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RFID Based Fuel Payment System Design

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ABSTRACT

In the current era, technological developments are so rapid and there are not a few technologies that offer a variety of advantages, both in terms of the functionality of the technology or its effectiveness, which of course all aim to make it easier for users, namely humans themselves. One example is RFID. This system has been widely applied both to identify an item, as a security system, and a toll payment system as well as arriving at an educational institution. The purpose of this research is to design a BBM payment system at gas stations based on RFID. Of course this aims to overcome some of the problems that occur and develop in the location. In this system, a card will be used as an RFID tag which will later be used as a payment medium that will be detected on a device that already attached to the refueling machine. This research uses the sprint design method which is the development of the design thinking method. That way by using the sprint design method in which there are stages of approach to the user, it is hoped that they can find the main problems faced and be able to design a solution that is able to overcome the existing problems.

Keywords: RFID, Design Thinking, BBM, Payment System, Design Sprint

INTRODUCTION

This is an era where technology is very influential in human life, especially in the current era. Along with the rapid development of technology which is driven by complex human needs, especially in digital technology that offers freedom to access information, it even offers a faster transaction process. This can be seen from the data of users in Indonesia who transact using mobile which is 31%. Therefore, with the existence of human technology, it can be helped in several aspects of human life itself, one of which is the effectiveness of the function of the technology. referred to is a radio frequency-based reader technology.

Based on the rapid development of technology, it is necessary to update the outdated technologies. This is because the latest technology has experienced several functional improvements in various aspects compared to previous technologies. One of them is the technology used in refueling oil in Indonesia which needs to be updated with new technology. The new technology in question is Radio Frequency Identification or so-called RFID is most often used to store a serial number that shows the identity of a person or object on a microchip that is included in the RFI D tag. However, at this time, the use of RFID has varied, depending on the research problem.

The process of paying for fuel oil at the public refueling stations (SPBU) which is still manual-based resulted in several problems that occurred, be it human error or technical error. long vehicles which in some cases can cause a traffic jam. Because of some of the problems above, we want to develop this RFID-based fuel oil payment system to help solve the problem. Where its implementation will be able to solve some of the above problems effectively and provide security while maintaining user comfort. So that fuel oil users can as they should and can divided evenly because the existing problems may be minimized.

METHOD

This study uses the Design sprint method. Design sprint is a method for building product concepts and prototypes within 5 days which has 5 very communicative and interactive stages to issue all ideas, inspiration, creativity, existing problems, solutions which are then realized in a prototype that must be completed. and cross-checked to potential users. The stages in the Design sprint method:

1. Understanding the Problem
2. Sketching the Solution
3. Decide on the Best Solution
4. Create a Prototype
5. Validate Results

In the first stage, namely understanding, mapping the problem to be solved. This mapping was carried out together with all team members to look at the problem from various perspectives. In the mapping process, it will produce a formulation of the problem to be solved and unite views on the purpose of making the product. At this stage, the minimum standard of the product to be made is obtained, for example: the product can help users to write code efficiently.

The second stage, namely sketch, is the stage where team members individually sketch solutions to the problems obtained. This stage is carried out individually to maximize the creativity of each member. If this stage is carried out as a team, it will take a long time and each team member will be limited in their thinking space with the idea that was proposed first.

The third stage, decide, is the stage to collect ideas from all members and determine the best solution for later execution as a team. At this stage, the advantages and disadvantages of the proposed ideas will be discussed. This stage is not only the stage of choosing ideas but also seeing the possibility of collaborating ideas with one another.

The next stage, namely the prototype, is the execution stage where a mock-up of the product is made. At this stage, the division of tasks for each team member will be carried out. This stage is not only aimed at producing a mock-up but also a stage where each member can experiment with other ideas that might be added to the product.

The last stage is validation, which is the stage where a series of trials are carried out to determine whether the mock-up made is in accordance with the minimum standards specified in the first stage. These trials are usually carried out by users or other people who are not directly involved in the mock-up creation stage.

The transmitted data can be in the form of codes that aim to identify a particular object. In RFID, the identification process is carried out by an RFID reader and an RFID tag. The RFID tag is placed on an object or object to be identified. Each RFID tag has a unique identification number (ID number), so that no RFID tag has the same ID number.

The RFID tag consists of an integrated circuit chip and an antenna. The electronic circuit of the RFID tag generally has a memory that allows the RFID tag to have the ability to store data. The memory on the tag is divided into cells. Some cells store Read Only data, such as an ID number. All RFID tags get an ID number when the tag is produced. RFID reader is a liaison between application software and an antenna that will

radiate radio waves to the RFID tag. Radio waves transmitted by the antenna propagate in the surrounding space. As a result, data can be transferred wirelessly to an RFID tag located adjacent to the antenna. ID12 is a reader that specifically detects 125kHz RFID tags. ID-12 compatible RFID tags include GK4001 and EM4001 with a reading of approx. ± 12cm.

RESULTS AND DISCUSSION

Understanding Problems

Based on the results of the discussion, we succeeded in concluding several main problems that occur in refueling, namely, the time for refueling is relatively slow, and the payment transaction process is sometimes problematic which can be detrimental to both parties. some of the problems above by using technology that is simple but has high functionality.

Competitive Overview

According to our review, the use of an ATM card or credit card has actually been able to overcome the problem of transactions in refueling fuel, but the payment process using an ATM card still takes a long time, because the driver must first enter the ATM pin and wait for the payment receipt. Sometimes there are also cases where the driver's ATM cannot be identified by the device.

Interviews

Based on the results of our interviews with drivers of both wheeled and four-wheeled vehicles as well as gas station officers, we concluded that the problems experienced were that some motorists complained several times that the gas station attendants returned the wrong amount of money or on the other hand, the driver paid the wrong amount of money or there was a possibility that the driver had paid the wrong amount. using counterfeit money.

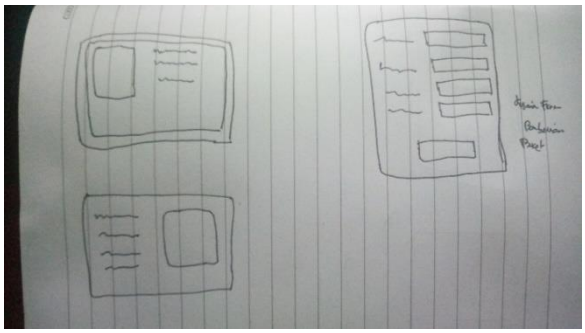


Figure 1. Initial design sketch

Field Visits

After conducting a field visit, we also saw that there was a traffic jam due to the long queues that took up part of the main road because refueling took a long time.

Stakeholders (Stakeholder Map)
Stakeholders included in refueling:
- The rider is a BBM user
- The gas station officer is the person who is in charge and responsible for the fuel filling process
- Money storage media bank

Conclusions and initial ideas

Our conclusion is that a technology is needed that is able to overcome some of the problems experienced by users, both in terms of drivers and officers without disturbing the process of the existing transaction flow. For this reason, our initial idea was to use RFID technology.

Define Method

User experience

The initial stage to use this product is the user (rider) must register and fill in the balance which will be used to pay, after that the user will be given an RFID card as a payment medium. to an RFID card detector and enter the nominal amount of the purchase of BBM. After that the balance will be reduced according to the purchase of fuel oil.

Design Principle

Our design principle is to produce a product that is easy to operate and full of benefits.

First Tweet

Forgot to bring your wallet when filling up with gas? Or do you often get the rest of the change that doesn't match? Please use E-MB and get the convenience of refueling.

Diverge Methods

At this stage the team has proposed several temporary designs for the products to be made, including the design of an RFID card and an application for top-up balances. According to user needs.

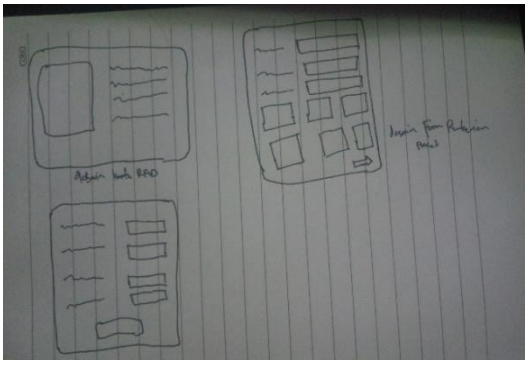


Figure 2. Initial Design sketch 2

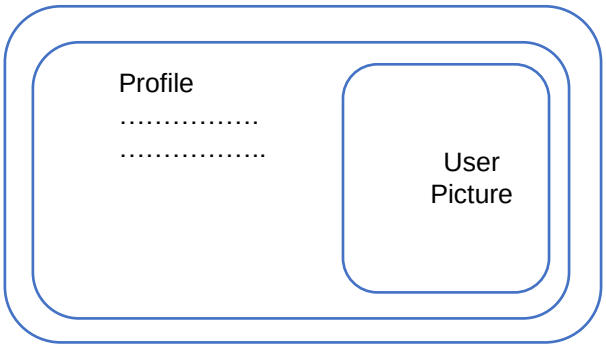
Decide

At this stage the team must decide on several designs that have been proposed through voting. After that, take the design that gets the most votes and proceed to the next stage, namely the selected design.

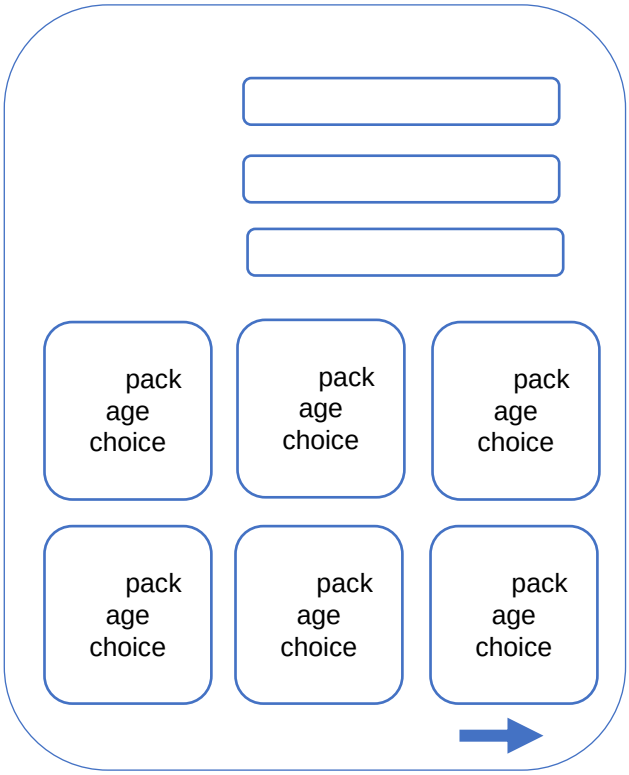
Prototype

In this phase the team has designed a simple as an initial description of the product made and is the implementation of the results of the team's decision.

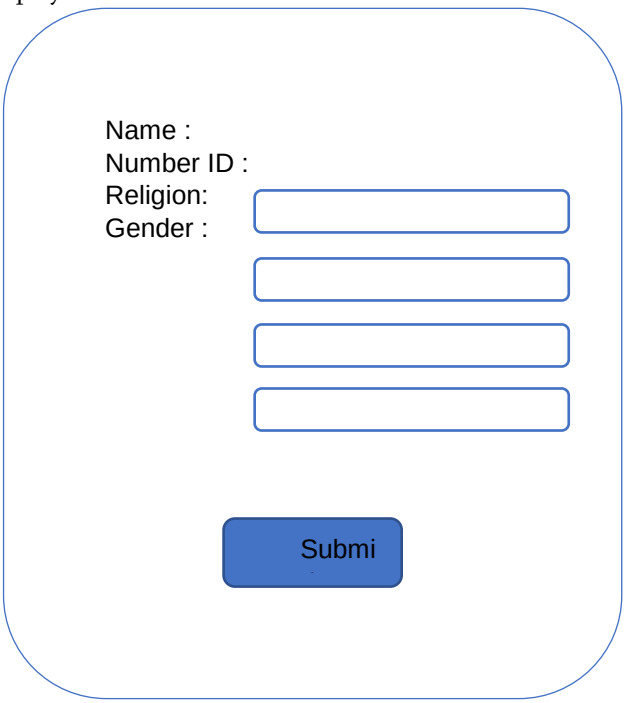
- Display of RFID Card



- Display of Balance Replenishment Form



- Registration Form Display



CONCLUSION

After going through several stages, the team concluded that an RFID-Based Fuel Payment System is very necessary in the market, which sees the problems that arise. With technology, if it can be realized, there will be several benefits, both in terms of drivers and officers. The advantage from the driver's point of view is that the driver will get convenience in transactions, one of which is that the driver does not need to be afraid of getting change that may not be appropriate. Vice versa for officers where the officer will not return the wrong amount of money because the system does the calculations and reduces the possibility of a driver. who pays with counterfeit money. After that, if the driver uses the BBM Payment System with RFID and the gas station also applies it, there will be a fast and simple transaction process that will also reduce the long queues that eat up roads that lead to traffic jams.

REFERENCES

Anwar, S., Darjat, D., & Zahra, A. A. (2015). Perancangan Sistem Pengisian Bahan Bakar Premium dan Solar Bersubsidi dengan Teknologi RFID Sebagai Pembatas Jumlah Beli dan Pembeli. *Transient: Jurnal Ilmiah Teknik Elektro*, *4*(1), 208-214.

Angriani, G. (2019). *Perancangan Sistem Informasi Penyewaan Alat Berat Pada PT. Batanghari Sembilan Jambi* (Doctoral dissertation, STIKOM DINAMIKA BANGSA).

Aska, F. Z. (2015). Implementasi Radio Frequency Identification Sebagai Otomasi Pada Smart Home," Smarthome Dengan RFID, p. 2.

Herdiyanto, D. W., & Pratomo, I. (2016, July). Passenger authentication and payment system using RFID based on-board unit for surabaya mass rapid transportation. In *2016 International Seminar on Intelligent Technology and Its Applications (ISITIA)* (pp. 305-310). IEEE.

Jayanti, W. E., Meilinda, E., & Desi, D. (2018). Perancangan Sistem Informasi Manajemen Distribusi Gas Elpiji Berbasis Web pada PT. Mita Kalbar Pontianak. *Jurnal Khatulistiwa Informatika*, *6*(2).

Kontu, R. H., Sompie, S. R., & Sinsuw, A. A. (2015). Perancangan Sistem Pembaca Surat Tanda Nomor Kendaraan Dengan Teknologi NFC. *Jurnal Teknik Elektro dan Komputer*, *4*(3), 79-85.

Mulyawan, A., & Novia, D. (2016). Aplikasi pembayaran pajak kendaraan bermotor online berbasis web (studi kasus di samsat soreang kab. bandung). *Jurnal Computech & Bisnis*, *10*(1), 30-39.

Nadya Direkove, G. S. M. (2015). Design Sprint Methods, Playbook for startups and designers," Design Sprint, p. 3

Noer, A., Hasanuddin, Z. B., & Djamaluddin, D. (2017, July). Implementation of RFID based raspberry Pi for user authentication and offline intelligent payment system. In *2017 15th International Conference on Quality in Research (QiR): International Symposium on Electrical and Computer Engineering* (pp. 251-255). IEEE.

Orin, C. E. (2018). *RANCANG BANGUN SISTEM PENGISIAN BAHAN BAKAR MINYAK MENGGUNAKAN NEAR FIELD COMMUNICATION (NFC)* (Doctoral dissertation, Universitas Andalas).

Sanusi, C. A., Kusumadewi, R., & Aziz, T. S. (2022). Pengaruh Perceived Usefulness Dan Kemudahan Penggunaan Terhadap Kepuasan Konsumen E-Toll. *Entrepreneur: Jurnal Bisnis Manajemen Dan Kewirausahaan*, *3*(1), 391-405.

Winata, L. C. D. C. (2017). *PERANCANGAN SISTEM INFORMASI PENYEWAAN ALAT BERAT PADA PT. PANCA MANDIRI LESTARI JAMBI* (Doctoral dissertation, STIKOM Dinamika Bangsa Jambi).

Welim, Y. Y., Wisjhnuadji, T. W., & Firmansyah, R. (2015). Pengembangan sistem informasi service kendaraan pada bengkel kfmp. *Simetris: Jurnal Teknik Mesin, Elektro dan Ilmu Komputer*, *6*(1), 17-26.

Yurfianto, A. F., Sumaryanto, S., & Sulartopo, S. (2020). Penerapan Teknologi E-Money Untuk Pembayaran Di SPBU Berbasis Mikrokontroler. *Elkom: Jurnal Elektronika dan Komputer*, *13*(2), 104-117.