

Design and Implementation of Secure Polije (Politeknik Negeri Jember) Fintech Payment System for DiKantin

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Abstract. Based on several studies, it has been found that people have now adapted to new payment models, namely using technology (fintech). Buying products and services online has become a new trend, so fintech itself is not new in Indonesia. The development of fintech in Indonesia itself tends to continue to show positive improvements. This is the basis for this research, which aims to develop a Secure Polije Fintech Payment System. It was provided in the form of student and employee cards. The development was conducted in several steps including literature review, development, implementation, and testing. The test results show 100% for the Black Box Test and 98% for UAT. Based on the test results, it is hoped that the application of the system developed by the research will be able to realize easy, integrated transactions at the Politeknik Negeri Jember.

Keywords: secure Polije fintech payment system, IoT

1. Introduction

The purchase of products and services online has become a rapidly growing trend, and this is reflected in fintech statistics. In 2019, the data collected in this research indicates that the number of transactions using fintech reached an astonishing figure of 3.5 trillion US dollars. However, the development of this phenomenon did not stop there. In just two years, in 2021, the number of transactions using fintech increased significantly to reach 4.9 trillion US dollars. This phenomenon reflects the rapid growth in the adoption of financial technology and its use in online payments for products and services. Within the framework of this research, it was found that purchasing products and services online has become a dominant trend in consumer behavior. As was conducted in 2015 [2], explored important aspects of digital payment in the world by adopting a biometric approach. This study demonstrated that biometric technology can play a crucial role in securing transactions and identifying fintech users more safely and reliably. Furthermore, conducted in 2009 [3], focused on the development of protocols for fintech. This research marked an important milestone in understanding how fintech develops the underlying infrastructure of its operations. The protocols developed in this research form the basis for modern fintech systems, enabling fast, secure, and efficient transactions. The results of the research [3] also highlight the importance of technical research and infrastructure development to support fintech growth.

Fintech has gained a strong foothold in the Indonesian financial ecosystem and is not unfamiliar to the public. Several fintech platforms, such as OVO and GoPay, have become familiar names for users in Indonesia. [4]. Fintech initiatives and platforms have provided innovative solutions for various financial needs of the public, ranging from bill payments to investments. This reflects the rapid adaptation of the public to more modern and efficient financial technology [9][10][11][12]. The primary goal of this research is to create a secure and reliable fintech payment system, based on a robust framework that encompasses a number of relevant related research [2], [3], [5], [6], [7], integrated with various business sectors existing at Politeknik Negeri Jember. This research is not only focused on technology development but also its implementation in various aspects of daily life, especially in the context of education and the academic environment at Politeknik Negeri Jember. This approach reflects a commitment to using open and sustainable technological solutions in developing the Secure Polije Fintech Payment System.

DiKantin is a system created by implementing the digitization of financial services (Fintech), enabling the DiKantin system to carry out transactions virtually through a fintech payment gateway without the need to visit an ATM or bank first. DiKantin is developed through two platforms is it mobile and website, which interact seamlessly using modern, secure, and reliable Fintech solutions.

Therefore, this research not only responds to the public's need for better payment solutions but also serves as a contribution to the positive development of fintech in Indonesia. This opens up significant opportunities to change how the public and businesses interact with financial technology, and it is expected to have a significant positive impact on the Indonesian financial ecosystem.

The User Acceptance Testing (UAT) using the black-box testing method aims to evaluate the system's performance from the perspective of its functionality. This involves ensuring that the system operates according to the predefined functions and that the outcomes produced align with the predetermined expectations [13]. The UAT implementation occurs in the final testing stage when the system is ready for use. The primary focus is on delivering software that can meet user needs. The goal is not only to fulfill system specifications and usability but also to validate whether the system can be accepted or not according to the desired standards [14]. So, the results of the UAT on the DiKantin system are utilized to understand the end-user requirements [15] for the DiKantin system.

The results of this research are expected to make a significant contribution to the development of financial technology and policies at Politeknik Negeri Jember and can serve as a guide for fintech development in the educational context. Additionally, integration with various business sectors can create significant added value for the environment at Politeknik Negeri Jember and the people interacting with the institution.

2. Research Method

2.1. Research Procedure

The research procedure used in this study is visually explained in Figure 1. These stages were carefully chosen and based on a rigorous methodology to ensure that the system developed by

the research meets the requirements and follows state-of-the-art trends in the financial technology world.

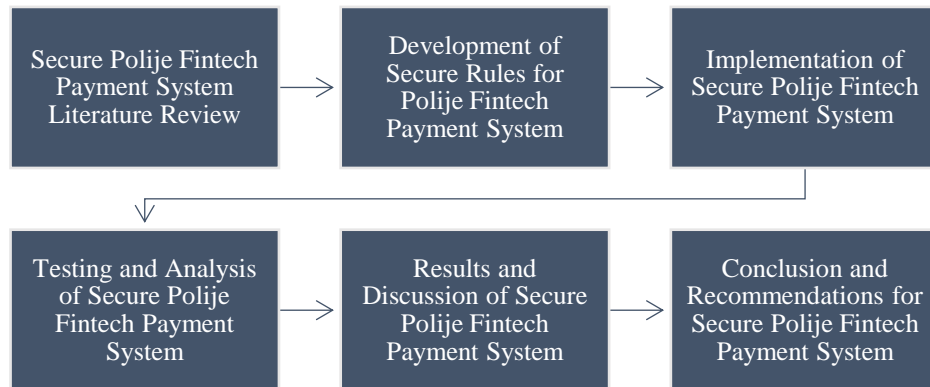


Fig. 1 Research Procedure

2.1.1. Secure Polije Fintech Payment System Literature Review

A literature review, based on Figure 1, was conducted to gather information from various references related to the issues to be discussed. Theories related to the issues under investigation were utilized as the foundation for data processing. In this stage, the state of the art was obtained. The literature review conducted indicated existing needs that had not been met, and references from this research were presented to address those gaps.

2.1.2. Development of Secure Rules for Polije Fintech Payment System

The development of secure rules is a crucial stage in this research because, in this study, rules serve as a reference in determining each part of the process. In this research, rules were also utilized to ensure that security was well-guaranteed in every transaction.

2.1.3. Implementation of Secure Polije Fintech Payment System

The obtained rules were then implemented into the Secure Polije Fintech Payment System using the Rule-Based System approach. The use of the Rule-Based System method aimed to generate more accurate readings.

2.1.4. Testing and Analysis of Secure Polije Fintech Payment System

The testing phase was one of the crucial processes in this research, aiming to ensure that every feature of the Secure Polije Fintech Payment System operates effectively so that the outputs produced align with the specified requirements. During this stage, an analysis was also conducted on each result from the series of tests. The outcomes of this analysis phase were used as material for the results and discussion section.

2.1.5. Results and Discussion of Secure Polije Fintech Payment System

The results of the data processing, in the form of the accuracy of the tool, were then compared with manual calculations to test accuracy as a ground truth. The results obtained in this stage were discussed regarding the factors influencing the accuracy values obtained.

2.1.6. Conclusion and Recommendations for Secure Polije Fintech Payment System

In this stage, the final phase of the research, conclusions were drawn from the results of the analysis and discussion, and recommendations were provided for further research. In this section, a review was also conducted on the implementation of related technology/research. This was done to ensure that the research makes a clear contribution or novelty to the research field.

2.2. Research Design

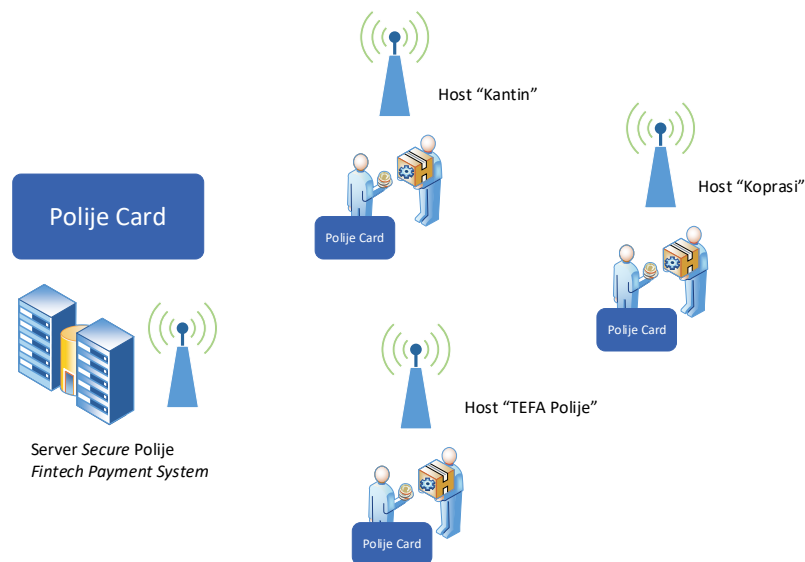


Fig. 2 Design of the Secure Polije Fintech Payment System Implementation

The design of this research is illustrated in Figure 2. The initial phase of Secure Polije Fintech Payment System's planning was to be implemented in the form of an RF-ID-based card payment system. This approach aimed to leverage technology that has proven effective in authentication and payments. Furthermore, the plan to integrate these cards in the form of student and staff cards was a strategic step with the potential to provide significant benefits to the entire Politeknik Negeri Jember community. Students and staff could access and use this system easily, creating efficiency in their day-to-day transactions, ranging from cafeteria payments to campus facility access. Implementing the system developed in this research is expected to bring about ease in integrated transactions at Politeknik Negeri Jember.

3. Result and Discussion

3.1. Interface Design

Based on the illustrated description of the creation of the Secure Polije Fintech Payment System, the implementation of the system can be observed in the interface display of the website and mobile application.

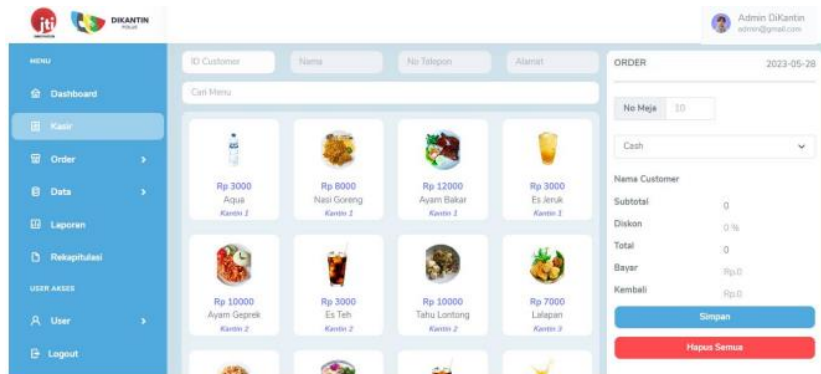


Fig 3. Display Kasir in the Website System

On the website system, as shown in Figure 3, the Cashier menu feature is provided. In this cashier's menu, food items are displayed, allowing the cashier to process transactions based on orders.

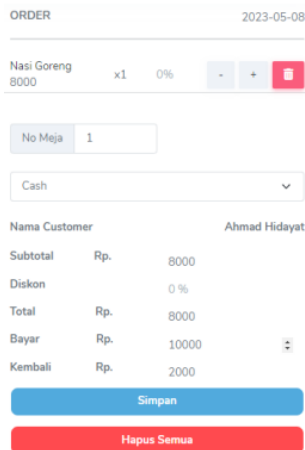


Fig 4. Nominal Transaction

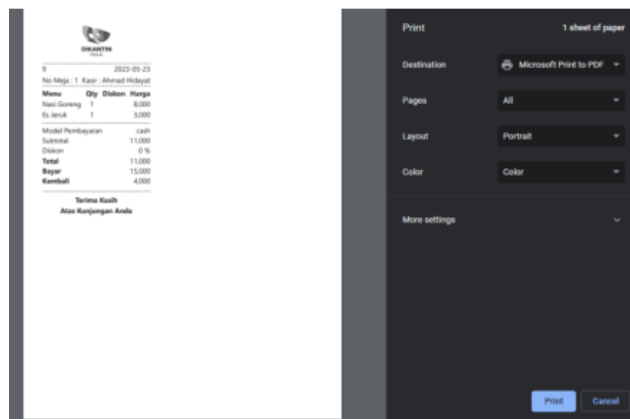


Fig 5. PrintTransaction

The system can calculate transactions, as illustrated in Figure 4, and print a transaction receipt, as shown in Figure 5.

No	Tanggal	Nama Menu	No Meja	Jumlah	Harga	Diskon (%)	Status
1	2023-05-26	Nasi Goreng	7	1	Rp 8,000		proses
2	2023-05-26	Ayam Geprek	7	2	Rp 10,000		proses
3	2023-05-26	Es Teh	7	1	Rp 3,000		proses
4	2023-05-25	Aqua	1	1	Rp 3,000		proses
5	2023-05-25	Es Jeruk	1	1	Rp 3,000		proses

Fig 6. Waitlist for Orders

In Figure 6, there is transaction data entered previously in the Cashier menu, which will then be accommodated in the Waitlist submenu. The Waitlist contains data that has not been completed in serving by the cafeteria.

No	Tanggal	Nama Menu	No Meja	Jumlah	Harga	Diskon (%)	Status
1	2023-05-26	Aqua	7	2	Rp 3,000		selesai
2	2023-05-26	Lalapan	7	1	Rp 7,000		selesai
3	2023-05-25	Aqua	1	5	Rp 3,000		selesai
4	2023-05-25	Tahu Lontong	1	4	Rp 10,000		selesai
5	2023-05-25	Nutrisari	1	4	Rp 4,000		selesai

Fig 7. Completed Status

The transaction data that was previously in the Waitlist submenu will move to the Success submenu if its status becomes completed by the cafeteria, as illustrated in Figure 7.

No	Tgl Penjualan	Pembeli	Kasir	Kantin	Menu	Jumlah	Harga	Diskon	Status
1	2023-05-26	umum	Admin DiKantin	kantin 1	Nasi Goreng	1	Rp 8,000		proses
2	2023-05-25	umum	Admin DiKantin	kantin 1	Aqua	1	Rp 3,000		proses
3	2023-05-25	umum	Admin DiKantin	kantin 1	Es Jeruk	1	Rp 3,000		proses

Total Pendapatan : Rp 14,000

Fig 8. Report Menu

In Figure 8, the cafeteria can view income reports in the Report Menu. The displayed report is per cafeteria based on the selected date range.

Dari Tanggal	Sampai Tanggal	Proses
24/05/2023	28/05/2023	
Show 10 entries Search:		
Kantin	Jumlah	
kantin 1	Rp 21,000	
kantin 2	Rp 40,000	
kantin 3	Rp 7,000	
kantin 4	Rp 16,000	
Total Pendapatan :	Rp 84,000	

Showing 1 to 4 of 4 entries Previous 1 Next Cetak Rekapitulasi

Fig 9. Recapitulation Menu

There is a Recapitulation Menu that will display the Income Report for All Cafeterias based on the selected date range (See Figure 9).

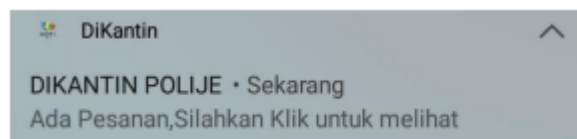


Fig 10. Notification in Mobile Application

Then, in the mobile application in Figure 10 each cafeteria will receive notification for incoming orders to manage the orders received by each cafeteria.



Fig 11. Order Detail

NO	Tanggal	Petugas	Menu	Jumlah
1	2023-05-11	Kasir 1	Es Jeruk	3
2	2023-05-11	Kasir 1	Es Jeruk	1
3	2023-05-11	Kasir 1	Ayam Bakar	1
4	2023-05-11	Kasir 1	Nasi Goreng	1
5	2023-05-11	Kasir 1	Aqua	1
6	2023-05-11	Kasir 1	Ayam Bakar	1
7	2023-05-11	Kasir 1	Ayam Bakar	1
8	2023-05-11	Kasir 1	Nasi Goreng	1
9	2023-05-11	Kasir 1	Ayam Bakar	1
10	2023-05-11	Kasir 1	Es Jeruk	1

Fig 12. Transaction History

In Figure 11, in the mobile application, orders that have been placed and processed can then be arranged for delivery. If the order has been delivered to the customer, a confirmation message will appear. Once delivered, the transaction for that order will be included in the History menu, as indicated in Figure 12.

3.1. Testing

During the Testing and Verification phase, black box testing and user acceptance testing methods are extensively utilized to examine the functionality of an application or system and to ensure the system's acceptance aligns with user needs. By conducting these tests, it can be determined whether the application's responses adhere to the defined scenarios or if there are any unexpected responses. The testing is carried out by the researcher and 12 other users following similar procedures. Based on the test results, it can be concluded that both applications operate effectively in accordance with the planned specifications and user requirements.

Table 1. User Acceptance Test Results

No	Description	SS	S	N	TS	STS	Total
1	Is the display of the DiKantin system appealing?	50	4	0	0	0	54
2	Do the menu icon functions on the system page operate smoothly?	55	0	0	0	0	55
3	Are the menus on the DiKantin system easily understandable?	50	4	0	0	0	54
4	Does the system facilitate the process of ordering transactions in the canteen of Politeknik Negeri Jember?	50	4	0	0	0	54
5	Does the DiKantin website provide sufficient information regarding menu details and transactions?	50	4	0	0	0	54
6	Is the DiKantin information system functioning according to requirements?	50	4	0	0	0	54
7	Is the system effectively managing data and information?	50	4	0	0	0	54
8	In your opinion, is the system deemed suitable for implementation?	50	4	0	0	0	54
Explanation of Results:							
SS: Strongly Agree, 5 points							
S: Agree, 4 points							
N: Neutral, 3 points							
TS: Disagree, 2 points							
STS: Strongly Disagree, 1 point							

From the table above, it can be observed that the total value from 11 respondents for the question is:

Q1: 54 points, the average value is calculated as $54/11=4.9$, the percentage value is $4.9/5=98\%$

Q2: 55 points, the average value is calculated as $55/11=5.0$, the percentage value is $5.0/5=100\%$

Q3: 54 points, the average value is calculated as $54/11=4.9$, the percentage value is $4.9/5=98\%$

Q4: 54 points, the average value is calculated as $54/11=4.9$, the percentage value is $4.9/5=98\%$

Q5: 54 points, the average value is calculated as $54/11=4.9$, the percentage value is $4.9/5=98\%$
Q6: 54 points, the average value is calculated as $54/11=4.9$, the percentage value is $4.9/5=98\%$
Q7: 54 points, the average value is calculated as $54/11=4.9$, the percentage value is $4.9/5=98\%$
Q8: 54 points, the average value is calculated as $54/11=4.9$, the percentage value is $4.9/5=98\%$

Based on the data collected from 11 respondents, it can be concluded that 98% of the features in the Secure Polije Fintech Payment System for DiKantin are functioning well and are acceptable to users. Based on the above test results [17], it can be concluded that the research findings indicate that the public has adapted to the new payment model, namely fintech. There has been a significant increase in the use of fintech as an online payment method, as reflected in the annual transaction data. This reflects a shift in consumer behaviour towards relying on technology for convenience and efficiency in transactions [4]. Additionally, this research also identifies factors influencing the public's adaptation to fintech, including financial literacy, security perception, and ease of use. These findings support related research results, such as research [2], which emphasize the importance of biometric factors in digital payments. Development of Open Source-Based Systems/Platforms. The open-source-based approach demonstrates a commitment to open and sustainable innovation. Using open source allows for collaboration, faster system growth and development, and a willingness to share knowledge and technology with a wider community.

The obtained rules are used in the implementation of the Secure Polije Fintech Payment System with a Rule-Based System approach. This approach aims to ensure that the system can read and process data with high accuracy. These rules are designed to guide the system in decision-making and actions based on the situation and available information.

So, the testing process for the Fintech Payment System involves thorough system testing to verify its performance and ensure that all features operate as expected [13]. During this phase, in-depth analysis is conducted on the results of the test series. These results will be crucial data sources for the results and discussion section of the research. This analysis will encompass evaluations of success rates, accuracy, reliability, and efficiency of the Secure Polije Fintech Payment System. It may also involve issue identification, necessary improvements, and recommendations for further development.

By following established rules, the system can recognize specific patterns and variables in transactions, which can aid in detecting and preventing errors or suspicious actions. The implementation of the Rule-Based System can also provide flexibility in updating and managing rules to adapt to changes in the business and technology environment. This allows the Secure Polije Fintech Payment System to remain relevant and responsive to developments in the fintech and tax world. Thus, this approach is key to creating a reliable and trustworthy system in the digital payment environment. By staying current with trends and the latest research, this research ensures that the developed system remains relevant and adaptable to the latest technological advancements.

4. Conclusion

The framework established serves as the primary foundation in the effort to develop the Secure Polije Fintech Payment System. This research confirms that society has successfully adapted to fintech in making online payments for products and services. The significant growth trends in the use of fintech as a payment tool underscore the importance of financial technology in transforming consumer habits. With a deeper understanding of the factors influencing adaptation, we can better comprehend its impact on the financial ecosystem and the development of future payment models. The system developed is ensured to not only function technically but also has the capability to support diverse needs in various business and administrative contexts within the campus environment. This approach reflects a commitment to harness sustainable and innovative open technology in the development of the Secure Polije Fintech Payment System. This research does not solely focus on technical aspects but also examines its impact on supporting economic growth and technological advancement within the academic environment.

The development of Fintech in Indonesia itself tends to show positive growth [4]. This serves as the foundation for this research, which aims to develop the Secure Polije Fintech Payment System. Therefore, future research in the Secure Polije Fintech segment should be a research priority in the coming years. In the further development of the Secure Polije Fintech Payment System, in its initial stages, it takes the form of payments using RF-ID-based cards. This step aims to utilize existing technology more efficiently, with the hope of facilitating safer and easier payments and transactions. Furthermore, the plan for future integration with student and staff cards is an exciting vision that can benefit the entire community of Politeknik Negeri Jember.

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