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Integrated Agricultural Information System Design: Case Study of UPT Mekanisasi Pertanian North Sumatera Province

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ARTICLE INFO	ABSTRACT
  How to cite : L. A. Harahap and T. K. Huda, "Integrated Agricultural Information System Design: Case Study of UPT Mekanisasi Pertanian North Sumatera Province", Journal of Sustainable Agriculture and Biosystem Engineering, Vol. 01, No. 01. 2023. 	The development of an integrated information system for agricultural agriculture is currently needed by farmers, especially farmers and people who use tools and machines, as well as industries that need information and data on the distribution of agricultural tools and machinery in Sumatera Utara. The purpose of this research is to build an integrated information system for web-based agriculture in UPT Mekanisasi Pertanian in order to be able to present information about agricultural tools and machinery in Province of Sumatera Utara. The steps of this research are to collect data of machine owned by UPT Mekanisasi Pertanian Provinsi Sumatera Utara, performing system requirements analysis, design system, build information systems, implement systems, and perform maintenance and documentation. The result of this study is an information system that is expected to be able to facilitate the officers of the UPT Mekanisasi Pertanian Provinsi Sumatera Utara in helping to disseminate information about agricultural tools and machines in Provinsi Sumatera Utara, to meet and fulfill the needs of farmers who use machinery and machineries in flexible, fast, accurate, and flexible information media. **Keywords**: design, integrated information system, Joomla, MySQL PHP

1. Introduction

Indonesia is an agricultural country with fertile farmlands and high productivity, especially in agriculture. Sufficient handling of machineries and supporting elements with information system will help Indonesian agriculture to grow and able to compete with another countries' agriculture. This condition is not currently attainable since there are not a lot of farmers using and accessing agricultural information directly.Less available applications to use by farmers worsen this condition. Currently existing applications have notbeen integrated with supportive functions useful for farmers due to weak interoperability between applications, which in turn cause lower agricultural information utility in Indonesia.

Agriculture is human activity including cultivation, forestry, animal husbandry and fisheries. Most of people in North Sumatera has agriculture as living, which attains around 60% of population. Therefore, development of information system for use in North Sumatera agricultural sector is expected to be able to ease agricultural information service.

Technical Operation Unit (UPT) Mekanisasi Pertanian North Sumatera Province is one of UPT in Food Plants and Horticulture Office of North Sumatera Province which functions to provide administrative, technical service, design engineering and modification, demonstration and quality certification of agricultural tools and machineries [1].

Information system is a system comprised of man-made components with an objective to attain, which is providing information, information holds an important part as stated by [2], where

information can reduce uncertainty factor of an event or condition thus could be manipulated to be useful for others. The use of information system has been used in many other fields to help with various task by making it easier, faster and more accurate, while in Indonesia the use of information system is still minimum [3]. Web-based information system which was designed for UPT Mekanisasi Pertanian North Sumatera Province was needed as a gateway for integrated information system in agriculture. The existence of this system was expected to ease farmers in obtaining information of Agricultural Tools and Machineries Distribution and Services Unit (UPJA) availability in North Sumatera Province. Aside of the designed function, in the future, the system is also expected to be able to provide registration service for agricultural tools and machineries testing and modification which in turn be processed further by UPT Mekanisasi Pertanian North Sumatera Province.

Integrated information system development in agriculture is currently needed by farmers, usually farmers and agricultural counselors in using agricultural tools and machineries, additionally, industries that operates in the field, thus, the development of a system that can accurately and reliably provide information is uregently needed to enable monitoring of distribution of agricultural tools and machineries in widely and fast manner through information system. The web based information system is designed to be accessed from various places, using various devices in the same time.

The steps of this research are collecting data about machineries and so on which are owned by UPT Mekanisasi Pertanian North Sumatra Province, performing system requirements analysis, designing system designs, building information systems, implementing systems, and performing maintenance and documentation. Severals similar reseraches has been done by others, such as in building of information system in Mitra Jaya agricultural machinery and tools workshop [4], information system of agricultural machinery and tools in Langkat regency, North Sumatera province [5], and web based agricultural machinery and tools information system in North Sumatera province [6]. This research is focused in the building of information system in UPT Mekanisasi Pertanian North Sumatera, in contrast of other reseraches.

The purpose of this research is to build a web-base integrated agricultural information system for UPT Mekanisasi Pertanian North Sumatera in order to be able to present information about agricultural tools and machineries in North Sumatra Province.

2. Materials and Methods

This research was conducted from March to May 2022 at UPT Agricultural Mechanization of North Sumatra Province Jl. General Dr. Abdul Haris Nasution No. 7, Medan Johor District, Medan City, North Sumatra Province.

The tools used in this research are Personal Computer (PC) with Intel® Celeron® CPU N4000 2.60 GHz processor which has 4GB RAM as hardware; Windows 10 as software; XamPP Control Panel v3.3.0 as web server; Joomla 4.0.6 as an application to create websites; and Google chrome as a search engine, Canva for editing images that will be inputted into the web.

The materials used in this study are data and information held by the Agricultural Mechanization Unit of North Sumatra Province, such as workshop contact data, UPJA data, agricultural tools and machinery testing tariff data, documentation, and others.

2.1 Methods

The method used in this study is data collection and information gathering as well as knowledge by conducting interviews to staff and high-ranking officials at the UPT Mekanisasi Pertanian North Sumatra Province and literature studies which then formulate the findings to be taken into consideration and as the input for to be designed system.

The procedure of this research is as follows:

1. Searching for information and determining data related to the menu design on the system to be designed. The data information used in this study is data owned by the UPT Mekanisasi Pertanian North Sumatra Province.
2. Data improvement and reorganizing, namely by evaluating and improving the data that has been obtained from UPT Mekanisasi Pertanian North Sumatra Province.
3. Specifies the menu to be listed on the system. This menu is determined based on data held by the UPT Mekanisasi Pertanian North Sumatra Province.

4. Performing system design. The design of this system is to describe the ability of the system to meet the information needs of users and to simplify the implementation process so that at this stage of implementation there is no deviation from the design outline that has been made. The next step is application of templates to the system to enhance the appearance of the system. The stages carried out in the design of the system design are:

- Input Design

  The input design used in this system is the design based on data that is already owned.

- Output Design

  The output design is carried out via next process: providing contact data for workshops, UPJA, and others, the data is covering the types of agricultural tools and machinaries in each sub-district, tool brands, number of tools and tool specifications.

- Database Design

  The design of the information system for the existence of workshops, UPJA, and others contact in North Sumatra Province uses a database built using MySQL. This database design focuses on the design of the database structure and data files used by the built information system.

- Process of Design

  The design process focuses on software design in the form of information system programs and procedures that are built. The display of the website is designed to interact intensively with the server in the form of input-output, thus an active page is built using XAMPP, PHP, and MySQL software to make it easier for users to connect with systems based on databases on the server. Building dynamic website pages using PHP scripts will then be processed by the apache web server and then later displayed by browser as HTML pages. Users can perform queries in dynamic web pages to manipulate data such as displaying, modifying, and deleting data.

- User Interface Design

  Design for user interface, interaction between users and computers as well as input and output design so the system built will be in accordance with user needs both in terms of information requirement and ease of use of the system.

5. Performing maintenance and documentation.

   Maintenance and documentation are related to continuous planning activities in order to support the continuation of a system and its development is assisted by a documentation. These activities include monitoring, evaluating and modifying the system to make the desired improvements. This is done to ensure that the new system implemented can meet the functional requirements created when the system was designed.

6. Data requirement description.

   Data required in this system are as follows :

   1) Workshop contact data is used as a menu in this information system which serves to determine the distribution of machineries in the workshops assisted by the UPT Mekanisasi Pertanian North Sumatra Province which is already widespread in the province.

   2) Data from UPJA is used as a menu in this information system which functions to determine the distribution of UPJA in various regencies and cities in North Sumatra Province.

   3) Data on machineries testing rates are used as one of the menus in this information system which serves to find out the rates for machine tools testing at the UPT Mekanisasi Pertanian North Sumatra Province.

   4) Documentation is used as a gallery menu in this information system which functions as a collection of photos of agricultural machinery owned by UPT Mekanisasi Pertanian North Sumatra Province as well as documentation of work programs of the UPT.

The required data mentioned will be updated anually, for the current design process, the data used were of one year prior.

3. Results and Discussion

3.1. Results
3.1.1. Brief description of North Sumatera Province
Geographically, North Sumatra is located at 1° - 4° north latitude and 98° - 100° east longitude, with a land area of 71,680 km² of which a large part of the land is located on the island of Sumatra and a small part is on the island of Nias, Batu islands, and several small islands, both in the west and on the east coast of the island of Sumatra [7]. The scope of this research includes aspects of the distribution of agricultural tools and machinery in workshops as contact data and the distribution of UPJA in North Sumatra Province based on data obtained from the UPT Mekanisasi Pertanian of North Sumatra Province.

3.1.2. System Design
The design of this system is to emphasis on the ability of the system to meet the information needs of users and to simplify the implementation process so that at the implementation stage there will be no deviation from the design outline that has been made.

3.1.3. Input Design
Design input includes design of the required data to obtain information about agricultural tools and machinery as well as the services of other agricultural tools and machines. In this input design there are other constituent components that are designed in such a way that they can be understood by the user.

3.1.4. Output Design
The purpose of the output design is to create information produced by the system by designing the processing results in the processing application program and supporting data in the form of text, tables, photos, and other formats that can be accessed through the website.

3.1.5. Database Design
Database design adjusts to what areas must be developed to cover all the data to be included in the system. In the database, data is processed and stored in preparation for the next step. MySQL database stores input data in the form of tables that can accommodate all available data.

3.1.6. User Interface Design
This is a design of facilities that can integrate process systems, databases, and knowledge components in a system with interactive use, with the aim of making it easier for users to utilize the system correctly and according to system needs.

Menus included in this system are as follows :

Homepage
Homepage is the starting page that appears when the system is launched or opened. The design of this page presents news and general description of the activities of the UPT Mekanisasi Pertanian North Sumatera immediately. Reporting of activities that have been carried out by the activities of the UPT Mekanisasi Pertanian North Sumatra Province which includes the community, agricultural tools and machineries, work programs, and so on.

Figure 1. Menu Beranda

Profile Menu

This profile menu was created specifically to display information about the UPT Mekanisasi Pertanian North Sumatra Province. When opening this profile menu the user will get more information about UPT Mekanisasi Pertanian North Sumatra Province, which will display several categories contained in this menu.
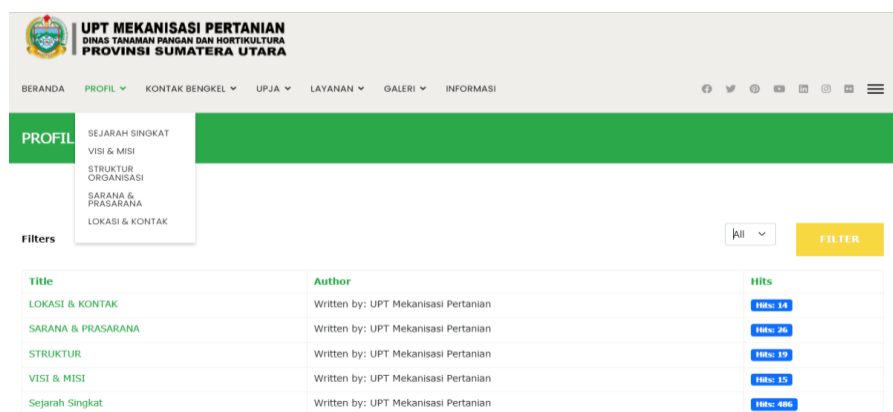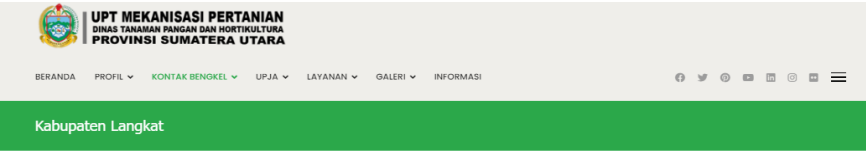

Figure 2. Profile Menu

Workshop Contact Menu

Workshop Contact Menu is the main menu on information systems that are relevant to research objectives and applications. This menu displays the contact data of the workshop owner who owns the machineries and list of machineries that are owned by the workshop in North Sumatra Province.

Figure 3. Workshop contact menu for Langkat Regency

UPJA Menu

The UPJA menu is a menu that provides information about the distribution of the Alsintan Service Unit which is spread across all regencies/cities in North Sumatra Province. By opening the UPJA menu, a Regency/City category will appear for which you want to know the information.

Figure 4. UPJA Menu on Mandailing Natal Regency category

Services Menu

Services menu contains information about the services provided by UPT Mekanisasi Pertanian North Sumatra Province that can be utilized by farmers who are planning to use agricultural machinery or people who need assistance regarding agricultural machinery in North Sumatra Province.

Figure 5. Services menu on Contextual Testing Tariff category

Gallery Menu
Gallery Menu is a menu that contains a collection of documentation of activities that have been carried out by the UPT Mekanisasi Pertanian North Sumatra Province and a collection of photos of agricultural tools and machineries owned by the UPT. This gallery menu also intends to inform users available agricultural tools and machineries as well as equipments that are owned by the UPT.
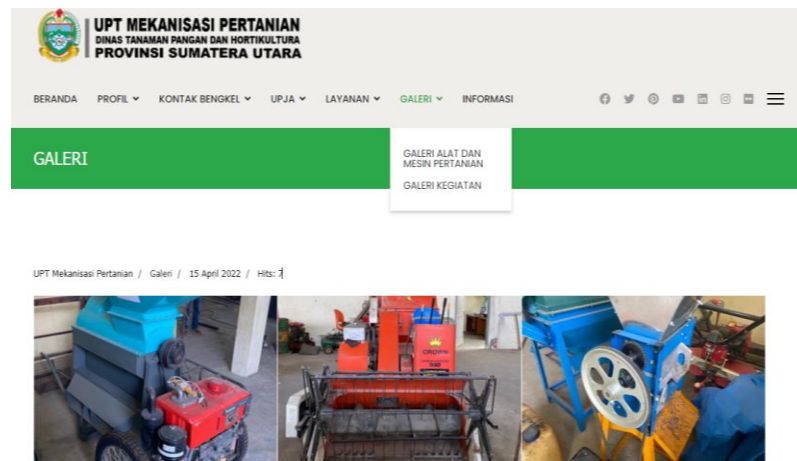

Figure 6. Gallery Menu

Information Menu
Information menu is a menu that contains information on news about activities carried out by the UPT and knowledge of agricultural tools and machines. When this menu is opened it will display a collection of news on UPT activities and knowledge about machineries arranged according to the date of creation of the information, where the top information is the latest information that has been made.
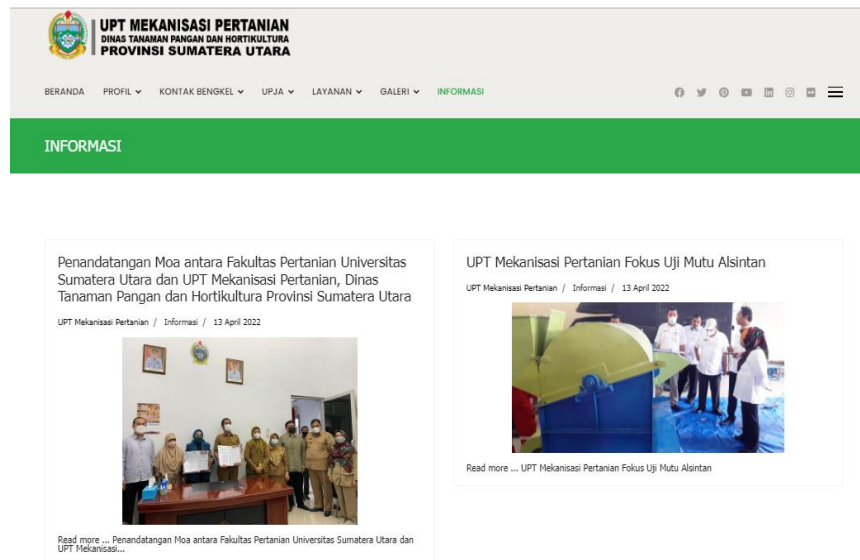
Figure 7. Information Menu

Website Administrator and Admin Page
Administrators are website admin officers and other parties who participate in the creation and modification of this system who can update the latest data and information on this system. Admin menu is a facility specifically intended for website administration officers and other parties that is used to modify, delete, and add items to the database.
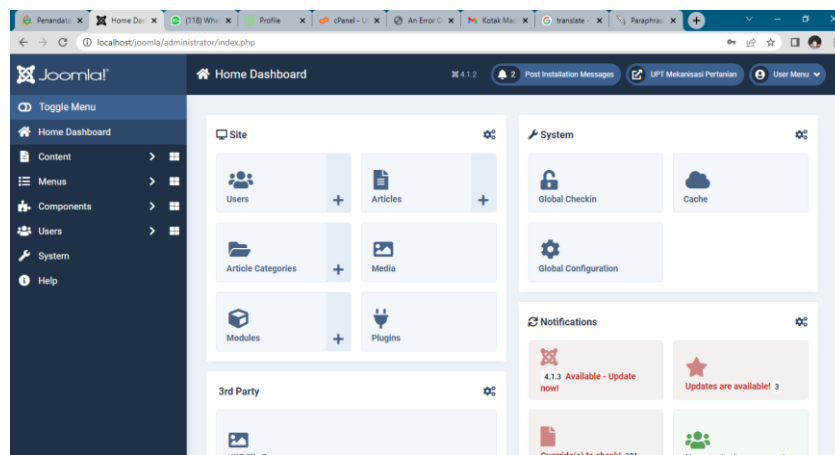

Figure 8. Admin Page

Hosting
Hosting is an internet service to store website data, which consists of storage capacity, access bandwidth, and database management service. This hosting process requires a domain, which is a specific network identification address used in website addresses to convert names from IP addresses into words that are easy to remember. The intended domain name used by this website is **www.uptmektanprovsu.go.id**, which is under administration process. Currently, the website is accessible via **uptmektanprovsu.skom.id**

Sistem Design Planning
The development of this system will be carried out periodically and continuously. This system development is expected to be continued by other researchers who will provide complaint form in the service menu section in the category section. This form should be useful for agricultural machinery users or other people who want to apply for machinery testing, machinery modifications, machinery engine rentals, and others who will be assisted directly by the UPT.

3.2 Discussion
The Information System was designed to make it easier for the UPT officers to disseminate information about agricultural tools and machineries in North Sumatra Province, the designs

showed in Figure 1 to 6 shows the current design which is expected to be update continously. Similar information systems in North Sumatra Province was existed, but are still limited and their development is less effective, therefore this information system is expected to meet and able to assist the needs of farmers who plans to use agricultural machinery in finding information through media that is flexible, fast, accurate, safe and simple thus the provided display can make users easy to understand while available to be accessed remotely in different places and at the same time.

The display of the website is made to be able to interact intensively with the server in the form of input-output, which uses XAMPP, PHP, and MySQL software to make it easier for users to interact with systems based on the database on the server. The user would simply need to press the various options or buttons that meet the information needs of the system, with each choice producing a response to the user's request, as can be seen in Figure 3 to 5. The website was successfully built using HTML, PHP and MySQL to provide intended service to stakeholders, however, the effect of the use are still needed to be evaluated, and this would require collaboration with UPT and other stakeholders.

In the future, to realize the integrated system, it is logical to design of website's mobile version, provide additional function to support administrative process on renting, applying for maintenance and modification of agricultural tools and machineries, and also, the improvement of gallery menu so that it could display each modified or developed tools and machineries in more details.

4. Conclusion

The website was successfully built to serve the function of dissemination of information to farmers and other stakeholders, however, since the research is about the design of an integrated system, it would require next step to reach integrated services into the system. The future researches will focus on provide additional services to assist farmers, educators, UPT and other stakeholders in terms of Agricultural Machinery and Tools use in North Sumatera Utara Province.

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