Design and usability assessment of DocManS: A document management system with security and social media features

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A B S T R A C T

A document management system (DMS) is required to handle any documents within an institution efficiently. However, several important features are lacking in the current DMS, such as security and social media features. This paper proposes a new solution to tackle the issues by developing a new document management system with security and social media features called DocManS. The development process and usability evaluation by users are presented in this paper. The usability assessment is performed with the use of the System Usability Scale (SUS) framework. The results show that the current version falls within the B range of the SUS framework and several enhancements for better usability in terms of social media sharing and privacy are recommended.

1. Introduction

In the digital era, government and private institutions consider information as the most important asset, and therefore it should be handled carefully, properly, and securely. The use of a document management system or DMS is often proposed in order to improve document management in institutions. The role of document management systems in educational institutions is inevitable as a digital format has been widely preferred considering its simplicity as well as providing added value in data processing (Jones, 2012). However, in line with the growing need for IT services based on specific user interests it is found that several features should be added to the new form of the document management system.

Currently, the processing of official documents is carried out in the State Polytechnic of Ujung Pandang has already used a semi-digital document management system in collecting, storing, and searching official documents. As the amount of data increases over time, the current system could not handle the problem properly. The problems are a long time to obtain stored data, even missing document often occurs. Another important problem is people addressed in the same document cannot share relevant information with each other which is something irrelevant in the current social media era.

Based on the gap found, this study aims to develop a new document management system for educational institutions which has two main features, enhanced security, and social media facilities in order to make it more user-friendly. DMS development that adheres to user-centric design is important for successful system implementation in any institution (Morales et al., 2017).

The paper is organized in the following structure. After the introduction, the theoretical foundation for the study is presented in section two. Then, section three describes research methods to carry out the study. A comprehensive explanation about the system development is mentioned in section four followed by usability evaluation in the next section. Finally, the paper is concluded in the last section.

2. Theoretical basis

In this section, fundamental mechanisms regarding official documents administered by government education institutions are described. Then it is followed by describing document management systems concept and application.

According to Permendikbud No. 160 Concerning Enforcement of the 2006 and 2014 Curriculum, the decree contains a statement binding on all parties involved and the position of the decision letter is at

the top level. If we compare it to other letters, the decision letter must be signed by a certain official or the highest leadership of the organization (Revida et al., 2020).

As mentioned in Revida et al. (2020) decisions are made or issued for the following purposes: 1) to determine or change the status or position of a member or employee or goods or materials, 2) to validate whether or not official writing is valid, 3) to formalize change status or dissolve an organizational unit or company agency, 4) to hand over certain authority to an official (delegation of authority), 5) to ratify the enactment of guidelines, laws, and others.

Several types of official documents might be divided into the following items:

1. Employment issues. Included in this type are official letters for appointment, promotion, agency, paid leave, administrative law, and retirement, etc.
2. Regulatory issues. Included in this type are official letters for code of conduct, correspondence guidelines, articles of association or bylaws, etc.
3. Additional issues. Included in this type are official letters for examination, graduation, awards, punishment, etc.

Any official documents administered officially mainly functions to determine/change the status/position of a person/employee/goods/material, to validate the regulation, to form/change the status/dissolve a company, to hand over certain authority, and to ratify the entry into force of a government directive or law.

As a result, the number of papers used increased significantly, and therefore it requires a paperless solution. Paperless offices are aimed at reducing the use of paper in daily operations within an organization. A document management system is an approach to realize paperless offices such as universities (Baco et al., 2012; Caseres et al., 2020).

So far, there have been several approaches to developing document management systems to deal with the issue. While some of them are commercial software, others are provided as open-source or free software (Baco et al., 2012).

There are several models of DMS that have been introduced which might be categorized from technology perspectives and licensing perspectives. From a technology perspective, DMS might be divided into the intranet and internet-based DMS. On the other hand, licensing perspectives to divide DMS into proprietary and nonproprietary or often called open source (Baco et al., 2012).

Apart from its different perspectives, DMS is aimed to ease the organization to manage its documents asset in a better and more efficient way to streamline the business process towards the organizational goal (Su et al., 2017).

3. Research methods

In general, this study is conducted within two main methods. The first one is the waterfall methodology which is commonly used in information systems development cases. Fig. 1 depicts the first methodology which is structured into six steps as:

a. Problem description is the first step to identify the actual problem and produce the so-called problem formulations for developing the desired system.
b. Tools identification is the step for analyzing any required tools both hardware and software in order to successfully address the given problem. This step produces the so-called system requirements.
c. Data collection is the next step for collecting users' opinions regarding any issues on current systems. This step provides the foundation for the system framework.
d. System design is the most important stage in which all inputs from previous steps are integrated to develop the system. This step is divided into several types, including system design, database design, and interface design.
e. The implementation stage is conducted once all systems are ready to operate. This step strongly requires close user interaction in order to operate.
f. Testing is the stage to evaluate whether the system has been working well according to user needs and see the parameters of the success of the website.
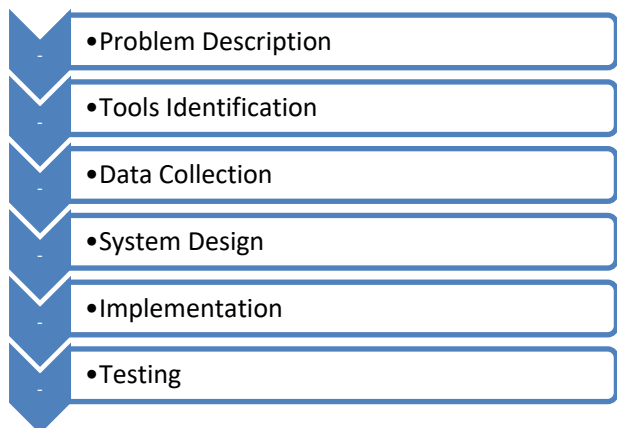

Fig. 1: Research methodology

The second methodology is applied to evaluate the usability of the system after the implementation step. The evaluation is performed using a specific framework for usability testing called System Usability Scale or SUS Framework (Brooke, 1996). System Usability Scale or SUS is used to perform an evaluation on the DocManS system. As suggested in (Brooke, 1996) SUS is a simple assessment method that might be applied for any assessments of systems usability which means valid to be applied in assessing DoCManS as well.

Similarly, survey research conducted by Sauro (2011) shows SUS has been widely recognized as a powerful and valid measurement to assess user perception on how usable a technology both in hardware and software forms in different fields. Table 1 shows the 10 questions within a SUS survey

(Brooke, 1996; Bangor et al., 2009). The SUS survey questions used in this study are presented in Table 1.

Table 1: SUS survey questions

Q1. I think that I would like to use DoCManS frequently.				
1	2	3	4	5
Q2. I found the system of DoCManS unnecessarily complex.				
1	2	3	4	5
Q3. I thought DoCManS was easy to use.				
1	2	3	4	5
Q4. I think that I would need the support of a technical person to be able to use DoCManS for the first time.				
1	2	3	4	5
Q5. I found the various functions in DoCManS were well integrated.				
1	2	3	4	5
Q6. I thought there was too much inconsistency in DoCManS.				
1	2	3	4	5
Q7. I would imagine that most students would learn to use DoCManS very quickly.				
1	2	3	4	5
Q8. I found DoCManS very cumbersome to use.				
1	2	3	4	5
Q9. I felt very confident using DoCManS.				
1	2	3	4	5
Q10. I needed to learn a lot of things before I could get going with DoCManS.				
1	2	3	4	5

4. System development

In the beginning, several initial models are arranged using several diagrams, flow charts, use case diagrams, entity-relationship diagrams.

4.1. Flowchart

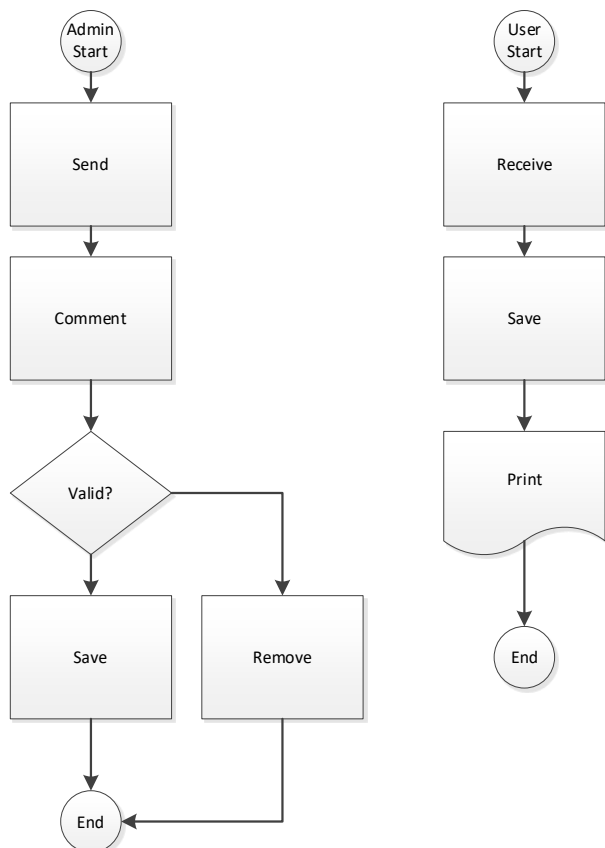Fig. 2 shows the example of a delivery flowchart.

Fig. 2: Example of a delivery flowchart

In this research, the user has several accesses in receiving mail, the access that the user has included, commenting on the letter that has been received and confirming the letter, where the confirmed letter will be validated by the admin. In case the received letter has an error, the user can notify the admin so that the admin will be able to send a new letter. All of these are clearly presented in Fig. 2.

4.2. Use case

In the use case diagram (Fig. 3), there are several features that might be performed by admin and users as follows:

1. User management features, user management in this study, where the admin can manage the access of all users.
2. Management profile feature where in this feature the user can edit/change e-mail, password, user name, and telephone number.
3. Access feature, access feature is where the admin can manage the access rights of each user in the database.
4. Search feature, this search feature allows users and admins to quickly search for letters they have received for a long time.
5. Incoming mail, in this feature the user can find out how many letters were received, whether in a year, monthly, or the total number of letters received.
6. Outgoing mail is only used by the admin, this feature provides information about how many letters have been issued both annually and monthly, and also the admin can find out all the letters that have been received for each assignment and employment.
7. Comment feature, in this feature the admin and user can comment on the incoming mail that each user has received. The point is to tell whether the letter is appropriate or not.
8. Duplicate document, this is a carbon copy or cc feature that only applies to cc users where in this feature the cc user can only see the incoming copy letter without being able to comment on the letter.

9. The preview feature, this preview feature is made in order to make it easier for users to see the

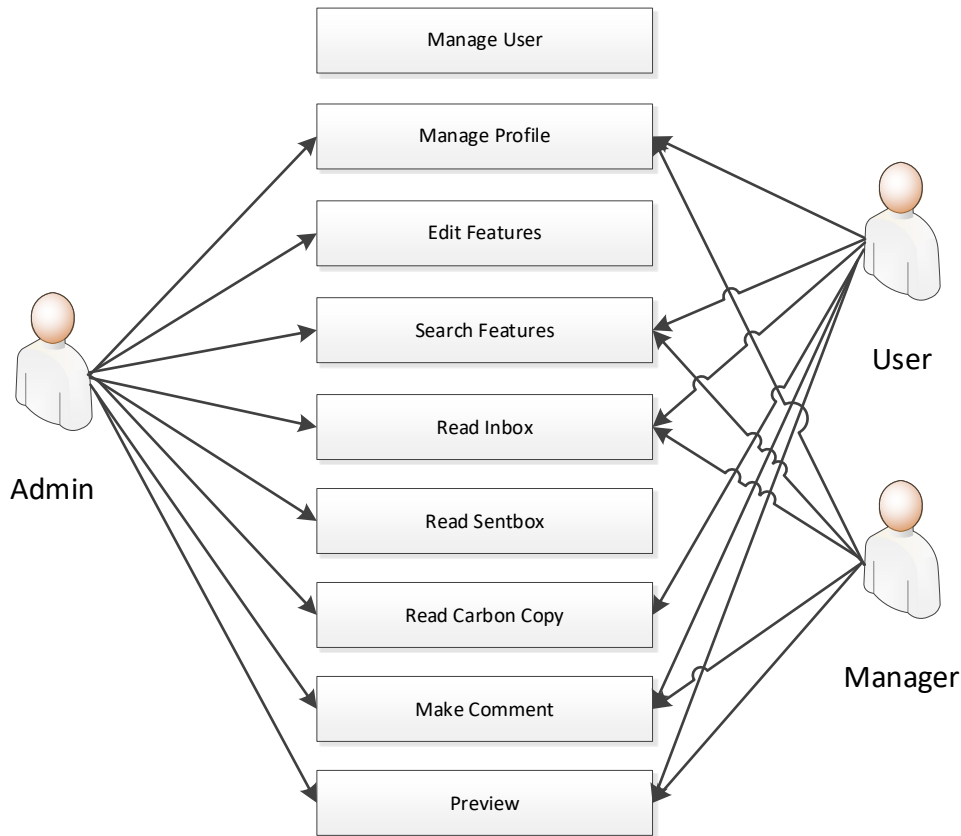letters that have been commented on and are on the dashboard page.

Fig. 3: Use case diagram

4.3. Entity relationship diagram (ERD)

Entity Relationship Diagram (ERD) is a model to explain the relationship between data relations. ERD to model data structures and relationships between data, to describe it used several notations and symbols.

As described in Fig. 4, there are 14 tables within the main database of the DocManS application. Table public.usr_user is the main table for handing all attributes associated to all users. The table is set to have two way relationships with 4 tables (public.srt_surat, public.usr_user_sessions, public.usr_group, and public.usr.user_sessions). Table public.usr_group also has two ways relationship with table public.usr_group_access_list.

Next, table public.usr_access_items which stores all document records and connected to other two tables called public.usr_user_access_list and public.usr_group_access_list. In addition, table public.srt_surat which deals with document flow has two ways relationshi with 4 other tables (public.srt_surat_attachments, public.srt_surat_komentar, public.srt_surat_targets, and public.srt_surat_tembusan) while table public.usr_user_sessions connected only to main table of public.usr_user.

Later, it is defined that both table public.usr_jurusan and table public.usr_program_studi has two ways relationship while the only independent table is the last one

called public.sys_config. Based on these, using PHP and CSS a new GUI look of DocManS ver1.00 is developed, and later improved in terms of background graphic and title text which produced DocManS ver1.01. The front end of DocManS ver 1.01 can be seen in Fig. 5.

Ensuring the security of DocManS is a paramount concern since this is considered a serious issue in digital documents which attain serious attention. Lack of security will lead to document breaches and eventually damage privacy (Syamsuddin and Hwang, 2014). In addition, ensuring the privacy of data maintained by DocManS should be taken into serious account to guarantee all information satisfies CIA Triad requirements (Syamsuddin and Hwang, 2010).

In terms of security and privacy issues, we have applied salted input to prevent inappropriate text input and hide the location of hashed passwords to prevent common user database attacks. CAPTCHA approach is also excellent in ensuring that the right user is the one who accesses DocManS and thus avoiding man in the middle attack (Alnfiai, 2020).

This feature does not only apply to administrators but also to all users of DocManS in order to ensure an adequate level of security to guarantee their privacy as users of DocManS. Using the correct username and password which must be refreshed every month by the DocManS systems, the administrator may start managing any official documents using the given window.

Fig. 6 shows the submission window for delivering an official letter to several lecturers and staff. This would automatically send the letter to the designated users as well as store the document file according to its classification. The users (lecturer or staff) to whom the document was addressed will receive notification via university email and with the given link would be able to open the document in the DocManS account.
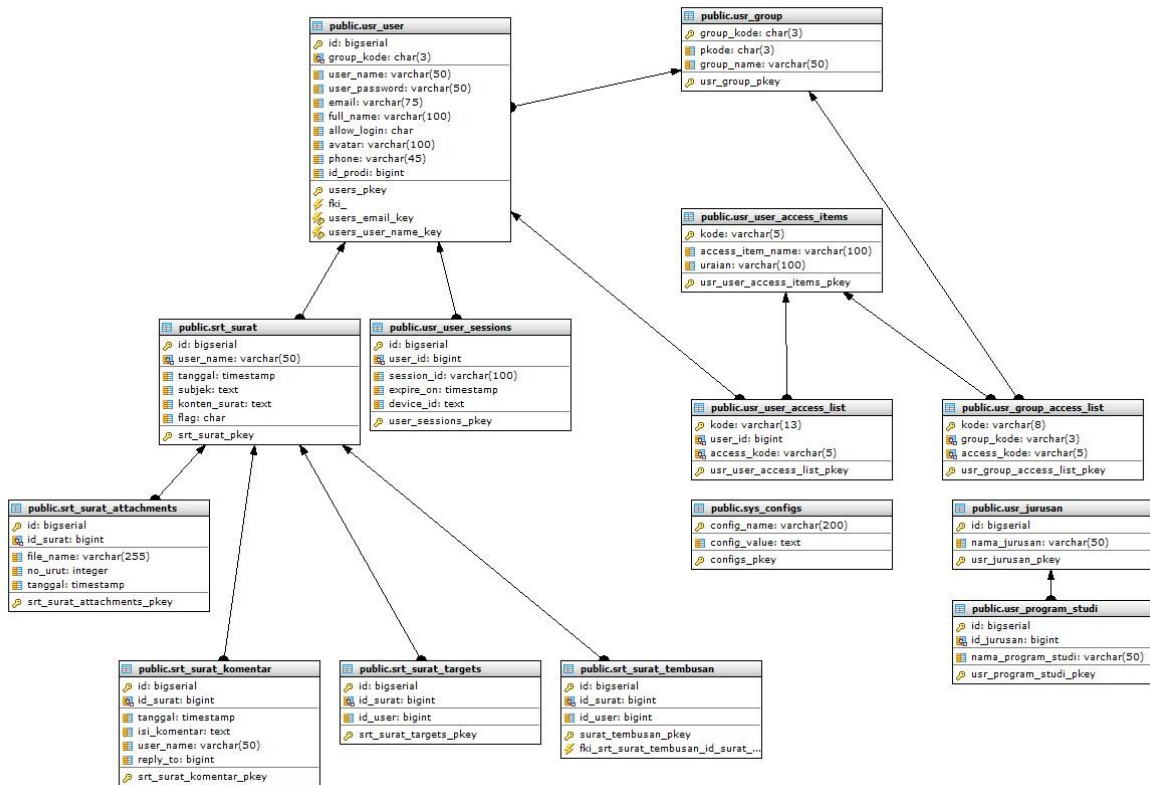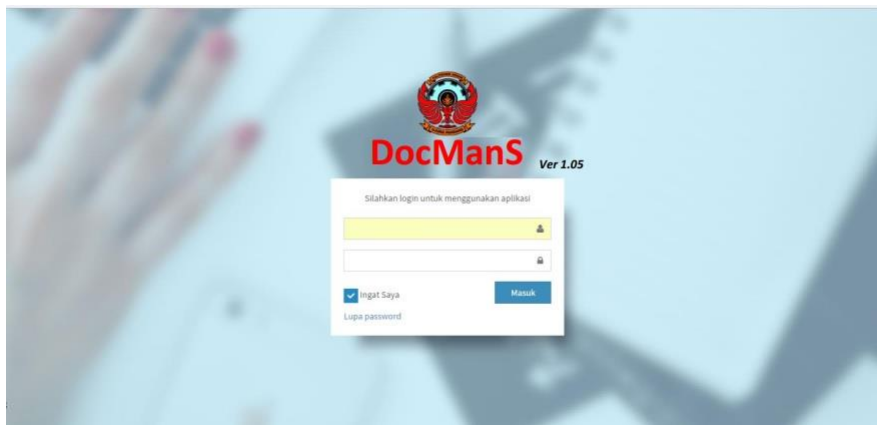

Fig. 4: Database structure

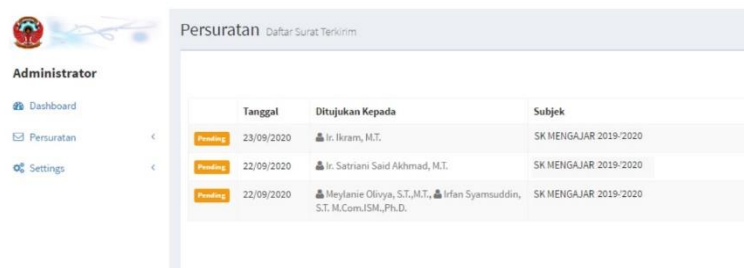

Fig. 5: Main GUI of DocManS

Fig. 6: Sending a document to specific users

The next feature of DocManS is its social media feature which allows all lecturers and staff who are addressed within the document to share the information (Thomas and Akdere, 2013). Through

such a feature, users may discuss and manage particular tasks given to them as mentioned in the document. As a result, they could manage and prepare earlier regarding the designated task mentioned in the document as shown in Fig. 7.
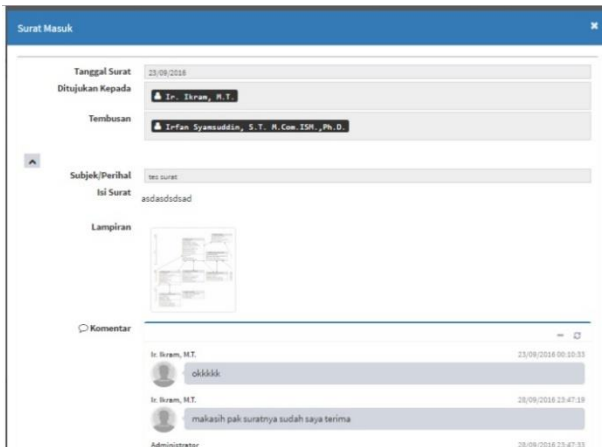

Fig. 7: Example of social media feature by users

In addition, DocManS allows the administrator to set access rights, and a group of each user, add the number of users in a group, set user group permissions, set individual user permissions, delete users in a group, and edit the data of each user in a group. Admin also can view outgoing mail for validating the mail. In case of human mistakes, the system always asks for any actions made by the admin, if not correct admin is able to cancel otherwise allow for the given action. Later, DocManS enables the administration of all official documents in a better way. Both per user and per time-based classifications are provided by the system, therefore the record of documents are presented in an appropriate way.

5. Usability evaluation

In this study, the SUS survey was conducted in a laboratory-based testing environment where users are asked to carry out specific tasks with DocManS. Essentially, SUS consists of 10 survey questions with a 5-response Likert scale. The Likert formatting ranged from 1 to 5 for strongly disagree to strongly agree (Brooke, 1996). The 10 survey questions are as follows with slight modifications according to the requirement in this study.

Based on Bangor et al. (2009), the process of SUS calculation is quite simple as there are only 10 questions to be collected. The calculation is as follows, odd-numbered items (eg. 1, 3, 5, 7, and 9), we should reduce the participant response score by 1. Then, for even-numbered questions (eg. 2, 4, 6, 8, 10) we should reduce the participant response score by 5.

Later, calculating the SUS value is performed by summing the scores of each item, which has a range of 1 to 5 with 1 strongly disagreeing and 5 strongly agreeing. At this stage values will be obtained are in between 0 to 4, in which 4 represents the most positive response to each question (Brooke, 1996).

Finally, after adding up all the individual scores, multiply by 2.5 to get the overall SUS score. The final value of the SUS score can be mapped in the range of SUS values to determine the extent of the use of DocManS according to respondents as depicted in Fig. 8 (Brooke, 1996; Bangor et al., 2009).

There are 16 respondents in a controlled environment, consisting of 6 lecturers and 10 staffs. In this process, respondents were given an additional explanation in case they are not sure or did not fully understand the purpose or scope of a particular question. Then, all respondents submitted the survey and we conducted the calculation to obtain the SUS score of each. The highest SUS scale is 100 while the lowest one is 65. The whole results are given in Table 2.

In order to understand what the final score means, Brooke (1996) presented a normalization technique to classify final SUS scores into A, B, C, D, E, and F usability groups. Therefore, using the SUS usability group, one can interpret their final SUS to score easily and straightforward from best imaginable (group A) to worst imaginable (group F).

As a result, by having a SUS score of 79.68, then respondents consider DocManS falls into the C group with a rating of Good according to SUS score (Fig. 8).

The final result clarifies that DocManS is easy to use and understandable by first-time users and this reflected that DocManS has solved document management system problems so far.
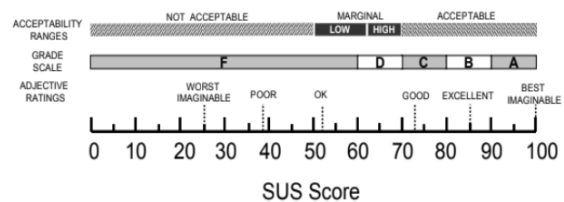

Fig. 8: Range of SUS score (Bangor, 2009)

In addition to the analysis, it is also important to mention that apart from SUS evaluation, several inputs are gained in order to improve current features into better ones in the future. They are summarized as follows:

a. Administrative operations can be done digitally and more organized manner by DocManS.
b. Password requirement to change every month is somewhat disliked by users although they consider that privacy of documents will have better guarantee with such approach.
c. Lecturers and staff whose documents are issued through DocManS feel comfortable organizing the documents and making discussion on it further using the social media facility of DocManS.
d. Reducing the risk of losing archives of official documents in the future.

Future improvements will accommodate the above inputs in order to improve the quality of DocManS for better usability and better security and social media facilities.

Table 2: Result of SUS survey

Respondents	S 1	S 2	S 3	S 4	S 5	S 6	S 7	S 8	S 9	S 10	Score
L-01	3	1	4	3	5	2	4	1	3	1	77.5
L-02	4	1	2	2	3	2	5	1	5	1	80
L-03	5	1	5	1	5	1	5	1	5	1	100
L-04	4	3	2	2	3	2	2	1	5	1	67.5
L-05	4	3	3	2	4	2	2	1	5	1	72.5
L-06	5	2	5	3	5	2	4	2	5	1	85
S-07	5	3	5	2	5	1	2	1	5	2	82.5
S-08	4	1	2	2	5	2	2	1	5	1	77.5
S-09	5	1	5	1	5	1	5	1	5	2	97.5
S-10	5	2	5	3	5	2	4	3	5	1	82.5
S-11	3	1	3	3	3	1	5	2	4	2	72.5
S-12	4	3	4	2	4	4	5	3	2	1	65
S-13	3	1	2	2	5	2	2	1	5	1	75
S-14	5	2	5	3	5	2	4	1	5	2	85
S-15	5	1	2	2	3	1	2	1	5	1	77.5
S-16	4	1	4	2	3	2	2	1	5	1	77.5
							Overall SUS Score				78.68

6. Conclusion

This study presents the development of DocManS. It is a new document management system with security and social media features aimed at ensuring the security of preserved official documents within the organization and the ability for a user to share with social media facility provided by DocManS. Evaluation of its usability is then performed with the use of the System Usability Scale (SUS) framework for lecturers and staff. The results show that the current version has already satisfied both user groups and they recommend several enhancements for better usability in terms of social media sharing and privacy.

It is suggested to improve the service of DocManS based on several recommendations by the users such as with better security and providing tagging for users which is currently enabled for an administrator. In the future, DocManS will be enhanced by developing a mobile version to provide extended supports for mobile users.

Compliance with ethical standards

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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