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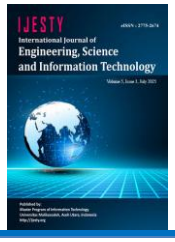

Comparative Study on the Implementation of Knowledge Management Systems for Aglaonema Farmers: A Structured Method and UML Object Approach

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Abstract

Aglaonema farming holds significant economic potential, but challenges in knowledge management often hinder farmers' productivity. Knowledge Management Systems (KMS) provide effective solutions for managing knowledge efficiently. This study aims to conduct a comparative analysis of KMS implementation for aglaonema farmers using a structured and object-oriented method with the Unified Modeling Language (UML). The research methodology includes identifying farmers' needs, developing systems using both approaches, conducting functionality testing, and performing a comparative analysis based on effectiveness, efficiency, and ease of use. The study's results indicate that the object-oriented approach with UML offers greater flexibility in development and adaptation to changing user needs. At the same time, the structured method provides stability within a well-defined system. User evaluations reveal a preference for UML-based systems, particularly in supporting dynamic knowledge access and integrating market price prediction features. The study concludes that the object-oriented approach with UML is more suitable for KMS development in agribusiness, where an adaptive and responsive system is essential.

Keywords: *Knowledge Management System, Aglaonema, Farmers, Structured Method, UML.*

1. Introduction

The cultivation of Aglaonema, an ornamental plant with high economic value, is experiencing increasing demand in both local and international markets. However, farmers often face various challenges during the cultivation process, including managing knowledge about cultivation techniques, controlling pests and diseases, and predicting market prices. In this context, implementing a Knowledge Management System (KMS) is a promising solution to enhance the efficiency and productivity of aglaonema farmers. A KMS can assist in collecting, storing, processing, and distributing knowledge to farmers. Various approaches can be utilized during its development, including structured and object-oriented approaches with the Unified Modeling Language (UML). The structured method offers a systematic approach with clearly defined stages. In contrast, the object-oriented approach with UML provides flexibility and the ability to model systems that more accurately represent real-world scenarios.

Because actual knowledge is difficult to comprehend, share, and spread throughout organizational sectors, knowledge management (KM) is regarded as a critical strategic resource for businesses. By investing in KM, companies can make sure that businesses can use the available knowledge. Efficiently and reliably [1]. The Knowledge Management System (KMS) is an asset data turnover strategy component in some scientific domains. With (KMS), it will be simpler to repeatedly get the specific data you wish to trace and absorb. This data can establish new scientific disciplines, keeping scientific fields as current and sustainable as possible [2]. According to Rahmawati et al.'s findings in [3], the application (KMS) offers intuitive access to corporate papers, ad hoc solutions, and specific data that depends on the utilization of computer systems or web-based technologies. Knowledge management is a series of activities to identify, create, explain, and distribute knowledge to be reused, known and learned within the organization [4]. Khakpour has a different opinion [5]. They argue that knowledge management is about using organizational brainpower in an organized and systematic way to increase efficiency, ensure competitive advantage, and encourage organizational Innovation.

Meanwhile, [6] said that knowledge management recognizes and assigns specific intellectual values to companies so that they can produce new knowledge to get a competitive edge, complete access to the company, and the ability to access information coding and technological capabilities. According to Chatti and Dur [7], Knowledge management is an integrated and methodical approach that uses databases, documents, policies, and procedures, as well as the expertise and experience of individuals and organizations, to identify, manage, and share a business's information assets [8]. Over the past few decades, knowledge management as a scientific subject has gained attention and become a significant idea that draws interest from various academics, practitioners, and disciplines. Based on some earlier knowledge management system research. Findings from research [9] construct a knowledge system that will assist users—the government, researchers, and community—in conducting mangrove conservation. The system development model used in this study uses the System Development Life Cycle (SDLC). Investigate [10] A knowledge management system (KMS) offers a method for locating, logging, disseminating, and assessing issues via a system. Assist in classifying, arranging, and presenting issues along with appropriate solutions.

This project aims to apply the Lesson Learned System technique to build a prototype (KMS) for mobile-based stress management in cattle that meets users' needs. [11] a knowledge management system that farmers may utilize to learn how to manage illnesses that affect oil palm. This project uses a usability engineering approach to design a knowledge management system that processes knowledge using an Android-based smartphone and the Knowledge Management System Life Cycle (KMS LC) technique.

Knowledge Management System (KMS) to support oil palm producers based on rural involvement in line with the community, according to research results [12]. Users may generate, search, and store knowledge with KMS. A back-end is required to process, store, and integrate data for the system to operate as intended. The test results demonstrate that all endpoints are usable and that the front-end and back-end systems have been integrated. Research [13] on state losses in LAPAN (SIMAPKLA) created KMS by applying the Life Cycle of the Knowledge Management System (KMS LC).

The Aglaonema Nusantara Association (ASA), the Agriculture and Fisheries Food Security Service (DKP3), and the Mainstay Farmers and Fishermen Contact (KTNA) comprise the Aglaonema Farmers Institution. The majority of farmers in Aglaonema do not belong to organizations. Cultivation, marketing, and the Aglo trend lack institutional knowledge and operations. The following are the limitations that the author's initial investigation of Aglaonema farmers in the Depok region of West Java revealed: [1] There was a severe lack of communication between Aglaonema farmers. [2] planting variations are carried out based on experience and habits, and [3] direct marketing is done to customers who visit the stalls. Lack of seeds makes it challenging to replace if a variance sells it all and runs out; [4] research institutions that help nurseries and agribusiness support are absent; [5]. [6] Aglaonema farmer organizations were established but not as successful, and [7] There is still a lack of advice from the local government or office for empowering farmers. These limitations make it challenging for the farming family of Aglaonema to improve their standard of living and income.

According to the preliminary survey, farmers who fit the definition of success also have connections and communication with other farmers, traders, and customers. Farmers can develop Aglaonema agribusiness and exchange information using this communication. The Knowledge Management (KM) paradigm must be used to bring knowledge management to Aglaonema farmers to improve agribusiness. Furthermore, it is well recognized that prosperous farmers maintain connections and communicate with traders, customers, and other farmers. Farmers can develop Aglaonema agribusiness and exchange information through this communication.

It has been demonstrated that the use of technology-based internet has improved the performance of the agricultural sector [14]. Additionally, the costs and advantages could be computed using this method [15]. [16]. Competency can be increased by media sharing of knowledge [17]. Based on the above description, this research compares the design analysis of Knowledge Management Systems (KMS) for agribusiness farmers using a structured method and an object-oriented approach with UML (Unified Modeling Language). This study seeks to identify the advantages and disadvantages of each process in the context of knowledge management within the aglaonema agribusiness sector.

2. Literature Review

Needs Analysis: Collect data on the needs of aglaonema farmers through interviews, observations, and questionnaires.
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2.1. Knowledge Management System

Knowledge management (KM) is a company's process to generate, preserve, share, and use knowledge. An organization's capacity to understand its surroundings and incorporate that understanding into its business procedures can be enhanced by knowledge [18].

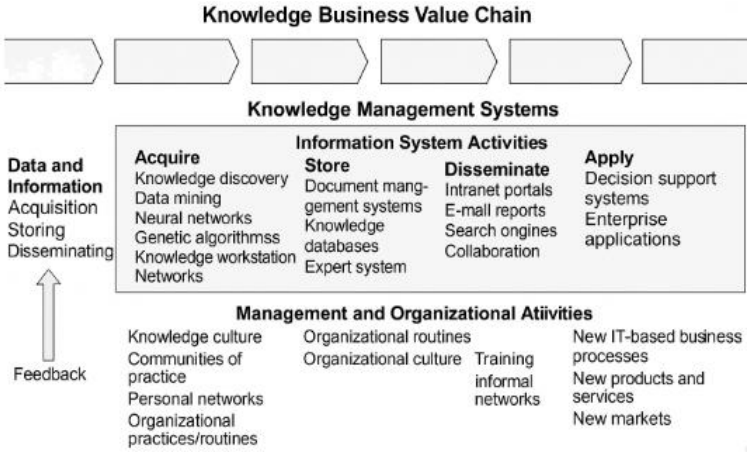

Fig 1. Knowledge Management System

Knowledge management can speed up access to information and knowledge and improve decision-making [19]. The development of IT increasingly supports the implementation of KM in a technology-supported system, commonly referred to as a knowledge management system (KMS) [20], as seen in the image above.

2.2. System Development Method

The system development process is an automated activity, method, best practice, and equipment used by stakeholders to develop continuously improved information systems and Software [21]. The system development method used in this research is the RAD method with object-oriented.

2.3. Concept Modeling

1. Using the Unified Modeling Language (UML).
   Modelling using the Unified Modeling Language is an object-oriented and visual-based modelling method. Therefore, modelling using UML is object modelling that focuses on defining static structures and dynamic information system models rather than defining data and process models whose goal is traditional development. UML offers diagrams grouped into five different perspectives for modelling a system, like a set of blueprints used to build a house [22].
   UML is one of the most reliable tools in object-oriented system development because it provides a visual modelling language that allows system developers to create blueprints for their vision in standard form. UML serves as a bridge in communicating several aspects of the system through some graphical elements that can be combined into diagrams. UML has many diagrams that can accommodate various points of view regarding the Software to be built. Unified Modeling Language (UML) is the language OMG (Object Management Group) proposed for modelling systems. This became the de facto standard due to its ease of use and intuitive notation. The UML model describes a set of objects that participate in an application and the interactions transmitted over teams [23]. UML shows how users interact with the application system. UML has many diagrams that can accommodate various points of view regarding the Software to be built.
   Using UML tools, the system development method uses Rapid Application Development (RAD) in object modelling. This strategy requires completing each process individually to make it easier to understand. The stages of the system development methodology with Rapid Application Development are carried out as follows [24].
   With the following stages:
   a. Create Use Case Diagrams
   b. Create a Use Case Description
   c. Make Activity Diagrams
   d. Create Class Diagrams
   e. Create an LRS (Logical Record Structured)
   f. Create a Relational Data Model
   g. Create Database Specifications
   h. Create a Graphic User Interface
   i. Create a Sequence Diagram

2. Using MSDLC (System Development Life Cycle) Structured model.
   That approach uses six stages to analyze and design a system. The system is developed using a specific analyzer and user activity cycles.
   SDLC stages carried out, namely:
   a. Identifying Problems, Opportunities, and Goals
   b. Analyzing System Requirements
   c. Designing Recommended Systems
   d. Developing and Documenting Software
   e. Testing and Maintaining the System

3. Research Method

This research employs both quantitative and qualitative approaches through the following stages:

1. Needs Analysis: Collect data on the needs of aglaonema farmers through interviews, observations, and questionnaires.
2. KMS Development Using Two Methods:
   a. Structured Method: Utilizing the System Development Life Cycle (SDLC) stages with a Waterfall approach.

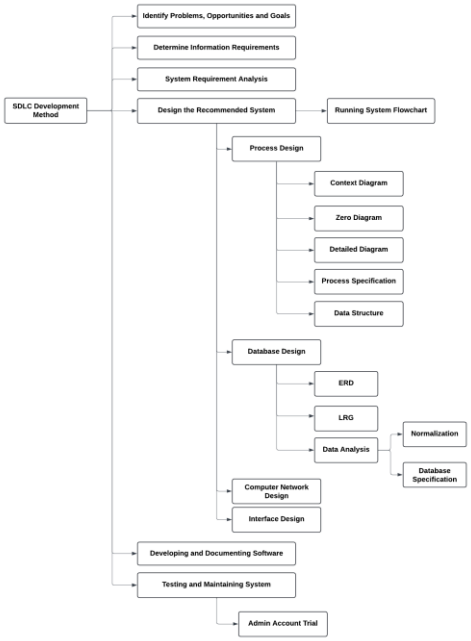

Fig 2. Framework for Thinking in the System Development Life Cycle Model

b. Object-oriented method with UML utilizing Rapid Application Development RAD and applying Object-Oriented Programming (OOP) stages with UML (Unified Modeling Language) modelling, including Use Case, Class Diagram, and Sequence Diagram.

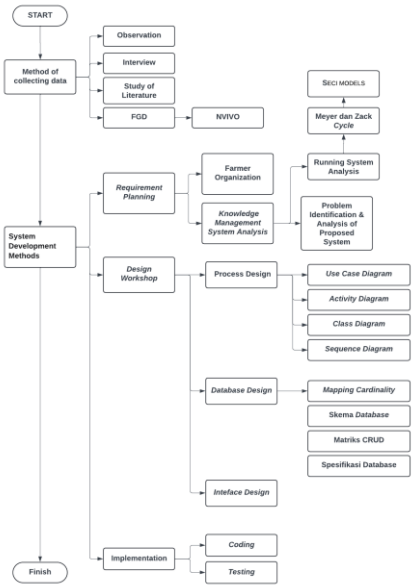

Fig 3. Research Thinking Framework for the RAD Model

3. Implementation and Testing: Implement both KMS approaches and conduct testing on system functionality, usability, and efficiency.
4. Comparative Analysis: Comparing test results based on parameters such as effectiveness, efficiency, scalability, and ease of maintenance.
5. Evaluation: Engaging farmers in system trials and gathering feedback for further analysis.

4. Results and Discussion

4.1. Basic Concepts: Difference Object Design

1. Object Design
   A new approach to looking at problems and systems (software systems, information systems, or other systems). The object-oriented approach views the system to be developed as a collection of objects that correspond to real-world objects. There are many ways to abstract and model those objects, starting with object abstraction. Class. relationships between classes to system abstractions. When abstracting and modelling this object, the data and processes belonging to the object will be encapsulated (wrapped) into a single unit

in software engineering. The concept of an object-oriented approach can be applied during the analysis stage. Planning. Programming and software testing. Various techniques can be used at each of these stages:

a. Object Oriented Analysis (OOA) and Object Oriented Design (OOD) from Peter Coad and Edward Yourdon [1990].
b. Object Modeling Technique (OMT) and James Rumbaugh, Michael Blaha, William Premerlan, Frederick Eddy and William Lorensen [1991].
c. Object-Oriented Software Engineering (OOSE) and Ivar Jacobson [1992].
d. Booch Method and Grady Booch [1994].
e. Sritrop, Steve Cook, and John Daniels [1994].
f. UML (Unified Modeling Language) by James Rumbaugh. Grady Booch and Ivar Jacobson [1997].

Tools used. For example, the use case diagram is shown in Figure 4, and the class diagram is presented in Figure 3 and Figure 4 interface.

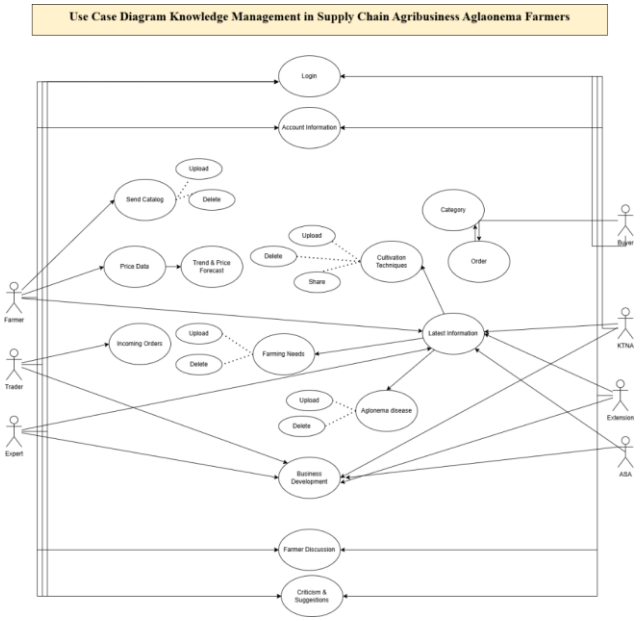

Fig 4. Use case diagrams

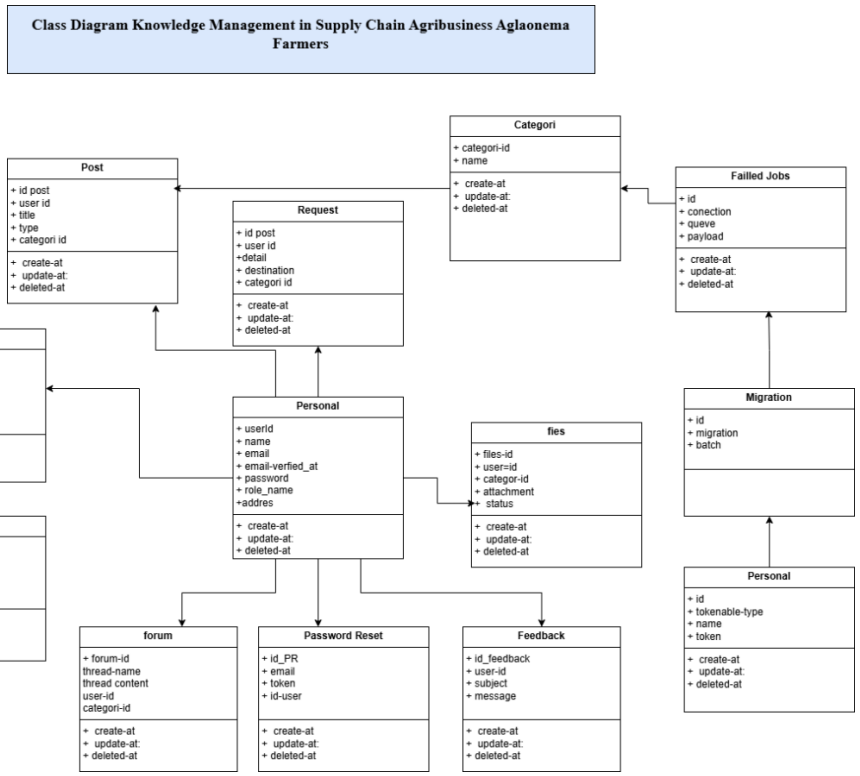

Fig 5. Class diagrams

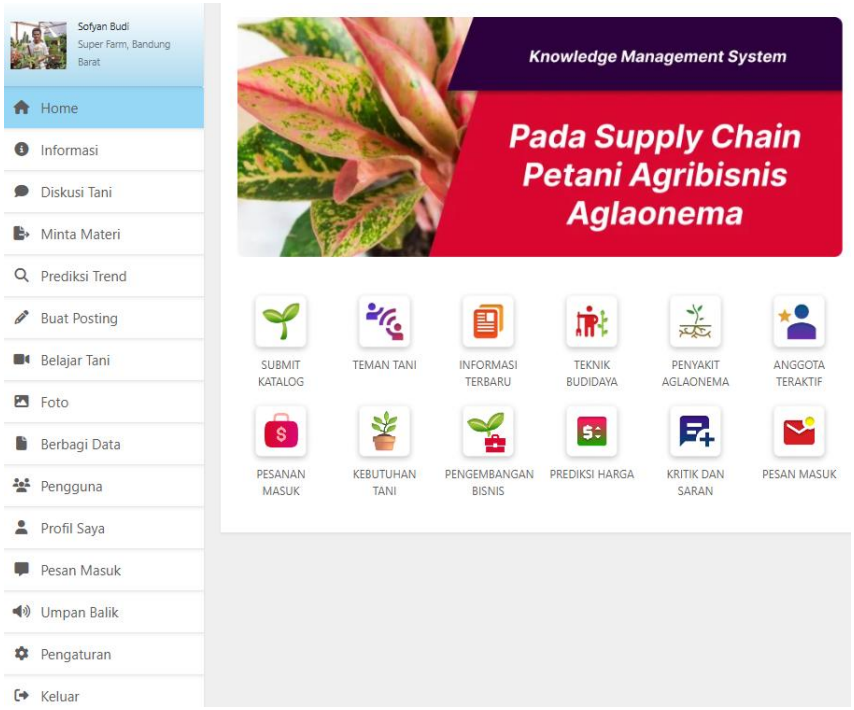

Fig 6. KMS Interface Aglaonema agribusiness farmers

2. Structured Design

The concept of structured system development is not new. Assembly engineering in factories and circuit design for electronic devices are two examples of this concept, and they are widely used in industries. This concept is still relatively new for developing information systems to produce products that satisfy users. Through a structured approach, complex problems in the organization can be solved, and the results of the system will be easy to maintain, flexible, more satisfying for the user, have good documentation, on time, according to the development budget, can increase productivity and the quality will be better. Good (error-free).

Tools used:

a. DFD (Data Flow Diagrams)
b. Data Dictionary
c. Entity Relationship Diagram (ERD)
d. State Transition Diagrams (STD)

Tools used For example, the use case diagram is shown in Figure 6, the Data Flow Diagram level 0, and the ER diagram is presented in Figure 7.

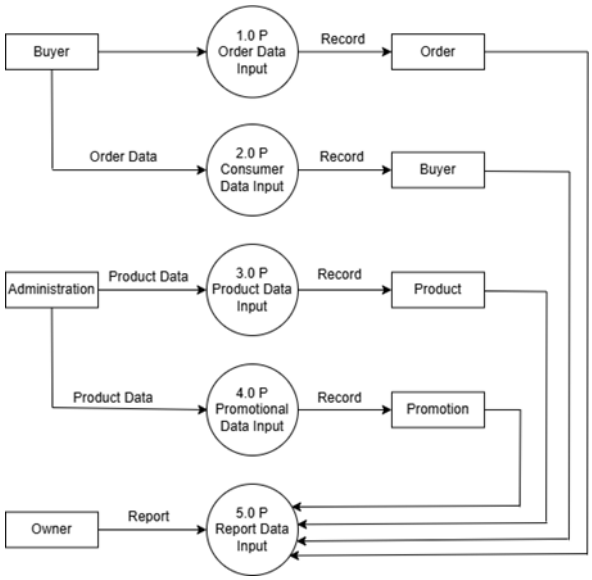

Fig 7. Level 0 Diagram

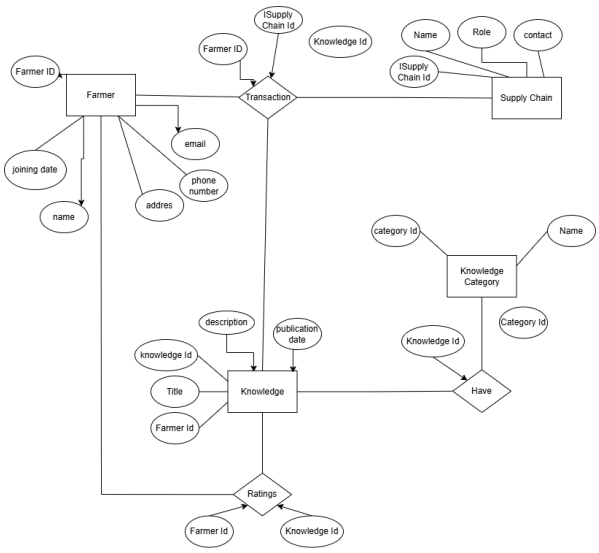

Fig 8. ER Diagram

The results of this study support previous findings. The results of the research show that the expert system design includes subsystems starting from the Context Diagram, DFD Level 0 with a subsystem for collecting initial data, consultations, and consultation results, DFD Level 1 with a subsystem for collecting nutritionist data, recording client data, recording nutritional needs data, and recording Complete activity level data with Regulatory Check and Level Balance for each level [25]. Designing a Knowledge Management System (KMS) for a design studio using UML and structured analysis can significantly improve the efficiency and effectiveness of the system. As a systematic and structured method for modelling, UML is widely used in various domains for designing and documenting systems. For example, in developing a web-based car wash queue scheduling system, UML models actors, activities, and processes, ensuring seamless integration of CRM strategies to improve business efficiency [26]. Likewise, the design of a tourism event information system in Semarang utilized UML to create a detailed and structured representation of the system, from the initial concept to detailed event logistics, thus helping effectively disseminate information to users [27].

In software development management, the Raikes Design Studio project for Hudl demonstrated the effectiveness of combining Scrum with other methodologies, such as Extreme Programming, showing that a structured approach can improve communication and project results [28]. Furthermore, developing a web-based system for pencak silat competitions highlighted the need for structured analysis to streamline participant registration and scheduling, overcoming inefficiencies in manual processes [29]. The Philharmonic Flows framework is a foundational element, enabling the definition and execution of business object models, which is essential for object-aware process management [30]. By leveraging UML and structured analysis, KMS for design studios can be thoughtfully planned and executed, ensuring that all aspects of the system are well documented and managed efficiently, ultimately leading to increased knowledge sharing and project success. A comparative study of knowledge management systems (KMS) with Aglaonema farmers revealed significant insights into the effectiveness of traditional versus modern paradigms. This analysis highlights the need to integrate knowledge systems to increase farmers' competence and desire in agricultural practices. Traditional knowledge (TK) is often tacitly embedded in local practices and experiences, making it difficult to articulate and share [31]. Indigenous farming techniques, such as crop rotation and organic farming, demonstrate Sustainability and ecological harmony, which can be beneficial when integrated with modern practices [32].

3. Structured Method Implementation:

   The structured method produces a system that is more focused and easy for users to understand due to its systematic steps. These systems tend to be more rigid and less flexible in accommodating changing user needs. While they are highly suitable for projects with well-defined requirements from the outset, they offer limited adaptability to change. On the positive side, structured method-based systems provide stability and simplicity in basic operations. The implementation results indicate that the structured method is effective for novice users who require step-by-step guidance. Ease of Implementation: The structured method is straightforward and inexpensive, making it ideal for novice users. Familiar Tools: It often utilizes tools like Excel, enabling users with minimal technical expertise to engage effectively [33]. Cost-Effective: This approach typically requires less investment in training and resources, enhancing its accessibility for small-scale applications [34]. Simplicity in Complex Processes: The method encapsulates complex processes, allowing beginners to achieve results without extensive programming knowledge [35]. Cons: Lack of Flexibility: Structured methods can be rigid, limiting the user's ability to adapt the process to unique situations or evolving needs [36]. Challenges in Further Development: As projects increase in complexity, the initial structured approach may become cumbersome, making it difficult to scale or modify the solution effectively [37].

4. Implementation with UML:

   UML modelling produces a more flexible and easier-to-develop system using an object-oriented approach. UML allows better visualization of knowledge flows, making it easier for farmers to understand the relationships between system components. Objects with UML support the development of more adaptive systems but require a deeper understanding of OOP and UML concepts. The implementation results show that UML is more suitable for farmers with experience and need a system that can adapt quickly. UML-based systems receive positive responses from users regarding ease of access to information and flexibility in adding new features. Advantages: Flexible, easy to develop, good visualization. UML supports various types of diagrams (for example, use case, sequence, and activity diagrams) that can be adapted to different project needs [38]. UML simplifies the modelling process, allowing developers to visualize and document system architecture effectively [39]. UML's graphical nature

helps understand system interactions and requirements, improving stakeholder communication [40]. Disadvantages: It requires more time and costs and has higher complexity. Greater Time and Cost: Developing UML diagrams can be time-consuming and require significant resources, especially for large projects [41]. The variety of UML diagrams and their interrelationships can cause confusion and increased complexity in understanding the overall system [42]. Based on these findings, the object approach with UML is more recommended for KMS development in dynamic agribusiness sectors such as aglaonema farmers, especially in supporting practical knowledge and market predictions that require regular updates.

Small Projects: Structured Methods For small projects, structured methods are recommended for convenience and efficiency. Efficiency: The structured method streamlines processes, reducing the time and resources needed for project management [43]. Case Study Insight: Implementing a structured approach in small-scale companies has demonstrated improved decision-making and operational efficiency [44]. Significant Projects: UML Approach For large projects, UML is advisable due to its adaptability to changes and support for ongoing system development. Dynamic Adaptability: UML enables dynamic adjustments in large-scale operations, accommodating evolving agricultural practices [45]. Enhanced Management: UML diagrams facilitate the design and maintenance of complex systems, improving communication and understanding among team members [46]. This research provides valuable guidance for system developers in selecting the appropriate method to meet the implementation needs of aglaonema farmers. These farmers face significant challenges, including limited communication, conventional marketing practices, and insufficient use of Information and Communication Technology (ICT).

Implementing KMS can enhance the productivity and quality of aglaonema plants through improved knowledge management. The lack of support from research institutions exacerbates these challenges, underscoring the need for a robust KMS to foster collaboration and learning [46]. By implementing a KMS, farmers can share experiences, access diverse knowledge sources, and refine their production and marketing strategies [46]. Measuring the success of information systems projects, addressing the complexity and ambiguity in existing theories while proposing a structured evaluation model [47]. Undeniably, people's life patterns and technological developments are interrelated within a supply and demand cycle [48]. [49] Demonstrates a comprehensive approach to understanding KMS success in a given context. These findings emphasize the need for information sharing between farmers and stakeholders to improve productivity and quality in agribusiness, in line with consumer demands and technological advancements, which can be implemented through a knowledge management system platform in the Aglaonema agribusiness supply chain [50] [51]. Aglaonema farmers require a system that can effectively store, manage, and share knowledge about plant care, marketing, and development. Structured Methods: Provide quick solutions for basic needs, offering simplicity and efficiency for smaller-scale applications. UML Approach: Delivers more comprehensive solutions for complex needs, ensuring scalability and adaptability for dynamic and large-scale projects. It emphasizes that an information system is a collection of interrelated computer components that collect, process, store, and provide output information needed to complete a business tasks chain [52]. The information system must be innovative to overcome challenges [53].

5. Conclusion

The design analysis of a web-based Knowledge Management System (KMS) for aglaonema farmers using two design methods—modern and traditional—demonstrates that both approaches can be effectively implemented. The object-oriented system utilizes tools such as UML (Unified Modeling Language). In contrast, the structured system employs DFD (Data Flow Diagram) and ERD (Entity Relationship Diagram) designs. Implementing a digital KMS can facilitate sharing experiences and knowledge, helping to overcome challenges faced by aglaonema farmers, such as limited communication and a lack of Innovation.

This research reveals that both methods offer distinct advantages and disadvantages. The choice of method should be tailored to the farmers' needs, the level of project complexity, and the availability of resources. Structured methods are more suitable for initial implementations, while UML is better suited for long-term development and managing more complex systems.

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