

# Smart Campus Development as a Supporter of Research and Community Service Activities at Indonesian Hindu University

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**Abstract**— Smart campus is a system for managing various campus resources both internally and externally in a systematic, effective and efficient manner based on the Internet of Things / IoT and Artificial Intelligent), in such a way that the quality of services and the implementation of the tri dharma activities of higher education run optimally. However, implementing a smart campus requires a lot of time and money. Smart campus in its implementation involves many facilities that are realized, such as at least providing an adequate wifi area. The implementation of the smart campus gradually or in miniature finally appears like smart e-learning; smart department or institution; smart faculty. This study aims to develop a smart campus at the Indonesian Hindu University in stages. The initial stage is planned to develop a modern and efficient research and community service management (smart LPPM) called ASTALIDIMAS at the Research and Community Service Institute at the Indonesian Hindu University. The system is designed online-based starting from the menu for proposing research proposals and community service, checking by reviewers and reporting documentation. The importance of developing a smart campus at Indonesian Hindu universities is expected to be able to accelerate the achievement of the vision, mission of becoming a leading university in Indonesia as well as the best center for the study and development of Indonesian Hindu religion and culture in the region..

**Keywords**— Smart campus, LPPM, UNHI, IoT, Artificial Intelligent.

## I. THEORETICAL BACKGROUND

### A. Smart Campus

A lot of research on smart campus has been done by adopting the definition of smart city. Smart campus development refers to various activities that involve the academic community in carrying out the Tri Dharma College activities by utilizing the assistance of using information technology as the main supporting facility. In its implementation, a smart campus requires many facilities and infrastructure so that the development of a smart campus can be realized. And finally, in miniature, smart campus technology began to appear such as smart class rooms, smart laboratories, smart buildings, smart departments or smart faculty (Dharma Putra, 2017).

Furthermore, according to (Iqbal, et al., 2018) Smart campus is a concept in an effort to facilitate the learning process and other activities on campus by utilizing the assistance of Information Technology. According to (Supratman, et al., 2019) in his research, it is stated that universities that successfully utilize information and communication technology

or what are often referred to as smart campuses, in this case as an effort to increase competitive competitiveness, essentially depend on a number of indicators, namely technoware, infoware, orgaware, and humanware.

In addition, according to (Syidada & Wahyuningtyas, 2019) also mentions that smart campuses can be used as a means by universities to be able to win competitions in the industrial era 4.0. Smart campuses can help universities in their efforts to provide fast, accurate, and real-time services to the entire academic community. (Huetas Celdran et al., 2019) it is also mentioned that smart campuses can provide online tools that are geographically dispersed to be able to access learning resources and laboratories.

Based on research (Fortes, et al., 2019) At the University of Malaga, sophisticated information and communication technologies have been adopted in the IoT infrastructure to build smart campuses that can be used to support efficient management and innovative education and research activities. According to (Tjaritham, T, et al., 2018) that the University of New South Wales in Australia implemented an IoT pilot project for four smart campus use cases: classroom attendance, student study space use, parking lot occupancy, and bus stop management. Educational institutions have developed smart campuses but still only in the form of energy efficiency, waste management, and environmental sustainability. However, rarely do they emphasize the improvement of teaching/learning experiences and services in carrying out the activities of the Tri Dharma of university.

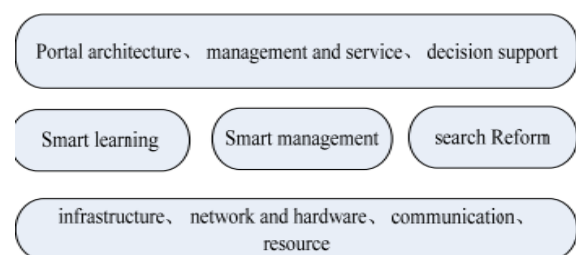


Figure 1. Smart Campus Model

Source: Xiao Nie (2013)

Based on Figure 1. the components that must be owned to develop smart campus technology which consist of:

- Portal architecture: Portal architectur is the main component that must be prepared in the development of a smart campus.

- b) Management service: Management service is prepared to provide good service for lecturers and students
- c) Decision support: Decision support or making the right decisions is important in determining every policy taken by the institution.
- d) Smart learning: Smart learning must be prepared to support learning activities on campus.
- e) Smart management: Smart management is prepared to be able to manage activities carried out more quickly, precisely and efficiently.
- f) Search reform: Search services such as libraries are needed to facilitate lecturers and students in accessing the required material resources.
- g) Infrastructure: Provision of infrastructure used to support smart campus development.
- h) Network and hardware: Network and hardware must be owned to be able to guarantee the system used can run well
- i) Communication: Building a good communication system will make it easier to develop a smart campus.
- j) Resources: The provision of resources, both human and device, is an important point that determines that the development of a smart campus can run as expected.

#### *B. Indonesian Hindu University*

Reporting from the Akupintar article (Akupintar, 2020) The Indonesian Hindu University was founded from the desire of the Hindu Religious Council to build a boarding school (Religious College) as a place to learn Dharma. The wishes of the assemblies were then poured into a decision known as the "Ubud Campuhan Charter" which was later called the "Dharmacrama: which took place in Campur, Ubud, Gianyar Regency, Bali.

Based on point II contained in the Campuhan Ubud Charter, this became the starting point for the history of the establishment of a Hindu Religious College which at that time was named "Maha Widya Bawana" or the Hindu Dharma Institute (IHD). Two years later, on October 3, 1963, which coincided with Purnama Kartika (the 4th Purnama Sasih), the Hindu Institute of Higher Education was born in Indonesia.

At first the Hindu Dharma Institute only had two faculties, namely the Faculty of Religion and Culture and the Faculty of Teacher Training and Education. Religion and culture are important aspects to be maintained and preserved so that they are expected to be able to show their role in national development. Meanwhile, the Faculty of Teacher Training and Education, especially the Department of Biology, is expected to be able to disseminate to the public the meaning of the Usada Book (Traditional Medicine).

Due to the increasing number of enthusiasts and public interest, IHD redeveloped new faculties in order to accommodate the aspirations and desires of the community. Until the formation of the Faculty of Religious Law and the Faculty of Literature and Philosophy of Religion.

However, IHD, which has been running for 30 years and is the only institution of Hindu Religious Higher Education in Indonesia, has not been able to produce undergraduate graduates who are truly able to answer the challenges of the times, and ultimately cannot compete with other university

graduates, resulting in many IHD graduates become unemployed. On that basis, it is necessary to make efforts in mastering science, technology, special skills, which must be possessed but without conflicting with religious values. Then by looking at the background of the establishment of IHD which was initially only driven by a noble desire without proper guidance, since then IHD has been transformed into a Hindu University which is expected to be able to follow the development of science and future challenges. Until May 19, 1993, the Decree of the Minister of Education and Culture of the Republic of Indonesia No. 75/D/O/1993 IHD officially changed its form to Universitas Hindu Indonesia.

#### *C. Smart Campus Components*

Judging from the many studies that have been carried out related to smart campuses, there are several important components that need to be prepared in order to support the implementation of smart campuses, ranging from technology to the required features. Including the following:

In research (Mardiyanto & Rahayu, 2019) important components in smart campus development are:

- a) *Infrastructure Provision*: Infrastructure is an important component in the development of a smart campus. The infrastructure in question can be in the form of internet services, servers and other supporting infrastructure.
- b) *Provision of campus basic services*: Campus basic services are services or systems prepared by the campus to be used by students and lecturers
- c) *Provision of Applications and content*: Provision of applications and content is a service that needs to be prepared to provide convenience to students
- d) *Management of customer business on campus*: Business management in the campus environment is an effort by the campus to improve campus development. Good business management will give satisfaction to customers, in this case students.

#### *D. UML (Unified Modeling Language)*

The system design used in the development of this system uses UML (Unified Modeling Language). According to Rosa in (Irmayani & Susyatih, 2017), UML is one of the language standards used to define the requirements of a system, analyze a system and describe an object-oriented modeling architecture.

#### *E. Use Case Diagram*

According to (Setiawan & Khairuzzaman, 2017) Use Case Diagram is a diagram that displays interactions between users. Where users in the form of people, equipment and other systems that interact with the system to be built. The use case displays the functionality of the system as well as the prerequisites that must be met in system development. According to (Lisnawaty, 2014), Use case is a modeling of the software application to be made. Use Case describes an interaction between users and the system to be created.

#### *F. Activity Diagram*

According to (Lisnawaty, 2014), explained that Activity Diagram is a technique to describe procedural logic, business processes and workflows. According to (Irmayani & Susyatih,

2017), Activity Diagrams describe the main activities of users in the software application that will be created.

G. Sequence Diagram

According to (Irmayani & Susyati, 2017), Sequence Diagrams describe how a software application is able to respond to what the user does. According to (Sukanto and Salahuddin, 2016) states that the Sequence Diagram describes the behavior of an object. Sequence Diagrams are made to see the scenarios created in the use case.

II. METHODOLOGY

A. Method

Based on the research framework, the data analysis in this study uses descriptive analysis method, which is a method to get in-depth data, a data that contains meaning and can significantly affect the substance of the research (Sugiyono, 2018). This method presents directly the nature of the relationship between researchers and participants or objects and research subjects and seeks to analyze research subjects in order to obtain in-depth data.

B. Data Collection Method

In this study, data collection techniques were carried out using several methods as follows:

- a) Literature study is looking for theoretical references that are relevant to the cases or problems found. The study of literature or literature is related to theoretical studies and other references related to values, culture and norms that develop in the social situation under study, besides that library research is very important in conducting research, this is because research cannot be separated from scientific literature (Sugiyono, 2012).
- b) Observation, namely observing directly to the object of research to see closely the activities carried out (Riduwan, 2010). Observations in this study were carried out through observations of the use of information technology in research institutions and community service at the university of Indonesia
- c) In-depth interviews. In this qualitative method there is known as the in-depth interview technique. The definition of in-depth interview is the process of obtaining information for research purposes by means of question and answer while face to face between the interviewer and the respondent or the person who is the resource person, with or without using an interview guide (Sutopo 2006).

D. System Design

The system design used in the development of this system uses UML (Unified Modeling Language). UML is a model for defining system requirements, analyzing systems and describing object-oriented architecture.

1. Use Case Diagrams

Use case diagrams describe the interaction between one or more users with the system to be created and to find out what features exist and who has the right to take advantage of these features.

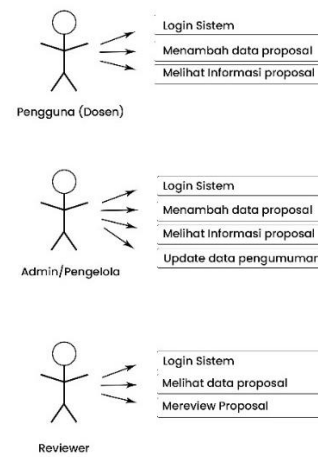


Figure 2. Use Case Diagram.

In Figure 2. the following is a use case diagram of the smart campus system, especially regarding research information systems and community service. In this system there are 3 users who will play a role, namely Manager or Admin, Lecturer and Reviewer. The manager or admin has access rights to all activities on the system. Lecturers have access rights to view and carry out research and service submission activities and the process of collecting reports in the system. Meanwhile, reviewers have access to see a list of research and service submissions and provide reviews of reports submitted by lecturers.

2. Sequence Diagrams

Sequence diagrams are used to describe how the interactions that occur in objects related to the system. Sequence diagrams will provide an overview of the functions that have been created in the use case diagram. In the development of research and community service information systems, several sequence diagrams were made including registration sequence diagrams, login sequence diagrams, research and service submission sequence diagrams.

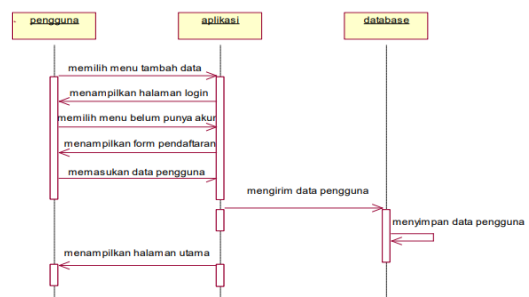


Figure 3. Sequence Diagram of Registration

Figure 3 describes the flow of the registration process on the system. This process is used when the user wants to carry out the process of submitting a proposal. If the user does not have an account, they will be directed to carry out the registration process. Furthermore, the user will enter user data into the system which is then sent to the database to check whether the data has been registered or not. Then the system will be directed to the main page.

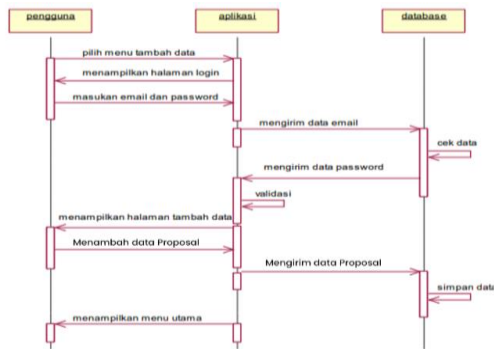


Figure 4. Sequence Diagram of Login and Proposal Submission

Figure 4 describes the flow of the registration process and proposal submission. This process is used when the user wants to submit a proposal. The user logs in first, and the system will send data to the database to check email and password. If you have registered your email and password, you will be directed to the main page. Next, the user continues by submitting a proposal, then the system will send the proposal data to the database for storage.

3. Activity Diagrams

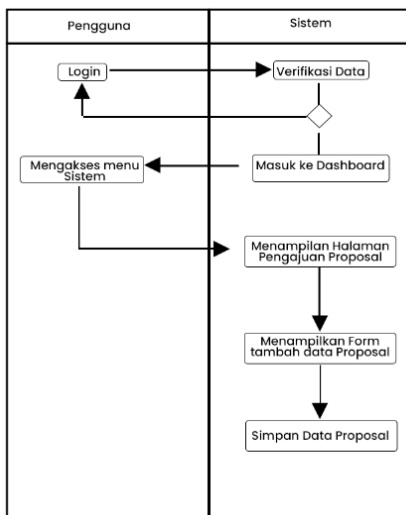


Figure 5. Activity Diagram

Figure 5. describes the overall process flow of the system. Starting from the login process, the system will send the username and password to the database. If the data has been registered, it will proceed to the main page. The next stage is the user will carry out the process of submitting a proposal. Data that has been successfully submitted is then stored in the database, if it fails, the system will remain on the submit proposal page.

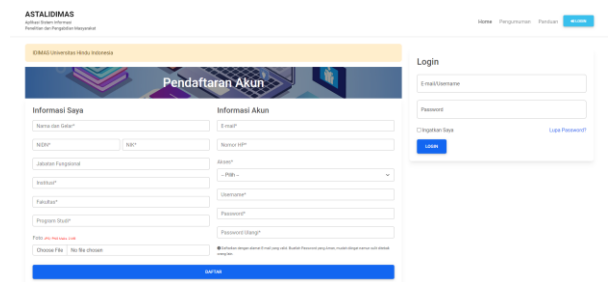
III. RESULTS AND DISCUSSION

ASTALIDISMAS or Integrated Research and Community Service Application, is an application specifically developed to support UNHI internal research and community service, according to the needs, latest features and university regulations. As well as regulatory developments related to research and community service.

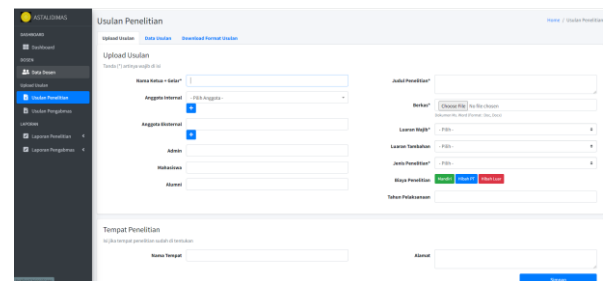
The features developed in this application range from proposal proposals, selection, implementation, monitoring, evaluation to reporting the results of research and community service. The fully developed features are set in the ASTALIDIMAS application. In the astalidismas system, there are 4 main stages, namely the proposal submission stage, the selection stage, the implementation stage, and the reporting stage.

A. The steps for proposing research and service proposals are as follows:

1) Before proposing a pole proposal the lecturer must have an account to access this application as shown in Figure 6.

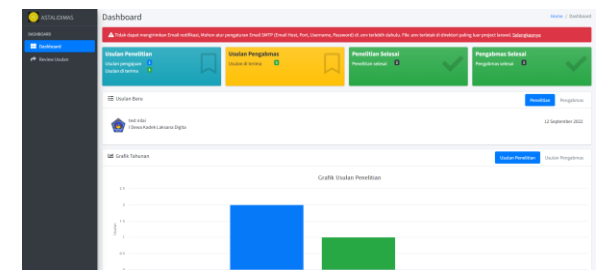


2) After the lecturer has an account, the lecturer then inputs the data for the proposed proposal as shown in Figure 7.



3) The proposed data that has entered the simlitabmas system is recorded on the ASTALIDIMAS System, which can be accessed by the admin.

4) Next, a review of the submitted proposals is carried out. As show in Figure 8



B. The selection stages of proposal and service proposals are as follows:

1) The submitted proposal will be selected by a reviewer who has been appointed by the Research and Community Service Institute (LPPM) of the Hindu University of Indonesia. As shown in Figure 9

No.	Pengusul	Judul	File	Jenis Penelitian	Biaya	Tanggal	Status	Aksi
1	12345678	Studi		Hubai PT	Rp. 25.000.000	31 September 2022	pengajuan	
<p><b>Nama Pengusul</b> : I Dewa Kadek Lukmana Diga  <b>Pakaitas</b> : FTS  <b>Program Studi</b> : Sistem Informatika</p>								
2	87654321	SMART LAM		Hubai PT	Rp. 25.000.000	31 September 2022	pengajuan	
<p><b>Nama Pengusul</b> : Wika Satya Guruh  <b>Pakaitas</b> : Pradaban  <b>Program Studi</b> : Sastra Kewanitaan</p>								
3	12345678	ASTALIDIMAS		Hubai PT	Rp. 25.000.000	31 September 2022	pengajuan	
<p><b>Nama Pengusul</b> : Indira Nur  <b>Pakaitas</b> : FKIS  <b>Program Studi</b> : Sistem Informatika</p>								
4	78901234	ASTALIDIMAS		Hubai PT	Rp. 25.000.000	31 September 2022	pengajuan	
<p><b>Nama Pengusul</b> : Wahyu Yudhanegara  <b>Pakaitas</b> : FEB  <b>Program Studi</b> : Manajemen</p>								

accompanied by a report on the use of finance used during research and community service.

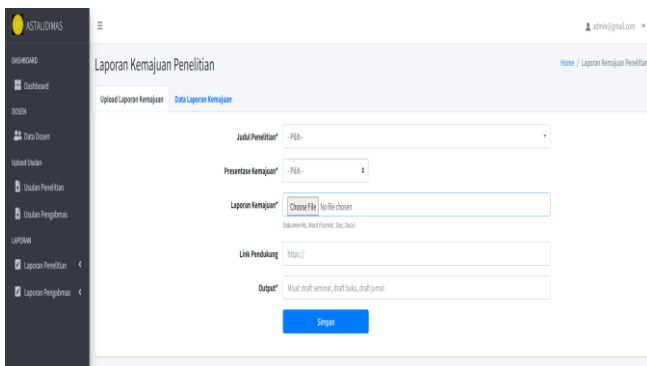
IV. CONCLUSION

- 1) An integrated application system for research and community service at the Hindu University of Indonesia is designed using an object-oriented programming model. The purpose of astalimas development is to produce a blue-print for smart campus development at the Indonesian Hindu University (UNHI), in the field of research and community service to support UNHI towards leading universities in Indonesia as well as the best center for the study and development of Indonesian Hindu religion and culture in the region.
- 2) This integrated system is developed online based, so that lecturers can propose research and community service easily, effectively and efficiently without being limited by time and space.
- 3) Produce a blue-print for the development of a smart campus at the Indonesian Hindu University, towards a leading university in Indonesia as well as the best center for the study and development of Indonesian Hindu religion and culture in the region.
- 4) The features developed in this application ranging from, proposal proposal, selection, implementation, monitoring, evaluation to reporting the results of research and community service, are fully regulated in this application. So that research and community service can be managed efficiently, transparently and accountably

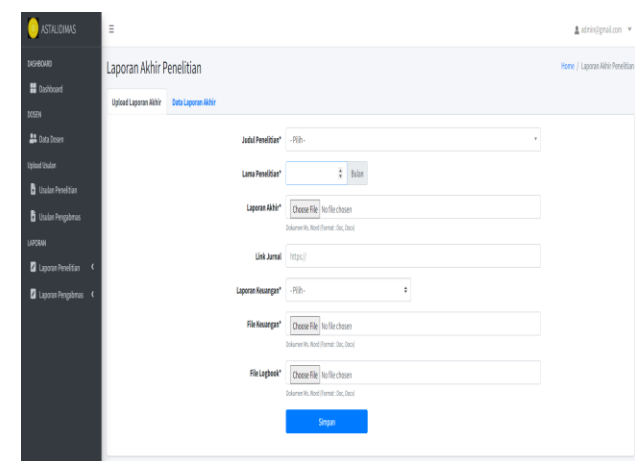
2) It is then announced to the proposing lecturer through LPPM

C. The stages of research and service implementation are as follows:

At the implementation stage, lecturers who receive research and community service proposals are required to enter a diary of the research and service activities carried out. Then send a progress report to ASTALIDIMAS as shown in Figure 10



The screenshot shows the 'Laporan Kemajuan Penelitian' (Research Progress Report) form. It includes fields for 'Judul Penelitian' (Research Title), 'Prestasi Kemajuan' (Progress Achievement), 'Laporan Kemajuan' (Progress Report) with a file upload button, 'Link Pendukung' (Supporting Link), and an 'Output' field with a text area. A 'Simpan' (Save) button is at the bottom.



The screenshot shows the 'Laporan Akhir Penelitian' (Final Research Report) form. It includes fields for 'Judul Penelitian' (Research Title), 'Lama Penelitian' (Duration of Research), 'Laporan Akhir' (Final Report) with a file upload button, 'Link Jurnal' (Journal Link), 'Laporan Keuangan' (Financial Report), 'File Keuangan' (Financial File) with a file upload button, and 'File Laporan' (Report File) with a file upload button. A 'Simpan' (Save) button is at the bottom.

D. The stage of reporting the results of research and community service.

At the stage of reporting the results of research and community service, the final report is sent to ASTALIDIMAS

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