

## Improving Invoice Management: A Web-based Application for the Hospitality IT Vendor Industry using Prototyping Model

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### Abstract

This research delves into the challenges faced by a hospitality IT vendor providing services to a diverse clientele in Indonesia. The vendor, relying on profits from clients for operational and developmental activities, needs help with the billing process. The complexities arise from various payment schemes, including full payments and installments, coupled with the annual requirement for clients to purchase a maintenance key for continued system access. The existing transaction process experiences delays due to difficulties searching for invoice data among numerous clients with varying payment times. These delays hinder the timely collection of subsequent payments, resulting in receivables and potential disruptions to the vendor's cash flow for operational and developmental costs. Traditional bill recording methods compound the problem with inaccuracies and data retrieval challenges. The findings of this research is a web-based application developed through the SDLC prototyping model to address these issues. The application, evaluated through User Acceptance Testing (UAT), successfully overcame the challenges. The results indicate that the application efficiently manages invoice data, facilitates timely payments, and enhances overall accuracy in data processing. In conclusion, the web-based application is an optimal solution, resolving invoice management issues and streamlining processes for the hospitality IT vendor.

Keywords: Hospitality, Invoice Management, Prototyping Model, Web-Based Application, Operational and Developmental.

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### 1. Introduction

The development of hotel industry in Indonesia is experiencing rapid growth in line with the development of the country's economy and tourism. In recent years, the hotel sector has become one of the most growing sectors in Indonesia. This hotel development is not surprising, considering that Indonesia has many interesting tourist destinations and natural beauty that attract local and international tourists [1].

Technological advances have brought major changes to the hotel industry in Indonesia. Modern hotels are now equipped with sophisticated hotel management systems, online bookings, and better customer service [2]. Advanced hotel management systems enable hotels to efficiently manage their operations, such as inventory management, room reservations, and guest attendance monitoring [3]. Online booking has made it easier for tourists to book hotels easily and quickly without coming directly to the hotel. Better customer service is also a focus in the hotel industry [4].

Hotels compete to provide a comfortable and satisfying stay for their guests by offering personalized service, modern facilities, and special needs such as halal food or accessibility for disabled guests [5]. The use of technology in the hotel industry is either developed independently or uses IT vendors with a license subscription mechanism [6]. The object of research in this study is a vendor providing hospitality system services that faces several business processes in terms of billing clients [7]. With many clients spread across

Indonesia, this vendor obtains profits that can be used to carry out and develop the company's operational activities [8].

The business process in hospitality system transactions/payments between vendors and clients can be carried out using a full payment scheme or installments [9]. After using the system for one year, the client must pay for a maintenance key to continue to use the services of the hospitality system provided by the vendor [10]. This maintenance key is used to renew the license to use system services and is paid annually (annual payment). The ongoing transaction process experienced many delays in payments from clients to vendors [11]. This delay in payment is caused by the fact that searching for invoice data is difficult due to the large number of clients and different payment times, so the maintenance key has the potential to be chaotic in terms of time. Subsequent payments that have yet to be paid will be collected within a mutually agreed period; this will result in receivables from customers being owed to vendors, resulting in the potential for the company's cash receipts to be hampered for operational and development costs. Bill recording is still carried out using conventional methods and often results in inaccurate data and the risk of errors in the recording process [12].

The recording results using conventional methods also make it difficult to find data [13]. Apart from that, in the invoice billing process, physical documents are still sent via Expedition services, so most invoices can

experience delays in arriving at the client's location or may not even be sent due to delivery errors [14]. Based on the problems related to invoice management, a more optimal business process solution is needed [15]. This research aims to make it easier to search for invoice data to reduce delays in payments for maintenance keys caused by the difficulty of finding invoice data that will be billed to clients. Apart from managing invoices, an additional feature that is needed is managing reports so that they can be summarized digitally, and that the data processed is more accurate than the conventional methods [16]. In several previous studies, website-based applications can be used to overcome problems related to managing similar business processes. Therefore, the results of designing a website-based application are the aim of this research so that it can become a solution [17].

## 2. Research Method

The utilization of prototyping models in the realm of software development has seen a notable surge in significance as a means of guaranteeing the triumph of information technology initiatives [18]. This model facilitates the process for developers to effectively design, test, and comprehend user requirements prior to the development of the software's final iteration [19]. Prototyping models are used to visually represent ideas, develop user interfaces, and detect possible issues at an early stage [20]. The use of this paradigm has the potential to provide time and resource savings, as it enables developers to rectify and enhance the design and functioning of the program prior to its deployment phase. Sequential Phases on Prototyping Model on Figure 1.

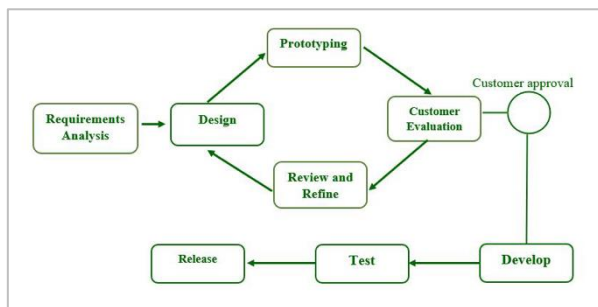


Figure 1. Sequential Phases on Prototyping Model

Figure 1 illustrates the sequential phases involved in requirements engineering within the context of the prototyping model. A comprehensive comprehension of the sequential procedures involved in a development methodology is necessary. The following sections delineate the many phases included by the prototyping model stage 1- Requirement Gathering and Analysis: This stage represents the preliminary phase in the implementation of the prototype model for the creation of web-based applications. During this phase, users are requested to articulate their anticipated outcomes or desires from the system.

Stage 2- Rapid Design: The primary phase of developing a prototype web-based application involves the use of the Unified Modeling Language (UML),

which is a widely acknowledged modeling language. The use of Unified Modeling Language (UML) has been utilized as a technique for graphically representing, developing, and documenting web-based applications and architectural designs.

Stage 3 involves the development of a prototype application, which will serve as the outcome of this stage. The design tools used for creating the mock-up of the application will using FIGMA. This prototype provides users with the capability to visually see the progress of the program. Stage 4, known as the Initial User Evaluation, aims to assess web-based applications. During this phase, consumers will engage in active participation in the process of functionality testing, followed by the provision of their comments.

Stage 5, known as the Refining Prototype stage, involves the use of user input obtained during the first user assessment. System developers employ the prototyping model to enhance the system by making it more comprehensive and thorough. The final design is authorized via the enhancement of the client's reaction to comments and recommendations. Stage 6 involves the implementation and maintenance of the product. The concluding phase of executing the Prototyping system development model involves the implementation of a web-based application on the designated research object, followed by the execution of maintenance activities in accordance with predetermined requirements and timetable.

User Acceptance Testing (UAT) is conducted by users to evaluate a web-based application's ability to meet their demands and offer accurate predictions or analysis. This testing is performed using a black box testing paradigm. The black box testing approach is designed to verify the proper functioning of web-based principal functions, ensuring that they align with user requirements and expectations, and yield the anticipated outcomes. User Acceptance Testing (UAT) is a crucial process that aids in the comprehensive evaluation of a web-based model by real end users. This evaluation serves to enhance the web-based model's prospects of success in the market and mitigate the potential for post-launch issues.

## 3. Result and Discussion

Six stages can be carried out based on the prototyping model used in this research. However, the discussion will only focus on the requirements gathering analysis, rapid design, construction, and evaluation stages. Meanwhile, due to time constraints, the Implementation and Maintenance stages cannot be carried out. In the first stage of implementing the prototyping model, interviews were conducted with staff and managers in invoice management. Six finance staff and one finance manager work in the finance department. The results of interviews conducted to obtain requirements gathering were then analyzed and summarized in the form of Table 1.

Table 1. Requirement Gathering Analysis

No	Requirements	Features
1	Main menu for the feature of application	Application dashboard
2	Invoice management	Add invoice and invoice list
3	Product management	Add Product and product list
4	Customer management	Add Customer and customer list
5	User management	Add User and user list

The results from Table 1 are then used as a basis for the next stage, namely creating a Unified Modeling Language (UML) diagram. Several UML diagrams have been created in this research in order to simplify the system design process. Because the focus of this research is the function of the application, only use case diagrams will be displayed to describe the main function of the application being designed. The use case diagram for the Invoice Management Web-Based Application centers on the Finance Staff user, encompassing four critical functionalities under the "Manage Invoice" use case: adding, viewing, updating, and deleting invoices. These functions ensure a comprehensive and efficient system for financial transactions. Additionally, an optional <<extend>> relationship introduces the capability to print invoices, providing flexibility in documentation. The diagram also includes a separate "Manage Product" use case with three functionalities: adding, viewing, and deleting products, enabling Finance Staff to manage diverse offerings. Altogether, this comprehensive framework empowers Finance Staff to navigate and control both invoices and products seamlessly within a digital environment, enhancing overall financial management efficiency. Invoice Management Use Case Diagram on Figure 2.

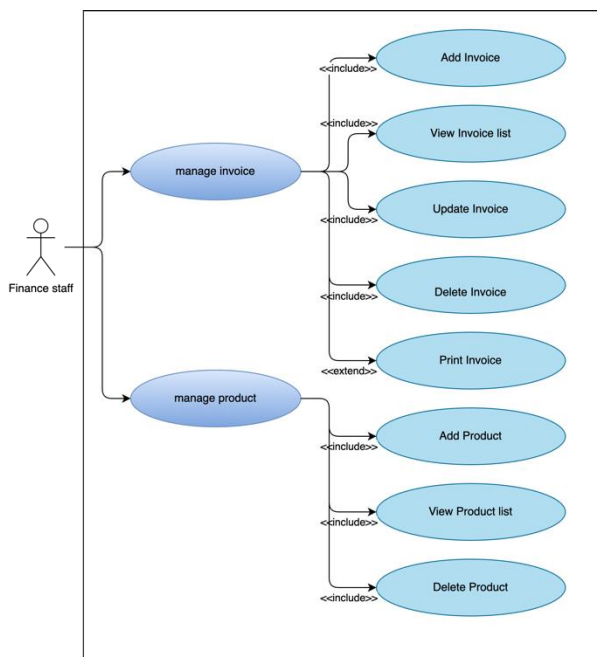


Figure 2. Invoice Management Use Case Diagram

After the second stage is successfully carried out, the UML diagram is used as a basis for designing web-based applications. Application design uses the Hypertext Preprocessor (PHP) programming language,

focusing on the back end. The framework used for design is Code Igniter, and MySQL is the Database Management System (DBMS). The following is the result of a web-based application design. Figure 1 is the application dashboard, with access to four main features. User's dashboard with four primary features on Figure 3. Create Invoice Menu Input Form on Figure 4. Invoice List and The Actions Button on Figure 5.

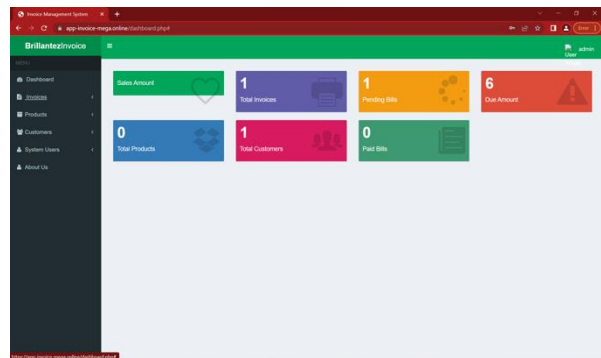


Figure 3. User's Dashboard with Four Primary Features

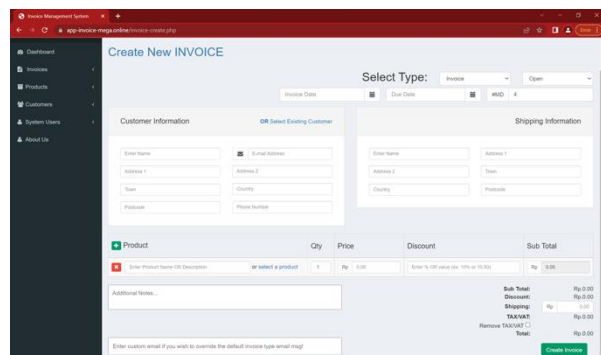


Figure 4. Create Invoice Menu Input Form

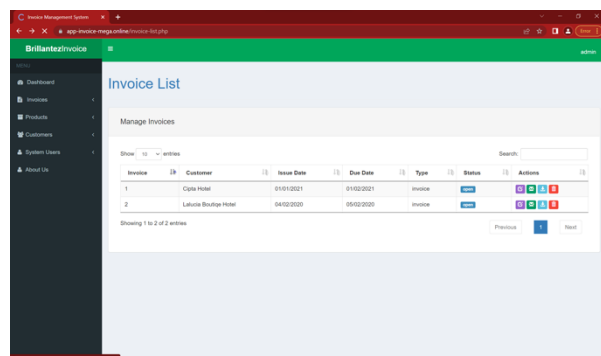


Figure 5. Invoice List and The Actions Button

Figures 4 and 5 are the user interface of the Manage Invoice feature. With the Manage Invoice feature, finance staff can add invoices, view invoice lists, update, delete, and print invoices. Apart from that, a search feature for invoices is based on the invoice number or customer name. In the Add invoice process, customer information must be input, such as customer name, address, telephone number, and shipping information, for sending the physical invoice to the customer's address. Usually, the customer's address is filled in with the hotel address because the customer in this industry is the hotel. Adding products can also be

done simultaneously as adding an invoice, making it easier for finance staff during the data input process. Add New Product (Systems for Hotel) on Figure 6. Product List (Systems for Hotel) Figure 7.

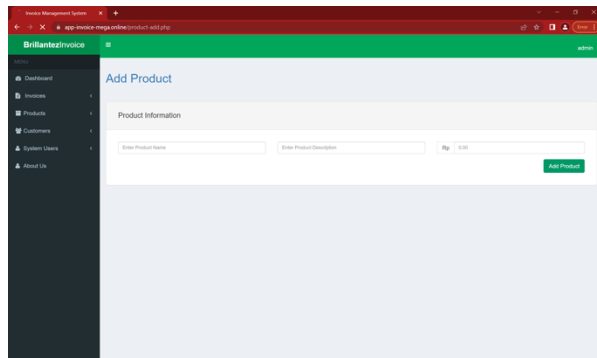


Figure 6. Add New Product (Systems for Hotel)

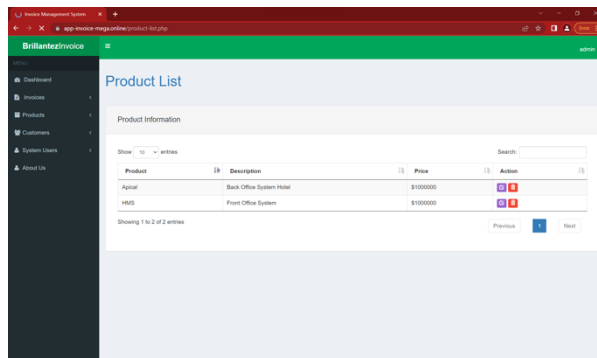


Figure 7. Product List (Systems for Hotel)

Furthermore, several inputs can be used to describe the products being sold in the product management feature. In the business process at Hospitality IT Vendor, the product sold is a system for hotel management. This system can be used by hotels that are customers with a maintenance key obtained through an annual subscription. Add Clients (Hotels) on Figure 8. Display of Clients List's on Figure 9.

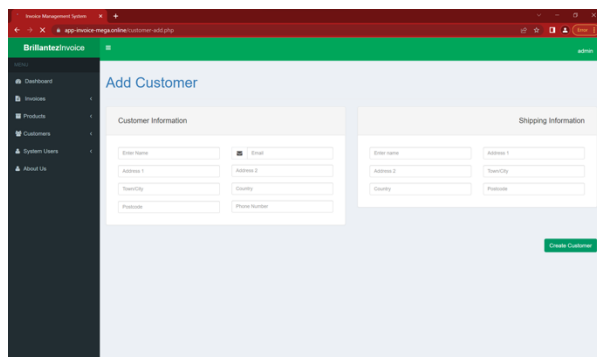


Figure 8. Add Clients (Hotels)

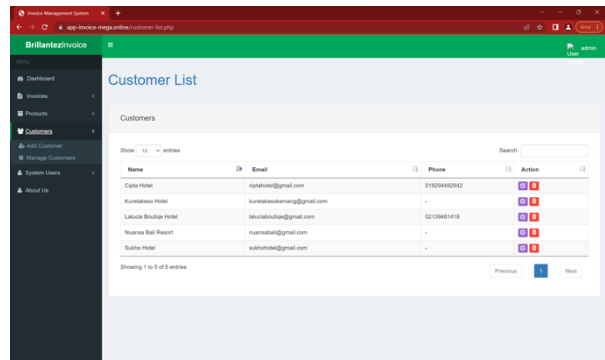


Figure 9. Display of Clients List's

Then, in the Add Clients and Client List features, several input forms have previously been explained in Figures 4 and 5. In the client list feature, finance staff can view client information and delete clients who have not continued their subscriptions. The clients that appear on the client list are important information for finance staff to be able to create invoices because client data needs to be input. Add New User for Invoice Management on Figure 10. Invoice Management Users List on Figure 11.

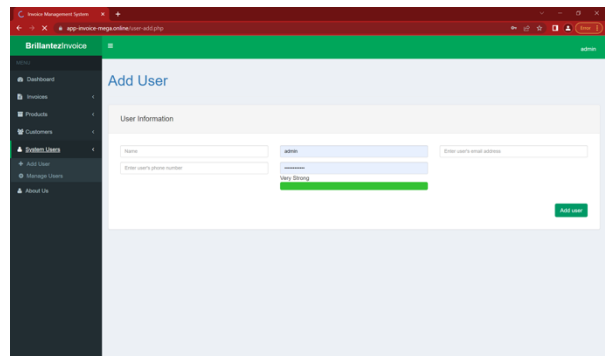


Figure 10. Add New User for Invoice Management

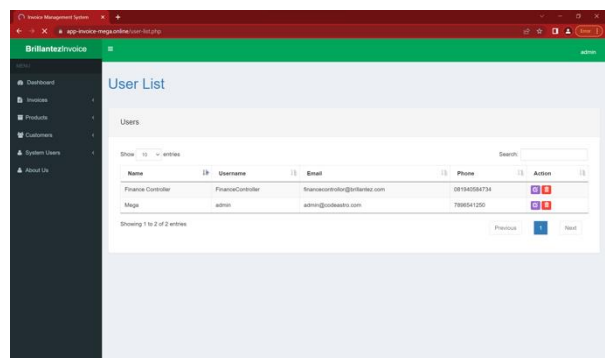


Figure 11. Invoice Management Users List

In Figures 10 and 11, there are features in this invoice management application to add new users, namely finance staff. Apart from adding new users, this feature can also be used to view the list, search for, and delete users. The role that has access rights to manage users is the Manager role, where this role is the Administrator role. In the final stage of this research, an evaluation was carried out using the user acceptance test (UAT) method to validate the function of the application that had been designed. This evaluation was conducted by conducting direct testing by application users, namely



six finance staff and a finance manager. Testing is carried out using a computer in the office where this application will be implemented. Evaluated Are Log-In/Log-Out on Table 2.

Table 2. Evaluated Are Log-In/Log-Out

No	Functionality test	result
1	Manage maintenance key for client.	Passed
2	Input product name, product description, and product price.	Passed
3	Input hotel name, email, address1, address2, city, country, postcode, and phone number.	Passed
4	Input invoice date, select customer, and select product.	Passed
5	Log in and log out application.	Passed

The main features evaluated are log-in/log-out, invoice, product, customer, and user management. The results of the functionality test using the UAT method show that the five main functions of this application can be used according to their intended purpose. Even though the results of this test show that the four main functions of this application run smoothly, further experiments still need to be carried out by comparing with several other test methods so that the test results are more certain.

#### 4. Conclusion

This research results in a web-based invoice management application designed using a prototyping model. This research also proves that the prototyping model is very relevant for system design or development with a relatively short duration. The User Acceptance Test (UAT) testing phase shows that all the features available in the application have passed testing with indicators that all functions can be used without problems. The features available in the application can be applied to Hospitality IT Vendors for business needs in managing invoices so that they can overcome obstacles related to billing delays and search for data much more quickly and easily.

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