MOBILE APPS SMART INVENTORY WITH NEAR FIELD COMMUNICATION

TUGAS AKHIR

Diajukan Sebagai Salah Satu Syarat
untuk Memperoleh Gelar Sarjana Komputer pada
Program Studi Sistem Informasi

Oleh:

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FAKULTAS SAINS DAN TEKNOLOGI
UNIVERSITAS ISLAM NEGERI SULTAN SYARIF KASIM RIAU
PEKANBARU
2023

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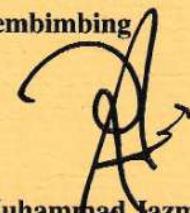
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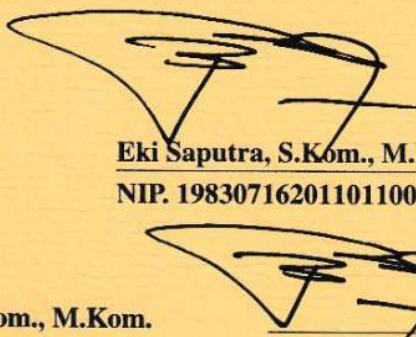
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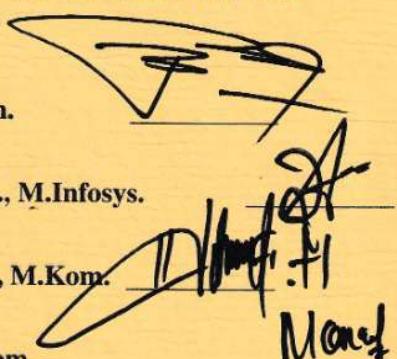
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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

Assalamu'alaikum Warahmatullahi Wabarakaatuh

Alhamdulillahi Rabbil 'Alamin, segala puji bagi Allah *Subhanahu Wa Ta'ala* sebagai bentuk rasa syukur atas segala nikmat yang telah diberikan tanpa ada kekurangan sedikitpun. Shalawat beserta salam tak lupa pula kita ucapkan kepada Nabi Muhammad *Shallallahu 'Alaihi Wa Sallam* dengan mengucapkan *Allahumma Sholli'ala Sayyidina Muhammad Wa'ala Ali Sayyidina Muhammad*. Semoga kita semua selalu senantiasa mendapat syafa'at-Nya di dunia maupun di akhirat, *Aamiin Ya Rabbal'alaamiin*. Kupersembahkan karya kecil ini sebagai salah satu hadiah istimewa bentuk bakti, rasa terimakasih, dan hormatku kepada orang tuaku tercinta, Papa dan Mama.

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Pekanbaru, 14 Juli 2023
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I R T M
International Conference
IIT, Delhi, India

2023
CONFERENCE
PROCEEDINGS

DATE: 20th - 22nd April, 2023

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IRTM 2023

We live in an inter-connected world. In the era of Industry 4.0, technology is getting embedded more and more in the way **'we learn, live, work and play'**.

This progression is accelerating at a pace never seen before. Inter disciplinary and collaborative research across disciplines within the Technology domain and Management domain, and across the Technology — Management interface is opening up exciting new possibilities for solving problems whose solutions are beyond the scope of a single discipline, domain or practice, and helping to create a brave, new world. We are living in an incredible time of change.

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The presentation of papers will be interspersed with **Keynote Talks** by eminent experts on the theme of the conference or individual domains.

Hadiul BagasTa <hadibagas11@gmail.com>

[IRTM 2023] Your paper #1570893725 ('Mobile Apps Smart Inventory with near Field Communication')

IRTM 2023 <irtm2023-chairs@edas.info>   30 Maret 2023 pukul 17.18
Kepada: Hadiul Bagasta <hadibagas11@gmail.com>, Muhammad Jazman <jazman@uin-suska.ac.id>, Muhammad Luthfi Hamzah <muhammad.luthfi@uin-suska.ac.id>, Mona Fronita <Monafronita@uin-suska.ac.id>, Eki Saputra <Eki.saputra@uin-suska.ac.id>

Dear Mr. Hadiul Bagasta:

Congratulations - your paper #1570893725 ('Mobile Apps Smart Inventory with near Field Communication') for IRTM 2023 has been **accepted** and will be presented in the session titled ___.

The reviews are below or can be found at 1570893725.

IRTM 2023 1

Comments for reviewers: write at least 100 words regarding this review

Overall, the manuscript provides a solid overview of the proposed project and effectively conveys the potential benefits of using NFC technology for product identification and tracking. However, additional information and clarification would improve the reader's understanding of the project's scope and implementation.

IRTM 2023 2

Comments for reviewers: write at least 100 words regarding this review

This is an interesting study and the authors have collected a unique dataset using cutting edge methodology. The paper is generally well written and structured

IRTM 2023 3

Comments for reviewers: write at least 100 words regarding this review

This paper has a potential to be accepted, but some important points have to be clarified or fixed before we can proceed and a positive action can be taken.

Regards,

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I R T M
International Conference
IIT, Delhi, India

Lampiran Surat :
Nomor   : Nomor 25/2021
Tanggal   : 10 September 2021

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Abstract—Inside the process of their work, logistics companies are constantly confronted with concerns about specific products, such as product identity verification, which is used in a variety of ways, including the use of barcodes, which are a simple way to convey specific information about a product. But, recent technological advancements in the field of product security have resulted in RFID, or Radio Frequency Identification, which may be used to monitor and detect product details far more easily than the current barcode system. With the advancement of new technology from the RFID system known as NFC, which stands for Near Field Communication and has a higher level of security, this project aims to develop NFC-based applications to ensure the authenticity of products and to make it easier to transfer items from warehouse to store. This system is made up of NFC modules that may be attached to any module and will be programmed using Microsoft Power Apps. NFC is an abbreviation for Near Field Communication. This is a short-range radio technology that allows communication amongst people who live in different parts of the country. This location will be used. Together with the card or tag in the shape of a sticker or a longer card, it has an antenna for communication with NFC, which allows information to be read from the card. Data will be stored on a smartphone in order to provide specific information about a product's identity. Now that the tag has been created with the identity of a certain item, it may be scanned with a smartphone to obtain the necessary information.

Keywords— Barcode, Radio Frequency Identification, RFID, Near Field Communication, NFC.

I. INTRODUCTION

Internet technology has made tremendous strides in tackling information-sharing challenges with the introduction and ubiquity of information technology. An increasing number of enterprises are implementing factory automation, Intelligent information storage management systems and workplace automation. The quick development of information technology has made it possible to assess an enterprise's market competitiveness with great power. As a result, developing a comprehensive enterprise inventory management system is essential to meet better the emerging requirements of corporate inventory management and enterprise inventory management efficiency [1]–[5]. Warehousing, bringing items out of the warehouse, taking inventory, processing cargo, storing, distributing, and other processes are examples of storage-related activities. The storage management system must reg upstream and downstream unit information logistics provide statistical reports to the appropriate storage units because storage acts as a link in the logistics of upstream and downstream unit information. Storage comprises three stages: warehousing operations management, stock management, and outbound management [6]–[10]. Historically, an inventory list that can be read by humans and adhesive labels have been used to track these devices. That used an NFC tag-based performance conditions by an Android application, a new inventory strategy was developed to simplify data collection [11]–[16].

NFC creates a communication link between devices close together (up to 10 cm) [17], [18]. NFC has several uses since it can transmit data between devices or between a device and an NFC tag. Despite minor variations, these tags are uniform, and the data is stored in the NDEF format (NFC Data Exchange Format). Data can be stored in increments ranging from 48 bytes (Ultralight) to 888 bytes (depending on the tag type) (NTAG216). The commonly used NTAG203 and its successor NTAG213 tags have a storage capacity of 144 Bytes [19]. Based on the RFID standard (ISO/EIC 14443)[20], NFC is an ISO/IEC 18092 short-range wireless connection standard [21], [22]. The atomic pieces that link the physical and digital worlds have been identified as NFC, Wireless Sensor and Actuator Networks (WSAN), and RFID. In the year 2015, "five percent of the 600-650 million near-field communication (NFC) equipped phones will have been sold" [23]. NFC technology combines a smartcard and a smartcard reader into a single device, usually a mobile phone. The NFC device is embedded in a mobile device like a phone. NFC tag with no battery that relies exclusively on the electromagnetic field created by the smartphone NFC link [9],[10].

The system being proposed is based on NFC technology, RFID's replacement. Because of the nearby digital communication and some authentication encryption

algorithms that will be utilized to avoid 3rd hacking or reprogramming, this technology is more secure than its predecessor. It is, however, still in its early stages [26]–[29]. Nokia, Sony, and Philips collaborated in 2004 to create a near-field communication technology standard [30], [31]. NFC is based on principles and the inductive coupling interaction between magnetic and electrical fields. Nokia manufactured the first NFC-enabled mobile phone in 2006. However, after Samsung unveiled the Nexus S smartphone in 2010, business interest in NFC-enabled mobile phones exploded and significantly increased market acceptability[32], [33].

NFC devices come in passive and active varieties[34]. Passive devices that don't produce their own RF field are powered by active devices' RF field. Similar to RFID tags, passive devices, usually referred to as tags, feature an antenna and memory that can be read-only, rewritable, or writable just once[35]–[38]. For example, cell phones with NFC capabilities can switch between active and passive modes. In active communication, both devices generate their own RF field to transfer data, whereas in passive communication, only the initiator develops the RF field to transmit data. NFC is an RFID-based communication technology that has lately been widely deployed in smartphones and other mobile devices[39]. A reader-like smartphone responder-like passive NFC tag is typically included in a comprehensive NFC system. Any NFC-enabled device, such as a smartphone, can wirelessly activate the NFC tag with an alternating magnetic field and transfer data with the tag via signal modulation using inductive coupling[40], [41].

The Type 4 Tag Platform must include the NDEF Tag Application. The NDEF Tag Application saves NDEF messages on a Type 4 Tag Platform, which has a file system that supports at least two EF files and the NDEF file. In EF files, the byte with the lowest offset value is the Most Significant Byte (MSB), while the byte with the highest offset value is the Least Significant Byte (LSB)[42]. A legacy platform supports a subset of a Technology (also known as a Technology Subset) that employs a specific subgroup of NFC Type A or NFC Type B technology, including anti-collision.

It was planned to use a tag-based supply chain. To mark objects, barcodes, QR codes, and RFID tags been tried[43]. Barcodes and QR codes aren't pursued different reason: initially, establishing human-readable tags would necessitate the use of a specialist label printer, preventing device "decentralized" tagging; and second, establishing human-readable tags might necessitate the use of a specialist brand machine, preventing device "decentralized", Similarly, when those tags have been established, the information they keep is constant, which was a significant disadvantage because the new supply chain must be able to activate locally, which meant that accessing or modifying product data by a gadget within immediate control required for being able even without a database connection. In this scenario, NFC tags were the only option. Like a result, the NFC tags blazed a profitable trail because many gadgets already support NFC. As a result, living thing stock labels could be covered with NFC tags, allowing inventory information to be received and updated by verifying the tag by an NFC-enabled mobile phone. Using a smartphone as a sensor reader would result in significant cost savings and ease of market entry.

II. RESEARCH METODOLOGY

This research was carried out by applying the stages in accordance with Figure 1, which started from the design stage then carried out the stage of collecting tools and materials, then carried out the manufacturing and assembling stages of the tools, then the tool testing stage, after that there was a design if not carried out the stage modification, if yes, the next stage of observation and analysis of the tool is carried out.
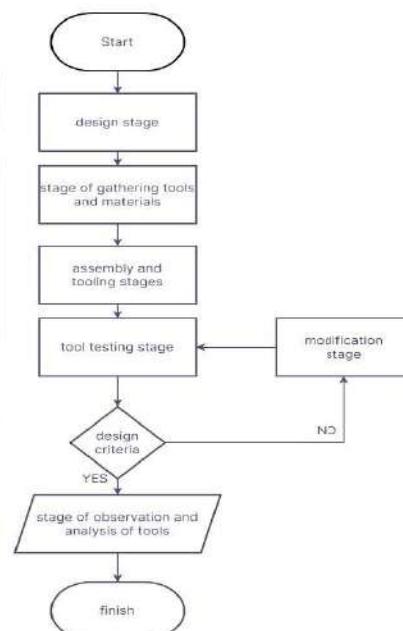
A. Inventory Management

Inventory management is a task that monitors and maintains ideal stock composition to improve productivity, efficiency, and effectiveness in business operations. A good inventory management system is essential for any business when carrying out its operations. Inventory management is the process of managing the procurement or inventory of products owned by an office or company to carry out its operational activities; a business activity cannot be carried out without inventory [44].

B. Microsoft PowerApps

PowerApps is a platform-agnostic service for developing applications. This application performs best on a smartphone or tablet. PowerApps is a business tool. PowerApps can be built entirely in a browser, optimized for mobile use, and can connect to a large amount of data. After creating an app in PowerApps Studio, you can provide user access. PowerApps' 'runtime' application is used to launch applications on mobile devices. This runtime application is known as 'players' and is available for Android, iOS, and Windows Mobile devices. In addition, PowerApps allows you to connect to a database[45], [46].

C. Near Field Communication

Near Field Communication (NFC) combines near-field identification and interconnection technology, allowing for near-field communication between mobile phones, consumer electronics, PCs, and smart objects. NFC is a sterile solution for storing data in an ever-expanding and interconnected world, allowing faster and easier communication. NFC was created by Charles Walton, who first used RFID in 1983 and then improved the technology so that it grew to become NFC. NFC communication, a 13.56 MHz signal that allows a bandwidth smaller than 424 Kbit/s is used[47], [48].

D. NFC TAG

NFC tags serve as ultra-portable devices and compact reading systems to measure an object quantitatively. The tag comes with a mobile phone installed a newly developed program based on Near Field Communication (NFC), which is no stranger to Identification such as Radio Frequency (RFID). Tags that are directed can activate NFC tags (without battery). NFC tags, in general, do not have a daily source. In addition, they receive compensation from Radio Signal Frequency (RF) readers. A limited amount of information can be stored in an NFC-enabled memory. Memory capacity varies depending on the IC chip[49], [50].

E. NFC Data Exchange Format (NDEF)

The NFC Forum has produced a Signature Record Type definition to avoid confusion. The NFC Data Exchange Format now includes a digital signature. As a result, recipients of NDEF communications might develop trust in the data they receive. The NFC Data Exchange Format is used to organize the data in tags (NDEF). A standard format called NDEF is used to store structured data on NFC tags and transmit data across peer-to-peer networks between two NFC devices. The NFC Data Exchange Format establishes a standard format and guidelines for sharing data structures using NFC. NDEF records contain application-specific data structures as well as type information. An NDEF message is made up of many documents. Shows the layout of an NDEF record type A and an NDEF message type B[51].

F. SMARTPHONE

A smartphone is an essential tool for meeting various consumer needs and expectations [52]. Smartphone applications can be beneficial and enjoyable for users, resulting in user satisfaction. Smartphones are now equipped with advanced features such as NFC technology (that is, Smartphones with NFC-Enabled). This has effectively transformed smartphones into a part of people's daily lives. Because of NFC, new items are being added to the existing zones. Smartphones with NFC capability are commonly used for various purposes, one of which is inventory management. However, not every smartphone supports NFC in the vicinity. In NFC, smartphones are used as NFC readers and to enter NFC tags.

III. RESULT AND ANALYSIS

A. Planning Interface

1. Login Page Display

The login page is where the user enters the username and password to enter the system because the login page is the entrance to a system.
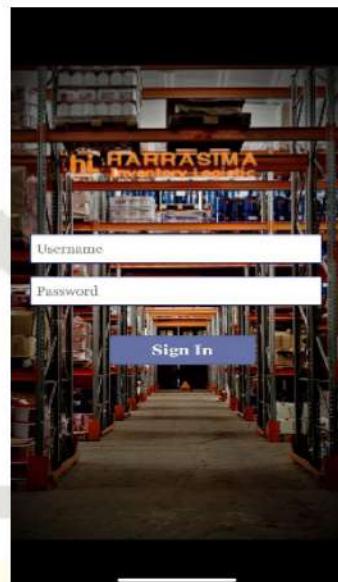
Fig.1 Login Page Display

The Login page is the first to appear when the system is operating and is also the admin's Login page. You must submit a username and password in order to log in before you can access the admin system's main page.

2. Main Page

This page contains the main menu for the inventory tracking application.

Fig.2 Main Page

Based on the image above, it is clear that the system's home screen has a number of menu links, including Read NFC, View Stock, and View Stock Progress. System visitors are welcomed on the primary page.

3. NFC Tag Reading Form Display

The image below shows the form that the user will fill in in the form of computer specification data in the laboratory that will be included in the NFC tag.
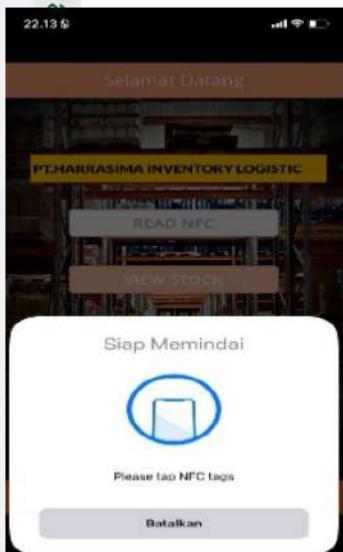
Fig.3 NFC tag reading form display

The NFC Read screen serves as a display for object detection. This screen displays data from a product that already has an NFC tag attached to it.

4. Display Login Page on Website

The login page is a page where the user enters a username and password so they can enter the system because the login page is the entrance to a system.
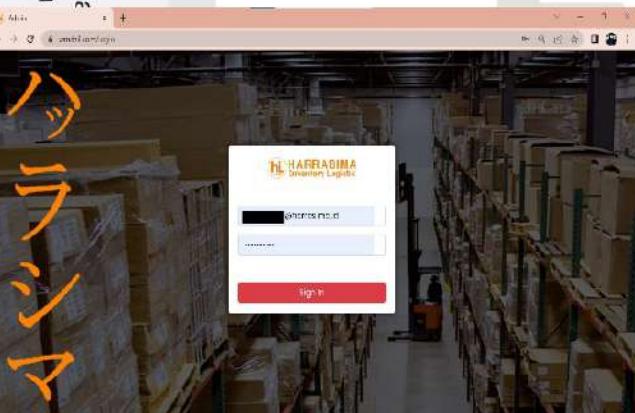
Fig.4 Display Login page on website

5. Display Login Page Display Home on Website

The home page is the main page of the Inventory Tracking System which contains a description and also contains the Inventory menu, reports and logout.
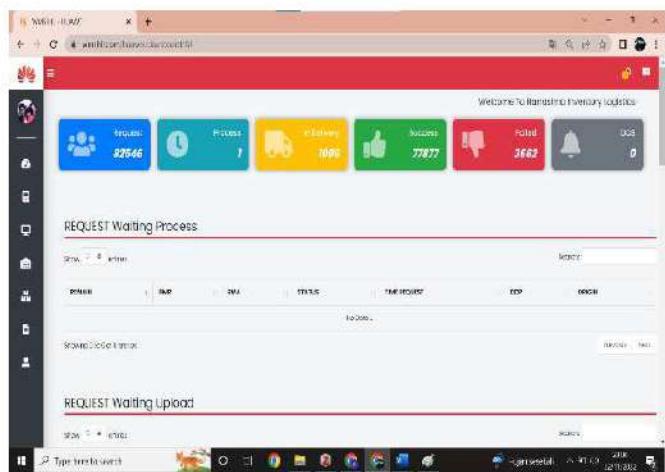
Fig.5 Display login page display home on website

6. Display Report Page on Website

After all module data is written into such NFC tag and stored into the dbms, the data was taken and displayed to the user.

Fig.6 Display report page on website

B. *Making an Inventory Application using PowerApps*

1. Coding NFC

NFC Coding to activate the NFC reader on a smartphone which is automatically activated immediately.

Fig.7 Coding NFC

This is an illustration of nfc coding used in Microsoft Power Apps to produce nfc values.

2. Result Coding NFC

NFC coding results on PowerApps to activate the NFC reader and automatically activate
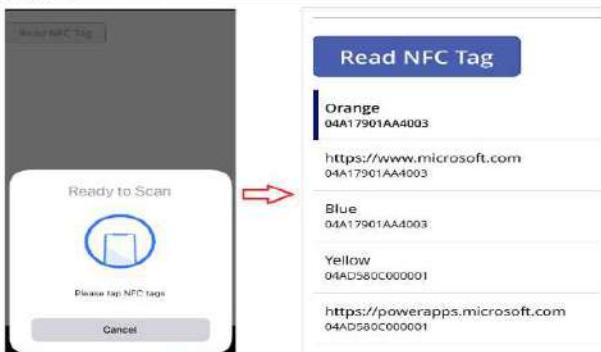
Fig.8 Result Coding NFC

As seen in the image above, information is displayed after nfc has been set up to receive from nfc tags.

C. System Testing

The Black box method is used for inventory system testing. Black box testing involves determining whether the system under development agrees with the functional specifications.

Table 1. System Planning

No	Test Scenario	Expected results	Conclusion
1.	open the smartphone application	application view	successful
2.	Menu Sign In	home page	successful
3.	read tags	home page	successful
4.	open system menu	system view	successful
5.	enter the admin page	admin page	successful
6.	enter the user page	user page	successful

IV. CONCLUTION

NFC is a solid foundation for the answer for logistics businesses. because it can facilitate and speed up performance when looking for or finding goods and calculating the amount of an item. because all you need for the NFC work procedure is an NFC tag and an NFC reader. This makes the use of NFC as a developing technology by logistics or inventory-based businesses highly suggested.

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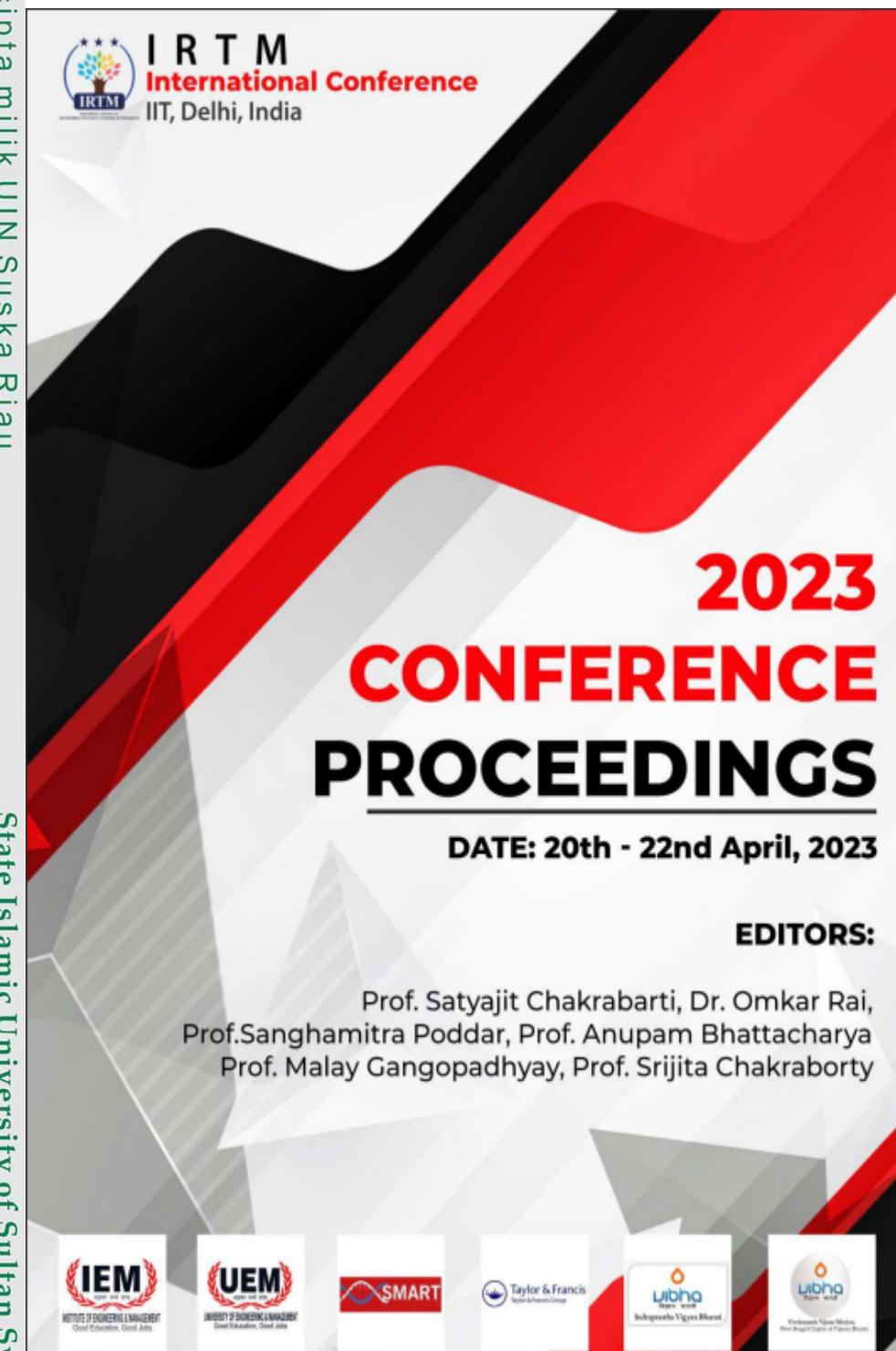
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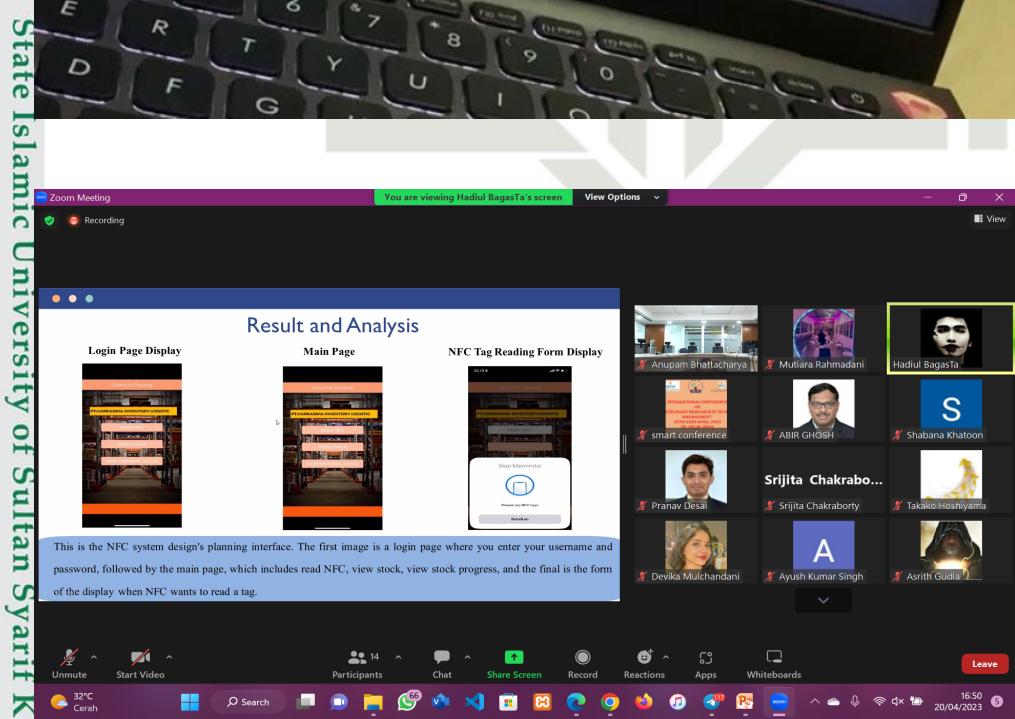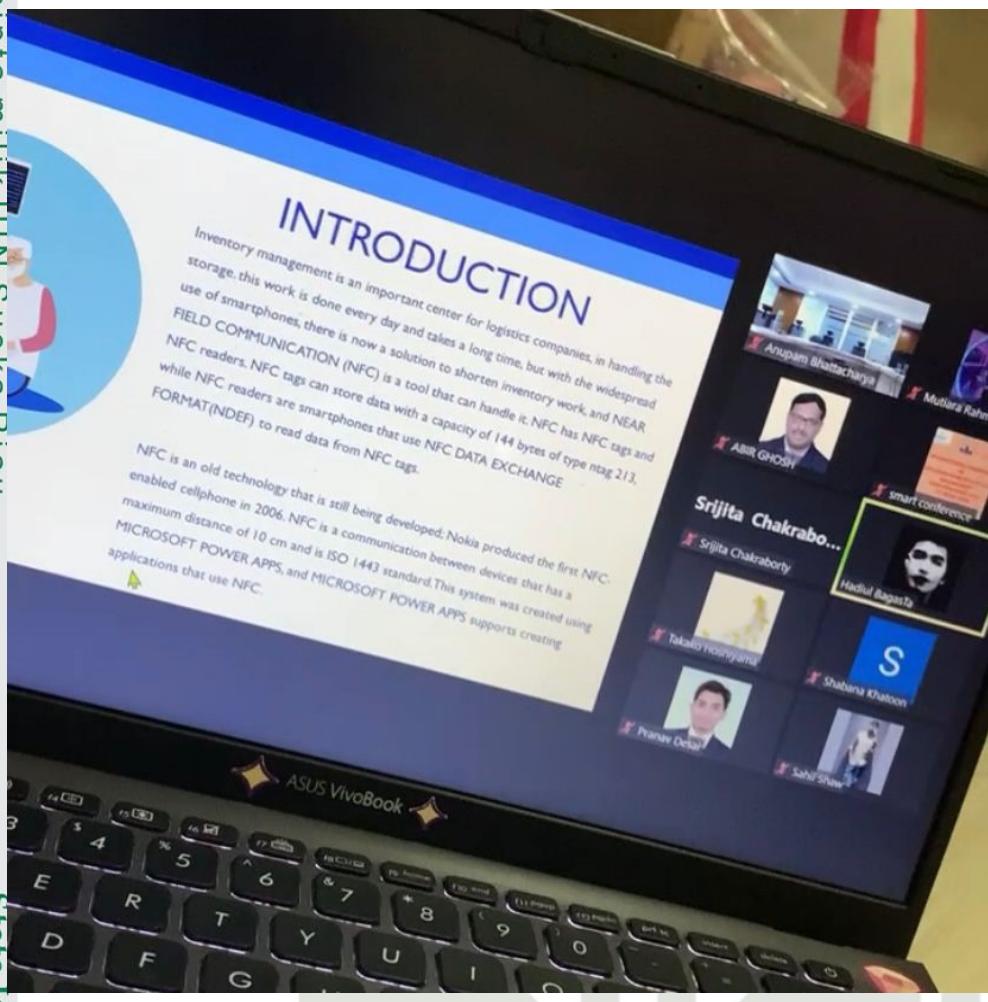
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Address	Mr. Hadiul Bagasta Gg. Kartama, Perumahan Provinsi, No. 56 Pekanbaru 28215 Indonesia

DAFTAR RIWAYAT HIDUP

Peneliti bernama Hadiul Bagasta yang lahir di Duri, tanggal 14 September 2001. Peneliti merupakan anak dari Bapak Tarmizi dan Ibu Enita Roza. Peneliti merupakan anak ketiga dari tiga bersaudara, yang mana Harlan Olief Taritra adalah abang dan Vaneela Quinzy adalah adik peneliti. Pada tahun 2006 peneliti memulai pendidikan dengan masuk TK islam di Kota Duri dan lulus pada tahun 2007. Lalu melanjutkan pendidikan Sekolah Dasar di SD Negeri 005 Mandau yang ada di Kota Duri, Kab. Bengkalis. Peneliti menyelesaikan pendidikan Sekolah Dasar pada tahun 2013. Setelah itu peneliti melanjutkan pendidikan di SMP Negeri 2 Mandau, Duri. Kemudian, setelah menyelesaikan pendidikan di SMP Negeri 2 Mandau, pada tahun 2016 peneliti melanjutkan pendidikan di SMA Negeri 1 Mandau dengan mengambil jurusan IPA. Dan menyelesaikan pendidikan di SMA Negeri 1 Mandau pada tahun 2019. Setelah itu peneliti pun melanjutkan pendidikan dengan mendaftar ke beberapa Universitas yang ada di Indonesia. Dan *alhamdulillah* pada tahun 2019 peneliti diterima menjadi mahasiswa di Program Studi Sistem Informasi Fakultas Sains dan Teknologi Universitas Islam Negeri Sultan Syarif Kasim Riau melalui jalur SBMPTN. Peneliti pernah menjadi Ketua Kemah Bakti Mahasiswa Sistem Informasi (KBM-SI) 2020. Peneliti juga tergabung dalam Himpunan Mahasiswa Sistem Informasi (HIMASI) periode 2021/2022 sebagai Kepala Divisi Pendidikan dan Kebudayaan. Akhir kata peneliti mengucapkan rasa syukur yang tak terhingga serta ribuan terimakasih atas bantuan dari seluruh pihak yang terkait sehingga selesainya Tugas Akhir yang berjudul *"Mobile Apps Smart Inventory With Near Field Communication"* yang *alhamdulillah* Tugas Akhir peneliti ini diterima dan akan terbit pada *International Conference on Interdisciplinary Research in Technology and Management (IRTM) 2023 by Taylor and Francis indexing SCOPUS*.