

Cloud Computing Based Thesis Collaborative Platform to Support Innovation and Development of IT Solution

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ABSTRACT

Even though a thesis is an important scientific work produced by students in higher education, the innovative ideas and solutions from the thesis often do not receive follow-up or a platform for real implementation. It is estimated that more than 100,000 undergraduate graduates in information technology (IT) each year have the potential to produce innovative IT solutions through their thesis. To overcome these problems, this research proposeoks developing a collaborative thesis platform based on cloud computing. This platform aims to be a forum for students to realise innovative and quality ideas from their theses. The platform will facilitate collaboration between students and parties who need IT solutions and provide incentive income opportunities for the students involved. By leveraging cloud computing, the platform offers quick and easy access to necessary resources without worrying about local server maintenance. It is hoped that this platform can encourage the development of innovative and quality IT solutions by utilizing ideas from the thesis. The platform has the potential to increase IT graduates' contribution to information technology development, open up incentive income opportunities for students, and facilitate student-industry collaboration in producing IT solutions relevant to real needs.

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Introduction

The existence of scientific works in higher education is a very important and inseparable part of the tri dharma of the university that it carries. The ability to write scientific papers is an absolute competency that university graduates must possess to their respective scientific characteristics (Dharma et al., 2019; Khan et al., 2020; Muhammad Kamal Zubair, 2020). Scientific work is usually one of the requirements for completing studies at a certain level at a university. For the Diploma program, one must make a working paper, Strata-1 must write a thesis, Strata-2 thesis and for the Doctoral program

must make a dissertation. It takes more time, energy and thought than usual to complete it. (Gregoriou et al., 2019; Li et al., 2019)

In the ever-evolving digital era, organizations in various sectors rely on information technology (IT). Organizations, be it businesses, schools, or governments, rely increasingly on applications to improve operational efficiency, optimize decision-making, and solve complex business problems. Therefore, it is crucial to create applications that are innovative and efficient IT solutions.

In the context of higher education, a thesis is one of the important components in the study program. According to the *kompas.com* website, the total number of undergraduate graduates in the field of information technology (IT) is 100,000 people every year, and several applications that have been developed in the thesis from among IT graduates have the potential to become an IT solution. The thesis provides an opportunity for students to develop their understanding of the IT field they are studying and contribute new contributions through the resulting innovations and solutions. However, after the assessment, the thesis and its ideas are often wasted without any follow-up or a forum to make them real. In a situation like this, a *platform* is needed that allows students to work together and helps them make the ideas in their thesis real. The *platform* must provide various features that allow them to find people who can or are interested in making their ideas in the thesis real. One of them is creating a collaborative *thesis platform* based on cloud computing, allowing quick and easy access to the necessary resources without thinking about other maintenance, such as *on-premise servers*. With this thesis collaborative *platform*, students get the opportunity to realise and implement the ideas contained in their thesis so that they can support the development of innovative and quality IT solutions. In addition (El-Attar et al., 2019; Ouhmad et al., 2019; Ridoh & Putra, 2021), this *platform* can also be a forum for students to obtain incentives and realise their ideas in their thesis.

Several researchers have previously researched cloud-based systems, and the systems built for the following theses are some of the studies:

Research conducted by Sudiatmika et al. (2022) with the title *Implementation of Cloud Computing in Pharmacies in Bali Based on Software As A Service*, the difference In this previous study, the use of cloud computing model used in the development was in the form of BaaS while in this study, it was IaaS. The SaaS concept used does not have tenants, while in this study, each application that will be rented is in the form of a multi-tenant.

Research conducted by Zaki et al. (2023), titled *Implementation of Cloud Computing Based on Software as a Service (SaaS) Using OwnCloud for UINSU Information Systems Student Data Processing*. The difference is that in this previous study, *cloud* technology was *cloud storage*, while in this study, it was *cloud computing*.

Therefore, this research aims to develop a collaborative *platform* for the cloud-based thesis that can support innovation and development of IT solutions. The *platform* is expected to provide or even connect IT graduates with parties who need ideas from the work they write in their final project. This *platform* is expected to increase the development of innovative and quality IT solutions to make a greater contribution to the development of information technology.

Materials and Methods

This research is based on a survey that supports the author's observation results. Observations show a lack of follow-up to the completed thesis, so the valuable ideas are not realized. The survey was conducted with respondents who had completed S1 Informatics Engineering and produced an application as the final product of the thesis. Respondents were asked whether their application had been implemented into a real product or service. The survey results showed: (Koç et al., 2021)

Table 1 Survey Result

Answer	Respondents	Percentage
Yes	26	52%
No	24	48%
Total	50	100%

Data shows that 48% of respondents answered "No", confirming that many thesis papers did not receive adequate follow-up. This finding emphasizes the importance of building a platform to realise and publish applications from a thesis.

Data Collection Techniques

This study uses two data collection techniques:

1. Literature Studies: Reviewing literature, journals, and books relevant to this research.
2. Observation: Make direct observations on handling theses that have been written and assessed. The results of observations show that many theses do not receive the attention they deserve and are often neglected.

Research Object

This research focuses on a collaborative platform for a thesis based on cloud computing. This platform facilitates students in realizing, marketing, and publishing applications from their thesis and connecting them with clients or stakeholders who need IT solutions.

Problem Analysis Methods

The fishbone diagram was designed by Kaoru Ishikawa in 1953 and aims to express opinions about the possible possibilities for finding a solution to a problem (Defrisal et al., 2024). In this study, the problem analysis method used is *a fishbone* diagram; it can also be called an Ishikawa diagram; *this* diagram was chosen because it can show a clear model of the relationship between causes and problems, which is the research theme. The following is the result of *the fishbone* diagram that shows the problems that serve to identify the needs of the *platform* to be created:

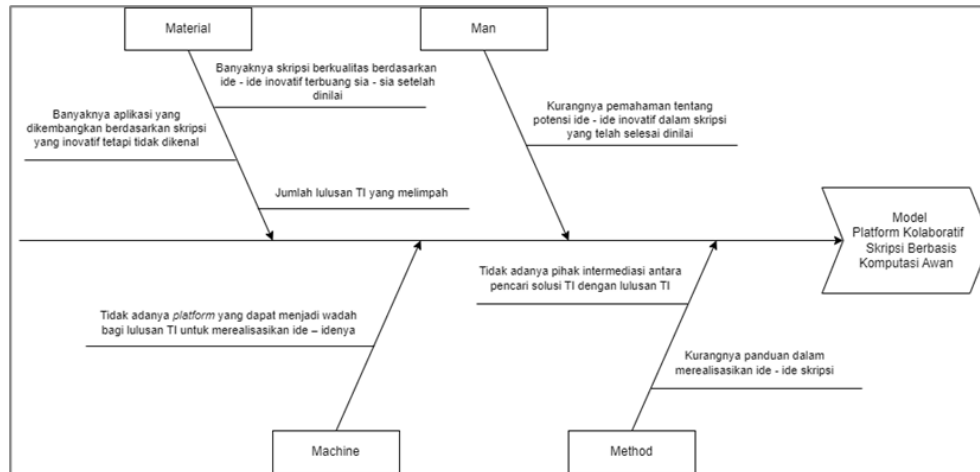


Figure 1. Fishbone Diagram

Table 2 Fishbone Diagram Description

Aspects	Reason	Result
<i>Man</i>	Lack of understanding of the potential for innovative ideas in the thesis that has been assessed	Students do not identify or explore innovative ideas well.
<i>Material</i>	The number of quality theses based on innovative ideas is wasted after being assessed	A thesis that has the potential to become an IT solution is wasted for nothing.
	Many applications developed based on innovative but unknown theses	Applications that have been developed with innovative ideas are missing out on the opportunity to become applications that can become IT solutions
	Abundant number of IT graduates	The innovation potential of IT graduates is not well utilized
<i>Method</i>	There is no intermediary between IT solution seekers and students	IT solution seekers do not identify the potential of valuable ideas for IT solutions.
	Lack of guidance in realizing thesis ideas	The potential for innovative ideas in the thesis may not be realized or implemented properly.
<i>Machine</i>	There is no adequate <i>platform</i> that can be a forum for IT graduates to realise their ideas	The ideas contained in the thesis are not realized, so that these ideas are wasted in vain

Software Development Methods

In selecting software development methods, the author chooses to use *the waterfall* method as the main approach in developing this *platform*, which is also commonly referred to as the waterfall model.

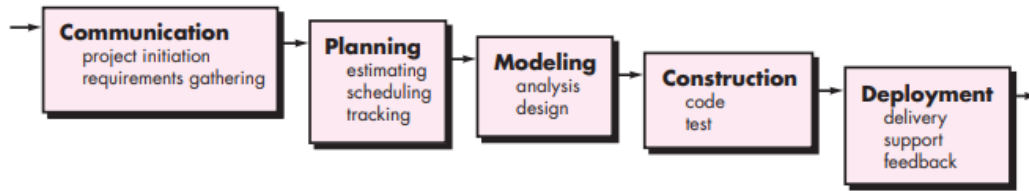


Figure 2. Waterfall Method according to (Pressman, 2015)

The following are some of the steps that will be applied to this research that refer to the waterfall development method: (Jh & Prastowo, 2021)

1. **Communication:** Before starting a project, it is important to communicate intensively with the customer to understand the project objectives. This stage includes project initialization, problem analysis, data collection, and software features and functions definition. Additional references, such as journals and online resources, can be used for data collection.
2. **Planning:** The next step includes estimating technical tasks, identifying risks, allocating resources, work product specifications, work schedules, and monitoring project progress.
3. **Modeling:** This stage involves designing system architecture, focusing on data structures, software architecture, user interfaces, and algorithms. The goal is to understand the overall picture of the project better.
4. **The construction step** involves translating a design into code or format that a machine can execute. After the coding stage, testing is carried out to identify and correct errors.
5. **Deployment:** This step involves deploying software to customers, periodic maintenance, repairs, evaluations, and development based on feedback to ensure the system remains functional and evolving as needed.

Result and Discussion

Blackbox Testing

In this stage, the thesis collaborative platform system that has been built is by using Waterfall method is tested with Blackbox testing, so that it can be ensured that all functions that have been defined previously have run well and appropriately. The following is a table of the test results:

Table 3 IT Graduate Blackbox Testing

Test Class	Test List	Test Details	Expected Results	Results
Register Page	Register Successful	Filling in the registration information that has not been registered	A new IT graduate account will be created based on the information that has been entered	Appropriate
	Register Failed	Filling in the registered registration information	The system will display a registration error message	Appropriate
Login Page	Successful Login	Filling in valid login information	The IT graduate account has	Appropriate

			successfully logged in and will be redirected to the Dashboard Overview page	
	Login Failed	Fill in invalid login information	The system will display a login error message	Appropriate
App Page Menu	Application Menu Function	Click on the "Applications" navigation menu	Displays applications that have been submitted previously, if not, the application submission form will be displayed	Appropriate
	Submit Application	Fill application information completely and click submit	Displays success message	Appropriate
	Application Publish Approval Monitoring	View your app's publish approval status	View detailed information about the app's publish approval status	Appropriate
Royalty Page Menu	Royalty Menu Function	Click on the navigation menu "Royalty"	Displays royalties earned from buyers who subscribe to the submitted application	Appropriate
Development Page Menu	Development Menu Function	Click on the "Development" navigation menu	Displays a wide range of application development info, namely: offers given, ongoing development and completed development	Appropriate
	Accepting Offers	Click "Accept" on the development offer form	IT graduates can join the development team and can see the development in progress	Appropriate
	Decline an Offer	Click "Decline" on the development bid form	IT graduates do not join the development team and cannot see ongoing development	Appropriate
Settings Page Menu	Menu Function of the Settings Page	Click the "Settings" menu	Displays a menu to set the profile and password of the IT graduate account	Appropriate

Table 4 Buyer Blackbox Testing

Test Class	Test List	Test Details	Expected Results	Results
Register Page	Register Successful	Filling in the registration information that has not been registered	A new buyer account will be created based on the information you have entered	Appropriate
	Register Failed	Filling in the registered registration information	The system will display a registration error message	Appropriate
Login Page	Successful Login	Filling in valid login information	The buyer's account is successfully logged in and will be redirected to the landing page to search and view the available applications on the platform	Appropriate
	Login Failed	Fill in invalid login information	The system will display a login error message	Appropriate
Search and View Apps Page	Search for Apps by App Name	Filling in the name of the app in the input field of the app search and press the enter key	Displays the entire app based on the input field value	Appropriate
	Search for Apps by Application Field	Click on one of the available field options	View all apps based on selected fields	Appropriate
	View the App in Detail	Click on one of the apps	Displays detailed application information	Appropriate
Application Details Page	Subscription	Select the subscription type and confirm and pay for it	Displays confirmation and payment capital based on the selected subscription type	Appropriate
	Making the Required Application Request	Fill out the request form provided	Displays a message that successfully requested an application	Appropriate
Menu My Subscriptions Page	My Subscriptions Page Menu Function	Click the menu "My Subscriptions"	View your subscriptions	Appropriate

	Access Subscription	Click the "Open App" button on the selected subscription	Direct shoppers to the subscription address	Appropriate
	Making a Maintenance Request	Click the "Yellow with Screwdriver icon" button on the selected subscription	Displays the capital to make maintenance requests	Appropriate
Maintenances Page Menu	Maintenances Page Menu Function	Click the "Maintenances" menu	Displays maintenance requests that have been created	Appropriate
My Transactions Page Menu	My Transactions Page Menu Function	Click the "My Transactions" menu	View transaction history and billing	Appropriate
My Request Page Menu	My Request Page Menu Function	Click the "My Requests" menu	View requests that have been made	Appropriate
Settings Page Menu	Menu Function of the Settings Page	Click the "Settings" menu	Displays a menu to set the buyer's account profile and password	Appropriate

Table 5 Evaluator Blackbox Testing

Test Class	Test List	Test Details	Expected Results	Results
Login Page	Successful Login	Fill in valid login information	The evaluator account is successfully logged in and will be directed to the Dashboard with the Application Evaluation Assignment page	Appropriate
	Login Failed	Fill in invalid login information	The system will display a login error message	Appropriate
Application Evaluation Assignment Page	View Application Evaluation Assignments	When the login is successful	View assigned assignments on an evaluator account	Appropriate
	View Assignments in Detail	Click on an assignment	View detailed assignment information	Appropriate
Application Evaluation Details Page	Evaluating Applications	Filling out the evaluation form based on the results of the evaluation that	Displays a successful evaluation of the app and updates the evaluation status message	Appropriate

has been carried out

Table 6 Project Leader Blackbox Testing

Test Class	Test List	Test Details	Expected Results	Results
Login Page	Successful Login	Filling in valid login information	The project leader account is successfully logged in and will be directed to the Dashboard with the Application Development Team Assignment page	Appropriate
	Login Failed	Filling in invalid login information	The system will display a login error message	Appropriate
Application Development Team Assignment Page	View Application Development Team Assignments	When the login is successful	View assigned assignments on the project leader's account	Appropriate
	View Assignments in Detail	Click on an assignment	View detailed assignment information	Appropriate
Development Team Detail Page	Fill in the discussion link	Fill out the discussion link form with the link that has been created and click the "Submit" button	Display a message that successfully submits a discussion link	Appropriate
	Creating a Development Team	Click the "Add Developer" button	Displaying developer addition capital	Appropriate
	Renewing the Expansion Status	Select the status and click the "Update" button	Show success messages and update app status	Appropriate

Table 7 Developer Blackbox Testing

Test Class	Test List	Test Details	Expected Results	Results
Login Page	Successful Login	Fill in valid login information	The developer account is successfully logged in and will be redirected to the <i>Dashboard</i> with the Application Development Assignment page	Appropriate

	Login Failed	Filling in invalid login information	The system will display a <i>login</i> error message	Appropriate
Application Development Assignment Page	View App Development Assignments	When the login is successful	View assignments assigned to a developer account	Appropriate
	View Assignments in Detail	Click on an assignment	View detailed assignment information	Appropriate
	Go to the Discussion Link of Development	Click the "Blue with Project Icon" button	Directing developers to the address of the discussion link	Appropriate

Table 8 Subscription PIC Blackbox Testing

Test Class	Test List	Test Details	Expected Results	Results
Login Page	Successful Login	Filling in valid login information	The subscription PIC account is successfully logged in and will be redirected to the Dashboard with the Subscription PIC Assignment page	Appropriate
	Login Failed	Filling in invalid login information	The system will display a login error message	Appropriate
Subscription PIC Assignment Page	View Subscription PIC Assignments	When the login is successful	View assigned assignments on a subscription PIC account	Appropriate
	View Assignments in Detail	Click on an assignment	View detailed assignment information	Appropriate
	Filling in the Subscription Deployment Link	Filling out the deployment link form from the link that has been obtained from the deployment process and click the "Submit" button	Displays a successful message and updates the subscription deployment status	Appropriate

Table 9 Admin Blackbox Testing

Test Class	Test List	Test Details	Expected Results	Results
Login Page	Successful Login	Fill in valid login information	The admin account is successfully logged in and will be redirected to the	Appropriate

			Dashboard Overview page	
	Login Failed	Fill in invalid login information	The system will display a login error message	Appropriate
App Page Menu	Click on the "Applications" navigation menu	Click on the "Applications" navigation menu	Displays all applications registered on the platform	Appropriate
	Deleting an App	Select the app and click the "Red with Trash Icon" button	Show success messages and delete apps	Appropriate
	View Application Details	Select the app and click on the "Blue with Eye Icon" button	Displaying an app detail page	Appropriate
	Assign an Evaluator	Select an evaluator on the form and click the "Assign Evaluator" button	Displays a successful evaluator assignment message	Appropriate
Application Details Page	Assign Project Leader	Select the project leader on the form and click the "Assign Project Leader" button	Displays a successful message to assign a project leader	Appropriate
	Updating the Publication Status of an Application	Select the publication status on the form and click the "Update Status" button	Display a success message and update the app's publication status	Appropriate
	Setting the Price of Each Subscription Type of the App	Select the subscription type and click the "Edit Price" button	View price edit form	Appropriate
	Subscription Menu Function	Click on the "Subscriptions" navigation menu	View all existing subscriptions	Appropriate
Subscription Page Menu	Delete a subscription	Select a subscription and click the "Red with Trash Icon" button	Show a successful message and delete a subscription	Appropriate
	View Subscription Details	Select a subscription and click on the "Blue with Eye Icon" button	View the subscription details page	Appropriate

Subscription Detail Page	Assign a Subscription PIC	Select the subscription PIC on the form and click the "Assign Subscription PIC" button	Displays a message that the subscription PIC was successfully assigned	Appropriate
Request Page Menu	Menu Request Function	Click the "Request" navigation menu	View all existing requests	Appropriate
	Answering a Request	Select the request and press the "Yellow with Pencil Icon" button	Displays the modal to answer the request	Appropriate
	Deleting a Request	Select the request and click the "Red with Trash Icon" button	Displaying a successful message and deleting a request	Appropriate
Royalty Page Menu	Royalty Menu Function	Click on the "Royalty" navigation menu	Displays all available royalties	Appropriate
	View Royalty Details	Select the royalty and click the "Blue with Eye Icon" button	View royalty details page	Appropriate
	Distributing Royalties from a Subscription	Click the "Add Royalty" button	Displaying capital to distribute royalties	Appropriate
	Renewing Royalty Distribution	Select the royalty distribution and press the "Yellow with Pencil Icon" button	Displaying capital to renew royalty distribution	Appropriate
	Removing Royalty Distribution	Select the royalty distribution and click the "Red with Trash Icon" button	Displaying a successful message and removing royalty distribution	Appropriate
Account Page Menu	Account Page Menu Function	Click the "Account" menu	Displays a menu to manage all accounts by role	Appropriate
Settings Page Menu	Menu Function of the Settings Page	Click the "Settings" menu	Displays a menu to set the profile and password of the admin account	Appropriate

Evaluation of Development Results

While developing and testing this application, several questions and problems have been identified and analyzed. Here is an analysis of the results of development and testing based on these issues:

1. Copyright Validation and Legal Conformity

In the development of an application, it's important to understand that copyright issues for an application tend to be ambiguous and not absolute. The sale of applications based on theses raises a problem concerning the ownership rights of theses, which are typically the property of universities. To address this issue, further development is needed, including implementing a licensing system, and royalty-sharing mechanisms and designing collaborative models that comply with university policies. Consultation with legal experts and university authorities is also necessary to ensure the platform can operate legally and ethically before wider implementation.

2. The Uniqueness of the Thesis Collaborative Platform Compared to Using Independent Development Services,

The uniqueness of the Collaborative Thesis Platform is its cloud computing-based management. Subscribers are free from the hassle of managing on-premise servers and system maintenance, as the platform handles all these aspects centrally. Unlike Independent Development Services that require self-management, this platform allows users to focus on content rather than technical infrastructure, thus enhancing efficiency.

3. Plagiarism Checking Process,

There is no checking process like "Turnitin" specifically for this application. The principle of originality remains important. Similarity in concept does not mean plagiarism; the most important thing is innovative implementation and added value provided. Focus on developing unique ideas and features, not absolute uniqueness.

Based on the things described above, further development is needed to improve the quality and usability of this system. This includes improving features, security, and compliance with applicable legal and ethical standards. Thus, this thesis collaborative platform system is expected to benefit students, universities, and the wider community.

Conclusion

Based on the final project research completed with the title "Cloud Computing-Based Thesis Collaborative Platform to Support Innovation and Development of IT Solutions", it can be concluded that Scientific papers, especially theses, have great potential to produce innovative ideas in the field of information technology. There is a gap between the development of ideas in the thesis and their implementation in the real world, as shown by the survey results, where 52% of respondents indicated a lack of adequate follow-up. The development of a cloud computing-based platform is a solution to bridge the gap mentioned in the previous point, to provide a forum to implement the ideas of IT graduates' theses, becoming an intermediary between IT graduates and those who need innovative solutions, creating incentive income opportunities for students who have completed their thesis. The platform will be developed using the Waterfall method, ensuring a systematic and structured approach in the development process. Problem analysis will be carried out using the Fishbone Diagram (Ishikawa), to identify the root cause of the problem comprehensively. Using cloud computing technology in this platform will facilitate easy and fast access and reduce the burden of infrastructure maintenance (Rashid & Chaturvedi, 2019). The development of this platform is

expected to have the potential to create an ecosystem that supports the development of innovative and quality IT solutions, as well as increase the relevance of higher education to industry needs.

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