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BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY/
INFORMATION SYSTEMS

INTERIM REPORT

Industry-Based Software Engineering Project
(IT4062)

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Academic Questions

1. User Interface and Experience (UI/UX) Design

- What were the key principles and considerations in designing the user interface for the Agriculture Information Management System?
- How did the user-centric design contribute to the system's usability and effectiveness in addressing the needs of different stakeholders (development officers, agriculture instructors, farmers)?

2. Requirement Gathering and Analysis

- What methodologies and techniques were employed during the requirement-gathering phase to understand the challenges faced by the agriculture service center?
- How were the identified requirements prioritized and translated into system features and functionalities?

3. Customized Web Application Development

- Can we elaborate on the technologies (PHP, HTML, CSS, JavaScript, MySQL) used in the development of web applications? How were these technologies chosen, and what advantages did they offer for this project?
- What were the main challenges faced during the development process, and how were they overcome?

4. Data Management and Analysis

- How does the system manage and process data in real-time?
- What are the data analysis techniques employed to optimize decision-making procedures for development officers and other stakeholders?
- Could we provide more details on the strong filtering features of the system and how they facilitate quick access to specific farmer information?

5. Precision Farming and Agricultural Innovation

- How does the system facilitate precision farming, especially in terms of calculating optimum fertilizer dosage for different land quantities? What algorithms or models are used for these calculations?
- In what ways does the active communication of information by agriculture instructors contribute to continuous learning and innovation in the agricultural sector?

6. Impact Assessment and Future Sustainability

- What metrics or indicators are being used to measure the impact of the Agriculture Information Management System on the efficiency and productivity of the agriculture service center?
- How is the project ensuring the sustainability of the system in the long run, both in terms of technology upgrades and user engagement?

7. Challenges and Lessons Learned

- What were the main challenges faced during the project, and what lessons were learned from overcoming these challenges?
- Are there any unexpected outcomes or insights gained during the implementation of the Agriculture Information Management System?

Aims

At the Sooriyawawa/Meegahajandura Agriculture Service Centre, our main goal with the Agriculture Information Management System (AIMS) is to introduce a new era of accuracy and efficiency. We try to improve the overall effectiveness of office operations by minimizing manual errors, cutting down on paperwork, and freeing up vital time for our hardworking team through thorough automation and data management. Agriculture Information Management System (AIMS) wants to give its users from development officers to agriculture instructors a robust and intuitive toolkit so they may be more empowered. We hope to make their work more manageable by streamlining processes and facilitating seamless access to extensive farmer data, freeing them up to concentrate on key projects that promote agricultural excellence. Moreover, AIMS acts as a promote for the advancement of sustainable farming methods, encouraging a mindset of paddy farmers and the staff of that office.

Objectives

Agriculture Information Management System (AIMS) is purposely developed with multiple primary goals in mind to realize our mission. First and foremost, we place a high priority on user registration and authentication that goes smoothly and guarantees safe access to the system's features. The second goal of AIMS is to create an effective data management system that will make it simple for development officers to enter, view, and edit the details of paddy farmers, guaranteeing the accuracy and completeness of the data. Our solution has a strong filtering feature that makes it easy to retrieve specific farmer information and improves the efficiency of data retrieval. Furthermore, AIMS serves as an active knowledge-sharing platform that enables agricultural educators to share the most recent news, notices, and technology expertise, promoting lifelong learning throughout the agricultural community. Furthermore, one of our main goals is precision farming, where the Agriculture Information Management System (AIMS) determines the best fertilizer dosages to maximize agricultural output while minimizing resource use.

Initial Literature Review

Introduction to Literature Review

The development of our Agriculture Information Management System (AIMS) was informed and guided by an extensive exploration of existing literature, research, and technologies in the fields of agricultural management, information systems, and precision farming. This literature review serves as the cornerstone upon which our innovative solution is built, allowing us to contextualize our project within the existing body of knowledge and identify gaps that our system addresses. By delving into the relevant academic and industry publications, we gained valuable insights into established practices, technological advancements, and challenges faced by agricultural service centers globally.

Contextualizing Agricultural Information Management

Agricultural information management systems have been the subject of considerable research and development due to the increasing demand for efficient, data-driven solutions in the agricultural sector. Studies have explored various aspects, including the use of web-based applications, data analytics, and decision support systems to enhance agricultural productivity, streamline operations, and improve communication among stakeholders. These studies have underscored the importance of tailored solutions that cater to the unique requirements of agricultural service centers and farming communities.

Advancements in Precision Farming

Precision farming techniques have gained prominence in recent years, emphasizing the need for accurate data collection, analysis, and interpretation to optimize agricultural practices. The literature has extensively covered topics such as precision agriculture technologies, sensor networks, and data-driven approaches to assess soil quality, crop health, and environmental factors. These advancements have paved the way for our AIMS project, enabling us to integrate precise calculations and recommendations into the system, thus revolutionizing traditional farming methods.

Addressing the Gap

Despite the wealth of knowledge available, a critical gap existed in the customization and integration of these technologies specifically tailored to the needs of agricultural service centers like the Sooriyawawa/Meegahajandura Agriculture Service Center. Existing systems often fell short in providing a comprehensive, user-friendly, and contextually relevant solution that could empower development officers, agriculture instructors, and farmers alike. Recognizing this gap, our project sought to bridge it by developing a highly adaptable, easy-to-use, and technologically advanced Agriculture Information Management System, addressing the specific challenges faced by the center and its stakeholders.

In the following sections, we delve into the key findings from the literature review, highlighting relevant studies and technologies that influenced the design, development, and implementation of our AIMS. Through this comprehensive exploration, we aimed to leverage the collective knowledge of the academic and industry community to create a transformative solution for agricultural management and precision farming.

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, and preventing 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.

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 the Census and Statistics Department.

Moreover, the 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 diseases 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 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.

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 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.

Project Progress (PR1)

Our software engineering group made great progress towards developing the Agriculture Information Management System (AIMS) at Progress Review - 1, ensuring that our developments smoothly matched the specified functional requirements.

These are the functional requirements that we have completed in the progress review - 1.

- Users can register to the system.
- Development officers can enter & view paddy farmer's details.
- The system can filter the data.
- Agriculture Instructors can provide up-to-date new technological knowledge and Notices.

In addition, our group put a lot of work into the design stage, precisely finishing each UML diagram. Our system is based on these diagrams, which give a clear graphical representation of the architecture and functions of the system. By reaching these benchmarks, we have not only fulfilled but also over the objectives specified in our functional specifications, providing a solid basis for the Agriculture Information Management System (AIMS) project's later stages.

Project Progress (PR2)

Our team reached important development milestones for our Agriculture Information Management System (AIMS) during Progress Review 1. We successfully put into place key features such as user registration, powerful data filtering, data entry and viewing for development officers, and a platform for agricultural instructors to exchange timely information and notices. We used UML diagrams to carefully design the entire system at the same time, resulting in a thorough understanding of the architecture of our project. These accomplishments demonstrated the commitment and skill of our team and laid a strong basis for the project.

At the second Progress Review, which took place on October 7th, we arrived at a critical point in the AIMS project.

Building on the achievements of the initial evaluation, we completed all functional needs that had been previously mentioned and effectively executed the intricate functionality of determining the best fertilizer dose for a given amount of land. With its ability to maximize agricultural productivity and reduce waste, this addition perfectly embodies our dedication to precision farming.

In addition, we demonstrated the agility and flexibility of our team during this evaluation by adopting according to the recommendations from the invigilators. Based on their input, we modified and improved the system to make sure our solution perfectly satisfies the requirements of the Sooriyawawa / Meegahajandura Agriculture Service Centre. These developments highlight our commitment to quality, creativity, and reactivity and establish AIMS as a cutting-edge.

Planned Progress

We are actively working on the last stages of development for our ongoing project, paying close attention to important details that are essential to the smooth operation and user experience of our Agriculture Information Management System (AIMS).

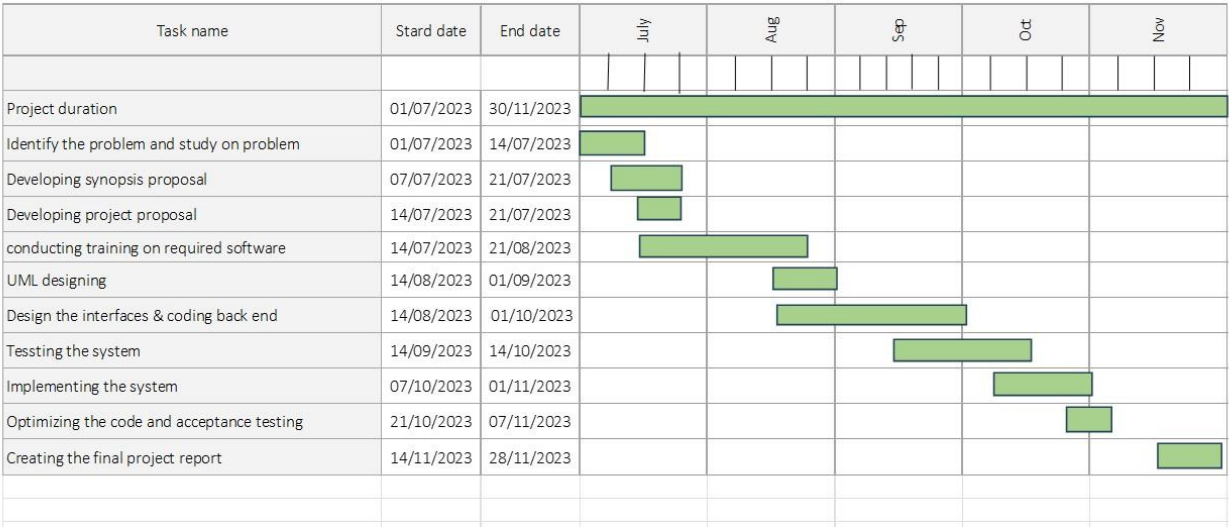
Our team is now working to improve the system's validation and authentication procedures so that users can access it securely and with authorization. Concurrently, we are thoroughly involved in creating a logical and user-friendly interface through careful UX/UI design, improving the platform's general usability and accessibility.

Furthermore, extensive testing is being implemented to authenticate the system's functions, ensuring its dependability and resilience in actual use cases. Our dedication to providing a superior, effective, and user-focused solution is what motivates these efforts.

We are focused on finishing these projects according to our project timeframe as the end-semester exams draw near. At the same time, we focus our efforts on preparing the final report for our AIMS project, which will emphasize our experience, accomplishments, and the revolutionary difference our technology is going to make in the agriculture industry.

Gantt Chart

PROJECT: Agriculture Information Management System



Milestones Chart

Milestones	Jul				Aug				Sep					Oct				Nov			
	1	2	3	4	1	2	3	4	1	2	3	4	5	1	2	3	4	1	2	3	4
1. Project Initiation	7/8 ◆																				
2. User Authentication and Registration			7/25 ◆																		
3. Development Officer Functionality (Data Entry, Viewing, Editing)					8/5 ◆																
4. Data Filtering and Reporting							8/25 ◆														
5. Senior Development Officer Functionality (Summary Dashboard)									9/2 ◆												
6. Agronomic Features (Fertilizer Calculation, Knowledge Sharing)										9/20 ◆											
7. Testing and Quality Assurance														10/5 ◆							
8. User Training and Documentation																	11/2 ◆				
9. Project Closure																		11/15 ◆			
10. Deployment and System Launch																		11/28 ◆			

Project Initiation (End Date: 2023-07-08): During this phase, the project will be initiated, and the team will define project objectives and stakeholders. The project's scope and requirements will be outlined, and a project plan will be created to guide the development process.

User Authentication and Registration (End Date: 2023-07-25): This milestone involves developing the user registration and authentication system, which is crucial for ensuring secure access to the Agriculture Information Management System.

Development Officer Functionality (End Date: 2023-08-05): This phase focuses on creating modules for data entry, viewing, and editing. Development officers will be able to input, access, and modify farmer data as needed.

Data Filtering and Reporting (End Date: 2023-08-25): Here, the system will be enhanced to allow users to filter data, making it easier to search for specific farmer records. Additionally, basic reporting capabilities for development officers will be implemented.

Senior Development Officer Functionality (End Date: 2023-09-02): A summarized dashboard will be created for senior development officers, providing them with quick access to essential information about the farmers and their activities.

Agronomic Features (End Date: 2023-09-20): This phase involves the development of agronomic features, including a module to calculate the amount of fertilizer suitable for specific lands and an information-sharing system to provide farmers with up-to-date technological knowledge.

Testing and Quality Assurance (End Date: 2023-10-05): The system will undergo rigorous testing to ensure its functionality, security, and user-friendliness. Any bugs or issues identified during testing will be addressed.

User Training and Documentation (End Date: 2023-11-02): Training sessions for development officers and senior development officers will be conducted, and user guides and documentation will be created to facilitate system use.

Project Closure (End Date: 2023-11-15): In this final phase, the project will be reviewed to ensure that all requirements are met. Project documentation will be completed, and the project will officially close.

Deployment and System Launch (End Date: 2023-11-28): The system will be deployed to a production environment, ensuring it is accessible to all authorized users. Security measures and access controls will be finalized.