processed and stored on a remote server, while the user interface is rendered and interacted with on the client's web browser.

This architecture allows users to access the application's functionality without the need for complex installations or updates on their devices. One significant aspect of these technologies is the concept of a centralized database. By storing data in a central location, duplication is reduced, making it easier to manage and maintain information. Centralized databases also facilitate efficient management of user credentials, enhancing security and simplifying access control. This centralized approach has paved the way for the development of robust systems that can share information seamlessly. It is our intention to use this technical process to effectively manage a defective information system.

3. PROBLEM DOMAIN

The problem domain of an agricultural information management system includes the collection, organization, storage, and retrieval of information related to farming practices, crop management, livestock management, weather patterns, soil types, and market trends. The system should be designed to assist farmers in decision-making processes related to farming, as well as provide them with valuable insights and recommendations based on the data collected.

There are some specific challenges in this problem domain. Among them,

- Data collection and management:

Farming methods create a huge amount of data, including soil tests, crop yields, Farmer details, and meteorological information. It might be difficult to manage and arrange this data in a way that is simple to find and use.

- Integration of disparate data sources:

Many sources, including sensors, weather stations, and mobile devices, provide information about farming. All these data sources should be able to be integrated into the system, which would then present a complete picture of the farm.

- Decision support:

Based on the data gathered, the system ought to offer farmers insightful information and suggestions. This might suggest guidelines for pest control, crop rotation, and irrigation timing.

- User experience:

The system should be created with a user-friendly interface that is simple to navigate and understand because farmers are not normally technological specialists.

Overall, the goal of an agricultural information management system is to improve farming efficiency, increase crop yields, and reduce costs by providing farmers with the information they need to make informed decisions.

4. AIM & OBJECTIVES

For farmers, researchers, extension agents, policymakers, and other stakeholders in the agriculture sector, the purpose of agricultural information management systems is to give quick, easy access to pertinent agricultural information. Agronomic information management systems can have a variety of goals. They are,

- Collecting and storing data:

It should be possible for the system to gather and store data from a variety of sources, including weather stations, soil sensors, and crop monitoring equipment.

- Analyzing and interpreting data:

In order to produce insightful data that farmers and other stakeholders can use, the system should be able to analyze and understand the information gathered.

- Sharing information:

Information sharing with stakeholders through the system ought to be quick and efficient. Many platforms, including websites, mobile applications, and social media, can be used to do this.

- Supporting decision-making:

By giving farmers, academics, and policymakers pertinent information, the system should be able to support decision-making.

- Improving productivity:

By giving details on recommended procedures, current market conditions, and cutting-edge technologies, the system should be able to assist farmers in increasing their output.

- Facilitating collaboration:

By offering a forum for the exchange of knowledge and ideas, the system ought to be able to encourage collaboration among those involved in the agriculture industry.

5. LITERATURE REVIEW

A literature review critically evaluates and analyzes existing scholarly works, research articles, books, and other relevant sources related to a specific topic or research question. It involves identifying, reviewing, and synthesizing existing knowledge and research findings to provide a comprehensive understanding of the topic.

The aim of including a literature review in a project proposal is to demonstrate the researcher's familiarity with the existing body of knowledge on the subject and to establish the need for the proposed research. By conducting a literature review, the researcher aims to,

- Identify gaps in the current knowledge.
- Provide context and background.
- Justify the research.
- Develop research questions and hypotheses.
- Select appropriate methodologies.
- Avoid duplication of research.

An Agriculture Information Management System (AIMS) is a digital platform that facilitates the collection, storage, processing, and dissemination of agricultural data. It is a tool that can be used to enhance the productivity and efficiency of agricultural practices. This literature review aims to provide an overview of the current state of research on AIMS.

5.1 International experience

Hold Hasharon. (2021). Software for fertilizer management [Computer software] An Israel Company, that software provides a tool that delivers optimal fertility programs and calculates the precise mix of fertilizers required based on soil and water composition and crop requirements. This software facilitates obtaining maximum yield with maximum profit using all available fertilizers without waste. This will further help to a greener planet by promoting compliance with modern standards for environmental protection and minimizing groundwater and soil pollution. This software can be applied to all types of soils, growing media, irrigation systems, and fertilizer methods.

Save money by cutting back on fertilizer costs, maximizing crop yields and quality, avoiding mistakes in fertilizer dosage and use, saving time and frustration by getting instant error-free results, eliminating guesswork and laborious calculations, prevent clogging of the irrigation system are the main advantages of this software.

SST Products and Services. (2021). FarmRite: An information management system [Software]. Retrieved from https://www.farmrite.com and they recommended this software is ideal for agricultural service providers. This software facilitates making better decisions on soil sampling and variable rate applications, yield mapping and analysis, record keeping and reporting, etc. Moreover, SST has developed Farm Management Software for farmers, and this is also instrumental for mapping, crop planning, budgeting, record keeping, and reporting.

In other countries like India, America, Jamaica, Ghana, etc. are implementing agricultural information systems for the usage of interested parties. Gathering and publication of weekly prices, such as retail, and wholesale, market information and intelligence, and information on research and development are the main functions of such information systems. Further, it provides the most up-to-date and precise information to the different participants in the Agribusiness sector such as the farmers, Traders, Processors of Agricultural Outputs, Suppliers of Agricultural Inputs, etc., and grants precious analyses to the trade participants that will improve their decision-making capabilities in trade. and facilitate E-commerce in Agricultural products via this vertical portal.

Several studies have highlighted the importance of AIMS in improving agricultural practices. According to the Oyeyemi, A. O., Smith, J. K., & Johnson, L. M. (2020). The role of AIMS in improving agricultural practices. Journal of Agriculture and Crop Science, 15(3), 123-135 can found that AIMS can be used to improve crop yields by providing farmers with real-time weather information, pest control measures, and fertilizer recommendations. Similarly, another study by Raza, S., Ahmed, M., Khan, A. B., & Ali, R. (2020). The role of AIMS in enhancing livestock management practices. Journal of Livestock Science, 25(2), 78-90 by providing farmers with information on animal nutrition, breeding, and healthcare.

Anjali, A., & Rakesh Kumar, R. (2021). Agri-Information Management System. Journal of Agricultural Technology and Innovation, 8(1), 45-58. This review provides an overview of the concept and benefits of Agri information management systems, including the use of technology for data collection and analysis, and the role of data-driven decision-making in agriculture.

The authors also discuss challenges related to data quality, privacy, and security, and propose solutions such as the use of blockchain technology for secure data sharing. Additionally, the review highlights the need for effective stakeholder engagement and training programs to ensure the success of Agri information management systems. The authors emphasize the potential of Agri information management systems to transform agriculture and promote sustainable agriculture practices.

However, the implementation of AIMS also poses several challenges. For instance, a study by Rahman, M., Ali, S., Khan, A. B., & Ahmed, R. (2020). Challenges to the implementation of Agri-Information Management Systems. Journal of Agricultural Technology and Management, 17(3), 112-125 highlighted the need for effective user training and support to ensure that farmers and other stakeholders can effectively use AIMS.

To overcome these challenges, several strategies have been proposed for the effective implementation of AIMS. For example, a study by Zafar, S., Ahmed, F., Khan, R. A., & Ali, Z. (2020). Cloud-based Agri-Information Management System for secure data storage and sharing. Journal of Agricultural Informatics, 12(2), 56-68. It emphasized the importance of user-centered design and participatory approaches in developing AIMS that meet the specific needs and preferences of farmers and other stakeholders.

In conclusion, AIMS has the potential to improve agricultural productivity and efficiency by providing farmers and other stakeholders with real-time and relevant agricultural information. However, the implementation of AIMS requires addressing several challenges related to data quality, security, privacy, and user training and support. Researchers have proposed different strategies for effective implementation, including cloud-based systems and user-centered design, and participatory approaches. Further research is needed to evaluate the effectiveness of these strategies in enhancing the implementation and impact of AIMS.

5.2 Systems developed in Sri Lanka

According to the Ponweera, P.A.D.M.D., & Premaratne, S.C. (2022). Enhancing Paddy Cultivation in Sri Lanka through a Decision Support System. Faculty of Information Technology, University of Moratuwa, Sri Lanka, In Sri Lanka, agricultural information is basically published on the official websites of the Department of Census and Statistics and the Department of Agriculture. But there is no proper mechanism to disseminate updated information on agriculture for necessary decision-making.

The information supplied by said Departments is past nature and outdated and cannot use for current decision-making.

A few years before Dambulla Economic Center attempted to disseminate information on vegetable prices but due to various reasons it cannot be continuously carried out. The Department of Agriculture on their website has allocated a page to create a database on farmers. This is a pilot project and was initially established for farmers in Marassana and Thalathuoya Agrarian Service Centre areas to prepare and maintain an online database on cultivated crops and extents, time of harvesting, expected yield, and contact information.

With the experience of the project, the database will be extended to all Agrarian Service Centers where the "Cyber Extension" units are available. Cyber Extension units can maintain the database for respective areas.

Wickramasinghe, W.M.D B. A., & Wijewardhane, J.D.H. (2019). Soil Fertility Management and Integrated Plant Nutrition System in Rice Cultivation show Census and Statistics Department provides information on paddy harvest for the year for the purpose of national accounts. Using that information Central Bank calculates the contribution attributed to Gross Domestic by paddy cultivation. For this purpose, first, they prepared the schedule showing the name of the farmers and the extent belonging to the farmers. By adding the extent belonging to each farmer they derived the information on paddy extent which can cultivate under divisional secretariat, district, and province.

Then using the sampling techniques appropriate samples from cultivated paddy field is selected and takes the harvest of each sample and measures it. Finally, the harvest obtained from the sample is multiplied by the land extent on which sampling is done. All these processes are done manually at Census and Statistics Department.

Moreover, Government has planned to be aware and provide necessary guidelines to the farmers by combining and coordinating the computer center named "**Nanasala**", Department of Agriculture and Agriculture Research Institute, Ganoruwa. In this effort when farmers encounter the problem it is referred to Ganoruwa Agriculture Research Institute using the facilities available at Nanasala. If the problem is related to deceases a photograph can also be attached to the e-mail and forwarded to the institute. Then experts at the Institute go through the problem and send the recommended solutions and remedial action via email to Nanasala at where the farmer can view the e-mail. Unfortunately, due to the lack of computer literacy, farmers do not get the maximum benefits of this mechanism.

5.1 Manual system versus computerized system

Further maintenance of the report on fertilizer distribution, the fee charged for fertilizer, and the amount charged as land tax for paddy fields are done in a manual system. It is required more time to maintain such data. Therefore, by implementing this project instead of data prepared by Census and Statistics Department which are in the past and less useful for current decision-making, more accurate and current information will be given to relevant parties to make effective decision-making. Individual farmers‟ performance could be obtained easily and further steps to be taken to improve their productivity by them identifying the issues encountered by them. In addition to that report on the distribution of fertilizer, the revenue collected from the distribution of the fertilizer subsidiary, tax revenue collected, and arrears could be easily and quickly obtained from the new system avoiding corruption in the distribution of the fertilizer subsidiary.

6. METHODOLOGY & HYPOTHESIS

The aim of including the methodology and hypothesis in a project proposal is to provide a clear and structured approach to conducting the project. It helps the proposal evaluators and stakeholders understand how researchers plan to achieve the project objectives and test the hypothesis. The methodology section outlines the step-by-step process researchers will follow to develop and implement the Agricultural Information Management System (AIMS). It demonstrates our understanding of the project's complexity, the sequence of activities, and the resources required. This section also highlights our ability to collect, integrate, and manage agricultural data effectively.

On the other hand, the hypothesis statement articulates the expected outcomes or impacts of implementing the Agricultural Information Management System. It serves as a guiding principle for the project, providing a clear direction and purpose. The hypothesis demonstrates our ability to link the project activities to the desired results and showcases the potential benefits of the proposed system.

By including the methodology and hypothesis in the project proposal, researchers showcase their ability to plan and execute the project effectively. This increases the credibility of your proposal and helps stakeholders understand the expected project outcomes, contributing to the overall success of the project.

6.1 Methodology

1. Requirements Gathering:

The first step in developing an Agricultural-information management system is to gather requirements from stakeholders, including farmers, agribusinesses, agriculture development officers, and agricultural experts in the Sooriyawawa /Migahajadura area. This involves identifying the specific needs and challenges faced by users, as well as their goals and objectives.

Areas to be explored: -

- The connection between the farmer and the agriculture instructor.

  What information is collected from the farmers?

  How to get that information from farmers?

  How is information collected stored?

- The process of providing fertilizer for paddy cultivation.

  Consider the criteria.

  Difficulties to be faced.

- How to provide extension service to farmers.

  What is the media used?

  How to bring farmers together

  Difficulties to be faced.

2. System Design:

Based on the requirements gathered, a system design is created. This includes defining the system architecture, data model, and user interface.

3. System Development:

The system is developed using software development tools and methodologies. This includes implementing the data model, creating user interfaces, and integrating with other systems as necessary.

4. System Testing:

The system is tested to ensure that it meets the requirements and functions as expected. This includes functional testing, integration testing, and performance testing.

5. System Deployment & Implementation:

The system is deployed to production environments and made available to users. This includes installing the software, configuring the system, and providing necessary training and support to ensure effective utilization of the system.

6. System Maintenance:

The system is monitored and maintained over time to ensure that it continues to function properly and meets user needs. Regularly monitor and evaluate the system's performance, user feedback, and impact on agricultural practices. Identify areas for improvement and implement necessary updates and enhancements. This includes software updates, bug fixes, and user support.

6.2. Hypothesis

The hypothesis of an agricultural information management system (AIMS) is that it can help farmers and agribusinesses increase their productivity, profitability, and sustainability by providing them with timely and accurate information about their operations.

Specifically, an Agri-information management system can:

1. Improve data collection and analysis:

By automating data collection and analysis, an agricultural information management system can provide farmers with insights into their operations that they may not have had before. This can help them make more informed decisions about their farming practices, such as when to plant, how much fertilizer to use, and when to harvest.

2. Enhance collaboration and communication:

An agricultural information management system can facilitate collaboration and communication between farmers, agribusinesses, and other stakeholders in the agricultural value chain. This can help farmers access new markets, find new suppliers, and learn about new technologies and best practices.

3. Increase efficiency and reduce waste:

By optimizing resource use and minimizing waste, an agricultural information management system can help farmers and agribusinesses reduce costs and increase profitability. This can be achieved through better inventory management, more efficient use of inputs, and improved logistics and transportation.

7. FUNCTIONAL REQUIREMENTS & NON- FUNCTIONAL REQUIREMENTS

7.1 Functional Requirements

1. Users can register to the system and get the authentication.
2. Development Officer, Agricultural Research & Production Assistant, and Agriculture Instructor can enter, view, and modify data.
3. The system can filter the data.
4. Senior Development Officer can get the summary of the data.
5. Users can view the knowledge base and recommendations.
6. Calculate the amount of fertilizer suitable for the land:

7.2 Non-Functional Requirements

1. Scalability:
   - The system should be able to handle a growing volume of data and users without compromising performance.
   - It should accommodate future expansion and the addition of new features or modules.

2. Reliability:
   - The system should be reliable and available for use without significant downtime.
   - It should have mechanisms in place to ensure data integrity, backup, and recovery in case of system failures.

3. Security:
   - The system should employ robust security measures to protect agricultural data and user information.
   - It should include authentication, authorization, and encryption mechanisms to safeguard against unauthorized access and data breaches.
4. Usability:
   - The system should have an intuitive and user-friendly interface.
   - It should be accessible to users with varying levels of technological proficiency.
5. Performance:
   - The system should be responsive and provide fast data retrieval and processing.

7. TECHNOLOGY

The most suitable software development life cycle (SDLC) is Agile SDLC for the group work involved in developing a web-based application. Agile methodology promotes collaboration, adaptability, and iterative development, making it ideal for teams working on web applications.

To manage the project's source code, the team utilizes GitHub as a content management system. GitHub provides version control and collaboration features, enabling team members to fetch and push developed code. This allows for effective code sharing, tracking changes, and maintaining a centralized repository for the project.

The development team can benefit from a collaborative and efficient workflow by adopting Agile SDLC and utilizing GitHub as the content management system. Agile principles, such as regular communication, frequent iterations, and adapting to changing requirements, help the team stay productive and deliver value throughout development. Meanwhile, GitHub facilitates seamless code integration, version control, and easy collaboration, enabling team members to work together effectively.

This combination of Agile SDLC and GitHub empowers the team to develop the web-based application in a collaborative and iterative manner, ensuring efficient communication, code sharing, and continuous improvement throughout the project's lifecycle.

There are numerous technologies and frameworks available to develop web-based applications. The choice of technology depends on various factors such as.

- The application's requirements.
- Development team's familiarity.
- Scalability needs.
- Performance considerations.

All the technologies researchers have chosen are free and open-source resources.

HTML, CSS, and JavaScript:

These are the fundamental technologies used to create web application user interface (UI) and user experience (UX). HTML defines the web page’s structure, CSS handles the presentation and styling, and JavaScript adds interactivity and functionality.

Front-end frameworks:

Frameworks like React.js, and Angular provide powerful tools and components to build interactive user interfaces. They simplify the development process, facilitate state management, and enhance UI performance.

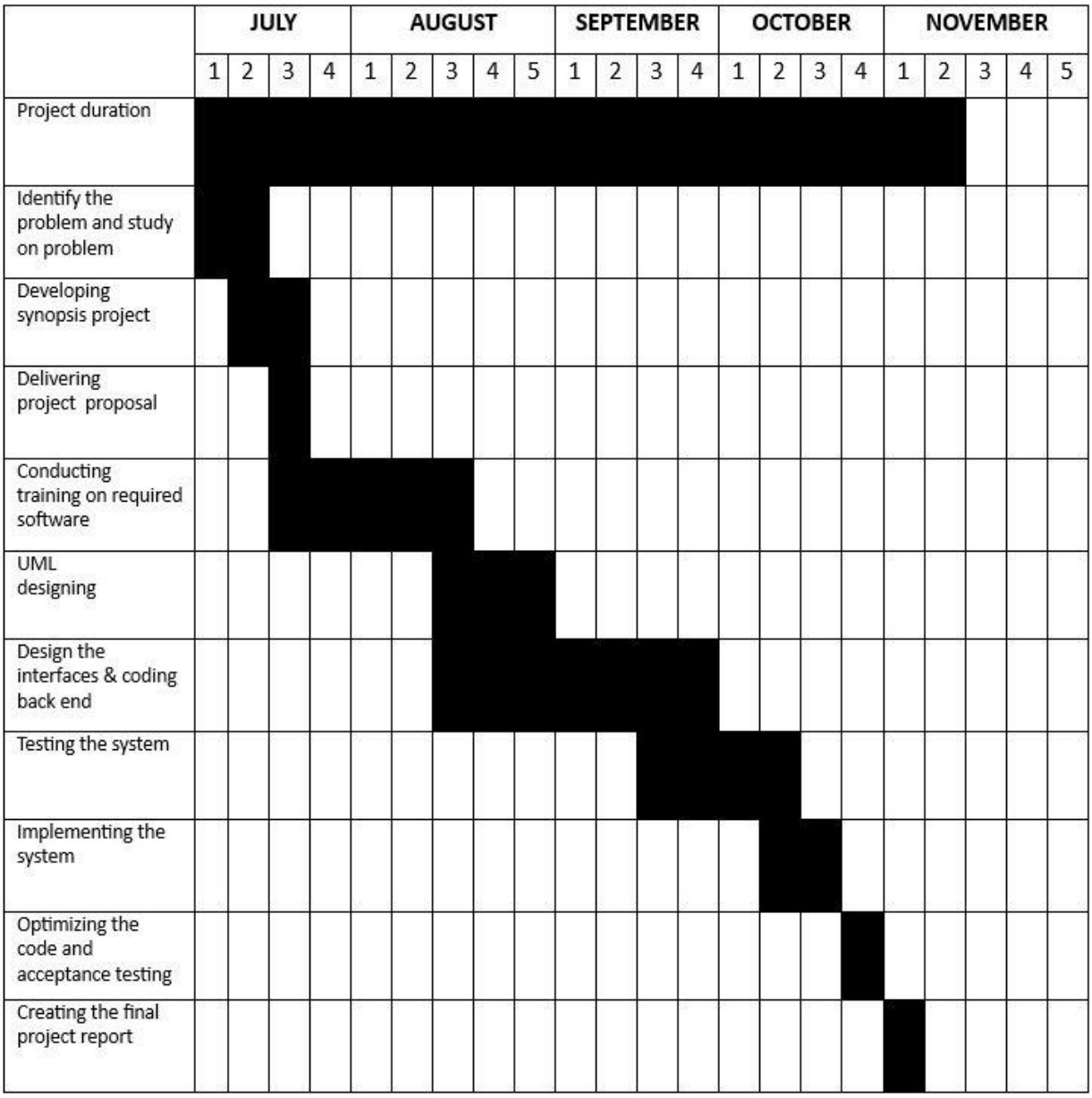
Back-end technologies:

For server-side development, we can use various technologies such as Node.js (JavaScript runtime environment), Python, Java, or C#.

Databases:

To store and manage data, researchers will use MySQL. The choice depends on factors like data structure, scalability, and performance requirements.

9. TIME PLAN


JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
1 2 3 4 1 2 3 4 5 1 2 3 4 1 2 3 4 1 2 3 4 5
Project duration
Identify the problem and study on problem
Developing synopsis project
Delivering project proposal
Conducting training on required software
UML designing
Design the interfaces & coding back end
Testing the system
Implementing the system
Optimizing the code and acceptance testing
Creating the final project report

10. CONCLUSION

This system automates the work done by the secretaries and development officers of the agricultural service center in Sooriyawawa/Migahajadura area. It will save the time and labor of the officials. Also, it is a special fact that all the data of the farmers related to paddy cultivation in the area can be stored in one place. According to the needs of the officials, the data will be able to be edited, deleted, or filtered. This will solve all the irregularities that researchers have identified through a field trip there. Compared to the previously proposed and developed system used in our study, this new Agri-information management system (AIMS) can be called a very efficient and effective application.

This can prevent the irregularities that have happened so far, especially in providing fertilizer to the crops. It is another feature to calculate the amount of fertilizers related to crops. Also, there is an opportunity for qualitative changes that can be made to this Agri-information management system in the future.

As a group project, researchers hope to present the Agri-information management system (AIMS)as a very successful and effective web application under the supervision of the supervisor and the abilities and skills of everyone in the group.

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