

Comparative Analysis of Document Management Systems for Document Development Process in Indonesian Public Institution

(Based on Curriculum Development at Puskurbuk)

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Abstract—The use of online collaboration in developing documents is still not popular in Indonesian public institutions. Therefore, it takes many budgets and much time to make a public document. Meanwhile, the government should improve the quality of public services effectively and efficiently. This paper discusses the comparison of three selected document management system (DMS) features, Doccept, eFileCabinet, and SharePoint that fit the context of document development collaboration. The research object is curriculum development process at Pusat Kurikulum dan Perbukuan / Puskurbuk (the center of curriculum and books). The result may become a recommendation to public institutions that want to move toward online collaboration.

Keyword—E-government; public institution; online collaboration; document management system;

I. INTRODUCTION

The development of e-government is an effort to develop the implementation of governance based on (utilize) electronic in order to improve the quality of public services effectively and efficiently. The use of information technology is mainly expected in order to facilitate the public to obtain information openly [1] which is called by public information openness. Public information openness ensure public participation or involvement in generating public information activity [2].

Several Indonesian public institutions still conduct a series offline workshops in generating public information. Therefore, it takes long time and a lot of costs (i.e. travel expense, hotel cost, meeting room cost, etc.), because participants come from various regions of Indonesia. In addition, it also causes participants continuously leave their duties and obligations at their home institution.

The solution for above problems is using online collaboration as one of information technology usage that encourage more efficient and cost-effective government, enable more convenient government services, facilitate public information openness, and make government more accountable to citizens [3].

Online collaboration is very useful for the work of geographically dispersed personnel and work independently in

their respective places. The use of e-mail and fax are far from satisfactory as they are time consuming and ineffective [4]. However, online collaboration system is transmitting packets over the internet which has any vulnerability of security attack. So, it's important that the information systems providing of authentication and protection of transmitted packets [5].

The aim of this paper is to find the most suitable software that involve online collaboration feature to facilitate document development process in Indonesian public institutions. In Section II we will give a brief review of previous research as a consideration of this research.

II. PREVIOUS RESEARCH

A. Online Collaboration

There are challenges on online collaboration implementation. *First* is faced with the decision of whether using available-market software or develop it. Previous research has discussed the benefits and hindrances of using SharePoint collaborative website as available market-software and developing traditional html/database website. The result indicated that the former offers schedule, financial, and functional advantages worth exploration by technical communicators pursuing development of collaborative work spaces. Meanwhile, the later has many technical and non-technical challenges that diminish benefit offered by the former [6]. Another research conduct case study that examined the use of collaborative technology in training post-graduate students to conduct distributed projects using existing platform (primarily SharePoint) rather than developing the new one. The result indicated that participants expressed high overall satisfaction. This enabled investing more time in content and simulation than software development [7]. Therefore, this paper further investigates and select the available-market software as online collaboration solution, as discussed in the Section II.B and Section III.B.

Second is the integration process consequences. The previous research findings suggested that integration is an inherently complex process involving continuous negotiations between various human and non-human actors. Introducing

new tools in an organization is difficult and will most often cause side effects and unforeseen consequences and also instigate changes in work practices [8]. This paper identifies the functional system requirement to reduce its problem, as discussed on the Section III.A.

Third is the lack of features/functional/tools of software. The previous research discussed collaboration and integration technologies for distributed teams, and take close look their tools for particular software processes, as the technologies often have a general purpose. The result indicated that the common lacks are no communication such as chats or forums for simultaneous synchronous and asynchronous communication, and no connection among tools [9]. Seeing the same object from its previous research, this paper identifies attribute evaluation based on the features of software, as discussed on the Section III.C.

B. Document Management System

One of the available-market softwares involving online collaboration is Document Management System (DMS). DMS is a system that automates and seamlessly manages the document management process to ensure compliance with all regulatory authorities [10]. DMS has two major components: storage and communication. Besides these, there are other components that offer supplementary performance and features to a DMS [11]. DMS is used to track, manage, and store documents.

The previous research about DMS usually discussed how to develop a DMS or, at least, its prototype to solve problem at particular company [12] [13] [14]. However, there was a research which conduct comparative study of Alfresco, Nuxeo and SharePoint as Enterprises Content Management (ECM) platform that involve collaboration and content management aspect in an integrated solution [15].

Unfortunately, the research on evaluating available-market software to be implemented in collaboration process at

Indonesian public institution didn't find in previous research. For those, this paper conduct comparative analysis of suitability of the features of DMS with the functional system requirement, as discussed on the Section III.D. Several research questions on this paper are:

- What DMS software that can be used to facilitate online collaboration in developing document?
- What attributes that can be used to evaluate suitability of DMS features with functional system requirements?
- Which DMS software that is the most suitable one with curriculum development process at Puskurbuk?

Those questions will be addressed by following research method on the Section III.

III. RESEARCH METHOD

This research completes four main phases namely identify system requirement, choosing DMS software, identify evaluation attributes, and comparative analysis of selected DMS software. Figure 1 shows the research flow diagram on this paper.

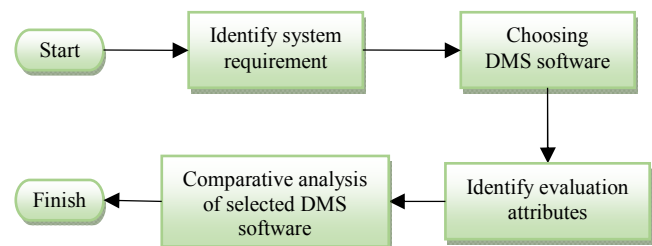


Fig 1. Research Flow Diagram

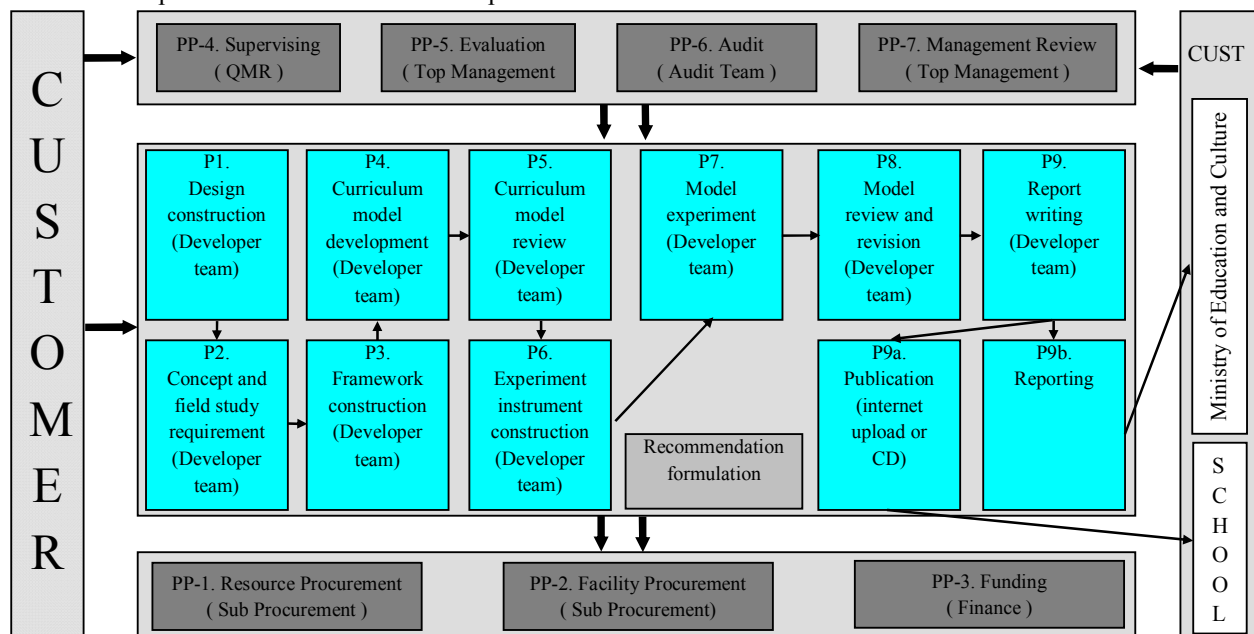


Fig 2. Business Process of Curriculum Development

A. Identify System Requirement

The development of public document is one of main tasks of a public institution in Indonesia. Usually, its activity is conducted by conventional meeting. In this paper, we use the curriculum development process at Pusat Kurikulum dan Perbukuan (Puskurbuk), Research and Development Board, The Ministry of Education and Culture [16] [17], The Republic of Indonesia, to identify system requirement based on two work guidance's (Business Process and Standard Operational Procedure/SOP) [18] [19].

Figure 2 shows the business process of curriculum development. Based on the business process and SOP we formulate the flow diagram of curriculum development collaboration process, as shown at Figure 3.

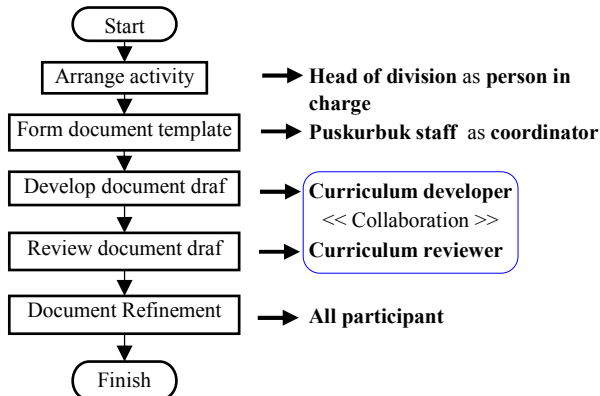
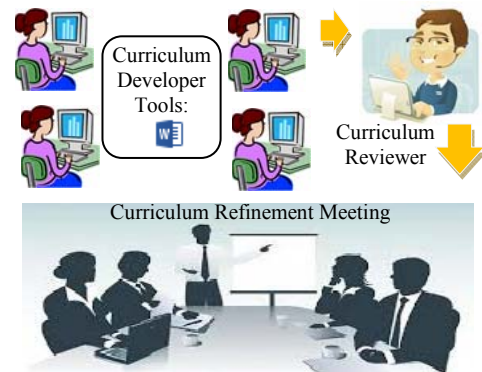


Fig 3. Flow Diagram of Curriculum Development Collaboration

Head of division, arranges an activity of documents development by preparing teams to develop various documents. The number of teams is depend on the number of document types that will be created, its name usually following the name of subject (e.g. math, science).

Each team is coordinated by Puskurbuk staff, he/she creates the document template with specific format as desired document result. Curriculum developers work together in many times to develop curriculum document, then the result reviewed by curriculum reviewer. These processes are conducted in a collaboration. In this case of collaboration means that the developers develop the same document but use different file in each stand-alone Microsoft Word application. The usual processes are to create file, open file, delete file, copy file, edit file, save file, convert file, print file, combine files, and send file. Any change of files should be accompanied by a change report. The final process is document refinement, all participant work together in meeting and presentation session to discuss the improvement and suggestion of the reviewer and finishing the curriculum document. Figure 4 illustrates the collaboration [20].



Source of pictures: www.google.com

Fig 4. Illustration of Collaboration

To move the collaboration process toward online collaboration, we identify the system requirement using use case diagram, as shown at Figure 5.

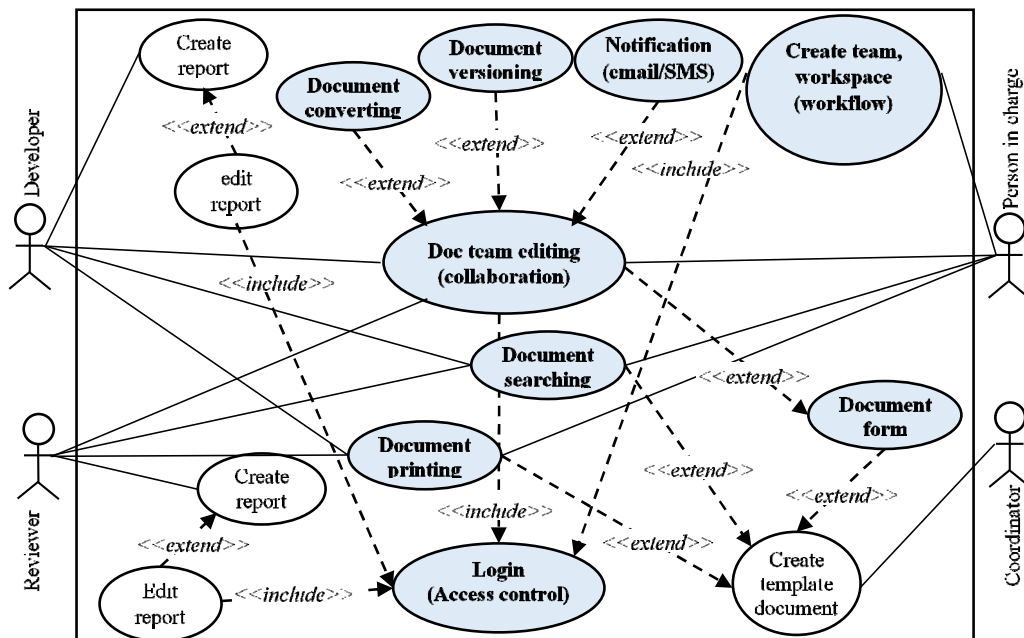


Fig 5. Use Case Diagram of Curriculum Development Online Collaboration

Based on use case diagram, we obtain the functional system requirement that use DMS features term as shown at Table I below.

TABLE I. FUNCTIONAL SYSTEM REQUIREMENT

No	Functional Requirement	Description
1.	Access Control	Access control is the rule on how the user accesses and has permissions to the document and/or system. The main goal of this feature is to protect documents from unauthorized operation
2.	Collaboration	The mechanism to work together to develop document
3.	Workflow	The function need of workflow in this case is to create a team that will collaborate in developing document.
4.	Version control	Facility to store each version of the document each time a modification occurs.
5.	System alert	The mechanism of send notification to authorized user when files changed or send invitation to the collaboration. Both using text messaging or email
6.	Document conversion	The mechanisms to change document type e.g. from doc or docx file to pdf file
7.	Full Text Search	The mechanisms to search any document based on content text, title, keyword, author, owner, etc.
8.	Print Management	The mechanisms to print a document

B. Choosing DMS Software

There are many vendors offer their product of DMS software that can be used for online collaboration. Nevertheless, we must find the best functionality based on user review or web product rating. Many web sites provide software review that can be used to be a consideration in choosing the software. The criteria of software are the best rating and the most popular software. Besides, the previous researches are the other consideration [6] [7] [8] [9] [15].

The research chooses three DMS softwares that meet the requirement and fulfil the criteria, they are Doccept, eFileCabinet, and SharePoint.

- **Doccept** offers robust document management system with features like Email Integration, Version Control, Auto Folder Structure, Improved Security & Regulatory Compliance, Mobile Compatible, Custom Meta Data, Document Expiration, Full text OCR, Workflows and others. Doccept provides comprehensive Dashboards, wide range of search capabilities, fully configurable access control and audit trail options [21].
- **eFileCabinet**, offers a suite of document management software (DMS) products and services that help businesses and individuals work quicker, smarter and more collaboratively. With more than 15 years in the document management industry, eFileCabinet is the trusted choice for nearly 200,000 users worldwide to store, share and protect their valuable and confidential data [21].

- DMS in **SharePoint** is metadata based document library where users can upload and tag documents, search based on keywords and tags and not worry whether they are accessing a duplicate or latest version of the file. SharePoint functionality and features of DMS are SharePoint Metadata, SharePoint Content Types, and Metadata Navigation. Office 365 is a solution primarily focused at companies, organizations or institutions that have a high need for internal communication and document sharing without the need for establishing complex infrastructures based on Microsoft Exchange4 or Share Point5 server [22].

Descriptions above is in marketing language form. We should deeply observe those DMS's in technical aspect table. For those, we have find out the technical aspect of Doccept, eFileCabinet, and SharePoint, as presented in Tabel II. The unidentified aspect filled by "N/A" abbreviation.

TABLE II. TECHNICAL ASPECT

Technical Aspect [15]	Doccept [23]	eFileCabinet [24]	SharePoint [15] [25]
Source code	Closed source	Closed source	Closed source
Pricing	Subscription fees	License fees for a number of package/seats	License fees for Microsoft package
Free Demo/Trial	Yes Free Demo	Yes Free Demo	Yes Free Trial
Deployment	Cloud, SaaS, Web, Installed – Mac, Installed – Windows, Mobile app	Cloud, SaaS, Web, Installed – Mac, Installed – Windows, Mobile app	Cloud, SaaS, On-premises, Hybrid, Mobile app
Cloud storage capacity	Based on Cloud Provider	N/A	Up to 1 TB
Sustainability	Sustainable	Sustainable	Very Sustainable
Supported Operating system	Windows, Mac OS	Windows Server 2008/2012, Mac OS	Windows Server 2008/2012 Windows
Supported DBMS	N/A	MS SQL Express	MS SQL Express MS SQL Server 2012
API used	full Web Services API	Open API, rich SDK	WebPart, JavaScript API, REST API, Schema, .NET server API, .NET client API, Webhooks API
Protocols	Database, LDAP, Active Directory Server	LDAP, ODMA, SOAP, REST, WebDav, HIPAA	Active Directory, Azure AD, LDAP, Federated, SQL, Custom
Used technologies and technical standard respect	Java, HTML5, and jQuery	C# and Visual Basic .Net	.NET platform, ASP.NET
Software architecture	Has a service oriented architecture	Has a service oriented architecture	Has a service oriented architecture

C. Identify Evaluation Attributes

The attributes evaluated by assessing its suitability with the functional requirement. Each evaluation result will be revealed by the words "suitable", "less suitable", and "unsuitable". It must first be checked whether the attribute is available on the selected DMS or not, then evaluate it. Table III shows the availability of features that meet the functional requirement.

TABLE III. DMS ATTRIBUTES

No	Feature	Doccept	eFileCabinet	SharePoint
1.	Access Control	1	1	1
2.	Collaboration	1	1	1
3.	Workflow	1	1	1
4.	Version control	1	1	1
5.	System alert	1	1	1
6.	Document conversion	1	1	1
7.	Full Text Search	1	1	1
8.	Print Management	1	1	1

Number 1 indicates the feature is available, if any, number 0 indicates the feature is not available. Fortunately, the expected features are all available. The further analysis will be discussed on Section III.D.

D. Comparative Analysis of Selected DMS Software

The criteria of selected DMS software's are the best ratings and reviews, most popular, and the most discussed in previous research. Therefore we are sure, those are the powerful softwares to solve the problems of conventional meeting collaboration, by using a set of available features in DMS software's. However, we have to find out the most suitable software with the requirement. The most important thing is the appropriateness of the services with the user's work habit, so the problems of integration found by previous research [8] will be eliminated and no training required.

The comparisons didn't analyse the whole features of DMS software's, but it conducted according to the requirement of curriculum development collaboration. Feature by feature comparisons of Doccept, eFileCabinet, and SharePoint are presented in the Table IV, as shown below.

TABLE IV. FEATURE BY FEATURE COMPARISON OF DOCCEPT, EFILECABINET, AND SHAREPOINT

No	Feature	Doccept	eFileCabinet	SharePoint
1.	Access Control	- User authentication - File access permission/protection	- User authentication - File access permission/protection	- User authentication - File access permission/protection
2.	Collaboration	- Using temporary file - Offline/stand-alone working - Other user didn't know any modification until file saved to DMS - No communication tools	- Using temporary file - Offline/stand-alone working - Other user didn't know any modification until file saved to DMS - No communication tools	- Using online file stored in the system - Online working - The user who are online can know the file modified - Online news feed as asynchronous communication
3.	Workflow	- Automate business process tasks. - Follow a route predefined by a set of procedural rules. - Document automatically moving from one worker to another	- Automate business process tasks. - Follow a route predefined by a set of procedural rules. - Document automatically moving from one worker to another	- Automate business process tasks. - Follow a route predefined by a set of procedural rules. - Document automatically moving from one worker to another
4.	Version control	- Provide new version when new file updated - Provide facility to roll-back the version to old version.	- Provide new version when new file updated - Provide facility to roll-back the version to old version.	- Provide new version when new file updated - Provide facility to roll-back the version to old version.
5.	System alert	- Alert sent when document changed and user invited to the workflow - Notification sent to SMS text or email	- Alert sent when document changed and user invited to the workflow - Notification sent to SMS text or email	- Alert sent when document changed and user invited to the workflow - Notification sent to SMS text or email
6.	Document conversion	- Using other application (e.g. MS Word, Excel, etc.)	- Using other application (e.g. MS Word, Excel, etc.)	- Using online application itself
7.	Full Text Search	File searching based on, content text of file, file name, author's name, keywords managed before, the date of file.	File searching based on, content text of file, file name, author's name, keywords managed before, the date of file.	File searching based on, content text of file, file name, author's name, keywords managed before, the date of file.
8.	Print Management	Using other application (e.g. MS Word, Excel, etc.)	Using other application (e.g. MS Word, Excel, etc.)	Using online application itself

IV. RESEARCH RESULT

Table IV show the comparison of three selected DMS's. We highlight access control feature that indicates all DMS provide authentication and protection of file as transmitted packets. It's important to ensure that they provide robust security for the online systems. Then, we summarize Table IV to become the suitability comparison result of the software as shown in Table V. It shows that SharePoint is the most suitable software for online collaboration of curriculum development process at Puskurbuk.

The word "suitable" indicates the feature fulfil the functional requirement of the curriculum development online collaboration and its mechanism is similar with current conventional collaboration mechanism and make some improvement process to make it more effective and efficient, while the word "less suitable" means the feature is fulfil the functional requirement, but the mechanism is not really similar with current conventional collaboration mechanism, therefore the user should be follow further training session and change their habit works.

TABLE V. SUITABILITY COMPARISON RESULT

No	Feature	Doccept	eFileCabinet	SharePoint
1.	Access Control	suitable	suitable	suitable
2.	Collaboration	less suitable	less suitable	suitable
3.	Workflow	suitable	suitable	suitable
4.	Version control	suitable	suitable	suitable
5.	System alert	suitable	suitable	suitable
6.	Document conversion	less suitable	less suitable	suitable
7.	Full Text Search	suitable	suitable	suitable
8.	Print Management	less suitable	less suitable	suitable

The “less suitable” words assigned at the collaboration feature of Doccept and eFileCabinet. It’s mean that in their collaboration process has any drawback than SharePoint. Users assigned in the workflow to join the collaboration. To edit the file, user must download file from the system. The file then opened in other applications (e.g. MS Word, Excel, etc.) as stand-alone working. At finish, the file temporarily save at local storage. At Doccept it must be uploaded manually to store to the systems, while at eFileCabinet can use ad-on facility or print to eFileCabinet. Meanwhile, at SharePoint, users invited to the team site, they can edit online document saved in the system. The file modified collaboratively. There is no need download and upload process. Besides, SharePoint provide asynchronous communication tools for users.

V. CONCLUSIONS AND FUTURE WORK

In this paper, we choose DMS that can be used to facilitate online collaboration in developing document from available-market software, evaluate attributes that represent DMS features which suitable with functional system requirements, and find the most suitable DMS with curriculum development process at Puskurbuk. The result show that in particular attributes SharePoint is more suitable than Doccept and eFileCabinet. It can provide workspace for users without much changes in work practices and also give some improvement. So, the standard user (curriculum developer or reviewer) needn’t to pass software training. The new working practices is only when developing site, and it is done by administrator (coordinator or person in charge of activity), while the standard user can work as usual.

The main feature is collaboration that provide online collaboration tools. However, to ensure that software is suitable with the users, the further experiment research is needed to analyse “before and after condition” regarding SharePoint usage whether there is an increasing on affectivity in term of cost and time.

VI. ACKNOWLEDGEMENT

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