# Development of knowledge management system for assisting the Agrotechno Edu-park establishments in Sriharjo village, Imogiri district, Bantul regency

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**Abstract.** Knowledge is important for ensuring the sustainability of the organization. Knowledge management is an effort in obtaining, selecting, organizing, abstracting, storing, presenting, sharing, implementing, and reviewing the accumulated knowledge so that each member in an organization can utilize and increase the mastery of specific knowledge. Knowledge Management System (KMS) as a tool for assisting the implementation of the concept in a specified context. Agrotechno Edu-park stands for Agricultural Technology Education Park, a place for agricultural production, technology showroom, education, and tourism as well. In the developing and establishing the concept of Agrotechno Edu-park, there is a vast amount of knowledge, but the ability of humans to use that knowledge is limited so that the potential can be lost. Consequently, it is necessary to manage the potential knowledge using a system. The objective of this study was to develop a knowledge management system for assisting the Agrotechno Edu-park establishment. The research was taken place in Sriharjo Village, Imogiri District, Bantul Regency. Data transformation to knowledge facilitated by a web-based application composed of three main components: 1) Regular daily post, 2) Knowledge Taxonomy Trees, and 3) Discussion (Question and Answer). The knowledge management cycle runs by the participation of the youth farmer community as the operator of the Agrotechno Edu-park, facilitated by the expert from the Department of Agricultural and Biosystems Engineering, Universitas Gadjah Mada. Verification and system evaluation were conducted by GAP analysis to measure the effectivity and usability of the knowledge management system.

## 1. Introduction

The number of knowledges in the world is doubling every 32 years [1]. Moreover, in digital-information era, knowledge growth in the world could reach five times over within four years. However, the ease of dissemination and development of knowledge that can be done by everyone becomes its challenge in being able to filter the truth of knowledge. Therefore, the effort in embodies and managing the knowledge need to be done, so that truth can be recognized and being accepted in society. Modern processes and systems enable knowledge sharing in new ways [2,3]. Knowledge management is a collection of processes that a person uses to gather, classify, store, retrieve, and share knowledge in their daily activities [4], and how these processes can support work activities [5].

Sriharjo Village Government in realizing sustainable development has a mission to improve the socio-economic welfare of the community by maximizing the local potential based on agriculture and tourism. In line with this mission, Sriharjo Village Government in cooperation with the Department of

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Agricultural and Biosystems Engineering Universitas Gadjah Mada, supported by YESSA (Yanmar Environmental Sustainability Support Association) implemented the Agrotechno Edu-park establishment program. According to previous study, Agrotechno Edu-park is an implementation of a precision agriculture system that is integrated with appropriate technology application that designed and conceptualized as an educational tourism park [6–8]. Agrotechno Edu-park has benefits in increasing agricultural productivity, as a place for educating and knowledge transfer about appropriate technology, and increasing the socio-economic of the community through tourism sector according to studies [9]. The program started in 2018, the Sriharjo Village Government has worked to find the best way to bring out the hidden potential of the local farmer for their better life and better economy through digital technology. Accordingly, the knowledge management system as the backbone technology for the Agrotechno Edu-park is necessary to be introduced. As an initial approach, the knowledge management system will be initiated to facilitate the knowledge needs of the Agrotechno Edu-park establishment support system [10–12].

The objective of this study was the development of a knowledge management system (KMS) for assisting the Agrotechno Edu-park establishment. The KMS was developed as a web application to support the flexible and scalable access and further development towards completed KMS. The concept of KMS on Agrotechno Edu-park, design of knowledge management system, and its testing and implementation will be explained carefully.


## 2. Materials and Method

### 2.1. Knowledge Management System (KMS)
The knowledge management system is a centralized database for storing information about some topics and from which other people can seek answers. This system facilitates the exchange of communities' information, but the emphasis is on identifying knowledge sources, knowledge analysis, and managing the flow of knowledge [13]. The main concept of a knowledge management system can be seen in Figure 1. (a). The data–information–knowledge–wisdom hierarchy (DIKW), referred to variously as the 'Knowledge Hierarchy', the 'Information Hierarchy' and the 'Knowledge Pyramid' is one of the fundamental, widely recognized and 'taken-for-granted' models in the knowledge management. Referring to studies [13] the hierarchy is used to contextualize data, information, knowledge, and sometimes wisdom, with respect to one another and to identify and describe the processes involved in the transformation of an entity at a lower level in the hierarchy (e.g. data) to an entity at a higher level in the hierarchy (e.g. information).

The implicit assumption is that data can be used to create information; information can be used to create knowledge, and knowledge can be used to create wisdom. The pyramid composed of four layers with the lowest layer is data, that defined as the products of observation. But, data are no use until they are in a useable (i.e. relevant) form. The next layer is Information contained in descriptions, answers to questions that begin with words such as who, what, when and how many. The main layer is knowledge, the know-how what that makes possible the transformation of information into instructions. Knowledge can be obtained either by transmission from the expert of it, by instruction, or by extracting it from experience. The upper and smallest layer is wisdom, that is the ability to increase effectiveness. Wisdom adds value, which requires the mental function that we call judgement. The ethical and aesthetic values that implies are inherent to the actor and are unique and personal.
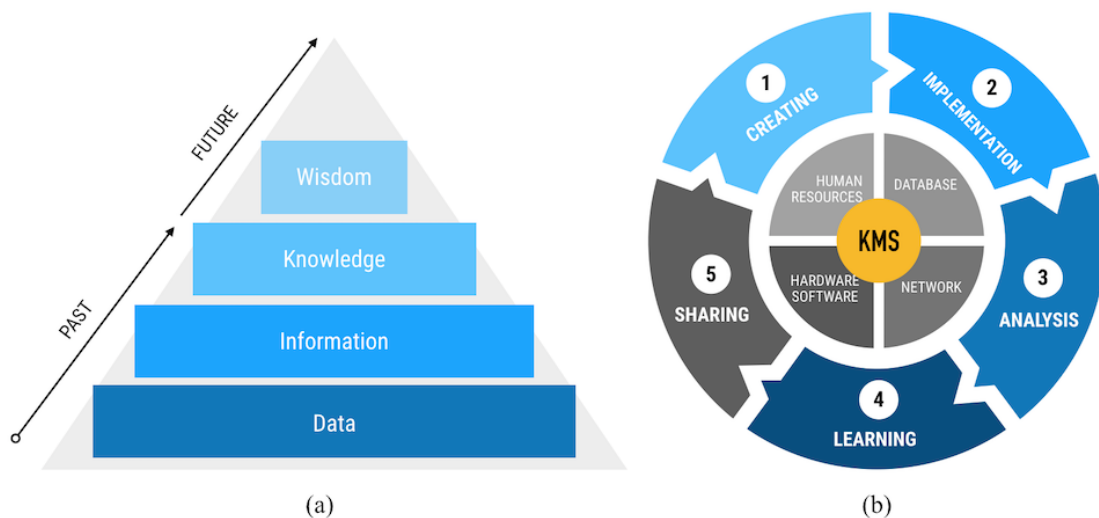
**Figure 1.** Figure of (a) Data–Information–Knowledge–Wisdom Hierarchy, and (b) Life Cycle of Development of Knowledge Management System

The development of a Knowledge Management System (KMS) requires a procedure that must be completed in each stage. The life cycle can be seen in Figure 1. (b). The life cycle consists of several modules working together in supporting the completed KMS. At present proposed modules are: 1) Learning or identifying the object, 2) Creating knowledge from the object, 3) Implementation of the developed knowledge, 4) Analysis of the performance of systems, and 5) Sharing the knowledge to others. In completing the KMS development process, several elements like human resource, hardware, and software, database, and the network is needed as the supporting system. The modules then connected as KMS for assisting Agrotechno Edu-park establishment. As the foundation of the overall system, the process of knowledge management is the entry point on the adoption of KMS.

*2.2. Development of Knowledge Management System*
The development process of the knowledge management system is displayed in **Error! Reference source not found.**. The overall process composed of (a) Preparation; (b) System design including the design of process, architecture, and system implementation; (c) System development covers the programming and additional module configuration; (d) Knowledge capturing, including the data entry, conversion from data to information using narration process, and development of knowledge taxonomy; (e) System deployment and utilization; and (f) Knowledge addition in case of the user cannot find the specific knowledge that they want to know, they can asking to the forum. Accordingly, the responses from other audiences or experts expected to solve. Further, if the content is considered as new knowledge then it will be listed in knowledge taxonomy. The knowledge and information that has been created are formed into knowledge taxonomy to facilitate the knowledge absorption process. the knowledge taxonomy and publication page (daily activity log) are periodically updated for improving the KMS. As a technical aspect, the KMS is built on a website based on Opensource Content Management System, WordPress. In which, various plugins are also applied which make it easier for the users to access the existing knowledge, plugins that applied to the website are DW Question & Answer, and Knowledge Base for Document and FAQs. One of the plugins that applied to KMS is Question & Answer to help user for asking and sharing some information and knowledge.
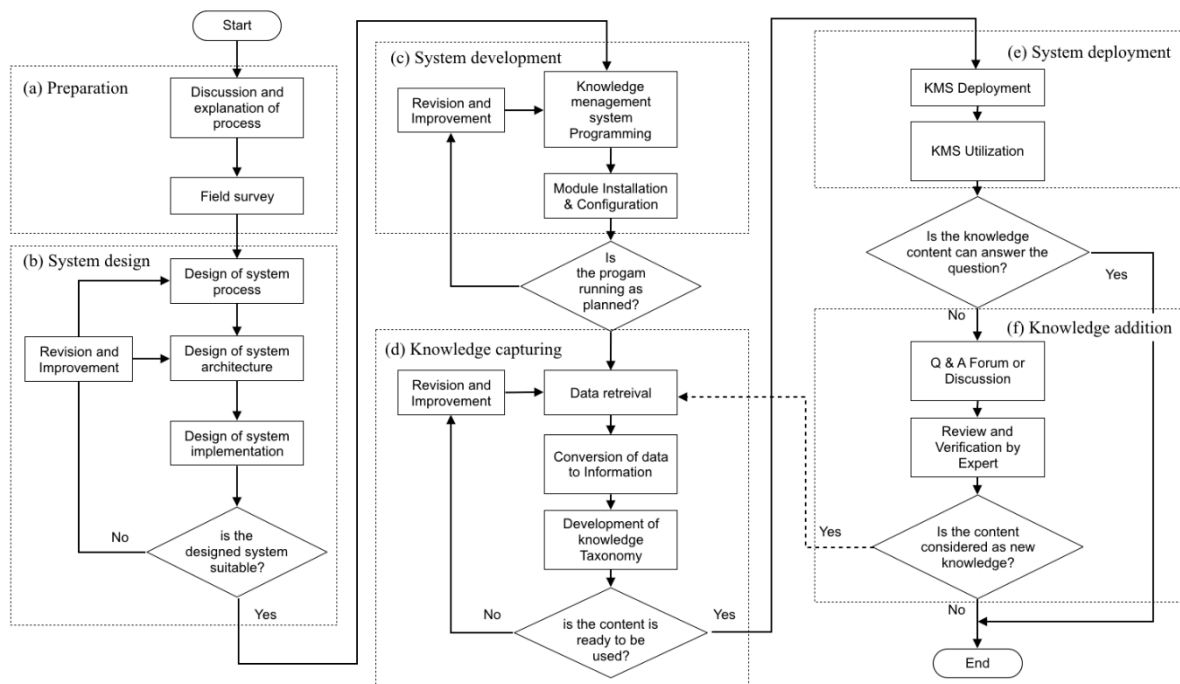
**Figure 2.** Development of Knowledge Management System Process

### 2.3. System Testing and Implementation

The Knowledge Management System has been tested and implemented to assist the Agrotechno Edu-park establishment in Sriharjo Village, Imogiri Sub-district, Bantul District, Yogyakarta province. Sriharjo Village has Taruna Tani (young farmer group) with 25 members and GAPOKTAN (farmer group) with 40 members, who have a program to establish the Agrotechno Edu-park. Taruna Tani and Gapoktan are expected to become the main actor who operating the KMS as an admin, user, or expert as well. The knowledge management system provided knowledge about Agrotechno Edu-park and also used it as a discussion forum that gives the user a place to ask questions and share knowledge all about Agrotechno Edu-park. Accordingly, GAP analysis is applied to analyze the knowledge gap between local farmer knowledge before and after the assessment of KMS. The goals are to find out how much the KMS can cover up the knowledge needs for the local farmer to establishing the Agrotechno Edu-park.

## 3. Result and Discussion

### 3.1. Web-based Knowledge Management System

The developed web-based Knowledge Management System can be seen in Figure 3, Figure 4, and Figure 5 consists of a homepage, knowledge management page, and Q & A Forum respectively. The Homepage composed of the main menu, features slider, regular news as an information repository, Video, and Photo documentary, Menara Ilmu news feed, and Partner. The homepage of the KMS named the Knowledge Management Center that can be accessed online through http://kmc.tp.ugm.ac.id.

The Knowledge Management Page shows the knowledge searching form and knowledge taxonomies from specified available knowledge. And the last is Q & A Forum for discussion in case user wants to ask a question related to the activity or something that they want to know. For better representation, the user should provide Title and Taxonomy for the question that has been asked.
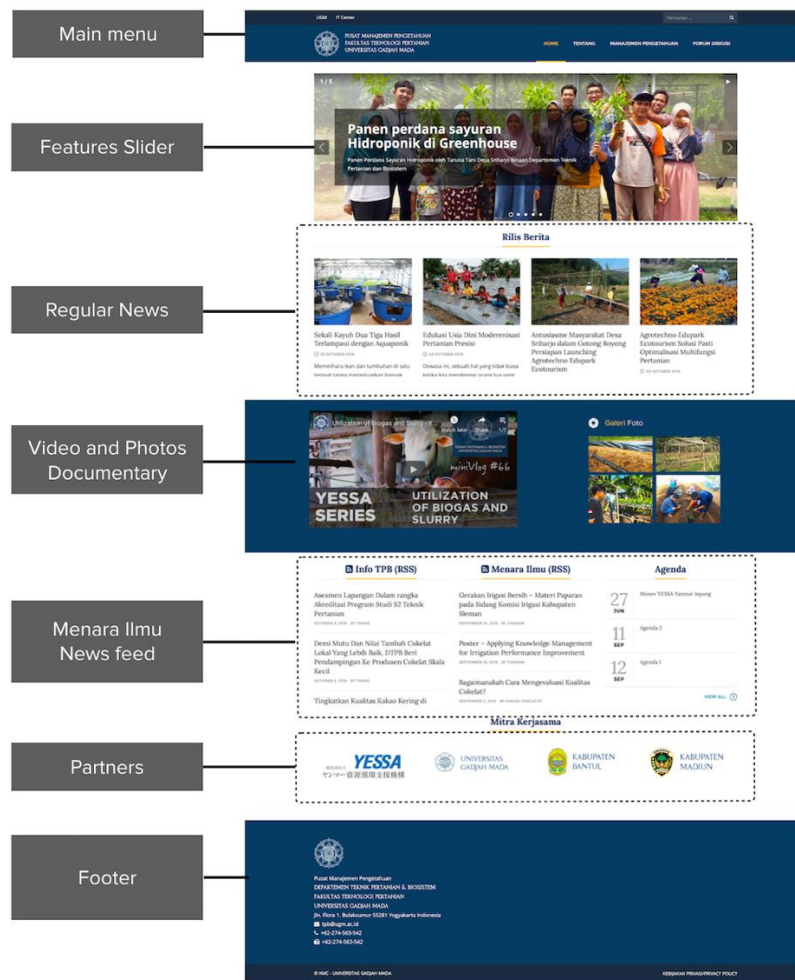
**Figure 3**. User interface of main home page of web-based Knowledge Management System
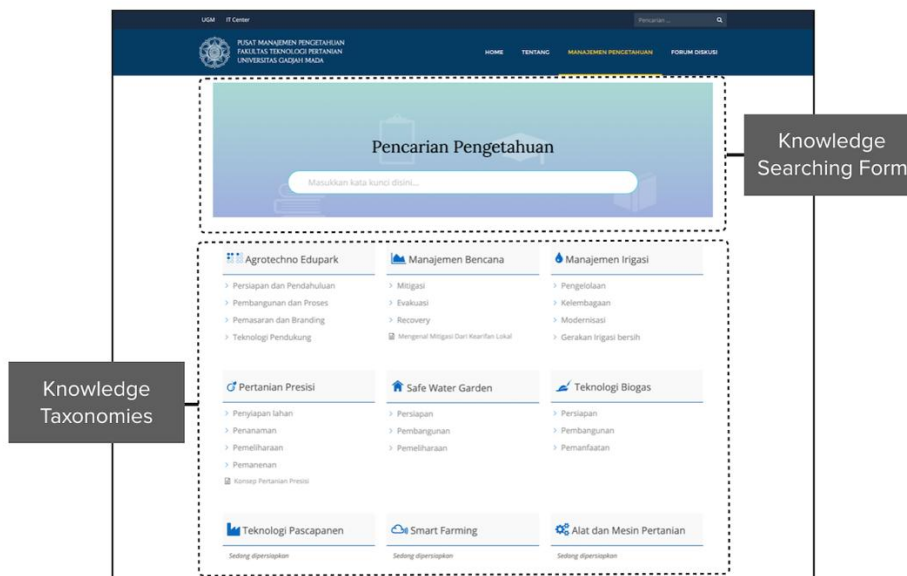


**Figure 4**. User interface of knowledge-based as part of Knowledge Management System
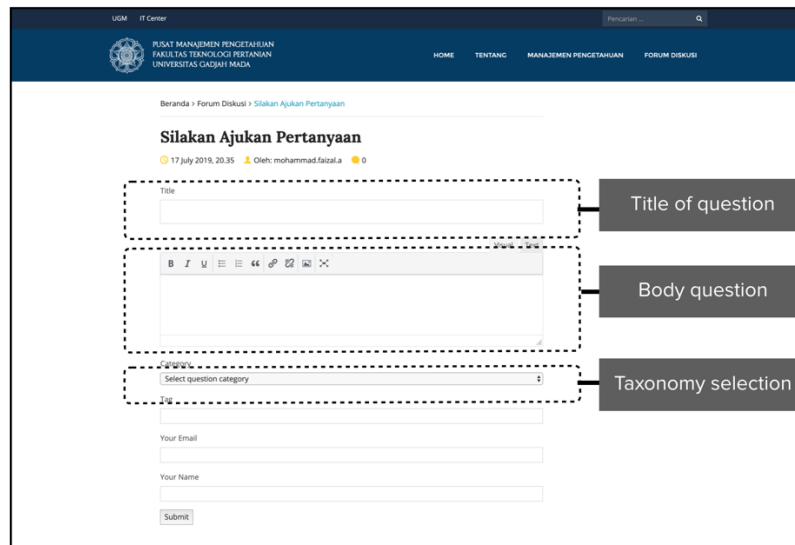
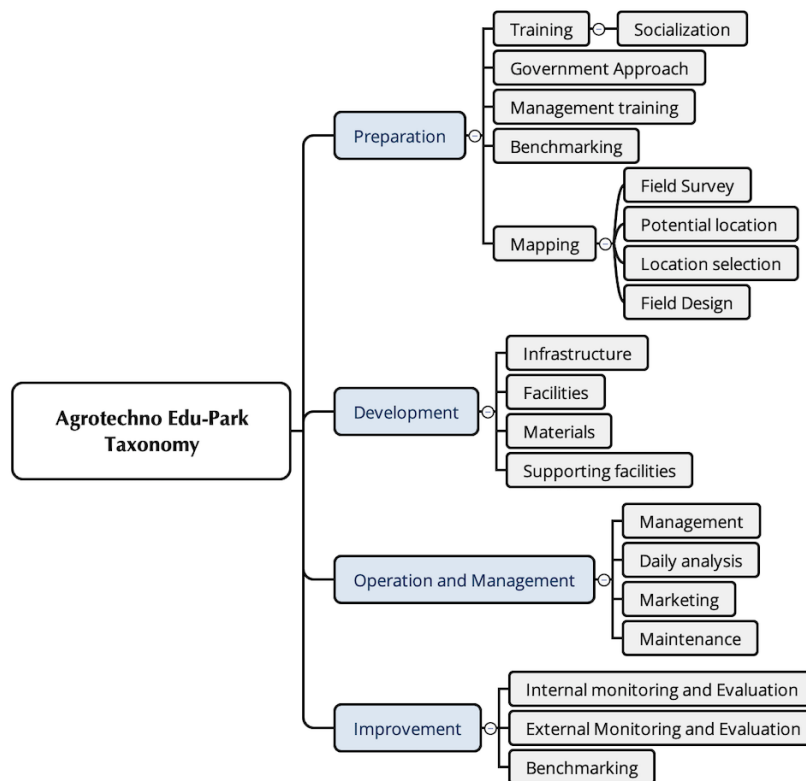**Figure 5**. User interface of discussion form for asking the question



**Figure 6**. Knowledge Taxonomy of Agrotechno Edu-park

### 3.2. Knowledge Taxonomy on Agrotechno Edu-park

Taxonomies are basic classification systems that enable us to describe concepts and their typical dependencies hierarchically. Knowledge taxonomy allows knowledge to be graphically represented in such a way that reflects the organization of concepts within a particular field of expertise or for the organization at large [7]. In the taxonomy system, higher up the concept is placed, the more general of the generic concept is. The lower concept is placed, the more specific an instance it is of higher-level

categories. Knowledge taxonomy is important as guidance for the knowledge management system development. The taxonomy can be mapped using a tree diagram showing the root-stem-branch of the knowledge for the specified context. The context of Agrotechno Edu-park can be classified into four main stems: (a) Preparation; (b) Development; (c) Operation and Management; and (d) Improvement. All the obtained knowledge from the daily activity related to Agrotechno Edu-park will be listed and attached in the Taxonomy for better understanding the whole knowledge in an explicit way. It is also making use of metadata, tagging on "information about information" [13]. The Agrotechno Edu-park knowledge taxonomy can be seen in Figure 6.

### 3.3. Transformation from Data to Knowledge using KMS

Data to knowledge transformation is facilitated by the Knowledge Management System. The main process from Data to Information is done by the user contributor by writing an article related to activity, program, or report related to Agrotechno Edu-park. The article provides a chronological story, supported by pictures or videos as evidence and supporting materials. Information to knowledge transformation facilitated by the expert for ensuring the information can be level up to knowledge for further benefit to others. The expert will list the knowledge into the taxonomy and narrate the new knowledge with general sentences that might useful for the "know-how" process.

During the process of system deployment, the user of KMS might found that the knowledge that they want to know is unavailable. Accordingly, the user can ask the question and waiting for other users or experts to answer the question. This collaborative process needs to be maintained by the operator to ensure that every question will be responded to by the expert for specified knowledge. Also, a collaboration between the user who has experience related to the questioned topic would help to run the knowledge management process smoothly. The transformation from data to knowledge using KMS can be seen in Figure 7.
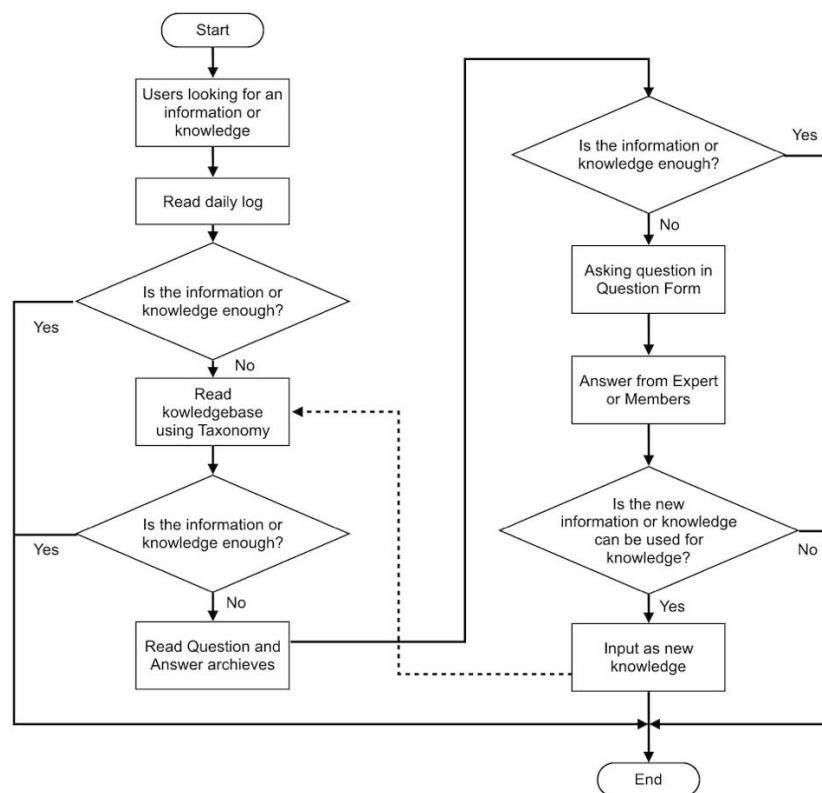


**Figure 7.** Schematic data flow of Data to Knowledge Transformation

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**Figure 8.** Example of daily activity log activity

*3.3.1. Daily Activity Logging.* With bridging and facilitating knowledge needed in the Agrotechno Edu-park development process, daily activity logging acts as a process in KMS that reports all the activities or phenomena that occurred. Daily activity logging is uploaded at 'rilis berita' page (regular news) as an information repository as can be seen in Figure 8. Daily activity logging is worked by an admin that transformed from data into information in the logging process. Daily activity logging also plays a role in the process of updating and adding the Agrotechno Edu-park knowledge taxonomy. The daily activity logging process is integrated with a database that stores Agrotechno Edu-park data and information.

*3.3.2. Discussion for Creating New Knowledge.* Another function of KMS is the discussion forum feature (Question & Answer). It also used for knowledge processing. The discussion forum is providing users a forum for asking for knowledge that doesn't available yet in the KMS. Users who didn't find the answers to what they are looking for on KMS are advised directly by the system to go to the discussion forum page. In the discussion forum, the user can search whether anything the user needs in 'what do you want to know?' tab. If it's didn't available, the users can start a conversation with a topic that they want to know in the 'ask question' tab. Later, the admin, expert, or other users can provide answers about the discussion that related to various perspectives of knowledge or other experiences. The most appropriate answer can be marked by giving a vote on the answer. The results of discussions in the questions and answers feature will be reviewed by experts to take an important point that can be used as knowledge.

3.3.3. *Updating the Knowledge Taxonomies.* Knowledge taxonomy is the main framework that supports the existing knowledge management process in KMS. Knowledge taxonomy presents the summary process of Agrotechno Edu-park. The existing content on knowledge taxonomy is integrated with the KMS database. Thus, knowledge taxonomy will continue to evolve and have a broad scope along with the intensity level of KMS operations. The admin will periodically be updating knowledge taxonomy based on the information and knowledge obtained and developed at KMS. Accordingly, all the parts of this system are connected one and another so the knowledge that contained can be improved.

**4. Conclusion and Future Works**

The Knowledge Management System has been developed as an initial stage for assisting the Agrotechno Edu-park establishments. The application formed as a Web-Application that developed

using WordPress and completed by plugins. The main objective of KMS is transforming data into knowledge that composed of three main components: 1) Daily Activity Logging, 2) Knowledge Taxonomy, and 3) Discussion Forum (Question and Answer). For the implementation, the system could help the Agrotechno Edu-park establishments process in Sriharjo village, Imogiri sub-district, Bantul District. The future works are to analyze the system performance with the GAP analysis to find out how much the KMS can cover up the knowledge needs for the local farmer to establishing the Agrotechno Edu-park.

## Acknowledgements

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