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Web-Based Convection Service Information System Using Waterfall Method

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ABSTRACT – *Khandiq Convection is a garment business in Bandung that still uses manual methods for order processing and sales recording, leading to data inaccuracy and loss risks. As digital technology advances, many businesses have adopted web-based information systems to streamline operations. However, existing systems are often generic and not suited to the specific needs of small and medium enterprises (SMEs). This study aims to develop a web-based information system tailored to Khandiq Convection's operations. Using the Waterfall method, the system was designed with CodeIgniter, PHP, and MySQL, and implemented via XAMPP. Data were collected through interviews, observation, and literature review. The results show that the system improves data accuracy, reduces errors, and enhances order and sales management. This solution addresses the gap in accessible and integrated digital tools for SME garment businesses, supporting operational efficiency and customer service in the digital era.*

Keywords *- CodeIgniter; Khandiq Convection; Waterfall method; Web-based information system.*

Sistem Informasi Pelayanan Konveksi Berbasis Web Menggunakan Metode Waterfall

ABSTRAK – *Khandiq Convection merupakan usaha konveksi di Bandung yang masih menggunakan metode manual dalam pemrosesan pesanan dan pencatatan penjualan, sehingga berisiko menyebabkan kehilangan dan ketidakakuratan data. Di era digital, banyak pelaku industri konveksi mulai mengadopsi sistem informasi berbasis web untuk meningkatkan efisiensi operasional. Namun, sebagian besar sistem tersebut bersifat umum dan tidak disesuaikan dengan kebutuhan spesifik usaha kecil menengah (UKM). Penelitian ini bertujuan mengembangkan sistem informasi berbasis web yang terintegrasi dan sesuai kebutuhan Khandiq Convection. Metode yang digunakan adalah Waterfall, dengan tahapan analisis, desain, pengkodean, dan pengujian. Sistem dibangun menggunakan CodeIgniter, PHP, dan MySQL, serta diimplementasikan melalui XAMPP. Hasil menunjukkan sistem dapat meningkatkan efisiensi pengelolaan data, mengurangi kesalahan, dan menyediakan informasi yang lebih akurat. Penelitian ini menjawab kesenjangan terhadap terbatasnya solusi digital yang terjangkau dan terintegrasi untuk UKM konveksi, serta mendukung transformasi digital usaha tersebut.*

Kata Kunci *- CodeIgniter; Khandiq Convection; Metode Waterfall; Sistem Informasi berbasis Web.*

1. INTRODUCTION

Information technology is a requirement to help business processes, organizations, and companies [1]. Currently, the growing technology supported by adequate infrastructure has made information a requirement that must be fulfilled by humans. As a result, this technology is available almost all over the world. The main means to fulfill the needs of information systems are easy access and relatively low cost. With a good information system, you can collect and generate data quickly and accurately [2]. Convection is a kind of business that focuses on making clothes, which is a promising business as clothes are an infinite basic human requirement [3]. These businesses commonly produce a wide range of products, including t-shirt, uniform, tracksuit, alma mater, and toga convections. Khandiq Convection is one of the many convections in Bandung City. They started out only accepting t-shirt orders, but now they also accept orders for poloshirts, hoodies, shirts and tracksuits for individuals, organizations, companies, schools, and other government agencies.

The Khandiq Convection Bussiness has not used information system technology in this era of advancing information technology for user.

Customers must come to the location directly because the convection only accepts orders at the outlet. This is considered ineffective because consumers do not have enough information about the product. This obstacle appears in the ordering process because it limits consumers who are interested in convection products, especially for those who live far from the outlet. In addition, recording after ordering or reporting the results of ordering and sales is less effective because it still uses handwriting, and the absence of a special book for recording results in the loss of transaction data or reports, and increases the opportunity for data manipulation at Khandiq Convection. Earlier research, such as that conducted by I Made Mahadithya Jayendra Widayana et al. found that the management system uses the prototype method to input clothing order data, change the workmanship process, change the quantity, change the order delivery, create a graph report, and create an order report [4].

Therefore, a computerized information system can make it easier for consumers to order products from Khandiq Convection and find out the various products available without having to come directly to the location. This system will also make it easier for Khandiq Convection to manage order and sales data that occurs. In addition, it is hoped that the information generated will be more accurate and can reduce errors in the ordering process and recording of order reports that occur at Khandiq Convection.

Based on the above problems, this research aims to develop a convection information system that can be accessed through the Khandiq Convection website so that convection management becomes easier and faster, especially for product data management, ordering, and sales.

2. LITERATURE REVIEW

2.1. Waterfall Method

The method used in making this convection service information system uses the waterfall method, because this method works systematically and sequentially in building a system [5] [6] [7].

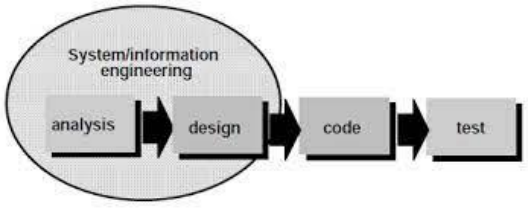

Figure 1. Method Waterfall *[8]*

Some of the stages in the Waterfall method can be seen in Figure 1 [9]:

Analysis, at this stage the software developer requires communication with the owner of the convection to know and understand the desired software.

Design, at this stage the specifications of the needs in the previous stage will be studied and designed a system that suits the needs of the convection.

Code, The process of translating the system design into a format that can be understood and executed by a computer is part of the program code generation stage in software development. The selection of a programming language that suits the needs of the project is included in these steps. If the system design has been carefully designed, the code can be generated automatically or mechanically.

Testing, In the testing process, the focus is on the software, in terms of logic and functional to ensure that all parts have been tested, this is done to minimize errors and ensure that the output produced is what the convection wants.

2.2. Information System

Based on Jogiyanto (2005), an information system is a system within an organization that brings together the processing needs of an organization [10]. daily transactions, support operations, are managerial and strategic activities of an organization and provide certain external parties with the necessary reports required" [11].

The quality of information depends on three things, namely information must be accurate, timeliness, relevance [11]. Accurate also means that the information should clearly reflect its purpose. Information must be accurate because from the source of information to the recipient [12].

2.2.1. Accurate

Accurate also means that the information should clearly reflect its purpose. Information must be accurate because from the source of information to the recipient information there may be a lot of distraction (noise) that can change or destroy the information.

2.2.2. Timeliness

Information that receives should not be late. Because information is the basis in decision making.

2.2.3. Relevance

The information has benefits for its use. The relevance of information for each person is different.

2.3. Framework Codeigniter

Based on Wahana Computer in a book entitled "mudah dan cepat membuat website dengan codeigniter", Framework is a collection of architecture or program writing patterns that are made in such a way so that it becomes a tool to speed up development of an application. Framework is a collection of functions, procedures and classes for a specific that are ready to use [13]. So that it can simplify and speed up the work of a programmer, without having to create functions or classes from scratch. So, with the framework, the work will be more organized and organized.

2.4. PHP

Based on Nugroho (2004), PHP (Hypertext Preprocessor) is a scripting language. programming language in the form of scripting, the working system of this programming is as an interpreter not as a compiler [14]. PHP was created by Rasmus Ledorf in 1994, initially it was not intended for distributed and only used on his personal homepage [15], [16].

2.5. MySQL

MySQL is an RDBMS (Relational Database Management System (RDBMS), and has been widely applied at the enterprise level (in the sense that it can be used in business high-end business equivalent to Micrososft SQL Server, Oracle, Sybase, SAP, and others).By installing XAMPP, there is no need to configure the to configure the apache web server, PHP and MySQL configuration manually, because XAMPP will install and configure them automatically. Some of the features and benefits of MySQL are:

a. No memory-leak and highly optimized memory usage which is highly optimized.
b. Various APIs are available for C++, Java (JDBC with Conector/J), Python, Perl, Tcl, ODBC (My ODBC), Eiffel, and Ruby.
c. MySQL is also multi-platform, being available for UNIX (including Linux), Windows and Mac.
d. MySQL can handle relational databases and can be used for both standalone and client server architecture.
e. MySQL software is open source, meaning we can take, use, and modify the source. can retrieve, use, and modify the source freely, without charge.

2.6. XAMPP

Based on Nugroho (2004), XAMPP is open source software, which supports many operating systems, is a compilation of several programs [14]. Its purpose is as a stand-alone server (localhost), which consists of the Apache HTTP server program, MySQL database, and language translators written in the PHP and perl programming languages. The name XAMPP stands for X (any operating system), apache, MySQL, PHP and perl.

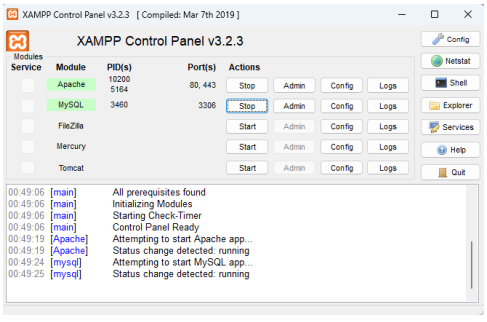

Figure 2. Web Server XAMPP

Based on Figure 2, by installing XAMPP software as local server, there is no need to configure the apache web server, PHP and MySQL manually, because XAMPP will install and configure them automatically, install and configure them automatically.

3. RESEARCH METHODS

3.1. Data Collection Methods

The object of this research is at the Khandiq Convection outlet, located on Jl. Surapati, Gang Muarajeun Lama 1 No.78 RT.06 RW.05, Cihaurgeulis, Cibeunying Kaler, Bandung City. The methods used to collect data include conducting interviews, direct observation, literature study. Data is collected through interviews conducted with the Owner of Khandiq Convection and all staff. This interview was conducted to find out the flow of the transaction process, system needs, and what obstacles are faced in managing the data [17].

3.2. Analysis of Required Hardware

Hardware needed in designing a web-based information system for convection services as follows.

Table 1. List of Required Hardware

No	Hardware
1	Intel(R) Core(TM) i3-2330M CPU@2.20GHz
2	Memory RAM 4 GB
3	SSD 512 GB
4	VGA Intel Standard
5	14 Inch Screen
6	Internet Network
7	Mouse, Keyboard, and other supporting hardware

In this research, Table 1 is a list of minimum hardware for designing web-based information systems for convection services.

3.3. Analysis of Required Software

Software needed in designing a web-based information system for convection services as follows

Table 2. List of Required Software

No	Software	Details
1	Windows	7/8/10 (32/64bit)
2	Browser	Chrome, Mozilla
3	Text Editor	VSCode / Sublime
4	Web Server XAMPP V3.2.3/ WAMP (customized)	PHP 7.3.2 MySQL 5.7 Apache 2.4.38

In this research, Table 2 is a list of mandatory software for designing web-based information systems for convection services. Besides that, there are still many optional software that participate in supporting the design process.

4. RESULTS AND DISCUSSION

4.1. Discussion

The following is an overview of the system designed based on the previous explanation. PHP-based web system completed with Codeigniter 3 framework to build a more dynamic website with MVC (Model, View, Controller) pattern and MySQL database. So that this system helps Khandiq Convection record and simplify managing customer orders, with a simple appearance so that it is easier for Khandiq Convection employees to understand.

4.2. Results

Based on the previous explanation, the author can initiate system design for the Khandiq Convection Information System. The structure and interaction of the system will be represented in diagrams drawn using the Unified Modeling Language (UML).

UML (Unified Modeling Language) is a visual modeling method used as a tool for developing object-oriented systems, UML diagrams that are often used include Use Case Diagram, Activity Diagram, Sequence Diagram, Class Diagram, State Machine Diagram, and Component Diagram [18].

4.2.1. Conseptual Database

A conceptual database is an abstract overview that describes how data is connected in an information system.

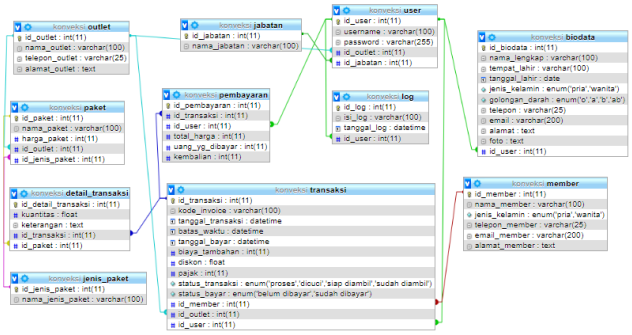

Figure 3. Conseptual Database Khandiq Convection

Based Figure 3, this conceptual database model is usually used to talk to stakeholders in a particular domain, such as users or system owners. If not required, this model can be used to replace the logical data model [19]. In the convection service web-based information system, the conceptual database is shown in Figure 3.

4.2.2. Activity Diagram

Activity diagram shows the sequence of actions in the built system. It shows the sequence of activities that occur, the decisions or branches taken, and the relationships between those activities [20].

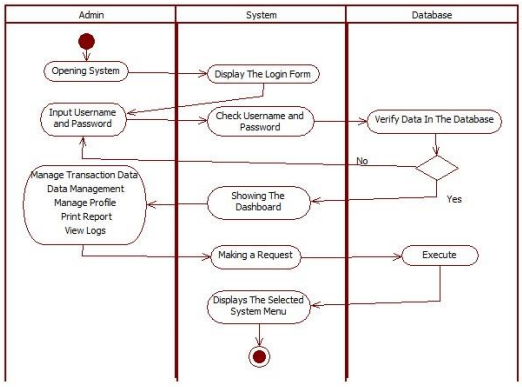

Figure 4. Activity Diagram Admin

As described in Figure 4 regarding the Activity Diagram. This diagram shows the flow of the convection system.

4.2.3. Use Case Diagram

Use case diagrams are used to describe the system from the user's point of view and indicate how the interaction between the user and the application is built. After the analysis and requirements are carried out, this model can be built [20]. There are two actors, namely;

Admin, (held by staff) can login, view data, add data, change data, delete data, search data, (on the transaction menu. Profile and data management) view logs, print reports, view users, edit users, add users, and delete users and logout.

Owner, (held by owner). Figure 5 shows the use case diagram of the Khandiq Convection system that the author has developed.

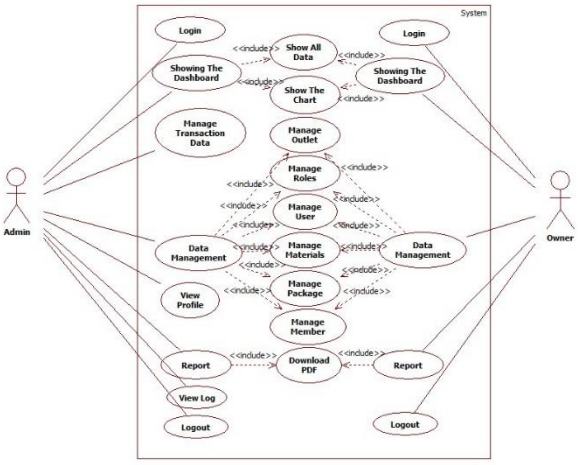

Figure 5. Use Case Diagram

4.2.4. Website Page

Here is a preview of the Khandiq Convection information system. Will be describe about this system.

Home page or main page is the initial interface when customers want to know Khandiq Convection, both products, addresses or numbers that can be contacted for ordering. This page has several navbars

or navigation bars.

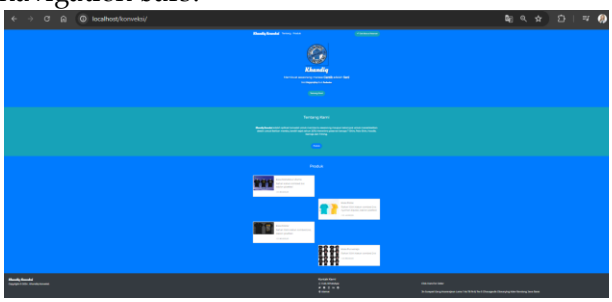

Figure 6. Home Page Display

This page can be seen in Figure 6. Navbar is a component in the website in the form of a menu and is usually found in the header of the website. The navbar on this page includes: about, products, check order status. besides the navbar there is a footer containing the address of the Khandiq convection outlet.

Based on Figure 7, the login page requires the admin to input identification information such as username and password to be allowed to access the convection system.

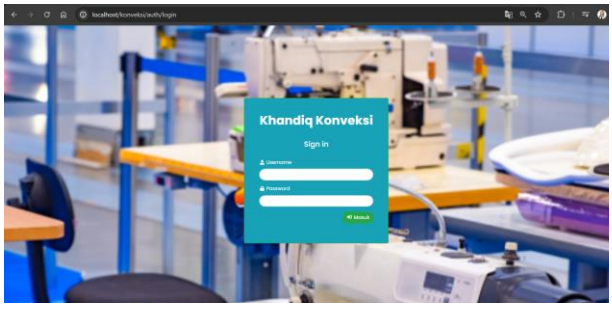

Figure 7. Login Display

On this page, based Figure 7 the admin can make data modifications and even reset the password.

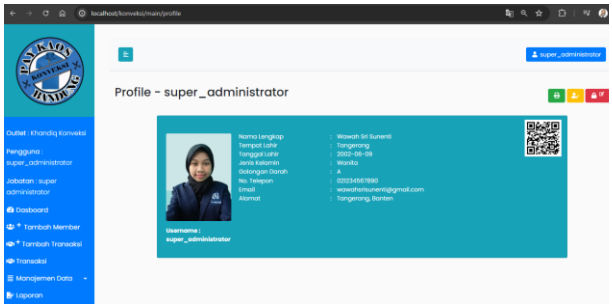

Figure 8. Profile Display

As shown in Figure 8, besides being able to view profile data on the page, we can also delete and print profile data.

Dashboard menu, this page will be displayed if the admin does login first. On this page the chart or statistics displayed are statistics on the number of transactions during the week as well as customers who often order.

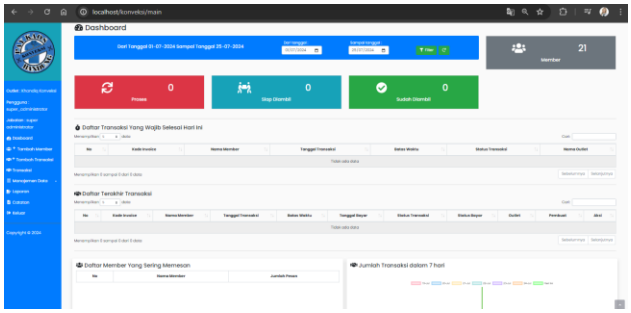

Figure 9. Dashboard Display

Based on Figure 9, there is also a table containing a list of orders that must be processed on that day on the dashboard page.

On the add member page based on Figure 10, the admin can add, view and search data. so that the content on this page will be recorded in the system for filling in the add transaction page.

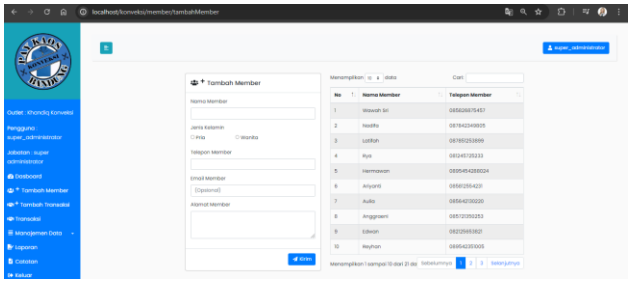

Figure 10. Member & Transaction Menu

On the add transaction page there is an additional fee form for either postage or administrative fees, discounts and tax fees for each outlet.

Based Figure 11, this page contains transaction records with CRUD (Create, Read, Update and Delete) operations.

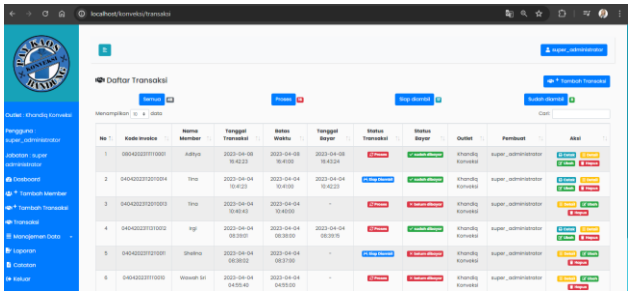

Figure 11. Management Data Menu

In Figure 11, this page consists of 11 columns where there are 3 transaction conditions, and 2 payment conditions.

All transaction data submitted by the admin. In addition, there is a data download in pdf format which is used to help the admin in the process of recapitulating data. In Figure 12, there is also a list of orders in tabular form displayed on this page.

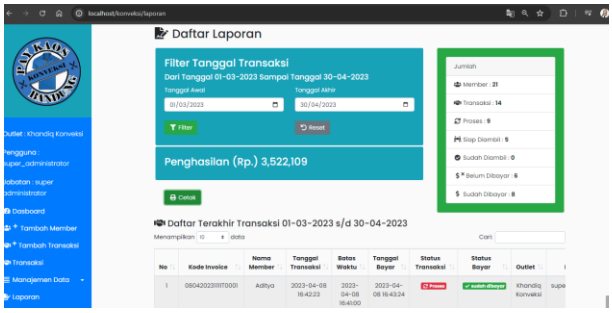

Figure 12. Report Menu

In checking order status to access this page, customers must first open the home page.

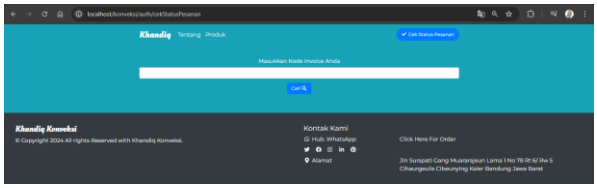

Figure 13. Check Order Status

In Figure 13, there is an invoice code form that is informed from the admin. Thus, this invoice code makes it easier for customers to track the progress of their orders at Khandiq Convection.

On Histosy page, all usage history that has been done by this user is stored on the history page, on the display of the page is in the form of a table and already contains history that has been done by the user.

On Log out page, the user clicks the logout button on the system. Then, the user will exit the system and return to the login page, then the user will not have access to pages or data that require authentication unless they log in again.

4.2.5. System Testing

Based on Febiharsa et al (2018), Blackbox testing is a software testing technique that checks the functionality of an application without observing its internal structure or how it works. This method focuses on testing the input and output of the application and can be applied at various levels of software testing, including unit, integration, system, and acceptance [21].

In our research, we conducted Blackbox testing by involving three experts specializing in software testing. Each expert evaluated different stages of the system testing process to ensure comprehensive coverage. The experts were responsible for the following stages:

Unit Testing has One expert focused on testing individual components to verify that each module operates correctly in isolation.

Integration Testing has Another expert assessed the interaction between integrated units to ensure they work together as expected.

System and Acceptance Testing is the third expert performed thorough testing on the complete system to validate its functionality against the specified requirements and to ensure the system meets user expectations.

Table 3. Black-Box Testing

Test Class	Input	Output	Results
Login	Email and Password are correct	Go to the dashboard or home page based on role.	Success
	Incorrect Email and Password	Return to the login page with an alert	Success
Profile	Displays the profile menu, with buttons to print profile, edit profile, view profile, and change password.	The system successfully displays profile, print profile, edit profile, view profile, and change password.	Success
Transaksi	Displays transaksi data with buttons to add transaksi , edit transaksi , view transaksi list, and delete transaksi.	The system successfully displays transaksi data, add transaksi, edit transaksi , view transaksi , and delete transaksi functions.	Success
Outlet	Displays outlet data with buttons to add outlets, edit outlets, view outlet list, and delete outlets.	The system successfully displays outlet data, add outlet , edit outlet, view outlet, and delete outlet functions.	Success
Roles	Displays roles data with buttons to add roles, edit roles, view roles list, and delete roles.	The system successfully displays roles data, add roles, edit roles , view roles, and delete roles functions.	Success
Pengguna	Displays pengguna data with buttons to add pengguna, edit pengguna, view pengguna lists, and delete pengguna.	The system successfully displays pengguna data, add pengguna, edit pengguna, view pengguna, and delete pengguna functions.	Success

Test Class	Input	Output	Results
Jenis Bahan	Displays jenis bahan data with buttons to add jenis bahan , edit jenis bahan, view jenis bahan lists, and delete jenis bahan.	The system successfully displays jenis bahan data, add jenis bahan, edit jenis bahan, view jenis bahan, and delete jenis bahan functions.	Success
Paket	Displays paket data with buttons to add paket , edit paket , view paket lists, and delete paket.	The system successfully displays paket data, add paket, edit paket, view paket, and delete paket.	Success
Member	Displays member data with buttons to add members, edit members, view member lists, and delete members.	The system successfully displays member data, add member, edit member, view member, and delete	Success
Cetak	Pressing the export data button	Downloading files in pdf format	Success
Logout	The user clicks the logout button on the system.	The user will exit the system and return to the login page.	Success

5. CONCLUSION

The author's research concluded that the web-based information system designed for Khandiq Convection aligns with their requirements. The system was subjected to black-box testing, yielding appropriate results and functioning as intended. Additionally, the system has proven beneficial for Khandiq Convection, particularly by simplifying the processes of data recording and reporting. Based on the system design created, it is important to acknowledge some existing shortcomings. One such issue is the need for a payment gateway to allow automatic verification of orders. Additionally, there is a requirement for a notification feature to alert users about orders that remain unprocessed.

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