Design and Evaluation of Smart Digital Signature Application User Interface for Document Legalization in COVID 19 Pandemic

Gita Fadila Fitriana[1]*, Merlinda Wibowo[2], Eko Aribowo[3]

[1,2]Informatics Engineering Study Program, Faculty of Informatics, Insitut Teknologi Telkom Purwokerto, Indonesia
[3]Informatics Engineering Study Program, Faculty of Technology Industry, Universitas Ahmad Dahlan, Indonesia

Abstract.
Purpose: This study aims to build an effective user interface digital signature application for document legalization.
Methods: The process of document publishing services and bureaucratic flows at universities affected by the pandemic can be simplified and accelerated with this application later. However, appropriate application design still needs to be done before application development. Therefore, application design is carried out on the User Interface (UI) to the prototype stage so that the application to be built can be more attractive, more effective, and efficient. In addition, to help the application succeed, it is also necessary to evaluate the design process.
Result: This testing process is carried out to prevent failures from later application development by implementing an easy and frequently used test, namely usability testing, namely the Usability Scale (SUS) System. The tests carried out have shown that the design proposed in this study gets a good score of 80.5, so it is effective and efficient to be implemented and implemented in the development of smart digital signature applications.
Novelty: This study is to design and evaluate the UI of the smart digital signature application to provide participation for the success of the application that will be developed later. Therefore, the smart digital signature application can be used effectively and efficiently as a document validation process during this pandemic, which is needed, especially in universities, to improve staff performance and support academic activities. The number of digital documents signed and sent will be the same as the documents received. Furthermore, the validity and integrity of the document can be monitored using the developed application.

Keywords: Smart Digital Signature, Document, Legalization, System Usability Scale, User Interface
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INTRODUCTION

COVID-19 spread so quickly that it became a global pandemic that hit developing countries, including Indonesia. It has affected the world of education, especially in higher education, in terms of economy, social activities, and management. This pandemic has significantly impacted employee performance, especially when working from home (WFH). The activities of the higher education academic community must continue and continue to run effectively even though the employees are on WFH. One of the things that often becomes an obstacle is the bureaucratic process that becomes the flow to produce policies and decisions [1], [2]. However, bureaucracy is always used to excuse late decisions in a policy. Therefore, more effective and efficient methods and methods are needed in the bureaucratic process but do not reduce the accountability factor for document changes [2]. These documents often contain important documents such as official contracts, financial transactions, etc. The most important thing included in the document is a signature on electronic documents (e-documents) or digital documents supporting government policies to prevent the spread of epidemics by limiting physical contact activities. Electronic documents are necessary to verify documents to ensure their validity, both the contents of the document and the person who signed it [3]. It is where the smart digital signature application can increase the effectiveness and efficiency of the document validation process. Smart digital signatures can prevent the use of fake data by data recipients [4]. Each received data has a signature that is always different from other or unique data, so the slightest modification will cause the signature to change drastically. A person's signature will also be different from someone else's signature. Like a manual signature, each person must maintain this signature so that it is not misused by unauthorized and irresponsible parties [1]. Confidentiality of documents is also needed to prevent information from being known by unauthorized parties. Therefore, it is necessary to secure and

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*Corresponding author.
Email addresses: gita@ittelkom-pwt.ac.id (Fitriana), merlindawibowo@gmail.com (Wibowo), ekoab@tif.uad.ac.id (Aribowo)

monitor documents that have been signed with this smart digital signature method. This smart digital signature application is designed and built to track the flow of documents to be signed and increase the efficiency and effectiveness of the document review process during a pandemic.

This smart digital signature application design is needed as an initial process before application development. This design can be in the form of a User interface (UI) which will determine the user's impression and increase the added value of the user when compared to similar applications [5], [6]. Each UI of an application will provide a different experience and impression on each user. UI design is one of the important factors that need to be done before focusing on the technical aspects of the main application. It needs to be done because the UI design can link the user and the application built later. Therefore, it needs to be made correctly and appropriately and pay attention to user convenience so that the community easily accepts. In addition, the UI design must be attractive and easy to understand to prevent the failure of an application [7]. Besides, the UI design process is then continued to the prototype stage. Then it is necessary to test this design using the usability test [5], [7] - [9]. This test is a method that is often used because it is easy and effective by asking questions to the user. The best testing technique often used is the System Usability Scale (SUS).

In this study, the authors design and evaluate the user interface of the smart digital signature application to provide participation for the success of the application that will be developed later. Therefore, the smart digital signature application can be used effectively and efficiently as a document validation process during this pandemic, which is very much needed, especially in universities, to improve staff performance and support academic activities. The number of digital documents signed and sent will be the same as the documents received. Furthermore, the validity and integrity of the document can be monitored using the developed application. In addition, they are accelerating the process of document publishing services and simplifying bureaucratic flows.

METHODS
The research framework steps carried out on the design of the smart digital signature application user interface are shown in Figure 1.

Literature Study and Problem Statements
The literature study was conducted to assist in the problem identification process to formulate the problem. Identification of problems in the research has been described in the introduction. From the problem formulation, the objectives and benefits of this research can be determined, namely, to design a smart digital signature application and evaluate the UI design to get the best design results that will be applied to the development of the proposed application later. This application is expected to help sign digital documents and monitor signatures during the pandemic.

The digital signature combines hash function and encryption with an asymmetric method [3], [4]. This method needs to be applied to documents because it provides a process of verifying the validity of documents. Digital signatures in Indonesia are regulated in Government Regulation No. 82 of 2012 concerning the Implementation of Electronic Systems and Transactions. The PP states that the Digital Signature functions as an authentication and verification tool for (1) the identity of the signer and (2) the integrity and authenticity of electronic information. In addition, every electronic document distributed through approved electronic media is in the form of a digital signature, not a wet-signature scanned from a scanner [10]. The existence of a signature in a document indicates. Then, the party signing the document already knows and agrees to the document's contents [11], [12]. The working process of an electronic digital signature is a signature consisting of electronic information that is attached, associated, or related to other electronic information that is used as a means of verification and authentication [13]. This designed method is different from a scanned signature and then pasted into an electronic document. A certified digital signature or digital signature is in the form of a data series that is added to an electronic document using mathematical calculations [14]. Therefore, to check, an electronic signature must be done electronically. Electronic signatures are unique because one person's signature will be different from another's signature. Like a manual signature, everyone must maintain this signature not to be misused by unauthorized parties.
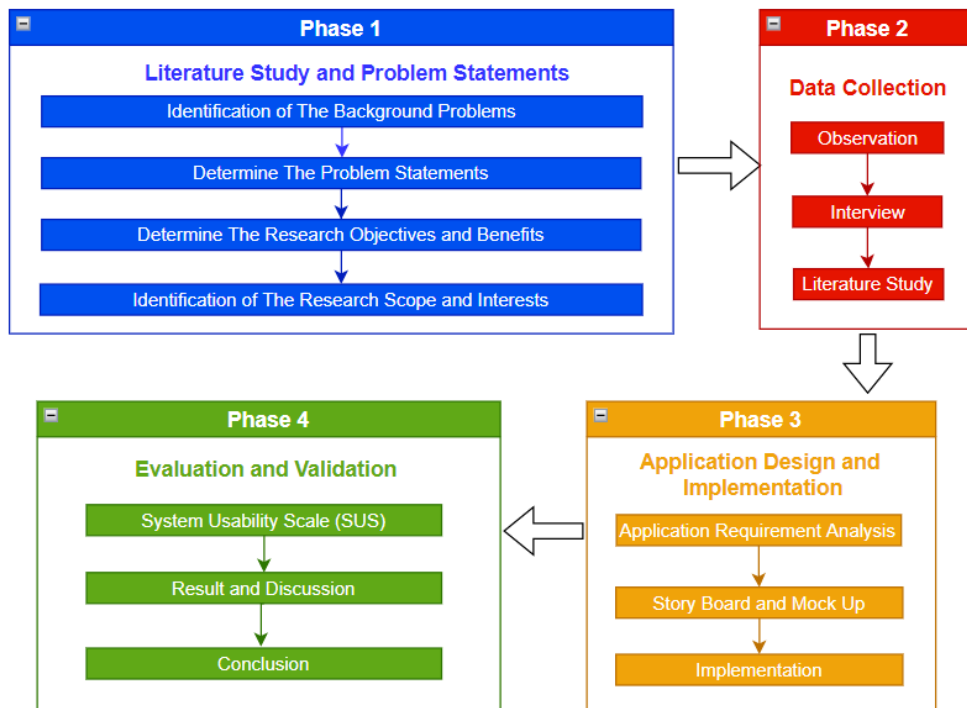
Figure 1. Research Framework

Data Collection

The data taken is supported in the preparation of this research by the direct observation method, namely collecting data directly through field observations. Furthermore, data is obtained from related units in universities that require digital signatures quickly, easily, effectively, and efficiently. Respondent data is 50 respondents who directly use Smart Digital Signature. The time needed to collect data as a user satisfaction test takes 30 days. The method used interview, this method uses questions and answers or face-to-face with trusted sources to obtain related data in this study. In addition, a literacy study was conducted to receive helpful information about this research. Later, the data collection process will also be carried out by distributing SUS questionnaires to evaluate the results of the designs that have been made.

Application Design and Implementation

UI design is one of the processes to create effective information and communication media between humans and computers. The UI is the most dominant part of the interactive application and is directly connected to the end-user to access the functionality of a system [9]. Therefore, a well-designed application will put the functions or features provided to good use. In this study, there are design requirements in the form of specifications for the tools used: Notebook complete with the operating system, design application for UI storyboard, graphic design application for designing UI mockup, usability questionnaire using SUS, and application for calculating SUS value. In addition, this research uses the Figma application for the implementation design UI. The implementation design UI guidelines made the user focus on the objects and subjects. Besides, the user's time span action is shorter and stays focused [6], [7]. The implementation guidelines for implementation design UI are the following:

1. Connectivity to meet user needs.
2. Simple information to get the user's attention.
3. Well-directed interactions and clear action sequences.
4. Informative and important information is needed.
5. Interactivity from simple and clear navigation and easy-to-do activities.
6. Friendly to users because the layout design and language are easy to understand.
7. The requirement is used widely.
8. Continuity and consistency in position against similar actions.
9. User personalization can control and there is support for it.
10. Internal flexibility on small and large screens and prevents design errors.

The implementation of this UI design produces a prototype as a guide for developing Smart Digital Signature.

Evaluation and Validation
In evaluating and validating the design in this study, usability testing was used. One of the usability tests that are often used and the most popular is SUS [5], [7] - [9]. SUS was developed by John Brooke, which is reliable, popular, effective, inexpensive, and can be used in a global assessment of application usability. SUS consists of ten question components and five answers ranging from strongly disagree to agree strongly and have a minimum score of 0 and a maximum of 100. In its original language, SUS is English but has been translated into Indonesian. The question component of SUS that will be used refers to Susilo and Yolanto's instrument adapted from Brooke's instrument [9]. The components of the SUS question can be seen in Table 1.

Table 1. The Indonesian version of SUS question components [9]

No	Component
1	I am thinking of using this system again.
2	I find this system complicated to use.
3	I find this system easy to use.
4	I need help from someone else or a technician in using this system.
5	I feel the features of this system are working properly.
6	I feel many things are inconsistent (incompatible with this system).
7	I feel like other people will understand how to use this system quickly.
8	I find this system confusing.
9	I feel there are no obstacles in using this system.
10	I need to get used to it first before using this system.

In Table 2, below are the SUS scores. The results of processing the respondent's SUS question components can be calculated to get the average value of their SUS score. Therefore, the proposed design is correct, efficient, and effective from the resulting score and follows the application's needs.

Table 2. SUS Score

>81	A	Excellent
68-81	B	Good
68	C	OK/Fair
51-67	D	Poor
<51	F	Worst

Testing the smart digital signature application prototype was carried out using SUS, which was given to twenty respondents. Determination of the number of respondents based on previous research, with twenty respondents, the problems tested approached the level of certainty of 95% [15] or a minimum sample size of 12-14 respondents for reliable results [18]. Therefore, respondents in this study amounted to twenty users who were divided into two groups, namely ten adult female respondents and ten adult male respondents. Data collection was carried out using a random sampling technique [15].

RESULT AND DISCUSSION
Users in this application can perform tasks based on predefined scenarios summarized in Table 3.

Table 3. User Scenario

Scenario Name	Job Description
Login	Enter username and password
Registration	Register an account on the application by filling out the form by verifying your identity as validation of the created account.
Document Endorsement	The process of validating digital documents by uploading documents and signing documents is choosing to sign individually or require someone else's signature.
View Document Story	View details of documents that are waiting and have been signed or canceled.
Viewing the activity log	Monitor the course of activities while accessing the application, especially the document validation process.

The next design stage is making a storyboard design. The storyboard design shows the initial design of the application UI before heading to the mockup design stage. For example, the storyboard design of the smart digital signature application is shown in Figure 2.
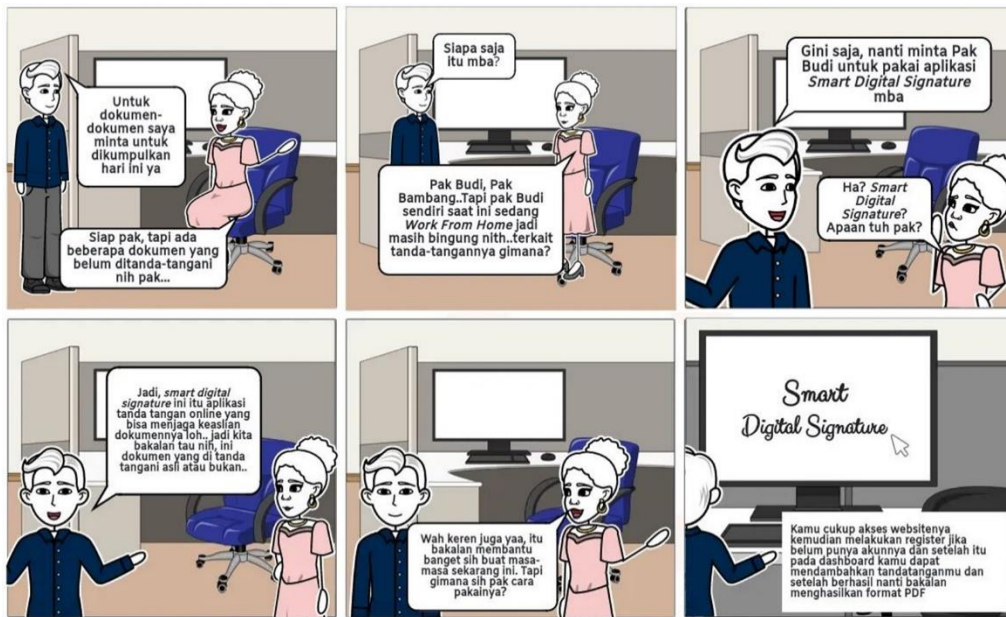
Figure 2. Storyboard of the smart digital signature application

The scenario started with staff (supervisors) who asked to collect important documents. However, some staff had not signed the documents because the staff is WFH. In addition, the secretary was confused about asking for the signatures. Then, the secretary received information that a website-based application called Smart Digital Signature "SIGNARE" can solve this problem, where this Smart Digital Signature is an online signature application that can be an authentic document that provides clear information that the document is genuine. or not. In this application, the user can register or log in. After that, on the dashboard, the user can add a document to request a signature from the person concerned, and later it will produce a PDF format for the signed document.

The next stage of UI design is the mockup design. Several smart digital signature application mockup designs are shown in Figure 3. Manuscripts can be presented with the support of tables, graphs, or images that are needed to clarify the results of the presentation verbally. Results and discussion is shown clearly and concisely.

The next stage of UI design is the mockup design. Here are some smart digital signature application mockup designs are shown in Figure 3.

(a)   (b)

(c)

(d)

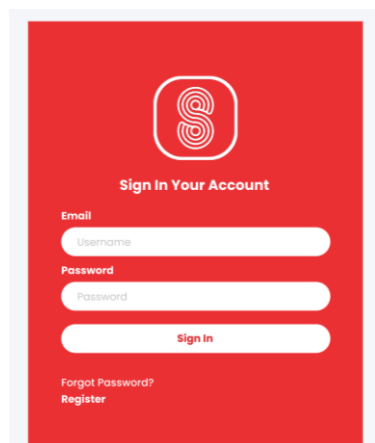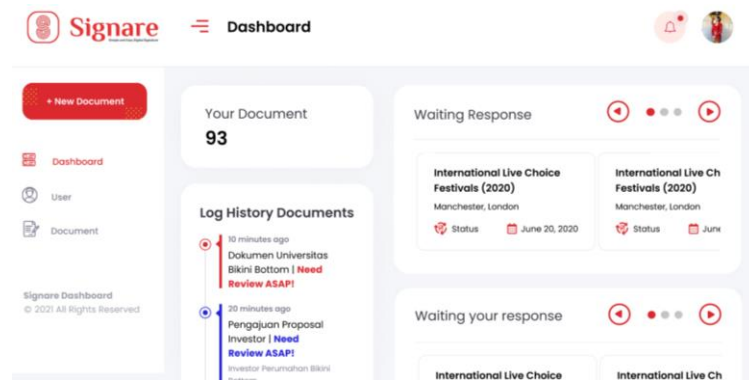Figure 3. (a) Login mockup (b) Registration mockup (c) Dashboard display mockup (d) Document upload display mockup to be signed
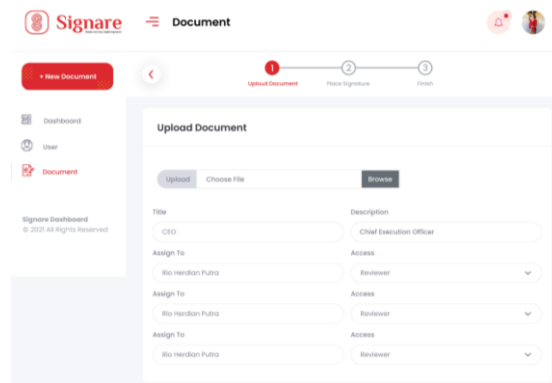
The design implementation stages of the mockup design to the prototype are carried out using the smart digital signature application in Figure 4.

(a)

(b)

(c)

Figure 4. (a) Prototype of login (b) Prototype of smart digital signature application (c) Prototype of upload of the document to be signed

This design stage then goes through the testing stage. The smart digital signature application design testing using SUS. From the data obtained from the SUS questionnaire, calculations were then performed according to the procedures in the SUS data analysis. The data from the SUS calculation are shown in Table 4.

Table 4. SUS Calculation Result Data

Respondent	Total	SUS Score	Respondent	Total	SUS Score
R1	21	52,5	R11	35	87.5
R2	28	70	R12	39	97.5
R3	30	75	R13	37	92.5
R4	30	75	R14	39	97.5
R5	31	77.5	R15	38	95
R6	29	72.5	R16	38	95
R7	27	67.5	R17	34	85
R8	31	77.5	R18	37	92.5
R9	27	67.5	R19	35	87.5
R10	21	52.5	R20	37	92.5
		Average Score			80.50

From Table 4, the average score obtained is 80.50. This score is a good score on the SUS test. Therefore, it can be said that the design of this smart digital signature application has been designed correctly and effectively and is ready to be implemented into a real application. The results of the SUS score from the prototype design of the smart digital signature application are above average. The results of the SUS score

for the UI design of this application prototype received an assessment in the "Good" category, as shown in Figure 5.

Figure 5. SUS test results

Based on Figure 5, this design stage is then tested to ensure that the design is designed correctly to the needs of Smart Digital Signature. The test results obtained an average score of 80.50, indicating a "good" score. However, this research has two novelties, to determine user satisfaction with the suitability of the implementation needs of this application. In addition, this research of SUS result test measured user satisfaction to evaluate the UI design before implementing the system.

CONCLUSION
The Smart Digital Signature application is developed to validate documents in the form of unique electronic signatures to prevent information from being known by unauthorized parties to signed documents. This application can also speed up the process of document publishing services and simplify the flow of bureaucracy. The design stage compiles user scenarios and UI designs to prototypes. This design stage is then tested to ensure that the design that has been made has been designed correctly and is following the needs of the smart digital signature application. The test results obtained an average score of 80.50, which indicates a "good" value. Therefore, this application design in the future can be improved from the side of the actual application development because this research is still at the prototype stage.

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