

Development of e-menu web service integrated with payment gateway using SOA method (Case Study: Angkringan Ateng)

Arfika Putri Risandi¹, Sanggita Erinne W. S², Nayaka Nadhiftya Almas³, Enri Hilmy Afriansyah⁴, Andreas Adiputra Marpaung⁵

^{1,2,3,4,5}Information System, Universitas Duta Bangsa, Indonesia

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ABSTRACT

This research discusses the development of an e-menu web service integrated with a payment gateway using the Service-Oriented Architecture (SOA) approach at Angkringan Ateng. This technology allows customers to view menus, order, and pay online, improving efficiency and quality of service. The SOA method was chosen for its flexibility and scalability in the development of complex systems, making it easy to integrate and maintain services independently. This study includes requirements analysis, architecture design, implementation, and system evaluation. The results show that the developed e-menu system is able to improve operations and customer experience, and can serve as a model for the development of similar applications in other culinary industries.

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Corresponding Author:

Arfika Putri Risandi,
Fakultas Ilmu Komputer,
Universitas Duta Bangsa,
Jl. Bhayangkara, 55, Surakarta, 57134, Indonesia.
Email: 210101051@mhs.udb.ac.id

1. INTRODUCTION

The development of information technology has encouraged the culinary sector to adopt digital systems. One solution that is developing is an e-menu web service that is integrated with a payment gateway. This solution allows customers to view menus, order and pay online, thereby increasing efficiency and service quality (Kolberg et al., 2023; Purba & Nurhaliza, 2023). This approach not only provides convenience for customers but also helps restaurants manage orders and payments more effectively.

The Service-Oriented Architecture (SOA) approach is very suitable for developing this web service, because it allows services to be changed or updated independently without affecting other services Lubis et al. (2020; Purnamafajari et al., 2021). Implementing SOA in e-menu web services increases system flexibility and scalability (Niknejad et al., 2020; Wibowo, 2022). By using SOA, each system component can be integrated easily, enabling faster development and responsiveness to dynamic market needs (Setyawan Putra Pratama & Sri Rahayu, 2024).

Case studies on small SMEs show that this technology can be adopted by small and medium enterprises (SMEs) to improve operations and competitiveness (Purba & Nurhaliza, 2023). The development of an integrated e-menu web service with a payment gateway for small angkringan SMEs is expected to become an effective example for other SMEs. This is important because SMEs often face challenges in adopting new technology due to limited resources (Woźniak, 2020; Zamani et al., 2021).

This research aims to develop an e-menu web service that is integrated with a payment gateway using the SOA method, with a case study on small SMEs. The objectives of this research are to design, implement, and evaluate the effectiveness of the integrated e-menu system in improving operational efficiency and customer satisfaction at Angkringan Ateng. The research is expected to provide several benefits in the field of science, including insights into the practical

application of SOA in small-scale culinary businesses and a model for integrating digital solutions in similar sectors. The expected benefits of this research include providing insights into the practical application of SOA in small-scale culinary businesses and a model for integrating digital solutions in similar sectors. It is hoped that the research results will become a reference for other culinary entrepreneurs in adopting similar technology to improve service quality and operational efficiency (DirgaF et al., 2021; Niknejad et al., 2020; Purba & Nurhaliza, 2023). Apart from that, this research is also expected to provide insight into how implementing SOA can optimize culinary business management in the digital era.

Thus, developing an e-menu web service integrated with a payment gateway using the SOA method is not only a technical solution but also an important business strategy for the continuity and development of culinary businesses in the future (Ma & Du, 2023; Niknejad et al., 2020).

2. RESEARCH METHOD

Information technology has influenced various sectors, including the culinary industry. Adoption of digital systems, such as e-menu web services integrated with payment gateways, allows customers to view menus, order and pay online, increasing efficiency and service quality (Elkholy et al., 2022; Nurdiansyah, 2021; Purba & Nurhaliza, 2023). The Service-Oriented Architecture (SOA) approach is suitable for developing web services because it allows services to be changed or updated independently without affecting other services (Lubis et al., 2020; Shadiq et al., 2020; Wibowo, 2022).

- a. Needs Analysis, objective: Understand the features and functions required in an e-menu system and payment gateway integration. Steps: Conduct interviews and surveys with stakeholders to identify system needs, prepare requirements documents that include main features such as menu appearance, ordering, and payment.
- b. SOA Architecture Design, objective: Design a system architecture based on SOA principles. Steps: Identify the services required (eg, menu display services, ordering services, payment services), design services modularly to ensure each service can operate independently, create architectural diagrams that explain the relationships between services and components, develop service specifications that include service descriptions, interfaces, and communication protocols.
- c. Service Development, goal: Develop the services that have been designed. Steps: Implement each service according to web service standards (eg, RESTful API), developing menu display services to display menu lists to customers, develop ordering services to handle the ordering process by customers, developing payment services to process payment transactions via payment gateways, using development tools such as PHP Native and MySQL.
- d. Integration and Testing, goal: Integrate the services that have been developed into one cohesive system and carry out testing. Steps: Integrate all services using predefined communication protocols, perform functional testing to ensure that each service functions correctly, perform load testing using tools such as JMeter to ensure the system can handle high transaction volumes, perform security testing to ensure that the system is safe from threats and attacks.
- e. Implementation and Evaluation, objective: Implement the system in Angkringan which is the case study and evaluate its performance. Steps: Implement the system in a real operational environment, collecting feedback from Angkringan users and owners through interviews and surveys, evaluate system performance based on feedback received and make improvements if necessary.

Tools and Technology, this research uses various tools and technologies to support system development and integration, including: a) Programming language: PHP Native; b) Framework: PHP Native for backend development; c) Database: MySQL; d) Payment Gateway API: Integration with relevant payment gateway services; e) Testing tools: Postman for API testing and JMeter for load testing.

Expected results, the result of this research is an integrated e-menu web service system with a payment gateway that can improve operational efficiency and customer experience at Angkringan. It is hoped that this system can become a model for developing similar applications in other culinary industries (Krisbiantoro, 2021; Purba & Nurhaliza, 2023). With the SOA approach, the system developed will have high flexibility and scalability, making it easier to add new features and maintain the system in the future (Lubis et al., 2020).

3. RESULTS AND DISCUSSIONS

If you consider the existing problems, the author uses an approach with the method, namely Service-Oriented Architecture (SOA).

Needs Analysis

At the needs analysis stage, interviews with Angkringan owners and surveys to customers were conducted to understand the features and functions required in the integrated e-menu system with payment gateway (Siddiq & Retnowo, 2023). The results of the analysis show that the system must be able to display a complete menu list with descriptions, images, and prices that can be updated easily by the Angkringan owner. In addition, customers should be able to select menu items, add them to the shopping cart, and place multiple orders at once (Fahmi et al., 2021; Giao et al., 2022).

The system should also be integrated with a payment gateway to facilitate online payments by various methods, including credit cards, e-wallets, and bank transfers (Siddiq & Retnowo, 2023). Customers are expected to receive notifications via email or SMS after successful booking and payment. Security is an important aspect, where the system must protect customer data and payment transactions with data encryption (Al Biruni et al., 2023; Yanto, 2022).

Stakeholder feedback shows that Angkringan owners want a system that is easy to use without requiring high technical knowledge, while customers want a quick and simple ordering and payment process.

SOA Architecture Design

The SOA architecture design is designed to ensure the flexibility and scalability of the system. The designed architecture diagram shows the relationship between the main services, such as menu appearance service, ordering service, and payment service. Each service is designed in a modular manner, allowing development, testing, and maintenance to be performed independently (Adler & Dika, 2022; Prasetyo & Lubis, 2020).

Service specifications include endpoints, methods, and service descriptions. For example, the menu view service uses the `/api/menu` endpoint with the GET method to retrieve the menu list from the database and send it to the frontend. The order service uses the `/api/order` endpoint with the POST method to receive order data from the frontend and store it in the order database. The payment service uses the `/api/payment` endpoint with the POST method to send payment data to the payment gateway and process the transaction (Samuel & Girsang, 2020).

This modular design ensures that each service can be changed or updated without affecting other services, and facilitates integration and maintenance. The following is the SOA architecture design.

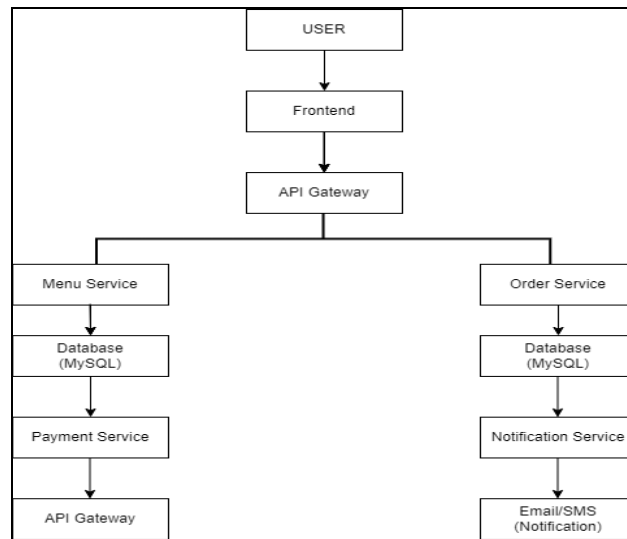


Figure 1. SOA design architecture

Service Development

Service development was done using native PHP. The menu appearance service was developed to display a list of menus stored in a MySQL database and accessed via a RESTful API. The booking service handles the booking process by customers and stores booking data in a MySQL database. The payment service is integrated with a payment gateway using an API provided by the payment service provider (Elianti & Pasaribu, 2023; Pudyawardana, 2023).

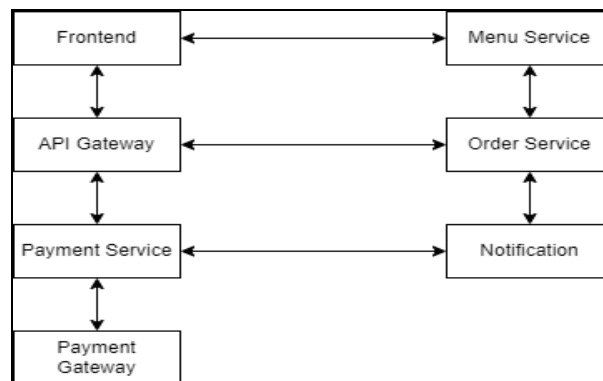


Figure 2. Service development plan

This modular and integrated service development design ensures the flexibility and scalability of the e-menu web service system. Each service can be developed, tested and maintained independently, allowing changes and updates to be made without disrupting other services. This approach supports the research objectives of improving operational efficiency and customer experience at Angkringan and provides a model that can be applied to other culinary industries (Subbulakshmi et al., 2020).

Integration and Testing

After development, the designed services were integrated into one cohesive system through an API Gateway. Functional testing is conducted to ensure each service functions according to specifications, covering common usage scenarios such as menu appearance, ordering, and payment.

Load testing using JMeter shows that the system can handle high transaction volumes. Security testing is performed to ensure the system is safe from threats such as SQL injection, XSS, and CSRF. Data encryption is applied to protect sensitive information such as payment details. E. Implementation.

The system that has been tested and declared ready is then implemented at Angkringan as a case study. Training was provided to Angkringan owners to use the system. Performance evaluation was conducted through feedback from users and Angkringan owners, which showed improvements in operational efficiency and customer experience. The evaluation results showed that the system successfully improved the quality of service, with some suggestions for improvement such as the addition of an order notification feature identified for further development.

Here are the results:

- a. Initial Display Page, on the first time accessing the system, users are directed to the initial display page for buyers to login or create a new member account for new customers.



Figure 3. Initial display page

- b. Login, the following is a display for login that contains username and password, and can create a new account for new customers.

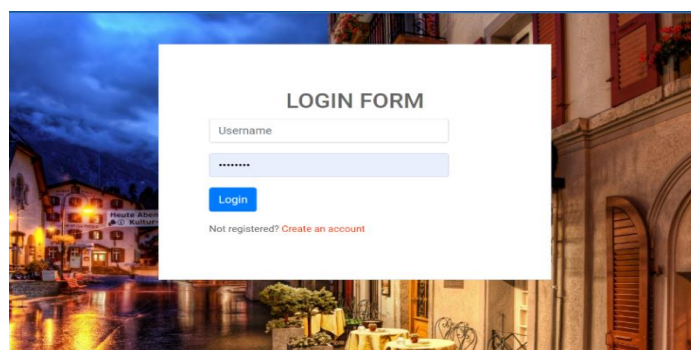


Figure 4. Login form

- c. Dashboard Menu, on this customer menu dashboard page displays a display of best seller menus that are sold.

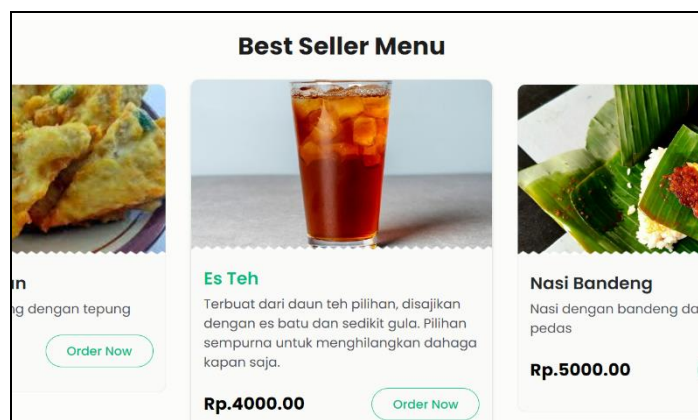


Figure 5. Dashboard menu

d. Menu Options, the menu interface makes ordering easy with simple steps and clear navigation. Menu categories such as "Fritters," "Drinks," and "Rice" make filtering easy. Each item is displayed with a picture, short description, and star rating to help customers choose quickly.

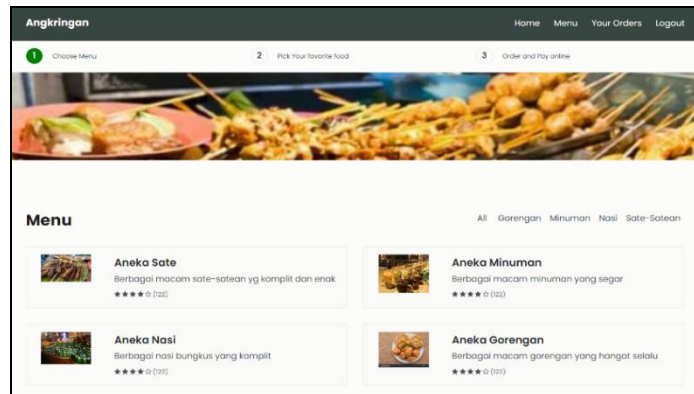


Figure 6. Menu options

e. Order Menu Display, this view shows a shopping cart with items, prices, and totals on the left, and a popular menu with descriptions and an "Add to Cart" button on the right. A "Checkout" button is available to complete the transaction.

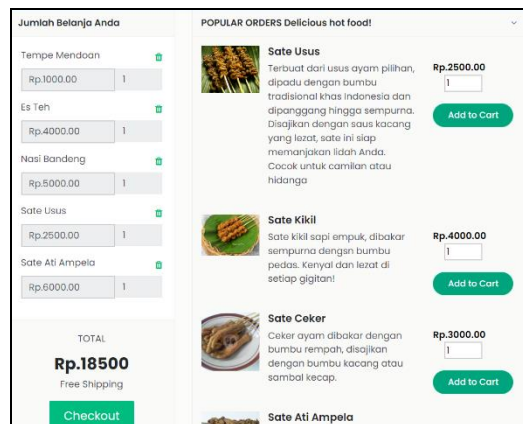


Figure 7. Order menu display

f. Payment View, this view shows a shopping cart summary with subtotals, shipping charges (free), and total. Payment method options include "Cash on Delivery," GoPay, and QRIS. An "Order now" button is available to complete the transaction.

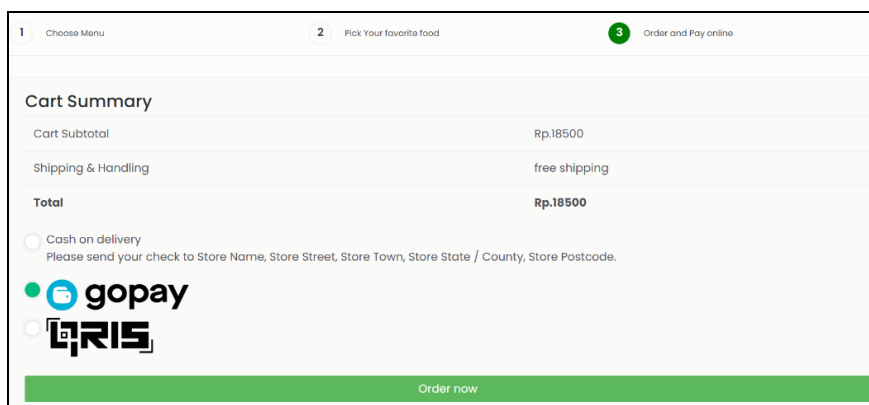


Figure 8. Payment view

g. Food Order Display, on this view, it shows the user can view the order items, quantity, price, status, date, and delete the order. The "Dispatch" button updates the status.

Item	Quantity	price	status	Date	Action
Tahu Bakso	1	Rp.2000.00	Dispatch	2024-07-02 23:03:32	
Wedang Jahe	1	Rp.5000.00	Dispatch	2024-07-02 23:03:41	
Tempe Mendaoan	1	Rp.3000.00	Dispatch	2024-07-02 23:31:11	
Es Teh	1	Rp.4000.00	Dispatch	2024-07-02 23:31:11	
Nasi Bandeng	1	Rp.5000.00	Dispatch	2024-07-02 23:31:11	

Figure 10. Food order display

4. CONCLUSION

Based on the research conducted, an integrated e-menu web service system with payment gateway for Angkringan has been successfully developed using the Service-Oriented Architecture (SOA) approach. The system is designed to improve operational efficiency and customer experience by allowing ordering and payment to be done online. The system enhances operational efficiency and customer experience through seamless online ordering and payment processes, offering a flexible and scalable solution that can be easily updated and integrated. It is hoped that this system will not only improve service quality and customer satisfaction but also serve as a model for the broader adoption of digital solutions in similar industries, thereby contributing valuable insights to the field of science. However, the research is limited by its focus on a single case study and controlled environment. Future research should expand the sample size, conduct long-term field studies, and explore advanced features such as AI-driven recommendations.

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