BUILD SAFE SECURITY SYSTEMS USING CODE, FINGER PRINTS, AND CAMERAS WITH KANSEI ENGINEERING METHOD

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ABSTRACT

The Financial Office of Koarmada II (Disku Koarmada II) has the ability to support the KRI oprasional or unit that is the demand of the Navy. To support the implementation of these tasks, the Koarmada II Financial Office needs to be equipped with special equipment to support the implementation of tasks in storing money and valuable state assets. IoT safe security system. That will monitor the security conditions in a storage is certainly very necessary for financial holders to be able to monitor the security conditions in the safe even remotely. Currently, The Financial Office of Koarmada II does not have a security system in the safe, in this study the author tried to design a security system with the Internet of things system, from the results of research on the entire system that works smoothly and the process of sending reports on accessing the safe to the mobile phone is very good. With this system, it is expected that financial holders can monitor through the application on the mobile phone if anyone accesses the safe, so as to prevent before the breach of the safe, even know if there are people who try to access the safe. From the existence of this security system will be able to complete the main tasks effectively and efficiently and able to minimize material losses.

Keywords : Kansei Engineering, Security Safe IoT system

1. Introduction

At this time the crime rate is increasing, especially theft cases that are increasingly rampant. The lack of prudence from humans as well as the lack of surveillance devices led to increased theft and the results of the search for evidence are often nil.But now technological advances also continue to grow rapidly, especially in the field of electronics. Brankas is a tool commonly used to store valuables so that a good security system is needed and an online monitoring device is needed to keep and know the condition of the safe remains safe.

The Indonesian Navy has an obligation to maintain sovereignty and security in the territorial waters of the Unitary State of the Republic of Indonesia, as for the additional task of the Navy itself, namely by carrying out the development of technology for the strength of the sea area, this case one of the tasks is to maintain important documents and state finances that will be held accountable, financial institutions in the Navy are held by a supply officer who has an obligation to support personnel, logistics and security and security documents. Therefore, a financial storage tool and documents are needed in order to support the implementation of soldier operations, with the importance of a storage tool that exists in the navy service environment, the author wants to create a safe security system to store and secure valuable documents with a high level of security in accordance with the development of current technology.

There is a problem that existed in the navy, namely in the task force or in kri about the storage of documents and money placed in an improper place resulting in material losses and hampered an operation. For example, in 2016 there was a safe break-in at the TNI Mabes resulting in the delay of an active support operation and also in 2018 there was a break-in at the Koarmada II Health Office.

With the current problems, there is an opportunity to develop an automated control system with remote security. To develop the control system, researchers named the IoT vault. This additional security equipment is controlled by using a mobile phone to see the safe condition of the material inside with the control process using the software contained in the safe, and the application system inside the mobile phone to report the access condition in the opening of the safe in real time. This tool also focuses on ergonomic products which

become a very important part, both in terms of comfort and safety of the wearer, so that the role of IoT safe can support every operation carried out in the task force or KRI.

The research in this thesis is designed to create a safe by utilizing IoT (Internet of Thing) technology by using a small computer as a controller and sim800 as a modem so that this tool can continue online and send photos to mobile phones with the aim of monitoring the state of the safe.

When there is a mismatch of codes and fingerprints between the bangkas owner and others then the camera will automatically take a photo and send it to the owner's phone so that the owner knows who wants to access the safe, through the application on the mobile phone in real time so that the possibility of safe becomes safe.In this study the authors used the Kansei Engineering Method. In addition, the object studied is a financial storage tool and documents with the Navy. The selection of such methods is due to trying to translate the results of the psychological feelings of officers and soldiers in their duties to store valuable assets, and the security system equipment is also not in the navy task force

2. Library Overview

2.1 Previous Research

From some existing research it will be a comparison or benchmark in the manufacture of design tools that will be made by the author, so it will make it easier to know the shortcomings of the former and then developed according to the demands of the work, the author took some previous research as a reference in multiplying the study material. Here is a previous study in the form of several journals related to the research conducted.

2.2 Planning In Products

Product planning is the process of finding ideas from a product and carrying out several steps until the product can be used. In addition, it must have another strategy if the product fails in its manufacture.

Success depends on the ability to identify consumer needs, then continually create products that can meet those needs at a low cost. This is not the responsibility of the marketing department, in the development of products based on the request or requirements and specifications of the product by the user is a good enough step, because with the desire-based kosnumen then the possibility of the product is not accepted by the user..

There are 5 specific dimensions related to profit value and commonly used to assess business performance in product development, namely:

1. Product Quality

   How well the product results from development efforts and can satisfy the needs of consumers. The quality of the goods will ultimately affect their use so as to determine the price that the user wants to pay

2. Product Cost

   The cost for equipment and tool capital as well as the production cost of each unit is called the manufacturing cost of the product. Product costs determine how much profit is generated on a given sales volume and sales price

3. Product Development Time

   Development time will determine the ability to compete, show responsiveness to technological changes and will ultimately determine the speed to receive economic returns from the efforts made by the development team.

4. Development Costs

   Usually the cost of development is one of the very important components of the investment needed to achieve profit

5. Development Capabilities.

   Development capabilities are assets that companies can use to develop products more effectively and economically in the future.

2.3 Product Development

There are 3 stages of the process in the development of new products / services, namely:

a. Interesting Market (Need pull / market Pull)

From this point of view, we have to make what can be sold. So the new product is determined based on the needs of consumers. New product types are determined through research & customer feedback, with little attention to technological developments. Need Pull will lead to the formation of incremental innovation.

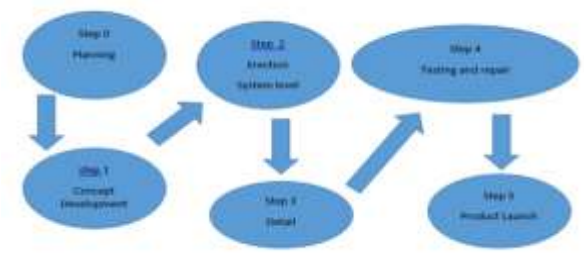
b. Pushing technology (Technology Push)

From this point of view it suggests we should sell what we can make. New products are obtained from production technology, the use of advanced technology and ease of operation, with little attention to the wearer. In other words, a new product or technology is encouraged or sold to a potential customer who does not request or know about the new product or technology. Technolgy Push will lead to radical innovation

c. Interfunctional

New products require cooperation between marketing, operations, engineering skills, and other functions so as to produce products that meet customer needs with the use of technology that provides the best benefits. For the success of innovation of new products or services required a combination of the first two models, namely the technical-linking and need-linking process. In addition, there are three elements that become considerant in creating new business opportunities, namely: relevant problems, technology sources and market demand.

According to Ulrich-Eppinger, (2001). The product development process generally goes through 6 tep, following Figure six step in product development.



a. Step 0 : Product planning is an activity referred to as "zero phase" because this activity precedes the approval of the project and the process of launching the actual product development.

b. Step 1 : concept development phase, objective needs identified, alternative product concepts raised and evaluated, from one or more to concepts selected for development and experimentation

c. Step 2 : Phase System level design, this system includes product architecture definitions and product descriptions into subsystems and components

d. Step 3 : Detailed design phase design includes complete specifications of the shape, materials and tolerances of all unique components in the product and identification of all standard components purchased from suppliers.

e. Step 4 : Testing and repair phase testing and repair involves construction and evaluation of various early production versions of the product.

f. Step 5 : Initial Production In this phase the product is made using the actual production system. The target of this initial production is to train the workforce in solving problems that arise in the actual production process. The transition from initial production to actual production is usually step by step. At some point during this transition period, the product was launched and began to be made available for distribution

2.4 Questionnaire Creation

Questionnaires are some written questions that are used to obtain information from the respondent in the sense of reports about his or her personality, or things he or she wants to know. In survey research, the use of questionnaires is very important in data collection. The main purpose of questionnaire creation is to obtain information relevant to the purpose of the survey by filling out questions asked by researchers to the selected respondents. The requirements of filling out a questionnaire are questions should be clear and lead to research objectives (Ginting, 2010).

There are four main components of a questionnaire, namely:

a. The existence of subjects, namely individuals or institutions that carry out research.

b. The existence of an invitation, namely a request from the researcher to participate in actively and objectively fill in the questions and statements available.

c. The existence of questionnaire filling instructions, where the available instructions must be understood.

d. The existence of questions and statements along with the place to fill in the answers, either in private, semi-closed, or open. In creating this question is also included with the field for the identity of the respondent.

Questionnaires are tools that researchers use to collect primary data. The stages of questionnaire making are as follows (Wijaya, 2011):

a. Level of satisfaction. The questionnaires in this section are used to measure the level of satisfaction felt by consumers.

b. Level of importance. Questionnaires in this section are used to measure how important an attribute is.

c. The level of expectation. This questionnaire is used to measure the level of consumer expectations of attributes.

2.5 Validity Test

Validity tests are useful for measuring whether the questionnaire is stable, accurate and its elements are homogeneous. So that if the validity obtained is higher, then the results of the test are increasingly about the target and increasingly showing what should be shown

.This validity test is conducted with internal validity, where the criteria used come from within the test tool itself and each item of each variable is correlated with the total value obtained from the low correlation coefficient and significant level, then the item in question is dropped, the significant level used is 5%. The calculation of correlation in each total variable using the formula of correlation technique "product moment" is formulated as follows:

$$r = \frac{N\left(\sum xy\right) - \left(\sum x \sum y\right)}{\left\{\left[N\sum x^2 - \left(\sum x\right)^2\right]\left[N\sum y^2 - \left(\sum y\right)^2\right]\right\}^{1/2}}$$

Where: : x = score each variable
y = total score of each respondent
N = number of respondents

Each variable that is hypothesized will be measured the correlation and compared to looking at the critical numbers. The way to view critical numbers is to look at row N-2 in the correlation table of the r value. In the implementation of data processing, to test the validity using SPSS software for Windows.

2.6 Reality Test

Reliability test used is one of them to see the level of consistency of respondents tehadap existing variables so that the data obtained will tend to give the same results (consistent)

As the formula for the variance coefficient (with Cronbrach) is:

Where α = Reliability coefficient

K = number of question items

Σ = Number of question items

σ_t^2 = Total varian

$$\alpha = \left[\frac{k}{(k-1)}\right]\left[1 - \frac{\sum \sigma_b^2}{\sigma_t^2}\right]$$

2.7 Prototyping

Prototype is the assessment of products through one or more dimensions (Ulrich and Eppinger, 2001). Prototypes are used for learning, communication, merging and as milestones. Some useful principles for guiding decisions about prototypes during product development, i.e. analytical prototypes are generally more flexible than physical prototypes. Physical prototypes are needed to detect unexpected phenomena, stages in prototyping:

a. Setting the goal of the prototype
b. Set the prototype forecast level
c. Outline a trial plan
d. Create acquisition, creation and testing schedules

After the prototype product is completed, a series of tests are carried out which include performance testing as well as mechanisms for the use of other functions of the product. This test will be conducted to see the results of the design according to what is expected and to compare whether the level of satisfaction with the use of the new product is better or not than before.

2.8 Kansei Engineering

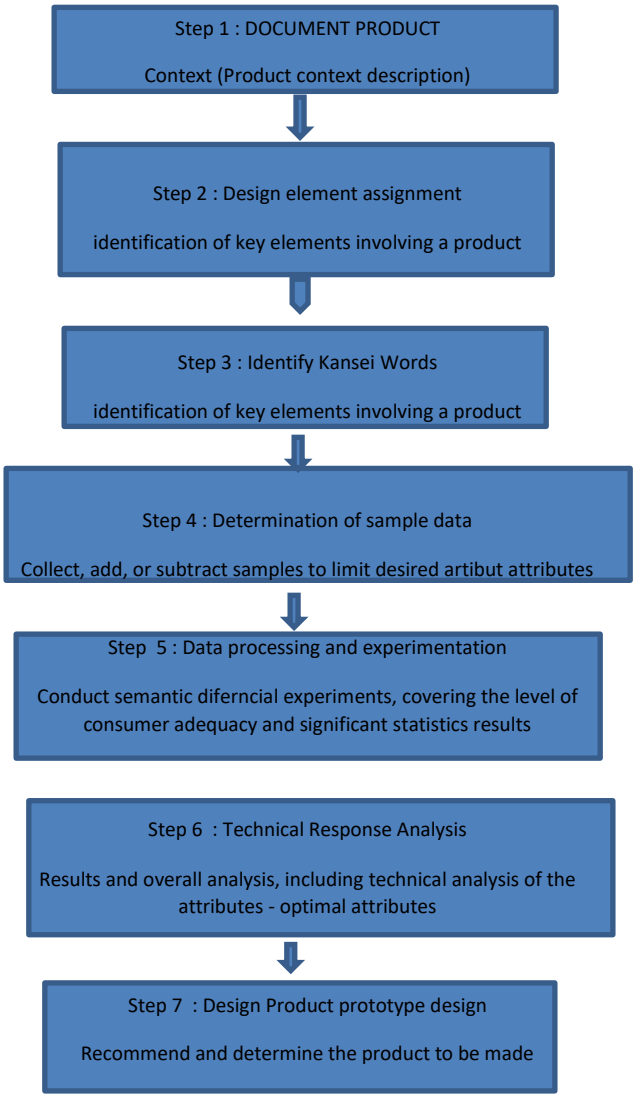
This method is the development or improvement of a product or service by translating psychological feelings and user needs into product design parameters. This method was first invented by Mitsuo Nagamachi (Nagamachi, 1995) as a new method of technicalization in the design and development of industrial products. The design parameters of this product as a reference for the industry to produce quality products with the right quantitative size of the production process

Kansei Engineering aims to produce new products based on customer feelings and demands. There are four items related to this technology, namely:

a. Understand customers' feelings about the product through ergonomic and psychological approach.
b. How to identify the design characteristics of a consumer kansei
c. How to build kansei engineering as an ergonomic technology.
d. How to adjust product design to the latest consumer changes to consumer preference trends.

Kansei Engineering collected words that represent the feelings of consumers are then selected to take the most relevant words. With regard to the second item, what is done is to conduct a survey or an experiment to find the relationship between kansei words and design elements. For the third item, advanced computers were used to develop the framework systematics of Kansei's engineering technology.

Kansei's method of getting reaction from consumers can be seen more clearly below,



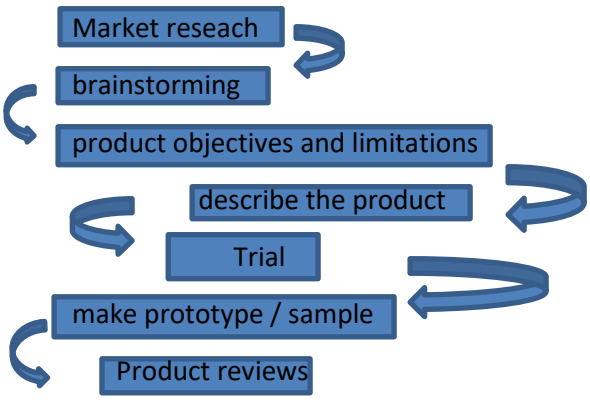
3. Research Methods

3.1 Research Design

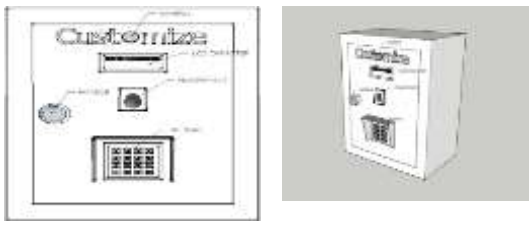
The research that will be conducted is applied research. this type of research was chosen because of the problems that exist in the Navy's work environment. This problem requires an element to find and follow a target in the processing of financial storage and documents in the task force, this research uses valuables and money storage tools in the form of safes with IoT systems..

3.1.1 Product Design

On this occasion the author will look at the needs of consumers, then precisely create the product as desired so that it can meet the needs at a low cost. To make a product will usually go through the following stages figure stage in the manufacture of the product.



The following is a safe design that the author later created to store valuable documents and money in the navy environment following figure of the IoT safe design.



3.1.2 Methodology

Methodology of the thesis report entitled "DESIGN SAFE SECURITY SYSTEM USING CODE, FINGERPRINT AND CAMERA WITH KANSEI ENGINEERING METHOD" based on IoT with the following steps

a. Literature Studies

To reinforce ideas and ideas, literature studies on sensors and microcontrollers were conducted. Literature used in the form of books, articles both from the internet and journals as well as research data and experiments that have been done before.

b. System Design

In this section the stages to perform the design of tools and systems include the design of systems in the form of hardware and software.

c. Hardware Creation

In this section the creation of each sensor node consisting of three sensors consists of a ph sensor module, a temperature sensor module, and a turbidity sensor module that will be integrated into the Arduino software creation In this section the software design stage consists of creating ESP8266 as Arduino's link with the local network, Arduino IDE as a C language writing program to program and configure the microcontroller then PHP is used to establish a connection with the sensor database.

d. Assembly of All System Components

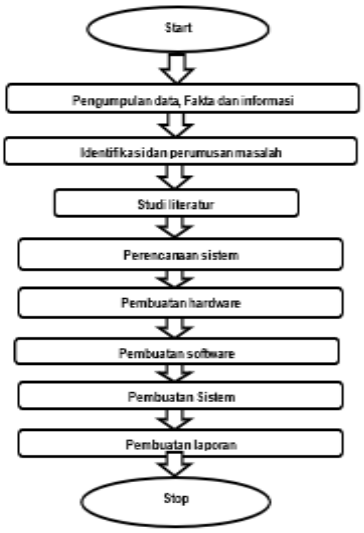
Once all the required components are available, then the next step is the process of assembling the components, making sure all the components that have been assembled work properly.

e. System Testers

This test is designed to know that the performance of each system from the results of the manufacture of hardware and software as expected. The testing phase includes testing per block and testing throughout the system. Testers per block are conducted to determine if the system is as planned.

f. Report Creation

Report creation is done after all stages are completed so that the results obtained from the creation of the system are explained in detail according to the data obtained following is a research flowchat.



4. Data Analysis and Discussion

In the discussion of this chapter is the collection and processing of data using kansei engineering method that is directly related to the initial condition of the research object. Furthermore, the data will be processed to produce the design of the existing initial conditions, both in the form of design and additional functions that can be used at the time of product manufacture.

Here is figure of the comparison of the safe used by koarmada II financial office with the IoT safe that the author later created.

From the comparison, the old safe only uses a code to open, while the IoT safe uses fingerprints and 6 codes and a camera that is entirely connected to the Internet, so that access activities are immediately reported on the owner's mobile phone.

There is some data needed in this study, which is obtained based on the results of p engamatan and interviews directly as well as the results of field studies and libraries. here's Figure of the IoT System which illustrates the mechanism of action of the system.

On IoT systems this tool has two security systems. The first uses a fingerprint or commonly called a fingerprint sensor, where the sensor reads the texture or characteristics of the user's fingerprint, and is converted into values that are then processed so that the output is a match of fingerprint data with the user. Security of the next layer of this system using the keypad dimana pengguna memasukkan kode kombinasi angka through the keypad. the way the keypad works is to input digital data on the microcontroller which will later be converted into a number code. From the data the number code will be compared with the number code that has been stored so that it will be obtained the result of the conformity of the code entered with the previously stored code.

From the two security systems will be grouped into two decisions that are appropriate and not. If the result is not correct then the camera placed on the safe door will take a picture and be sent on the user's phone as well as a notification of the attempted break-in of the safe.

the results of both layers of security are appropriate then the solenoid that serves to lock the safe will open so that the user can open the safe door and use it. In this case a notification will also be sent to the user's phone.

In this system using two types of data communication, namely sms gateway and internet. To speed up communication with mobile phone users of this system use sms gateway to send notifications. As for sending captured images from the camera, the system uses the internet. On the safe door there is also an LCD character as an interface between the user and the safe. On this system also allows the user to reset the password

as well as determine the master password. Master password is an alternative number code that can be used if the user forgets the previously saved password.

If the whole system works properly from the beginning to insert fingerprints, codes and modems that directly send a notification over the internet to the mobile phone then the Iot safe is perfect, and vice versa in case of network interruptions then the process of using the safe can not be used.

4.1 Determination of The Number of Questionnaire Data Samples

Data collection from the user is done using questionnaire method, which is filled by officers and members and civil servants Denma and Disku Koarmada II, often carrying out financial support to KRI or other units in the wall (questionnaire attached to attachment IV). the following is a recap of the number of financial members of Disku Koarmada II

From the data above the population is 124 people. To obtain the minimum sample count by using the Slovin formula (1998).

n = N / N.d^2 + 1 Where n = Number of samples

N = Population

d^2 = Precision set

The research population as mentioned earlier is 124 people (Officers and members of Denma and Disku Kormada II), the level of precision set by = 5% then the n value can be searched:

n = N/N.d^2 + 1

= 124 / (124).$(0,05)^2$ +1

= 124 / 1,31

= 94.65 ≈ 95 People

Next will be calculated the spread of questionnaires on each Unit . The distribution of questionnaires is carried out based on a proportionate proportion of the population.

It can be concluded that the minimum sample number is 95 respondents. Questionnaires will be distributed to officers and financial members consisting of:

No	Kesatuan	N.	Proporsi N.	sebaran n.
1	KUWIL	27	0.22	21
2	MAKO	28	0.23	22
3	AKUN I	27	0.22	21
4	AKUN II	28	0.23	22
5	AKUN DENMA	14	0.10	9
	Σ	12 4	1.00	95

2. MAKO = 22 People
3. AKUN I = 21 People
4. AKUN II = 22 People
5. AKUN DENMA = 9 People

4.1.2 Questionnaire Data Collection

The filled questionnaires are then reassembled to recap the results and graphed for easy understanding. The result is as follows figure respoden rank chart, Figure Old Service Chart, Figure Assignment Frequency Chart, table rank of respondents members, civil servants and officers, table length of respondents in Koarmada II, table frequency of assignment of members & officers and civil servants, and table the need for the development of IoT safe security system.

a. Rank of Respondent

Table 4.6 Pangkat Responden Anggota,Pns dan Perwira

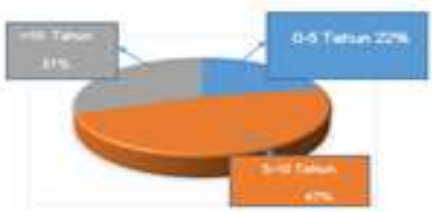
Perwira	Bintara	Tamtama	Pns
9	25	51	10

b. Figure Old Service Chart

Table 4.7 Lama Kedinasan Responden di Koarmada

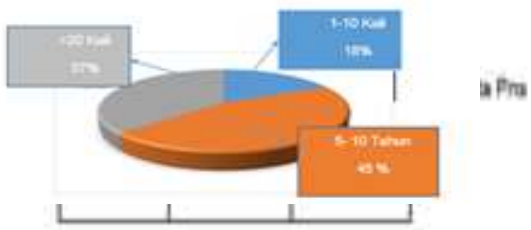
0 – 5 Tahun	5 – 10 Tahun	>10 Tahun
21	45	29

(Sumber Olah Data)



Long-standing responden in The Financial Office of Koarmada II

c.



d. The need for the development of IoT Table System Vaults The need for the development of IoT Safe Security Systems

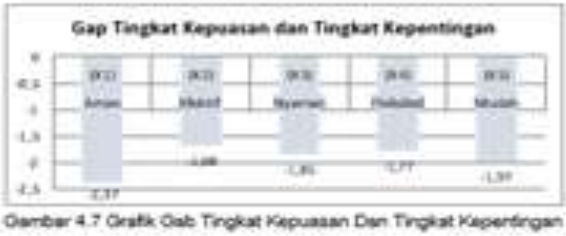
From the questionnaire data collected graph images above the need for the development of the tool states that 100% of respondents from officers and members and civil servants Denma, Disku Koarmada II supports for the development of a safe product using IoT.

4.1.6 Interpretation of Questionnaire Data

From the questionnaire data obtained, it can be known the average level of satisfaction (listed in attachment VI) and the level of importance (listed in appendix VII) of the user against the desire needed to safe the IoT security system. Then it is necessary to do the interpretation of questionnaire data to get things related to the needs of the user in the assignment. As from the results of the interview that produced kansei words that were translated into variable form that suits the desired needs of members and officers of the Navy supply corps.

There fore, it is necessary to calculate the difference in the satisfaction level of the system or tools that already exist in Disku Koarmada II, with the level of importance of the tool that should exist.

Table 4.10 Rata-rata Tingkat Kepuasan dan Tingkat Kepentingan



Gambar 4.7 Grafik Gab Tingkat Kepuasan Dan Tingkat Kepentingan

This calculation is present in each of these variables. Here's table on Average satisfaction levels and importance levels from questionnaire results and figure graphs of gab satisfaction levels and importance levels.

The data above can be known that there is a gap between the satisfaction level of the system and existing tools with the level of interest esired by the user. The highest gap is in the security variable (X1), meaning that the security variable becomes a priority demand that must take precedence in the assignment in the wall, so the expectation of an IoT safe security system tool is very expected

4.1.7 Determination of Order of Interest

By looking at the importance level data of each variable, it can be sorted what variable factors are the priority of product development. Table below shows the order of importance levels of ioT security system safe tool variables for officers and members

level of importance

Table 4.11 Urutan Tingkat Kepentingan

	4.13	3.83	3.91	3.70	3.83
	1	3	2	4	5

(Sumber Olah Data)

From the data table above it can be known that the order of the first level of importance is the safety factor, the second the comfort factor, the three effective factors, the four flexibility factors, and the fifth the ease factor. So that by knowing the order of importance level, it can be made a priority scale for the manufacture of a product.

4.1.8 Validity Test

Validity is a measure that indicates the validity or validity of an instrument. So the validity test refers to the extent to which an instrument performs a function. Instrument is said to be valid if the instrument can be used to measure what to measure (Sugiyono, 2006). Validity tests are useful for measuring whether the questionnaire is stable, accurate and its elements are homogeneous. If the validity obtained is higher, then the test is

increasingly about the target and increasingly showing what should be shown. Perhitungan spss for Windows software with the following steps

a. Enter questionnaire data on satisfaction and importance levels as well as total scores.

b. Fillinganalyze correlativebivariate

c. .Then enter all variables and click OK

Satisfaction level validity test table, If r_{Count}> r_{table}, Then the variable is valid. With known value r_{table} = 0,202

From the results of the calculation using SPSS software, and looking at the results about the validity test of the level of interest, it can be concluded that rhitung> rtable, which means the data of the importance-level questionnaire is valid. .Of all the variables at the satisfaction level as well as the level of importance, and meet the validity test, so that the questionnaire can be declared valid.

4.1.9 Reliability Test

The reliability of a measuring instrument is the determination or ability of the tool in measuring what it measures. That is, whenever the measuring instrument is used will give the same measuring result Reliability tests are used to see the level of consistency of respondents with existing variables so that the data obtained will tend to give the same results (consistent).

To do this test used SPSS software for windows, by using the following steps:

a. Enter attribute data into the SPSS software, only for valid variables.

b. Click analyse scale reliability analysis enter all OK variables.

d. If cronbach's alpha value > 0.6 then reliable. Here table is the result of reliability test of satisfaction level

Table Reliability Test Results Satisfaction Level

Case Processing Summary

		N	%
Cases	Valid	95	100,0
	Excluded[a]	0	,0
	Total	95	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,626	5

Case Processing Summary

		N	%
Cases	Valid	95	100,0
	Excluded[a]	0	,0
	Total	95	100,0

a. Listwise deletion based on all variables in the procedure.

As for the Importance Reliability Test is in table follows

Importance Reliability Test Results

Reliability Statistics

Cronbach's Alpha	N of Items
.608	5

From the recap data table above it turns out that cronbach's Alpha value for satisfaction level is 0.626 and Cronbach's Alpha value for importance level is 0.608. And this is greater than 0.6 so it can be concluded that the data is Reliable. This means that the consistency level of respondents with existing variables indicates that the data source obtained will tend to give the same (consistent) results.

4.2.0 Component Selection

Selection of components is required for the design of safe security system tools based on the priorities required in the Department of Finance. In the selection of components all technical responses that become a priority are drafted so that later will be selected one component that best suits the desired needs. The following table shows a comparison of the components to be used in the creation of IoT safe system tools

While the column on the block in yellow is the component chosen because it has advantages and is best suited to the need for financial security in the safe.

No	Jenis Komponen	Komponen Pembanding		
1.	Modul Komunikasi	SIM 800L 	Modem Wavecom 	SIM 900L 
2.	Microcontroller	Arduino Uno 	Arduino Nano 	Arduino Mega 
3.	Power Supply	5v 3A 	12v 5A 	24v 5A 
4.	Baterai	Lithium Ion 	Lithium Polimer 	Ni-Cd 
5.	Modul Camera	VC0706 	OV5642 	OV7670 
6.	Sensor Sidik Jari	FPM10A 	5100 SDK 	ZFM208SA 
7.	Display	Alpanumeric LCD 	LCD TFT 	LCD OLED 

Among the alternative components that exist then selected components that suit the needs of the tool are:

a. The communication module used is SIM800L. this module has smaller dimensions compared to other comparator communication modules. This module is quite efficient with a supply of 3.3V. features in this module are quite used in this tool.

b. The microcontrollers used are two Arduino Megas. Arduino Mega has a larger memory compared to other microcontrollers. It also requires a lot of GPIO to access all the pheriperals on this tool such as Sim 800L, Camera, MicroSD Module, Keypad, Fingerprint etc.

c. Power Supply used is 12v 5a where the power supply is enough to cover all the needs of components in this tool. It also comes with a 5v and 3.3v regulator to supply each component

d. The battery used is a type of Li-Po 3s 1100 MAh battery. This battery is used to temporarily replace PLN power when pln power goes out so that it remains safe even if the power goes out.

e. The camera module used is type VC0706 because this type of camera can be processed faster compared to other cameras. The camera uses serial communication with its microcontroller.

f. The fingerprint sensor used is ZFM208SA where it is highly compatible with Arduino controllers

4.2.1 Prototype Testing

After selecting the components of the safety device safe, the assembly of the components is carried out and obtained the results as shown below.

(A) Tampak Depan (B) Tampak Dalam (C) Tampak Samping

Design testing is done after the tool is finished. Testing is performed to see if the tool is working properly or not. Tests were also conducted to determine the durability of the device. The tool has been operating for more than 500 hours non-stop in standby mode to test which parts of the hardware are weak.

As for the operation of the tool has been done more than 100 times to test the locking mechanics whether it can survive or not. The following figure 4.7 safe in an off state is documentation of the testing tools that have been performed:

Figure Safe Off
(Data Processing Source)

Once the appliance is turned on the system will prepare all the sensors and components used. The following image of the boot system is the display displayed on the LCD.

(A) Layar On (B) Layar Siap Input Data (C) Sidik Jari

After boot mode is complete, the safe in standby mode (on) where the lcd lamp is off and the fingerprint lamp remains on.

Figure Safe in Standby Mode (on)

In standby mode the safe can be operated by pressing one of the keys on the keypad. the following enabling safes from standby mode is testing the operation of the safe.

Once the safe is active, the LCD will display as follows figure display on the LCD when fingerprint instruction

(A) LCD Siap (B) Masukkan Sidik Jari

.When the user puts his finger on the fingerprint sensor there are two possibilities that the fingerprint is detected correctly (according to registration) or wrong. Hereis the result of fingerprint sensor testing.

If the sensor detects that the fingerprint is correct (according to the registration data). So in figures system will ask for a number password.

Figure Number Password Requesting System

At this stage also the user will get two possibilities, namely true or false passwords. If the password is correct then the safe will open and the system will send a notification on the android applicationIf at the stage of entering the fingerprint or password the user's number makes an error three times then the system will automatically capture the user and the image can be seen on the android application. The system also closes safe access for 5 minutes

Solenoid condition when opening

Gambar 4.22 Notifikasi Pada Aplikasi Android Saat Brankas Berhasil Dibuka

(Sumber Olah Data)

Gambar 4.23 Notifikasi Pada Aplikasi Android Saat Brankas Tidak Berhasil Dibuka

(Sumber Olah Data)

Gambar 4.18 Kondisi Solenoid Saat Membuka dan Menutup

Gambar 4.19 Prototype Dalam Brankas

(Sumber Olah Data)

After we did the exposure about this tool, we also did a data retrieval using a questionnaire. This is to get the level of need of this tool. Here are pictures of Data Retrieval Documentation Using Questionnaires at Koarmada II Financial Office.

There are some drawbacks to this safe security tool, some fundamental drawbacks are in the long process such as shooting, storing on sd card module memory until it is sent to the hosting server takes up to 20 seconds. And another drawback is that no effort can be made if the safe is moved because the safe is not accompanied by a Location tracker such as a GPS tracker system, .the advantage of this safe tool with IoT system is that we can find out who will access the safe if there is an error three times entering the fingerprint then automatically the camera will immediately photograph and send through the safe holder's mobile phone, so that the identity of the person can be immediately known.

There are several important elements considered in making this product, namely ease of use, effectiveness, safety, and ergonomic design. Ease of use requires that this product be used by all users or sections on duty. Effectiveness requires that no wasted parts be attached to this tool. All parts are interconnected and supportive in the running of this tool. Security is the main point in the creation of this tool, where the function of this tool is to secure what is inside. Safety in terms of mechanics, systems and electricity. .The ergoononic design relates to the user's comfort in operating this tool. This tool is designed as simple as possible as a design.

5 Conclusion

Some things that can be inferred from this final task are as follows:

a. The author designed and made the tool effectively and efficiently and has ergonomic value to be easy to use in the task in accordance with the demands of technology and high security value, then the author tests the tool on parts of the Internet System in the safe and applications on the android is functioning well and smoothly.

b. The author tests the code that has been entered by six numbers and inserts three fingerprints whether it can function properly or not, then tests the camera that is already installed in the safe, from the test results that all the tools work well without any constraints.

c. For the results of the performance of this IoT system safe tool, the entire system works very well starting from inserting fingerprints, codes, cameras and internet modems in it, so that the safe can be monitored through android applications on the phone in real time

d. With the code system, fingerprints and cameras as well as android applications made for security, then in the problem of safe break-ins during this time will be solved. With this IoT system vault then we will get clear information in real time ownership of the safe, so it is very profitable for its users.

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