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Middleware Payment Gateway on the Digital Crowdfunding Platform

M. Bima Surya [1], Irwan Alnarus Kautsar [2], Yulian Findawati[3], Suhendro Busono[4]
[1,2,3]Muhammadiyah University of Sidoarjo, Indonesia
[,4] Management and Science University, Malaysia

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ABSTRACT

Objective: *This study aims to develop and implement a* ***microservices-based payment gateway middleware*** *integrated with* ***web services*** *to enhance transaction efficiency and reliability on* ***crowdfunding platforms****.* ***Background:*** *In the* ***digital era****, the demand for* ***fast, secure, and efficient transaction systems*** *has become increasingly critical, particularly in platforms handling large volumes of financial transactions. Traditional monolithic architectures often struggle to maintain scalability and flexibility, leading to potential bottlenecks and security risks.* ***Method:*** *The system was designed using a* ***microservices architecture****, allowing each payment-related process – such as authentication, transaction validation, and notification handling – to operate independently yet remain interconnected through APIs. Integration with* ***web services*** *ensures compatibility with various payment providers and crowdfunding systems.* ***Findings:*** *The implementation results demonstrate that the proposed middleware improves transaction processing speed, scalability, and fault tolerance compared to traditional models.* ***Conclusion:*** *The study concludes that adopting a microservices-based payment gateway middleware provides a sustainable solution for* ***high-volume digital transactions****, supporting the scalability, flexibility, and security required by modern* ***crowdfunding ecosystems****.*

INTRODUCTION

In the growing digital era fast, transactions fast, safe and accessible finance reliability is very important, especially in the e-commerce and fintech sectors. The system digital payments become runway online services, allowing real-time transactions with security high. However, the increasing transaction volume and complexity system challenge company in maintain performance and scalability. Solutions for overcome matter This is implement microservices architecture, which enables every service managed in a way independent, improve flexibility, scalability, and system reliability [1].

Project This focuses on the development and implementation of API- based payment gateways microservices architecture. Implementation This expected can give more solutions effective in handle need large transactions with still maintain standard high security. In addition, with use microservices approach, each component system can with easy to upgrade or customized without bother overall system, which ultimately can increase experience users and efficiency operational [2].

The marketplace platform plays role important in facilitate transaction between sellers and buyers with efficient way, without require seller for make own online store. However, one of the frequent obstacles faced is a verification process that requires an ID card and a bank account, which can become barrier for students or freelancers who have not own document the application. This designed for make it easier transaction for

students and freelancers with provide option more verification flexible, such as use card students or e-wallet for disbursement of funds [3].

Challenge main in the development of Sharia Fintech in Indonesia is low literacy Islamic finance, especially related understanding about usury. Research This using the UTAUT (Unified Theory of Acceptance and Use of Technology) model to see How knowledge about usury influence reception gate Islamic payments. Research objectives This is analyze factors such as Performance Expectancy, Effort Expectancy, Influence Social, and Conditions Facilitation that influences interest public in using Sharia Fintech, as well How understanding about usury strengthen factors the [4].

This research discusses the basic concepts relevant to the implementation of payment gateway middleware on a crowdfunding platform with web-based payment services. The discussion includes definitions of crowdfunding, payment gateways, middleware, and web services, as well as a study of related literature that supports this research [5].

In the Development of Islamic Crowdfunding in Indonesia Study This highlight the development of sharia- based crowdfunding in Indonesia and its impact towards MSMEs. The results show that the sharia crowdfunding platform can helping MSMEs to obtain access capital with more easy as well as increase welfare economy perpetrator business small [6]. Implementing crowdfunding for orphanage fundraising care. This model similar with crowdfunding system for MSMEs, which utilizes digital platforms to raise funds from society. The results show that method This can make things easier fundraising effective [7]. Design system information online payments that utilize payment gateways to make it easier online transactions. System This aim for increase safety and comfort for users in do transactions, at once provide structured transaction data with Good For make it easier management and data collection [8].

Progress technology financial (fintech) has bring up system funding alternative, namely crowdfunding, which provides opportunity new for MSME actors in access financing. One of the its shape is crowdfunding sharia- based, which implements Islamic principles and avoiding practice like usury, gharar, and maysir.

PT Shafiq Digital Indonesia is one of the platforms that implements approach this, according to with provision DSN-MUI Fatwa No. 117/DSN-MUI/II/2018. Although its growth positive, the implementation of sharia crowdfunding is still face challenge, good from aspect regulation, education, and access to capital. Therefore that, study to implementation sharia principles in system This is very important to support sustainable and appropriate development of MSMEs sharia [9].

Mulyatex Lurik, an MSME that operates in production cloth striped since in 1959, facing challenge in efficiency transaction Because Still use method manual recording, although already market the product by online.

For increase effectiveness digital services and transactions, research This develop system payment based Midtrans. With apply method development device Extreme Programming (XP) software, system This designed to be able to speed up the transaction

process, reduce error recording, and providing experience more payments practical for customer [10].

In today's digital era this, the transaction process Already should become more practical and safe. However, many system boarding payment still pending done manually, which is vulnerable to error administration and delays verification. Tenants often experience difficulty Because method limited and non- refundable payments integrated.

For answer challenge this, develop it system web -based boarding house payments that use service Midtrans as a payment gateway. Midtrans allows various method digital payments with level high security system This help boarding house owner monitors transaction in a way direct and easy tenant in finish payment. With utilizing the Laravel framework, the system This No only speed up the payment process, but also simplify recording and reporting finance in a way automatic and efficient [11].

Crowdfunding has become a popular method of raising funds online, but it still faces challenges such as a lack of transparency in fund flows and the potential for fraud. Blockchain technology offers a solution by offering a transparent and secure transaction system through a smart contract mechanism. With this technology, crowdfunding platforms are expected to instill greater user trust and streamline transaction processes efficiently [12].

Development technology in the current digital era This give influence big to various sector life, including in field economy. One of the the impact is emergence innovation known digital finance as financial technology (fintech**)**. Among the various fintech services, payment gateways are one of the most widely used. used Because give convenience in do transaction in a way fast and safe.

On the other hand, Micro, Small and Medium Enterprises (MSMEs) are bone back Indonesian economy. The role of MSMEs is very vital in open field work and support development area. However, in order to be able to compete in the middle rapid digital transformation, MSMEs need adopt technology finance such as payment gateways [13]. Increasing amount internet users in Indonesia also push adoption digital transactions by the public and actors business. One of the growing innovation is system fintech- based digital payments, such as OVO. Services This offer convenience and speed in transactions, even for business small.

MSMEs as an important pillar Indonesian economy is demanded for follow development technology, including in system payment. The use of OVO among MSMEs is increasing widespread and suspected bring impact to performance finance they [14]. Rapidly the development of e-commerce has increase need will system trusted digital payments, such as payment gateways. In Indonesia it self, the e-commerce sector shows significant growth, with an average increase reach 30% every the year.

Selecting the optimal payment gateway becomes matter crucial Because concerning various aspect like cost service, level security, convenience integration system, as well as satisfaction users. For face complexity in the election process said,

research This apply Analytical Hierarchy Process (AHP) method as tool help in analyze and determine alternative best based on a number of criteria that have been set [15].

RESEARCH METHOD

Study This apply CES Framework methodology, a methods used For measure level convenience or difficulties experienced customer in finish task or interact with company. Objectives the implementation of the CES Framework is For identify points where customers experience difficulties, so that company can reduce obstacles and improve experience customer

The CES Framework often implemented in E-Commerce, where at the moment customer checkout in online stores, systems can ask how much easy or difficult purchasing process said. If many customer feel that the process difficult, company can review repeat interface or confusing steps.

At the Requirement stage , research This implement development of a payment gateway for a digital crowdfunding platform, with a number of stage that refers to the transaction through Midtrans and various method payments, such as bank transfers, QRIS, or E-wallets. In implementing the CES Framework, there are three element The main elements defined are cause, effect, and solution. The output of the CES Framework is a canvas containing document One page with three box called the CES Box. CES Framework works as step beginning in development device soft, started from analysis, implementation, to testing.

Table 1. CES Framework 1

Cause	Effect	Solution
Payment methods his follow vendor	Vendor payment methods are usually easy integrated with a website or application business, so that speed up the admission process payment.	Implement interface programming Applications (apis) that can interact with various payment vendors so that make things easier development and maintenance.
Search Customer Funding Done Manually With Jump into the Field	Search Process Slow Customer so that eat time and cost	Digitalization of the Search Process Customer with the platform
Access Limitations by users	Limitations To supervision hinder growth	Provide access Easy to Crowdfunding Project

In context methods, functional and non- functional refers to two categories main in analysis and design system. Both own role important in ensure that system operate with good and fulfilling need business as well as technical. Category functional and non-

functional used for analyze necessary features There is in manufacturing application, so that can implemented in development digital products. Functional describe mandatory features There is in application, while non- functional covers features that are not must but recommended for increase mark sell product.

Table 2. Functional Features Non – Functional 1

Functional	**Non-functional**
Balance Display	Opening Account
Top Up	
Transfer	
Marketplace	
Virtual Account	

Use Case Diagram is one of the from various a type of UML diagram that depicts interaction between system with actor. This diagram also works for explain type interaction between users system with system That itself. The use case diagram has been displayed that There is four actor users application. namely user, merchant, kpg - server, and bank

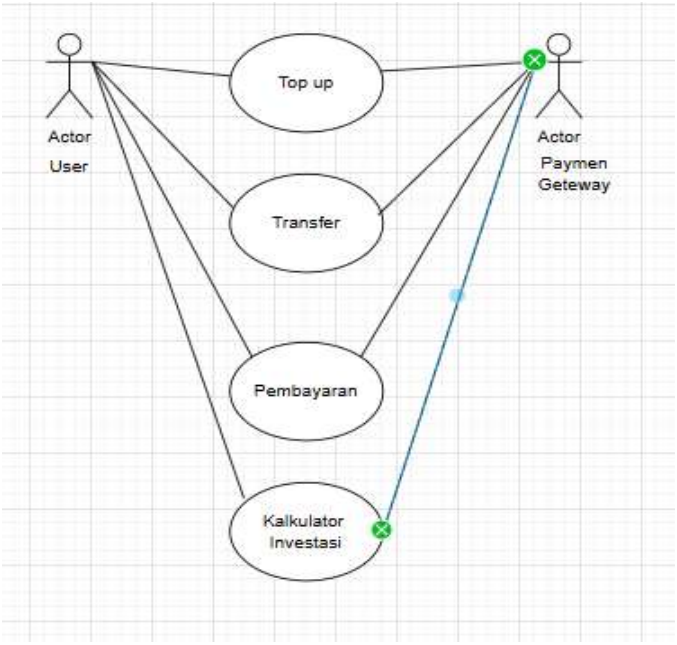


Figure 3. Use Case Diagram

In the use case diagram, it has been explained various things that can done by users, merchant, kpg - server,and bank inside system. user has a number of right access, such as choose product choice to basket shopping, continuing to stage method payment, up to finish payment.

A sequence diagram is one of the types of interaction diagrams in modeling a system that describes How objects each other interact in scenario certain along walking time. Below This is a Sequence Diagram for each user.

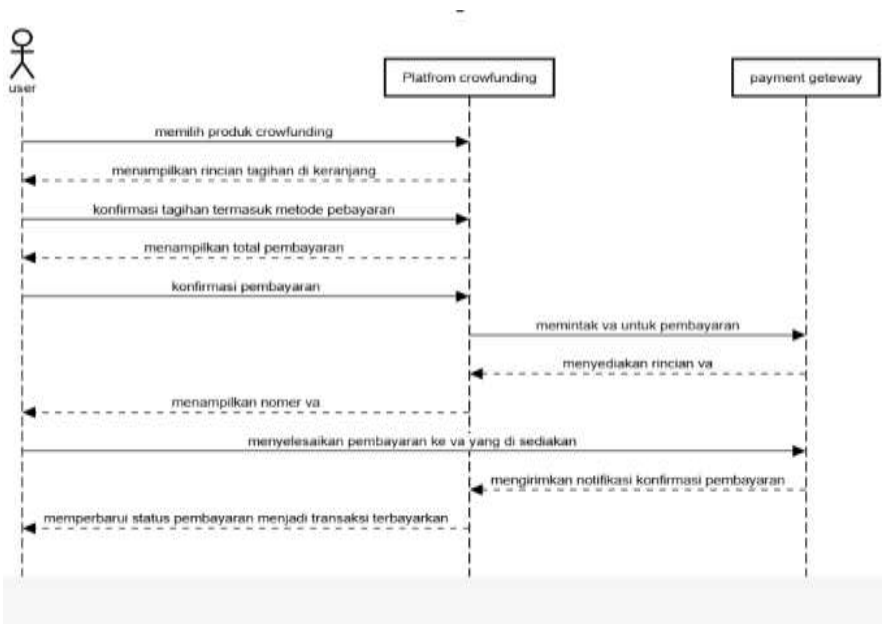


Figure 4. Sequence Diagram of the Marketplace Module Payment Flow

Figure 4. shows a sequence diagram of the user performing election items at merchant.user will see shopping as well as confirm orders and delivery then the merchant displays the total payment to the user.

RESULTS AND DISCUSSION

On the page this, the user can make account moreover formerly as step beginning for using the Akadin Platform. After succeed do registration, user will Obtain the email and password used for log in to in system.

On the page this, the user can make account moreover formerly as step beginning for using the Akadin Platform. After succeed do registration, user will Obtain the email and password used for log in to in system.

After successful login, the user will directed to page Akadin Platform homepage For start use available features.

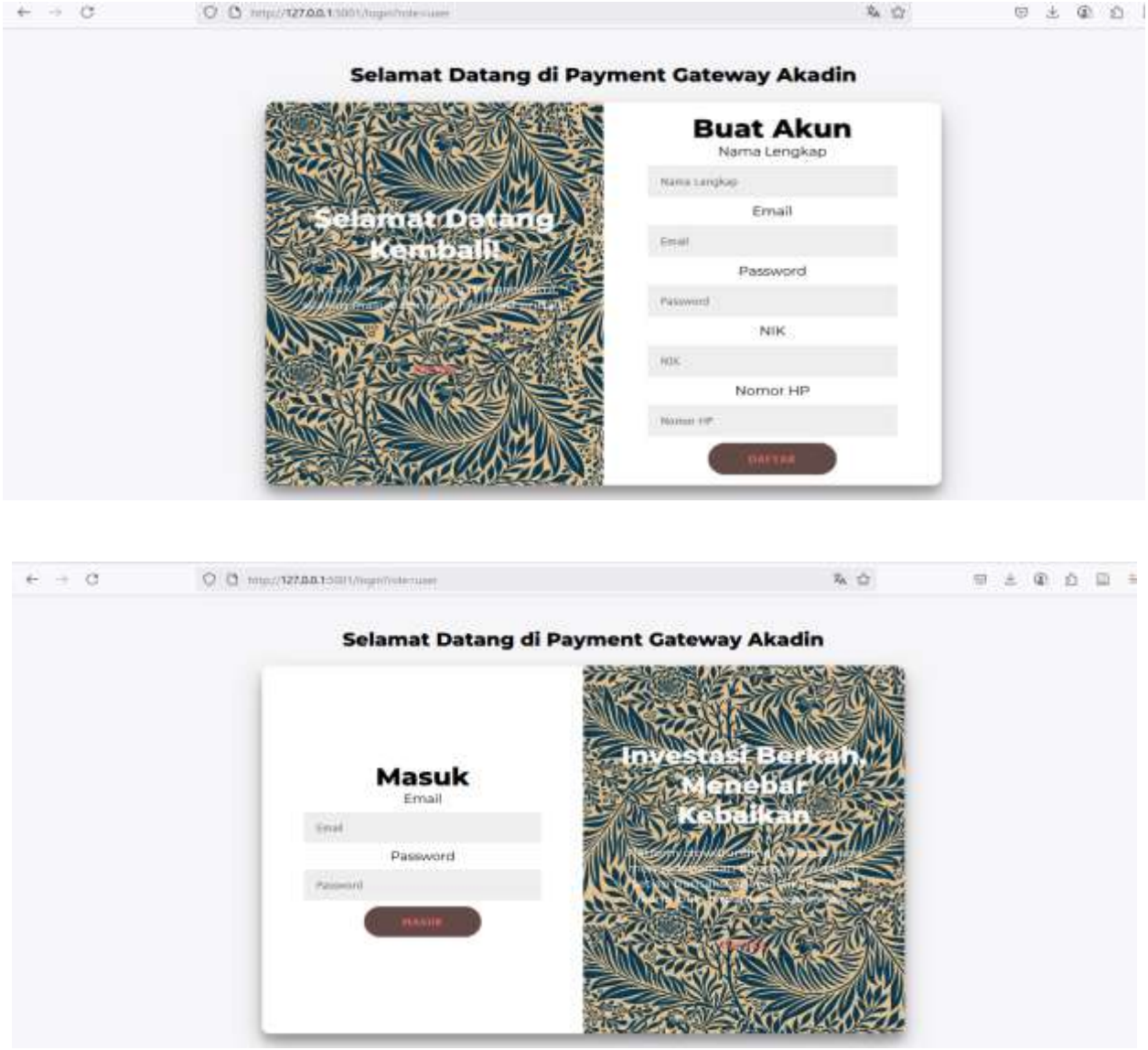
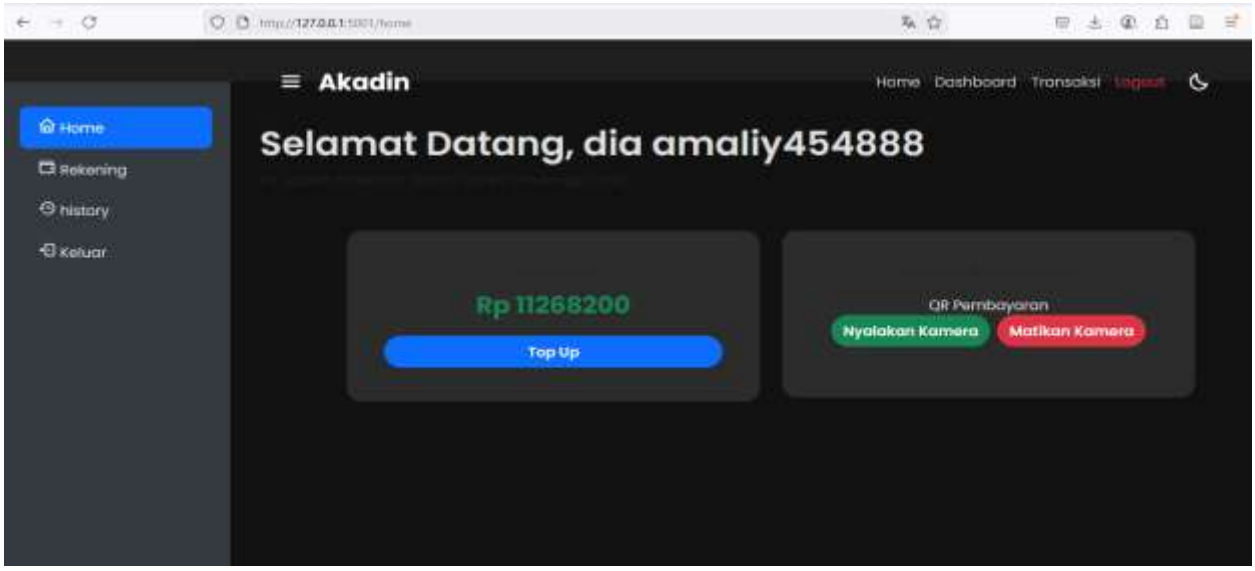


Figure 1. Home View

Welcome to Akadin, the system information your digital finances made easy in manage balance, view history transactions, and carry out payment via QR code.
After successful login, user will welcomed with greeting:

"Welcome, he amaliy454888", which indicates that account with that username has active and ready used. On the display left side of the screen, there is a number of navigation (slidebar) with option main as home displays summary accounts and information available balance, account

Provides a form for manufacturing account, history displays a list of transaction history You In a way complete and out give option safe for go out from account You.



Fugure 2. Top up view

On the Top Up screen, users can top up their balance before making payments. Users can choose between virtual accounts, GoPay, and QR codes.

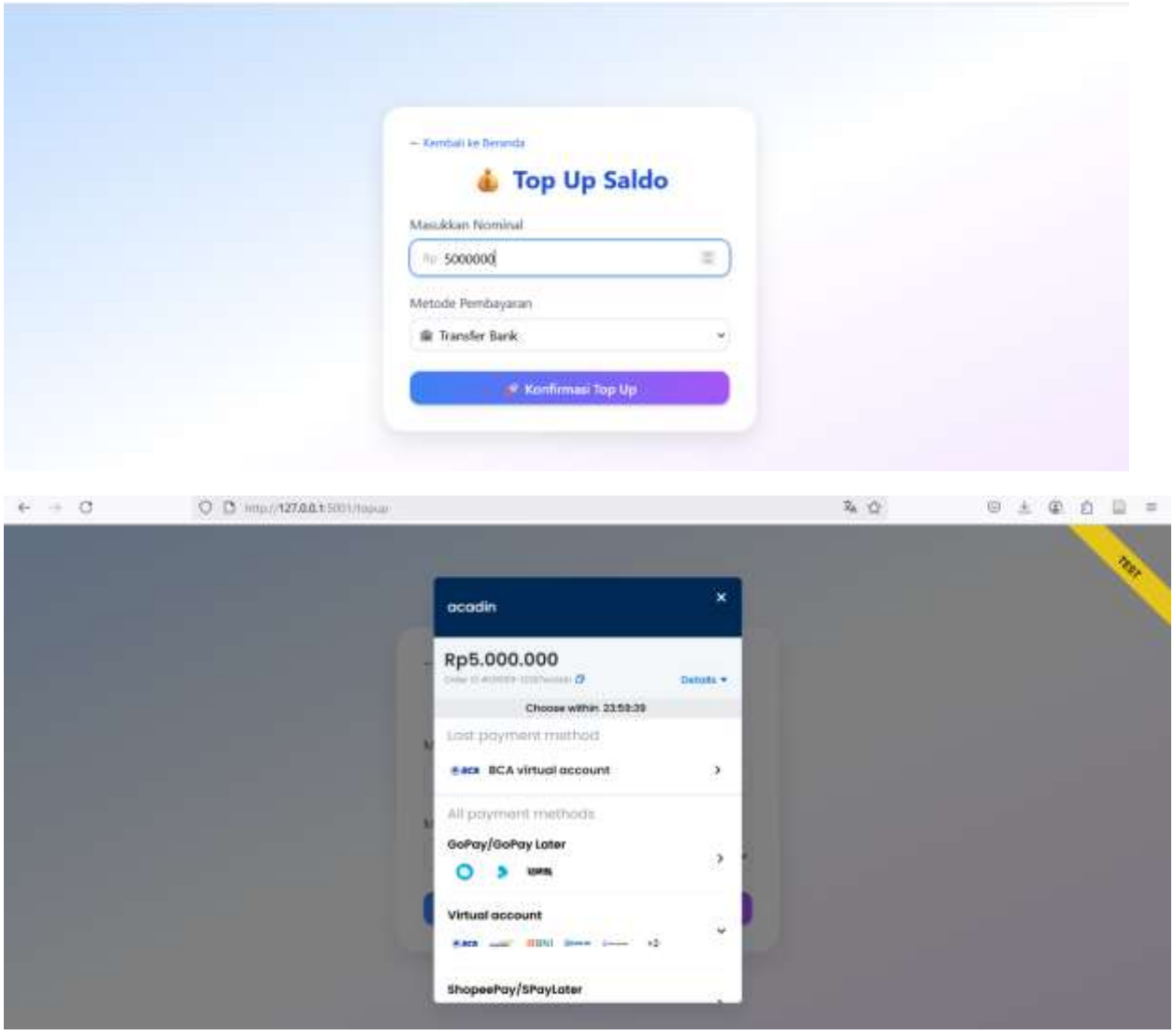


Figure 3. Account View

In this Account View, users can open an account so that users who do not have an account can open an account on the form provided on this platform.
The form contains full name, date of birth, gender, ID number, address and email.

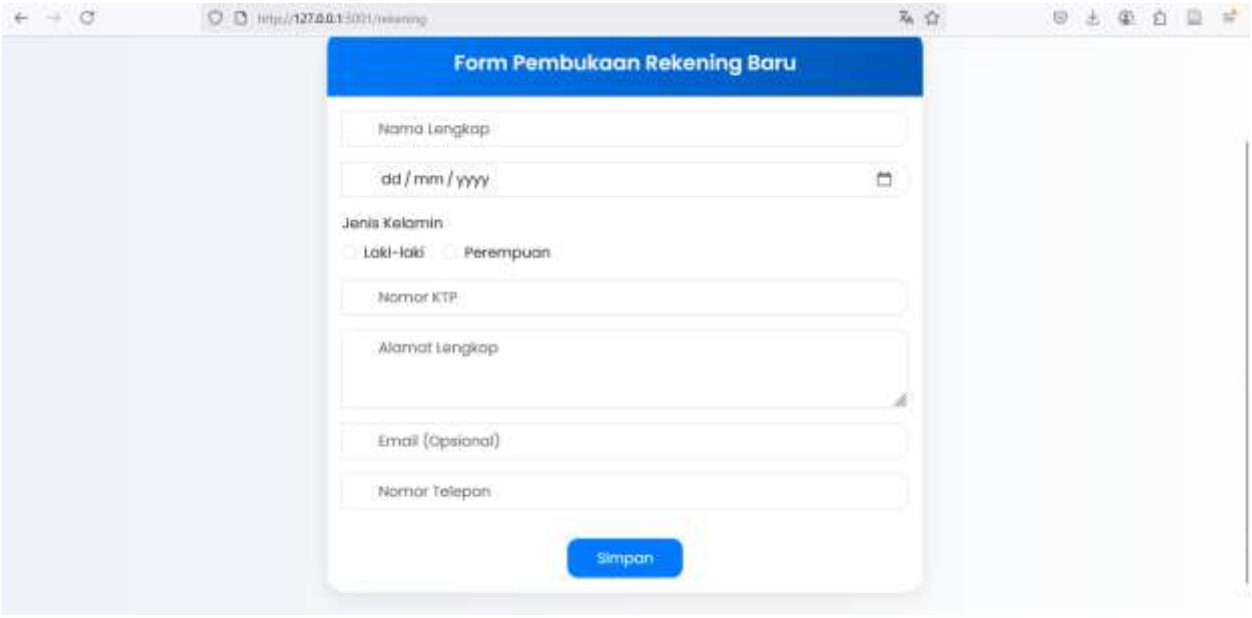
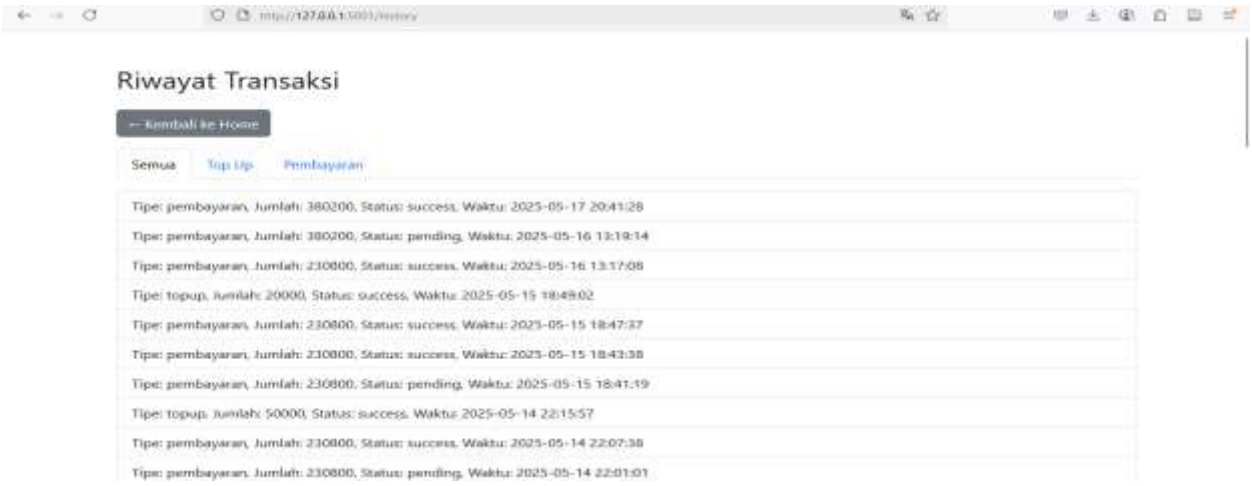
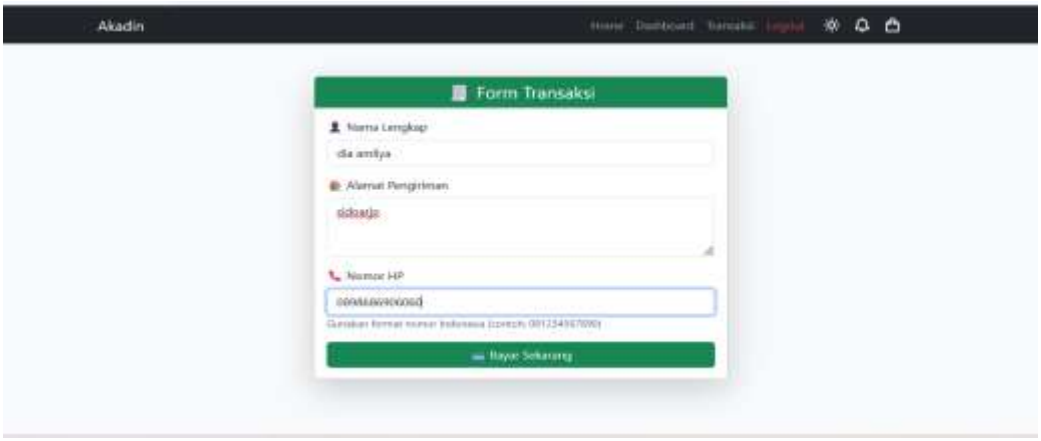


Figure 4. History View

The History view explains when the user has made all transactions recorded in the history. This page displays a list of user transactions, both top-ups and payments, along with information on the amount, status (success), and transaction time. Some history displays have main elements such as the transaction history title, the return home button, the All tab filter – Displays all transactions, Top Up – Only balance top up transactions, Payment – Only payment transactions, and transaction List : Contains details of type, amount , status, and time. transactions.



The transaction display on this Transaction screen shows users checking out items on the marketplace and must fill out a transaction form to proceed with payment. The form contains the full name, shipping address, and phone number.



CONCLUSION

Fundamental Finding : This study successfully designed and implemented a payment gateway–based middleware integrated with a microservices architecture and web services on a digital crowdfunding platform, demonstrating that the application of the CES Framework effectively identifies user challenges and provides appropriate digital solutions such as API payment integration and customer search digitalization. The developed system enhanced efficiency, security, and user experience through the successful implementation of top-up, account creation, and transaction history features supporting multiple payment methods, including virtual accounts, QRIS, and e-wallets. **Implication :** These findings suggest that integrating microservices and middleware technologies can significantly strengthen digital transaction systems and foster innovation within the crowdfunding and financial technology sectors, contributing to the growth of the digital economy. **Limitation :** However, this study was limited to prototype-level testing and did not include large-scale implementation or stress testing under real transaction volumes, which may affect the generalizability of the results. **Future Research :** Further studies should focus on scalability testing, user behavior analysis, and the integration of advanced security mechanisms such as blockchain or AI-driven fraud detection to enhance reliability and resilience in digital crowdfunding ecosystems.

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M. Bima Surya
Muhammadiyah University of Sidoarjo, Indonesia

*** Irwan Alnarus Kautsar (Corresponding Author)**
Muhammadiyah University of Sidoarjo, Indonesia
Email: irwan@umsida.ac.id

Yulian Findawati
Muhammadiyah University of Sidoarjo, Indonesia

Suhendro Busono
Management and Science University, Malaysia