

Web-Based Knowledge Management System Design By Applying The Becerra-Fernandez Knowledge Management Process Approach: Case Study At Pt Yafii Solusi Internasional

Adi Widyanto, Dana Indra Sensuse, Opitasari

Abstract: PT Yafii Solusi Internasional is an information technology company that focuses on developing computer systems in private and government companies. Staff do more work outside the office so there is very little time for staffs to meet face to face. As a result, miss configuration occurs often during the configuration and maintenance installation stages. The objective of this study is to build a knowledge management system to store and utilize employee knowledge. Therefore, it makes it easier for them to find solutions to problems that have been experienced by one employee and the others. The researcher collected the data through direct interview and literature study. Knowledge management conversion was carried out through the Becerra-Fernandez knowledge management process approach. Meanwhile, the system development method was performed through prototyping and is modeled using system analysis through the Unified Modeling Language (UML). System testing was carried out using Blackbox testing and user acceptance testing was carried out using the User Acceptance Test method with the Technology Acceptance Model. The results of this study found that a web-based knowledge management system was built through SharePoint, Git, Exchange Server. The features of the KMS include: managing personal documents, managing document repositories, collaborating on documents, conducting discussions, writing personal knowledge, writing wikis, looking for content knowledge, managing email, and managing source code.

Index Terms: Becerra-Fernandez, Blackbox testing, knowledge management system, knowledge management process, prototype, UM, user acceptance test, technology acceptance model

1. INTRODUCTION

PT Yafii Solusi Internasional is an information technology company that focuses on developing computer systems in private and government companies. There are several divisions at PT Yafii Solusi Internasional that play an important role in the running of the company's operations, including the infrastructure and developer division. Staffs from those divisions more often do work outside the office so there is very little time for the staffs to meet face to face. In addition, the process of knowledge sharing is hampered because there is no means of knowledge sharing that can be used due to time and place limitations. As a result, miss configurations often occur during configuration and maintenance installation stages. Turnover rate for employees of the developer division of PT Yafii Solusi Internasional is high. Knowledge, which is owned and obtained by employees, which comes from training and experience, should not be lost and remain an asset of the company. Thus, transfers can be made to each division that needs it.

1.1 Problem Identification

Based on the above background, the problems that occur at PT Yafii Solusi Internasional are as follows:

- Knowledge in both tacit and explicit forms which is stored in each staff member.
- Limited time and place so that it inhibits the process of knowledge sharing among staffs.
- There is no knowledge sharing media to increase

employee knowledge.

- The high level of employee turnover which results in the lack of knowledge assets owned by the company.

1.2 Formulation of the Problem

Based on the background, identification, and limitation of the problem above, the formulation of the research problem is about how the design of a web-based knowledge management system that can be accepted and utilized by PT Yafii Solusi Internasional to facilitate the process of operational activities in each division in the process of knowledge sharing.

1.3 Research Objectives

The objective of this study is expected to be a means to build a knowledge management system design that can be used to store and utilize knowledge from each staff and facilitate the process of operational activities related to knowledge sharing.

1.4 Significance of the Study

1.4.1 Practical Significance

The significance of this research is to build a web-based knowledge management system design as a means of knowledge sharing that is expected to help the company to overcome the existing problems; i.e. to maintain the knowledge assets that the company has with a high employee turnover rate. The web-based knowledge management system design is also expected to overcome the time and space constraints in the process of knowledge sharing.

1.4.2 Theoretical Significance

The theoretical significance of this research is as a reference in developing a knowledge management system, especially through the Becerra-Fernandez knowledge management process approach.

- *Adi Widyanto is currently pursuing masters degree program in Graduate Program in Computer Science, Postgraduate Program, Budi Luhur University, Indonesia, E-mail: adi.widyanto11@gmail.com*
- *Dana Indra Sensuse is a lecturer in faculty of computer science at Universitas Indonesia, E-mail: dana@cs.ui.ac.id*
- *Opitasari is currently pursuing masters degree program in Graduate Program in Computer Science, Postgraduate Program, Budi Luhur University, Indonesia, E-mail: opitasari@gmail.com*

2 THEORETICAL BASIS

2.1 Definition of Knowledge Management System

Knowledge Management System is considered as a system activity that involves human resources to use objects (tools and technology) in order to produce knowledge products to achieve goals [1]. Knowledge Management System is a system that facilitates the dissemination and storage of knowledge. Knowledge Management System supports the creation, storage, transfer and application of knowledge.

2.2 Knowledge Management Process

1.4.1 Process in Knowledge Management

There are several processes involved in knowledge management which include discovery, capture, sharing, and application [2]. The four knowledge management processes are supported by seven subprocesses consisting of a combination, socialization, externalization, internalization, exchange, direction, and routines. The socialization subprocess supports two KM processes: discovery and sharing. From the seven KM subprocesses, four (combination, socialization, externalization, and internalization) are based on the Nonaka method which focuses on how to change tacit knowledge and explicit knowledge.

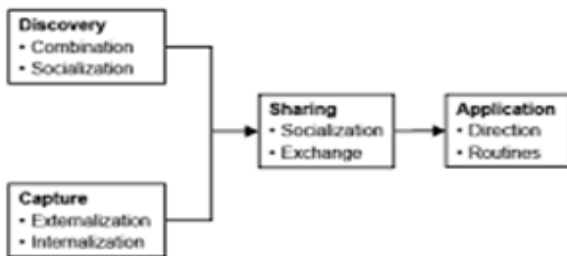


Fig. 1. Knowledge Management Processes

a. Discovery

Knowledge discovery is defined as the development of new tacit knowledge or explicit knowledge from data and information or from the synthesis of previous knowledge. The discovery of new explicit knowledge will depend on the subprocess of the combination.

b. Capture

The capture process is defined as a process of retrieving explicit knowledge or tacit knowledge that resides in a group of people, artifacts, or organizational agencies. The capture process itself is divided into two subprocesses: externalization and internalization.

c. Sharing

Knowledge sharing is the process by which explicit knowledge or tacit knowledge is communicated to others. This is an important process in increasing innovation and organizational performance. Sharing consists of two subprocesses: Socialization and Exchange.

d. Application

The application process depends on existing knowledge generated from the previous process; i.e. discovery, capture and sharing. The better the process of discovery, capture, and

sharing, the more likely it is that the required knowledge is available in decision making and task performance. The application consists of two subprocesses: Direction and Routines.

2.3 Review of Previous Studies

The following is a list of reviews from previous studies:

TABLE 1
REVIEW OF PREVIOUS STUDIES

Title	Method	Result
Prototype of E-Learning System Based on Knowledge Management: Case Study at Vocational High School of Generasi Madani [4]	the Tiwana framework method, the Becerra-Fernandez knowledge management system development framework, the testing of the Software Quality Assurance (SQA) method and ISO 9126	knowledge management-based e-learning system
Hybrid Soft System Methodology (SSM) and Becerra Approach for Modeling Knowledge Management System [6]	Soft System Methodology (SSM) and Becerra, contingency view approach	KMS which provides chat features, forum discussions, online libraries, and document management
Designing a Knowledge Management System in the IT section of Bina Nusantara using Blogs, Wikis, Forums and Documents [5]	Software Development Life Cycle (SDLC), iteration model	KM application based on SharePoint which has features such as Blog, Wiki, Forum, and Document.

Improvisation in this study that distinguishes from previous research is a feature of the system design technology used by collaborating documents and source code through the GitLab server. It also concentrates user authentication on the active directory and uses the single sign on feature. Then, this research infrastructure is developed by virtualization technology so that it can make it easier for administrators to scale-up the infrastructure of the system.

2.4 Point of View for Problem Solving

Based on the results of preliminary observations and theoretical studies that have been compiled by the author, then it can then be built into a framework for thinking about designing a web-based Knowledge Management System at PT Yafii Solusi Internasional.

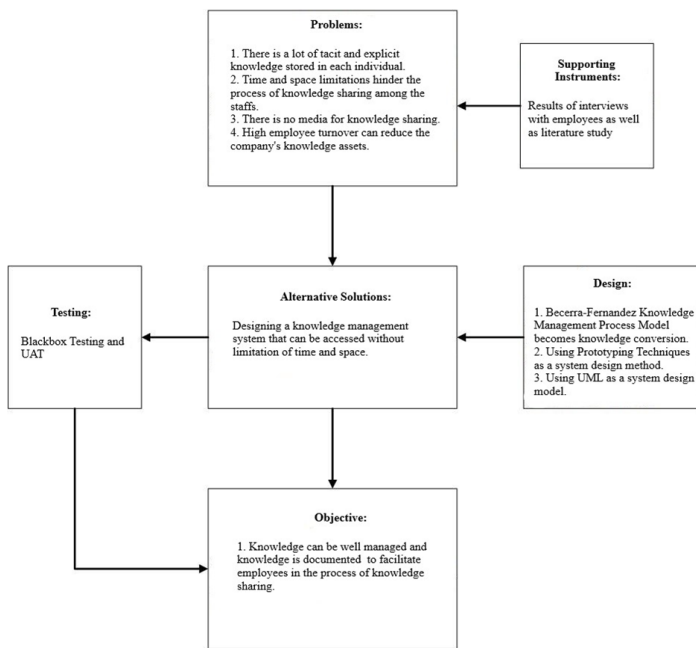


Fig. 2. Point of View for Problem Solving

This framework of thinking will begin by looking at the problem of the object that is currently being researched by conducting an interview process and a literature study of the previous research. Then, based on the results of the interview, the writer determines the current problems. The next step is to determine alternative solutions to be used. After determining the appropriate solution, the writer will design a knowledge management system and then develop it into a prototype knowledge management system that will be tested through Blackbox testing and user acceptance tests with the TAM model.

2.5 Hypothesis

Based on the problem formulation at related institutions and the conceptual framework that has been proposed, the researcher suspects that the design of a web-based knowledge management system using the Becerra-Fernandez Knowledge Management Process approach will produce an acceptable system in accordance with the needs of knowledge management at PT Yafii Solusi Internasional in order to develop a culture of knowledge sharing, and makes it easier for users to document and utilize knowledge at PT Yafii Solusi Internasional.

3. RESEARCH METHOD

3.1 Research Method

The analytical method used to capture knowledge is Becerra-Fernandez Knowledge Management Process method. Meanwhile, the prototype is used as a system design and analysis method. In addition, the system design uses an object-oriented approach. Implementation of system analysis and design uses web programming. Testing system functionality uses Blackbox testing. Then, user testing uses the User Acceptance Test with the TAM model to find out whether the system designed is acceptable to the user in terms of both usability and convenience.

3.2 Research Steps

The steps in the research implementation can be seen in the following figure:

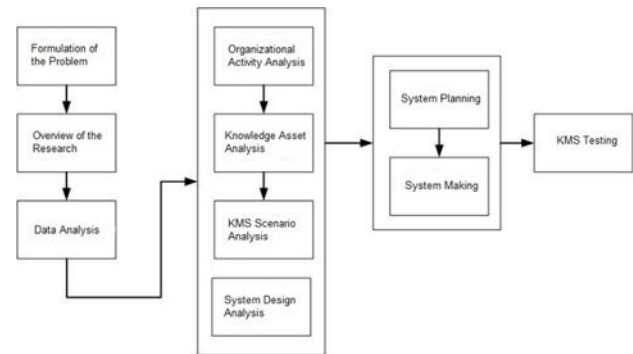


Fig. 3. Research Steps

An explanation of the research steps above is described below:

a. Problem Formulation

The initial step in this study is the formulation of the problem in PT Yafii Solusi Internasional by conducting direct interview with the Lead from each division. The results obtained are the points of the problem formulation in PT Yafii Solusi Internasional.

b. Overview of the Research

The next step is overview of the research by reading references related to knowledge management to obtain knowledge management theories related to the formulation of the problem.

c. Data Analysis

In this step the author tries to analyze the data obtained from interviewing users and looking for literature from scientific research related to the title of the researcher.

d. Organizational Activity Analysis

In this step the researcher determines the priorities of organizational activities or business processes in developing the knowledge management model. After determining the organizational activities, it can determine the area that can be prioritized in developing a knowledge management system.

e. Knowledge Asset Analysis

After obtaining data and information from the previous process, it can be grouped into any business process and data that can be used as knowledge, so that knowledge will be owned (assets). It is important to analyze this knowledge need so that knowledge is available at the relevant agencies.

f. Knowledge Management System Scenario Analysis

The analysis carried out at this stage is the analysis of each activity to create and formulate knowledge using the KM Process Becerra-Fernandez approach.

g. System Design Analysis

The next step is to design a system for PT Yafii Solusi Internasional. The input is a feature obtained from the Becerra Fernandez of KM Process Conversion result. Meanwhile, the output is use case, class diagram, and deployment diagram.

h. System Design

After obtaining use cases, classes and deployment diagrams related to the system being developed, the researchers began to make a layer design which results in the appearance of the system used as a KMS prototype.

i. Knowledge Management System Making

Next is to make a prototype based on knowledge management. The input of this stage is the knowledge management system model obtained from the results of the previous process.

j. Testing Knowledge Management System

The next step is to test the prototype that has been made. The testing aims to do the processes of knowledge management that is supported by the knowledge management system model by using the Blackbox testing method for system testing and User Acceptance Test with the Technology Acceptance Model (TAM) model for testing acceptance from the user side.

4. RESULTS AND DISCUSSION

4.1 Analysis of Interview Results

Interviews were conducted to determine the initial conditions of how the existing knowledge process in the research objects. Based on the results of the initial interview summarized above for several employees in the company, there are things that are of concern to the author for the development of this KMS, including the following:

- a. In the current condition at PT YSI in the process of sharing knowledge, is still carried out via mobile media such as WhatsApp, and e-mail to send progress or source data of the coding or configuration. It often causes miss communication such as loss of documentation or tutorial links.
- b. Functional needs in making the KMS prototype that is most needed is the document center to collaborate on documents. The next is a wiki to standardize configurations and store structured knowledge, and blogs that can store unstructured knowledge (uncategorized). Meanwhile, the special need for developers is the need for source code server to store project code.
- c. For the non-functional requirements most recommended by the user is a single identity, where all applications can use one username and password. The other needs are the system can be accessed from anywhere, as well as user friendly, and single sign on.

4.2 Organizational Activity Analysis

This section will explain how the activities carried out at PT Yafii Solusi Internasional:

4.2.1 Infrastructure Division

a. Kick Off/ Project Phas

In this business process, the project manager will commonly have a meeting with the customer. Generally, the project manager will invite the technical team to attend the meeting because it will discuss the scope of work and any needs related to the implementation of work in the customer environment. The following is the Kick Off Phase Activity Diagram:

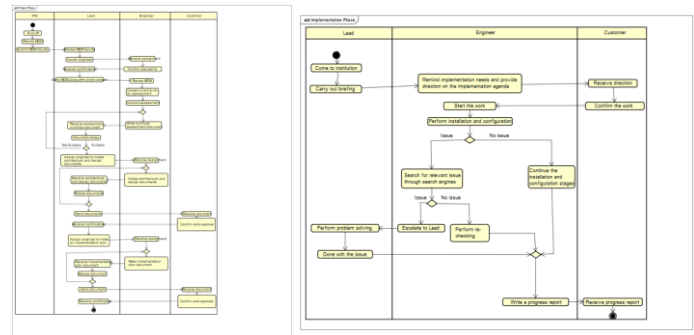


Fig 4. Kick Off Phase Activity Diagram

The project manager will inform the engineer and the lead to kick off the meeting with the customer. The results of the meeting were determined by the scope and working days. The activity carried out after the kick off meeting is: the engineer will conduct an assessment related to the condition of the existing system. The results of the assessment engineer will make a summary assessment document based on the findings of the current system conditions.

b. Implementation

After the scope of work has been agreed by the developer and the customer, the engineer will then carry out the development of the system. At this stage the engineer does the installation and configuration of the customer Datacenter/ Cloud subscription if the customer has a datacenter in the cloud. Here is the activity diagram implementation:

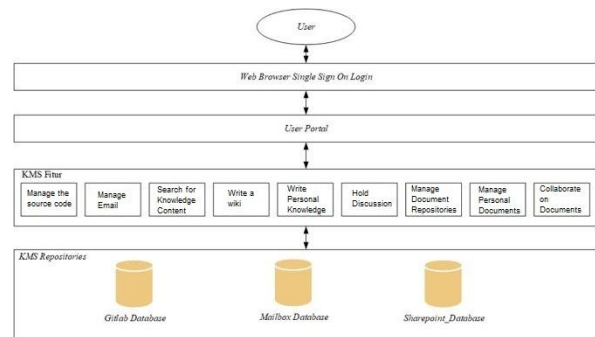


Fig 5. Implementation Activity Diagram

At the implementation stage, the technical team will carry out work according to the stages mentioned in the implementation plan document, if the technical team experiences problems, the technical team generally will search Google or open a Microsoft web portal to find solutions based on the main problem. If it is not found, usually the technical team will conduct internal discussions with individuals and with the team based on existing problems.

4.3 Knowledge Asset Analysis

4.3.1. Tacit Knowledge

Tacit Knowledge in PT Yafii Solusi Internasional is in the form of experience in problem solving that exist in the customer, planning and designing the system architecture to be developed, conducting training activities on the developed products from Microsoft and applications.

4.3.2 Explicit Knowledge

Explicit Knowledge in PT Yafii Solusi Internasional is data, information and documents either not yet or that have been documented; for instance, documents related to application usage guidelines, Operation Documents for customers, Minute of Meeting, assessment documents, progress reports, implementation documents, scripts, project source code, and others. The following table lists the existing knowledge at PT Yafii Solusi Internasional:

TABLE 2
LIT OF PT YSI KNOWLEDGE

Knowledge	Documented	
	Electronic	Non-Electronic
Server Installation and Configuration Knowledge	Yes	No
Knowledge in Creating Automation Scripting	Yes	No
Troubleshooting Issue	Yes	No
Knowledge in Minute of Meeting	Yes	Yes
Knowledge in Implementation Report	Yes	No
Operation Documents	Yes	Yes
Source Code Documentation	Yes	No
Knowledge Assessment Report	Yes	No
Knowledge of Architecture and Design Report	Yes	No
Knowledge of UAT Report	Yes	Yes

Based on the above table, it can be concluded that there has been a lot of documented knowledge both electronically on computers or non-electronics in the form of physical documents. The following are some forms of knowledge assets owned by PT Yafii Solusi Internasional seen from the knowledge of tacit and explicit knowledge.

TABLE 3

KNOWLEDGE ASSETS OF PT YAFII SOLUSI INTERNASIONAL

Business Process	Knowledge Process
Kick Off Meeting	Provide Workmanship Direction
Make Work Documentation	Make SOP Documentation
Installation and Configuration/ Coding	See the Installation/ Work Tutorial
Collaborate on Document	Combine the Knowledge
Troubleshoot	Take note of Troubleshoot results
Conduct a discussion related to the Issue	Conduct a Discussion Forum
Update the source code	Code Collaboration
See Previous Work	See the SOP guidance document
Look for a Usage Guide	Look for documentation or installation guides

4.4 Knowledge Management Scenario Analysis

Based on the existing problems and the results of the interview the user's needs that the researcher obtained, then in the next stage the writer will make a KMS model that can be developed at PT Yafii Solusi Internasional. The author converts knowledge using the process of discovery, capture, sharing, and application which is the Becerra-Fernandez model. Below is the relationship between business process activities and knowledge management at PT Yafii Solusi Internasional:

TABLE 4

PT KNOWLEDGE CONVERSION OF YAFII SOLUSI INTERNASIONAL

Business Process	KM Process	KMS Feature
Kick Off Meeting	Socialization for Knowledge Sharing, Direction	Manage Email
Conduct a discussion related to the Issue	Socialization for knowledge discovery	Hold discussions
Installation and Configuration/ Coding	Routines, Externalization combination internalization	Write a wiki
Make Work Documentation	Exchange	Manage personal documents
Troubleshoot	Exchange, direction	Write Personal Knowledge
Collaborate on Documents	Combination	Collaborate on Documents
Search for a Usage Guide	Internalization	Search for Knowledge Content
Update the source code	Externalization combination	Manage the source code
See Previous Work	Internalization	Manage Document Repositories

Furthermore, the authors make a KMS model that will be applied in the company, as follows:

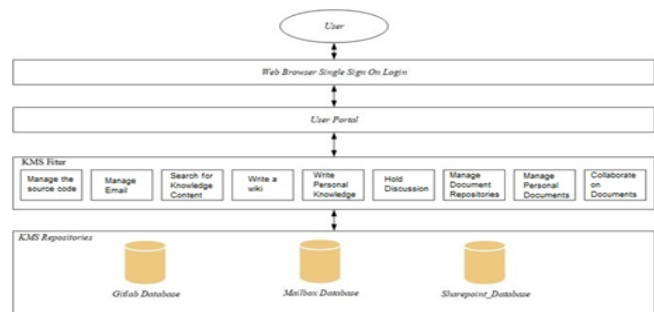


Fig 6. KMS Model Scenario of PT YSI

4.5 System Design Analysis

4.5.1 Use Case

Analysis Based on the knowledge model conversion in the previous section, the following use cases can be made on the system to be developed. Following is the Use Case Design of PT YSI Knowledge Management System:

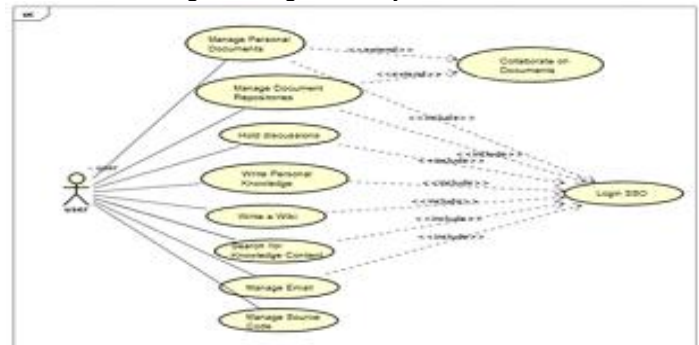


Fig 7. PT YSI KMS Use Case Diagram Design

Based on the picture above, the system will have 9 modules and each system module will have an account that is used to

log in the system (single sign on) where when the user will access the KMS application, the user must login first. Each module will be described as follows:

a. Login Single Sign On

Single Sign on Login is a portal used to log into the system, in this module, when the user successfully logged in, the user will be directed to the KMS portal. The following is the use case description Login Single sign on:

TABLE 5
USE CASE DESCRIPTION OF SSO LOGIN

Use Case Name	SSO Login
Actor	User
Description	The system login page matches the user level.
Pre-Conditions	The system is directed to the user login page
Main Actions	1. user enters the username 2. user enters the password 3. user select login
Post Condition	The system will direct the user to the portal page

In the above use case description, there is one actor: the user. The pre-condition is the user must log in first when the user accesses other sub domains such as the dashboard. There are 3 steps that users take, namely entering a username, entering a password, and selecting the login button. The post condition is if the user has successfully logged in the system will point to the application portal/ dashboard.

4.6 System Design

4.6.1 Interface Design

a. Portal

The portal page contains features of the Knowledge Management System developed at the PT Yafii Solusi Internasional organization. Each menu has an icon and a name.

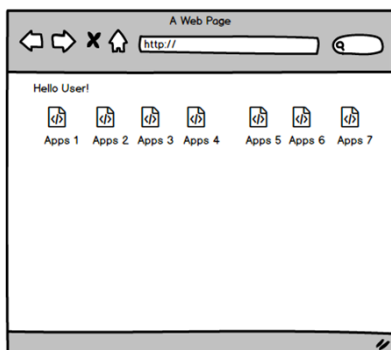


Fig 8. Portal Interface Design

b. Write Personal Knowledge Homepage

On the home page, writing personal knowledge contains the latest posts from users who have published articles / posts. Then, on the left side, there is a navigation menu available on the feature.

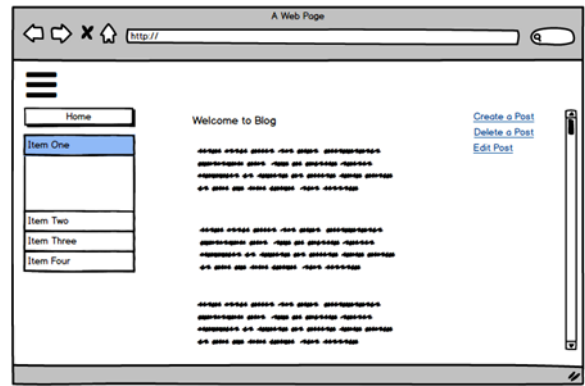


Fig 9. Interface Design Homepage Blog

4.6.2 Deployment Diagram

In the development of this KMS. It takes a variety of servers with their respective functions. The following analyzes the infrastructure requirements for KMS system development at PT Yafii Solusi Internasional:

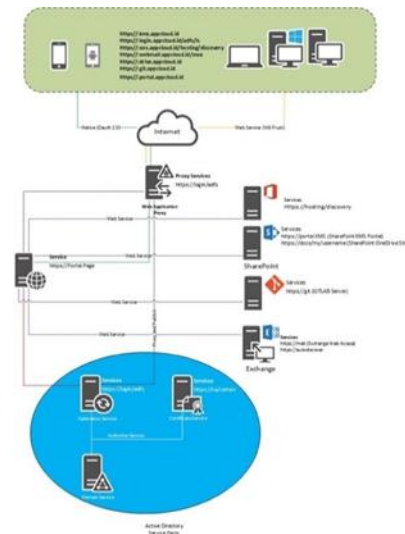


Fig 10. Deployment Diagram

4.6.3 System Display

a. Login Page

This login display contains the username and password textbox for logging into the system dashboard.

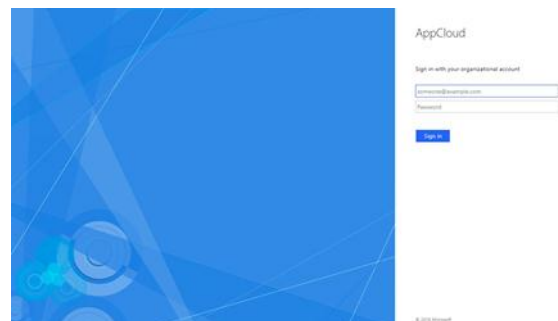


Fig 11. Login System Display

The function of the single sign on feature is that every user who wants to try to open the applcloud.id subdomain will point to that page.

b. Portal

After the user has successfully logged in, the system will lead to the page:

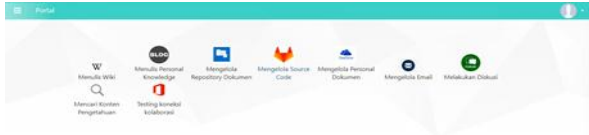


Fig 12. Display Portal System

On the portal page, there are KMS features developed in this study. By using single sign on technology, users do not need to log in a second time to enter all of these sub-systems.

4.7 System Testing

This stage of validation testing is carried out to ensure that the KMS prototype is made according to the expected functional requirements.

4.7.1 UAT Testing Results

KMS prototype testing is based on the User Acceptance Test (UAT) with the Technology Acceptance Model. The research instrument in this study was a questionnaire. This questionnaire consists of two parts: the first part contains the identity of respondents and the second part contains a number of questions using a Likert scale regarding the user's perception of the KMS being developed and the user's perception of the ease of use of the KMS.

4.7.1.1 Descriptive Analysis

a. User Perception of Ease of Use

The results of descriptive analysis of the perceived ease of use score data are presented in the following table:

TABLE 6
PERCEIVED EASE OF USE SCORES

No.	Questions	N	Min	Max	Mean
1	It is easy for me to log in to KMS using the single sign on feature	10	3	5	4.1
2	It is easy for me to learn to use the KMS that is being developed	10	3	5	4.0
3	I have no difficulty in using the features in KMS	10	3	5	3.8
4	KMS is easily accessed by using only a web browser	10	3	5	3.8
	Average				3.925

Based on the table it can be seen that for statements item 1 to item 4 for the user's perception of ease of use (perceived ease of use), on average the overall mean score is 3.925 with a total N of 10 respondents. User perceptions of the ease of use of KMS can be expressed as good or high, this shows that respondents have an easy-to-use perception toward KMS.

b. User Perception of Usability

The results of the descriptive analysis of data on User Perception scores on Usability are presented in the following Table:

TABLE 7
SCORES OF USER PERCEPTIONS OF USABILITY

No.	Questions	N	Min	Max	Mean
1	It is easier for me to search for tutorials using KMS	10	3	5	3.9
2	I learn more easily when using KMS	10	3	4	3.8
3	I do the installation/ coding faster using KMS content	10	3	5	4.2
	Average				3.967

Based on the table, it can be seen that for statements point 1 to point 3 for user perceptions of average benefits, the overall mean value gets a score of 3.967 with a total N of 10 respondents. User perceptions of the benefits of using KMS can be expressed as good or high, this shows the respondents have a perception that KMS provides benefits to its use.

c. Behavioral intention to use perspective

The results of descriptive analysis of behavioral intention to use score data are presented in the following table:

TABLE 7
BEHAVIORAL INTENTION TO USE SCORE

No.	Questions	N	Min	Max	Mean
1	I try using KMS to learn installation and coding	10	3	5	3.8
2	I try to use KMS as often as possible	10	3	5	3.9
3	I recommend colleagues to use KMS	10	4	5	4.2
	Average				3.967

Based on the above table, statements item 1 to item 3 for the perception of behavioral intention to use, on average, the overall value of the score means a score of 3.967 with a total N of 10 respondents. User perceptions of behavioral intention to use can be expressed as good or high, this shows the respondent has the perception that KMS is accepted.

5. CONCLUSION

5.1 Conclusion

Based on research conducted by the author on knowledge management systems in consulting companies in the field of IT consultants with the Becerra-Fernandez Knowledge Management Process approach: a case study of PT Solusi Internasional, some conclusions can be drawn as follows:

- Knowledge of tacit and explicit forms on employees can be converted with Becerra-Fernandez conversion model. Features of the conversion results are managing personal documents, managing document repositories, collaborating on documents, conducting discussions, writing personal knowledge, writing wikis, searching for content knowledge, managing email, and managing source code. The developed features have been through Blackbox testing by each division lead. The test results show that functionally the system can already be used by users.
- Time and space limitations faced by employees can be

overcome by knowledge developed with web-based technology that allows employees to access KMS using only a web browser. This is supported by the features of the developed KMS that can run only by using a web browser in its use. This conclusion is reinforced by the TAM testing method in the user's perception of the ease of KMS (Perceived of Ease to Use) is good. This is based on the mean value with a score of 3.925.

- c. Based on the results of research that has been done, researchers developed a knowledge management system into a media knowledge sharing among employees. The knowledge management was developed using the prototype method for software development and produced a KMS prototype in the form of a web-based application display built with SharePoint, Git, Exchange server. The results of testing the user's perception of the benefits of KMS (Perceived Usefulness) are good. This is based on the mean value with a score of 3.967. Thus, it is concluded that the media in the form of KMS development at PT Yafii Solusi Internasional is useful as a media knowledge sharing for employees of PT Yafii Solusi Internasional.
- d. To reduce the lack of knowledge assets at PT Yafii Solusi Internasional, the authors develop a knowledge management system that functions as a medium for storing organizational knowledge assets. To test the acceptance of the developed knowledge management, the authors conducted a TAM test with the perception of Behavioral Intention to Use in order to measure individual behavior towards the intention to use KMS to store the user's knowledge assets. The test results get a score of 3.967. In the Likert scale the examiners used in this study, the results showed that the score was included in the Fair/ Good criteria.

M.E. Sharpe, Inc.

- [4]. Alfarsi, Salman. (2017). Sistem E-Learning Berbasis Knowledge Management pada SMK Genrasi madani cibinong. *Jurnal Sisfotek Global*. 7(2). 62-63.
- [5]. Iskandar, Karto and Tony and Claudia Henlly, Phankova and Agustino, Wongso (2014). Perancangan Knowledge Management System Pada IT Bina Nusantara menggunakan Blog, Wiki, Forum Dan Document. *Comtech*, 5(1). 110-122.

5.2 Suggestions

Based on the results of the study, the author can provide some suggestions that are in accordance with the scope of this study as follows:

- a. Management should instruct employees to use this KMS prototype so that employee knowledge, both tacit and explicit, can be stored on KMS.
- b. To optimize the use of KMS outside the office, PT Yafii Solusi Internasional should publish the KMS application through the public network.
- c. In order to maximize the performance of the media knowledge management system, at PT Yafii Solusi Internasional, increasing standards for hardware should be carried out.
- d. Familiarize the culture of knowledge sharing among employees and conduct an evaluation of existing knowledge.

REFERENCES

- [1]. Dalkir, K. (2005). *Knowledge Management in Theory and Practice*. Burlington, USA: Elsevier Butterworth: Heinemann.
- [2]. Fernandez, Becerra., Gonzalez, avelino J., Sabherwal. (2004). *Knowledge Management, Challenge, Solution and Technologies*, Pearson/Prentice Hall.
- [3]. Becerra-Fernandez, I., Rajiv Sabherwal. (2010). *Knowledge Management : system and processes*.