

Superdough Inventory Web-based System

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Abstract: Inventory is a very extensive asset for the company since it is one of the main sources of revenue generation and subsequent earnings for the company's shareholders represented by the turnover of inventory. However, Superdough Bakery's records their stock manually for daily, weekly, and monthly in a logbook which this can lead to a high probability to record stocks and quantities incorrectly. Moreover, they need to manually check which materials are low in stock since the logbook only displays a list of materials and it does not provide a notification to the admin and staff. Therefore, Superdough Inventory System is proposed to overcome the problem by helping the owner and staff of the bakery to record the stock systematically through low stock material and expense reports. It can also help in managing supplier details. This system is designed based on an object-oriented approach and waterfall methodology which contains seven modules.

Keywords: Inventory, Stock, Material, Web-Based System

1. Introduction

Superdough Bakery is located at Jalan Mahmood, Kota Bharu, Kelantan and managed by the owner of the bakery, Mr.Syahmi Amin. The bakery sells a variety of coffees and pastries that are freshly baked by the bakery. The bakery records their stock manually for daily, weekly, and monthly in a logbook which this can lead to a high probability to record stocks and quantities incorrectly. Moreover, the workload of the staff has increased as they need to always check and record the stock. Another downside is that they need to manually check which materials are low in stock since the logbook just displays a list of materials and it does not provide a notification to the staff when materials are no longer left. This may cause the manager not to be able to order raw materials in a timely manner, resulting in certain menus being temporarily unavailable and causing a loss to business. Besides, the owner may face some difficulties in managing suppliers manually which it might be challenging to find the specific supplier details between tons of suppliers' list when want to order raw materials.

Therefore, Superdough Inventory System (SDI) is proposed to overcome the problem by helping the owner and staff of the bakery to record the stock daily, weekly, and monthly systematically. It also can help the bakery's owner in managing staff and supplier details. This system's objectives are to design and develop an inventory system for Superdough Bakery that helps in managing stock

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ingredients. It is also to evaluate the efficiency of the developed system. There are two users for this system which are admin and staff of the bakery where each of it contains seven and four modules respectively. Admin's modules include user registration, manage supplier, used material, material registration, material's category registration, profile, and report. Meanwhile, staff modules like admin's but excluding the report, manage supplier, and user registration modules.

This article is organized into six sections. The first part is an introduction describing the context of the project. The second section describes the literature review of the related work and existing systems. Next, the methodology used to develop the application is explained in Section 3. Then, section four describes the system analysis and design. The fifth section explains about the result and discussion. Lastly, the last section concludes the current work and highlights some instructions for future work.

2. Related Work

This section discusses literature review and all the related works collected to develop the proposed system.

2.1 Zoho Inventory System

Zoho Inventory is a cloud-based inventory management solution designed for small to midsize businesses. With its mobile app, Zoho is the perfect option for business owners who work on the move. Users get several inventory capabilities with Zoho Inventory's free plan that makes controlling the inventory simpler. It features inventory management including kitting and packaging options, low stock warnings, and payment gateways. In addition, Zoho Inventory is an excellent option for organizations that require assistance monitoring their inventory levels. It provides real-time tracking and notifications to assist businesses in keeping track of stock levels and avoiding stockouts [1].

2.2 SalesBinder Inventory System

SalesBinder is the most user-friendly, configurable, contemporary web-based inventory system. As a single integrated system, users can keep everything organized in real-time, including client accounts, prospects, purchase orders, estimates, invoices, and much more. Besides, it provides sophisticated inventory recording and monitoring tools, as well as excellent sales and CRM features. Its premium plan also supports integrations and offers the number of monthly records that may be counted as inventory items, accounts, or orders [2]. Its user-friendly interface also allows for extensive customization, allowing users to make it operate exactly the way they need it to, no matter where the users are on the globe.

2.3 Sortly Inventory System

Sortly is a cloud-based inventory management platform that caters to the needs of small businesses which includes features like activity tracking, multi-location tracking, barcoding, and audit trails. The multi-location monitoring tool also allows users to track several inventory locations, allowing them to know what things need to be restocked. Furthermore, it also provides offline mobile access and will immediately sync as soon as users are back online, so users can scan incoming and outgoing inventory even if their phone app does not have a signal.

2.4 Comparison with the Existing Systems

In the development of the Superdough Inventory System, the comparison table for three existing systems is made. The purpose of the study is to identify the advantages and disadvantages of the existing systems to use them as a reference when developing the system. The three existing related systems that have been chosen are Zoho Inventory System, SalesBinder Inventory System and Sortly Inventory System. The comparison of the existing system with the proposed system is shown in Table 1.

Table 1: System comparison

System / Features	Zoho Inventory System	SalesBinder Inventory System	Sortly Inventory System	Superdough Inventory System
Maximum item	Unlimited	100	100	Unlimited
Notification	/	/	/	/
Real-time tracking	/	/	/	/
Web-based	X	/	X	/
Product variations	/	/	/	/
Expense report	/	/	/	/
Low stock alert	/	/	/	/
Available material in inventory report	/	/	/	/
Most used material report	X	X	X	/
Supplier details	/	/	/	/

Based on Table 1, the Zoho Inventory System and SDI System allow unlimited items into inventory. Besides, all the systems provide real-time tracking, product variation, expense report, and low stock report. Furthermore, Zoho and Sortly Inventory System is not a web-based system instead, both of it are cloud-based system. The advantage of SDI system is it can generate reports based on most used material.

3. Methodology

The Waterfall model was chosen as the Software Development Life Cycle (SDLC) methodology used in this project since it sets requirement stability [3]. It consists of 5 phases which are analysis, design, implementation, testing and maintenance [4]. Since the waterfall approach does not allow for revisiting a previous phase, the discrete phases indicate how far a project is to overall completion at any given time. Therefore, project implementation should be conducted sequentially to this methodology phase. Table 2 presents the activities and the deliverable output in each phase during the software development life cycle in the project.

Table 2: Software development activities and the output

Phase	Activities	Output
-------	------------	--------

Analysis	<ul style="list-style-type: none"> Proposed the project. Conduct interview. Identify project objectives, problem statement, scope, and possible solution. Determine project schedule. 	<ul style="list-style-type: none"> Project proposal Gantt Chart System requirements UML use case diagram and specification
Design	<ul style="list-style-type: none"> Design user interface Design database 	<ul style="list-style-type: none"> Wireframe. Database design
Implementation	<ul style="list-style-type: none"> Start the coding. Connect interface with database. 	<ul style="list-style-type: none"> SDI system.
Testing	<ul style="list-style-type: none"> Conduct functionality, interoperability, security, usability, and scalability testing. 	<ul style="list-style-type: none"> Test Cases Test Report Results SDI system ready to be launched.
Maintenance	<ul style="list-style-type: none"> Monitor the system. Upgrade system if needed. Troubleshoot any error. 	<ul style="list-style-type: none"> SDI system function smoothly and safely.

4. System Analysis and Design

System design is essential in giving preparation of necessary data for developing systems such as input and output form. In system design, it also will explain about the flow of system by using a diagram such as use context diagram, data flow diagram, entity relationship diagram and flowchart. The purpose of system design is to give early illustrations to develop a real system.

4.1 System Requirement Analysis

The system requirements analysis's goal is to structure the system in a way that is independent of the implementation environment. This stage can establish the behavior and constraints of the system. Furthermore, the functional requirements are those that related to how the software system functions and are logically simple to understand and applied [5]. Table 3 shows the system functional requirements.

Table 3: Functional Requirements based on the system module

Module	Description
User registration	<ul style="list-style-type: none"> The system should allow the admin to register user's details to use the system.
Log in	<ul style="list-style-type: none"> The system should allow the admin and staff to log into them account by filling in the required email and password correctly. The system can detect whether user enter right or wrong username

Table 3: (cont)

	and password.
Material registration	<ul style="list-style-type: none"> The system should allow the user to add, delete, update, and read

		inventory details.
	•	The system should allow users to view inventory details.
Report	•	The system should generate most used material report based on selected date by user.
	•	The system should generate reports for available material in the inventory.
	•	The system should generate expense report based on selected.date by user.
	•	The system should generate low stock material report.
Manage supplier	•	The system should allow the admin to register supplier's details to use the system.
Material's category registration	•	The system should allow the user to add, delete, update, and view category details for the material.
Profile	•	The system should display profile details of user.
	•	The system should allow user to upload their profile image.

Non-functional requirements are limitations placed on the system that are employed to evaluate it. It also refers to quality features that users and other stakeholders regard as essential qualities, and they are seen as limitations on the structural elements of the system integration [5]. Table 4 shows the system non-functional requirements.

Table 4: Non-functional requirements

Requirements	Description
Availability	• The system can be access 24/7 except for scheduled maintenance.
Performance	• The appropriate error message will be displayed if there is unknown request. • The web pages required few seconds to load.
Security	• Only registered user can access into the system. • Only user with valid login credentials can log into the system. • Only admin can access into user registration, manage supplier, and report modules.
Capacity	• The system allows maximum unlimited items in the inventory. • The system allows maximum unlimited suppliers in the system.
Operational	• The system should be available only if there is Internet connection
Usability	• The system should provide a user-friendly interface to the user, ease to use and provide a real-time tracking of the inventory.

4.2 Context Diagram

Context diagram illustrates the scope of the system [6]. A visual representation called a context diagram makes the interfaces and boundaries of a project or process clear. Data flows, entities, processes, and data stores make up the context diagram. It displays not only how context is created, but

also how users interact with one another. Figure 1 shows a context diagram for the Superdough Inventory System.

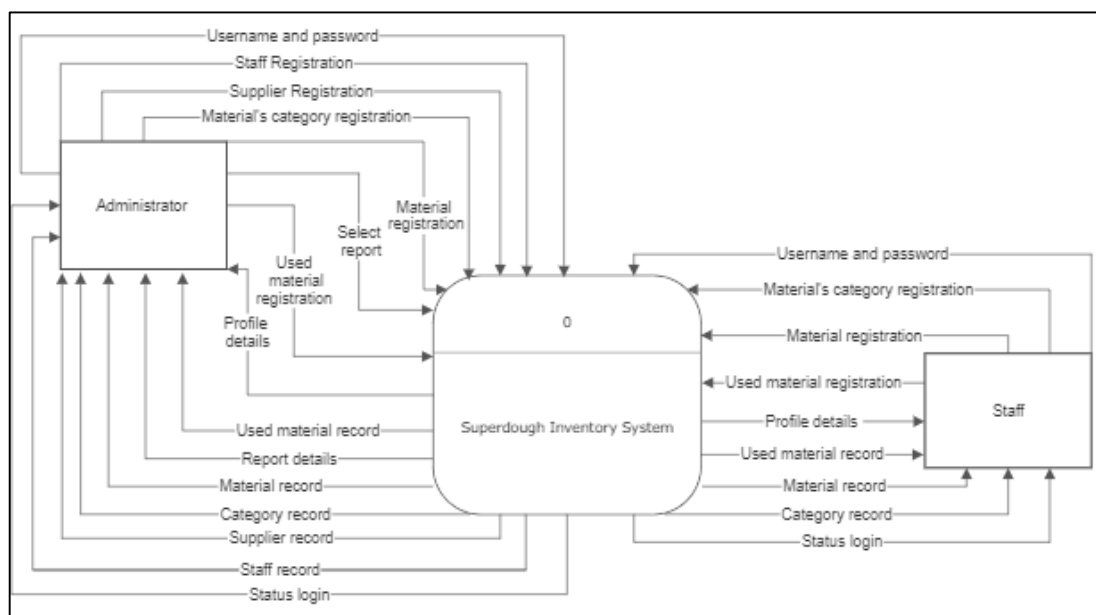


Figure 1: Context Diagram for Superdough Inventory System

Based on Figure 1, there are two types of users such as administrator and staff that are involved in the developed system. Admin allows us to manage the inventory system. Admin can also generate, and view report based the selected date. Furthermore, to manage the inventory details, the administrator needs to insert a valid username and password. Admin also responsible for registration of the staff and supplier. Besides, staff can register material and used material through the system. Staff can also view their profile details.

4.3 Data Flow Diagram (DFD)

A data flow diagram (DFD) shows how information moves through a system graphically. DFD often serves as the first stage in creating a system overview. It displays the flow of data into and out of the system. DFD of Superdough Inventory System is listed in **Appendix A**. The DFD for the input for process 1.0 (login) and process 2.0 (user registration) will be stored in user database. Furthermore, supplier data for process 3.0 (manage supplier) will be stored in suppliers database meanwhile category data for process 4.0 (material's category registration) will be stored in category database. Moreover, for the generation of report the data will be fetch from material and used material database.

4.4 Entity Relationship Diagram (ERD)

The connections between entity sets that are kept in a database are shown in an ERD. An entity represents an object or a data component in this sense. A collection of similar entities is known as an entity set. These items might have features that characterize them. In this system, both one to one or many and one to zero or many relationships are used. For example, an administrator can add one or many suppliers, while a supplier has one or many materials supplied. Figure 3 depicts the ERD of the SDI system.

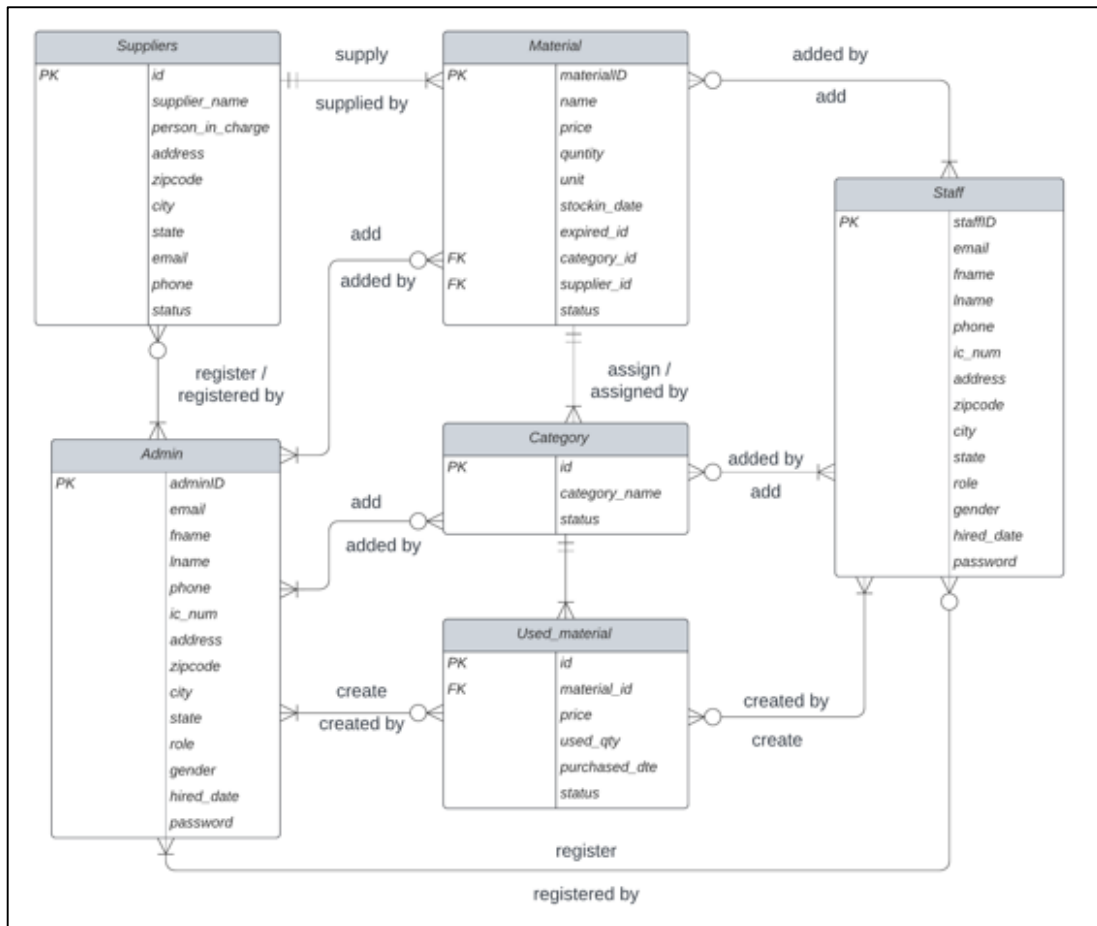


Figure 3: Entity Relationship Diagram for Superdough Inventory System

Based on Figure 3 above, at least one or many staff can add zero or many materials like admin. Besides, admin can register none or many suppliers. Moreover, one or many categories can be assigned to only one material meanwhile only one category can be assigned to one or many used materials.

4.5 Flowchart Diagram

An adaptable tool for expressing a system's actions and the internal logic of complicated processes is a flowchart [7]. It is designed as a model to show how the various tasks fit together to provide a service. It can also demonstrate the conditions needed to carry out specific tasks and how they connect to one another. Each user can access the system on their own. Figure 4 and Figure 5 show the flowchart of the system for the admin and staff respectively.

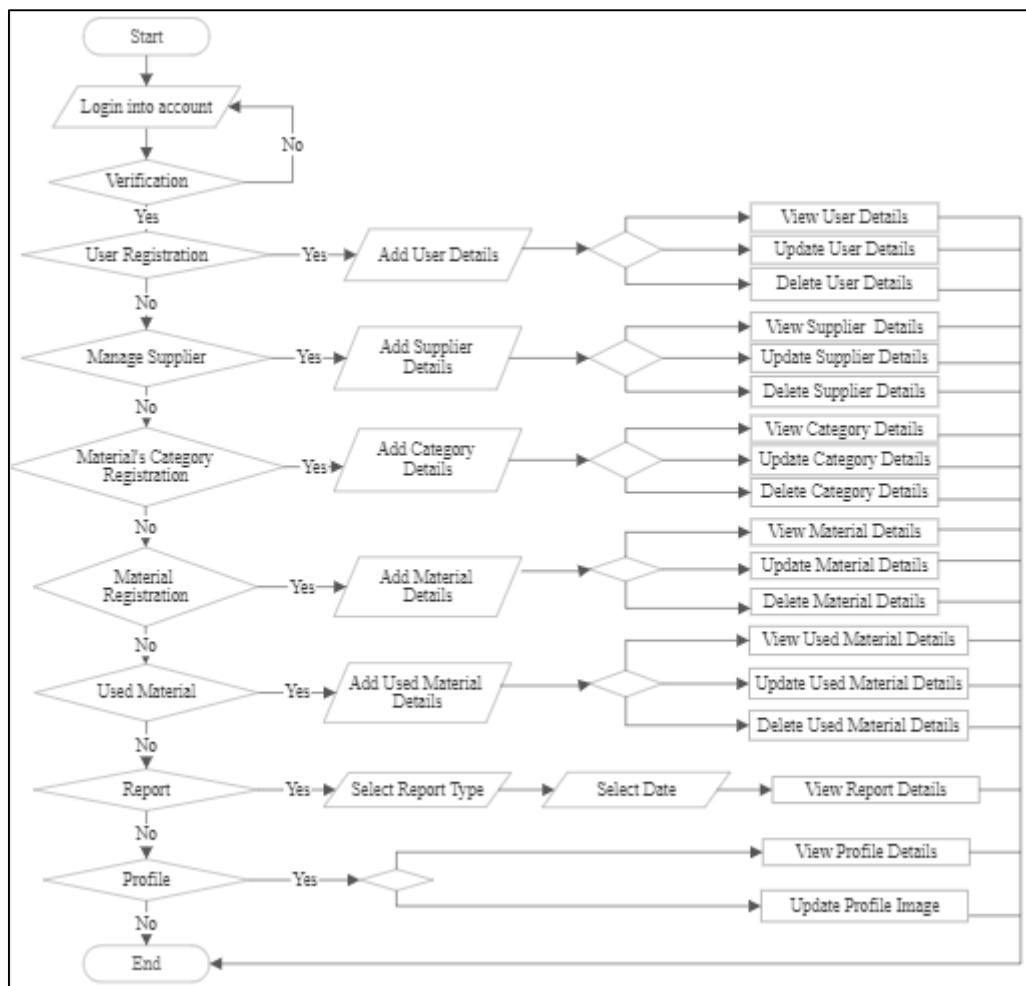


Figure 4: Admin flowchart of SDI

Based on Figure 4, firstly admin needs to login into the system. Once the login is successful, the admin can access all modules in the system. For user registration, manage supplier, material’s category registration, material registration, and used material, admin can add, update, delete and view the details of each module. For reports, admin can select reports to be generated based on selected date. Meanwhile, for profile module admin can view profile and update profile image.

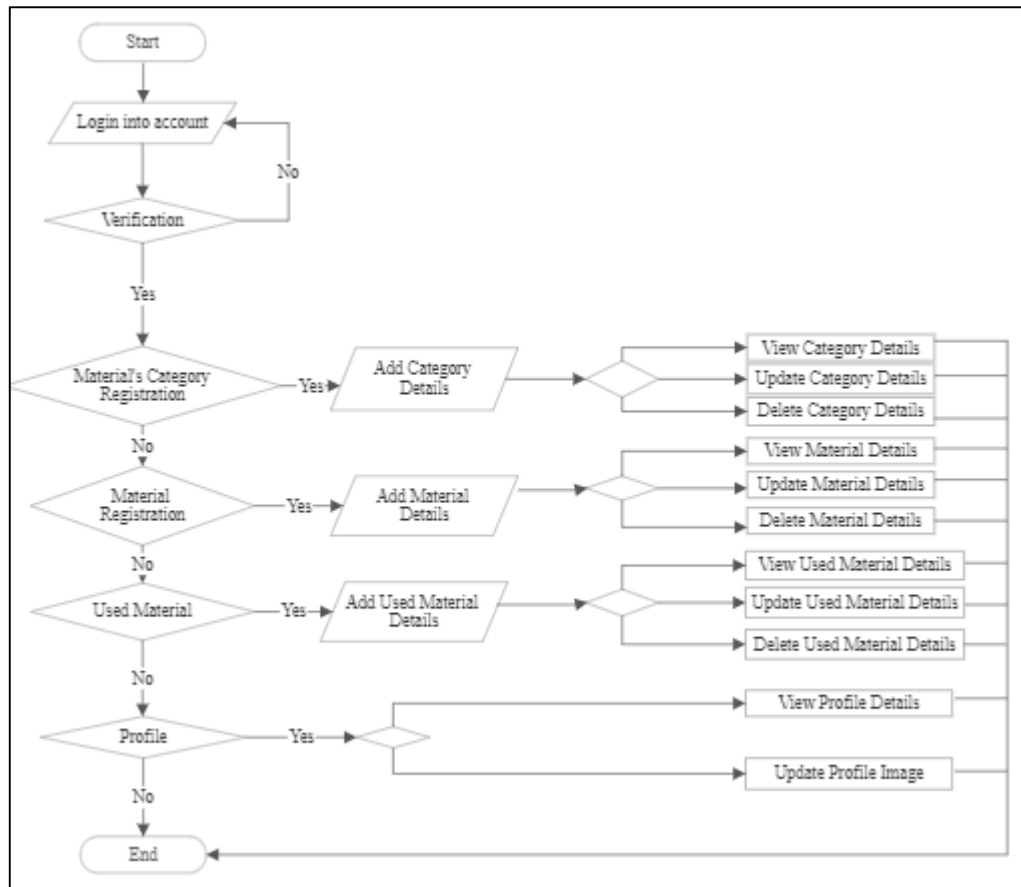


Figure 5: Staff flowchart of SDI

Based on Figure 5, firstly staff need to login into the system. Once the login is successful, the staff can access all modules in the system. For material's category registration, used material and material registration, staff can add, update, delete and view the details of each module. Meanwhile, for the profile module staff can view and update profile images.

5. Result and Discussion

The process of implementing a system is centered on how the system should be constructed and on making sure the system complies with quality standards. The creation of programmers that are used in the system's programming is necessary for system development. In addition, database development is a part of it. The goal of the testing process is to confirm that it can operate flawlessly and that every function complies with user demands and requirements. After the system is set to be developed and deployed for all users, the testing procedure is introduced to selected users. The test unit, integration system, and testing are the three general testing steps that were covered in this chapter.

5.1 System Implementation

The Visual Studio Code, which uses the Hypertext Preprocessor (PHP) programming language, was used to develop the Superdough Inventory System (SDI). A MySQL administration tool called phpMyAdmin is available from any web-enabled device. It was made in PHP, which is also what was utilized to make the front-end system. In addition, the PHP programming language, HyperText Markup Language (HTML), Cascading Style Sheets (CSS), and JavaScript were used to create the web based Superdough Inventory System. The phpMyAdmin database server and web server will host the database. Aside from that, the front end of a web-based system is created using the programming languages HTML and CSS, which are both markup languages. The administrator and staff records are kept in MySQL.

5.1.1 User Interface

The login page for the SDI system is shown in Figure 6. The user will use their username and password to log into the system. Figure 7 depicts the code section for the user login.

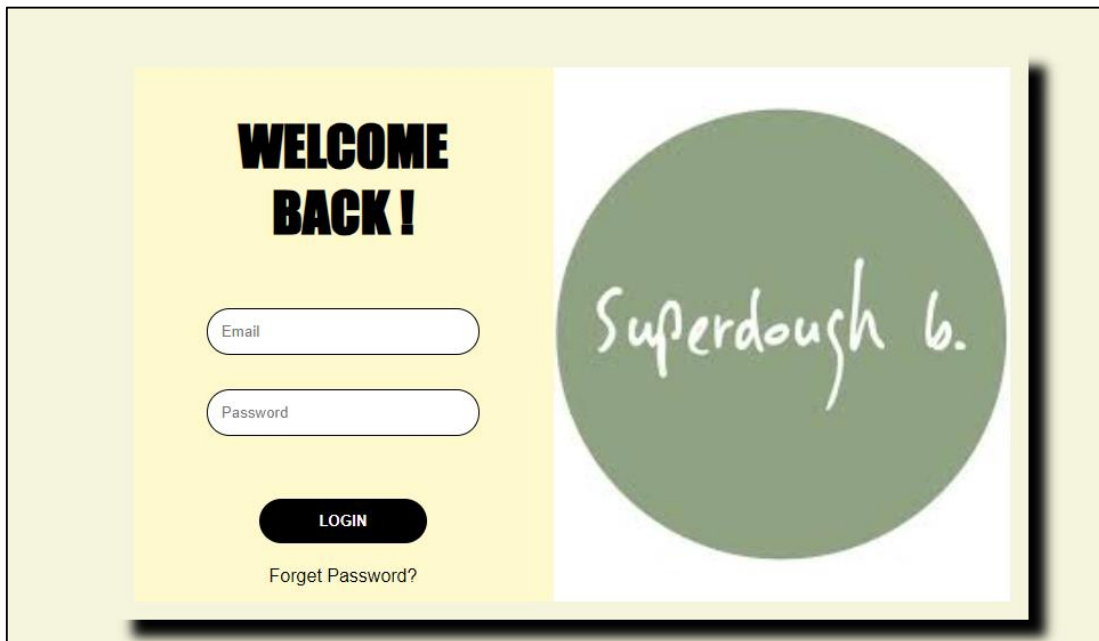


Figure 6: User Login

```

1 <?php
2 include "../php/codelogin.php";
3 ?>
4
5 <!DOCTYPE html>
6 <html lang="en">
7 <head>
8   <meta charset="UTF-8">
9   <meta name="viewport" content="width=device-width, initial-scale=1.0">
10  <title>Login Form</title>
11  <link rel="stylesheet" href="../css/style.css">
12 </head>
13 <body>
14   <div class="container" style="color:black;width:800px">
15     <form action="../php/codelogin.php" class="form" method="POST">
16       <h2>WELCOME BACK !</h2>
17
18       <?php if(isset($_GET['error'])) { ?>
19         <div class="alert alert-danger" role="alert">
20           <?=$_GET['error'] ?>
21         </div>
22       <?php ?>
23
24       <input type="email" name="email" class="box" placeholder="Email" required>
25       <input type="password" name="password" class="box" placeholder="Password" pattern="(?!.*\d)(?=.*[a-z])(?=.*[A-Z]).{8,}" required>
26       <input type="submit" name="btnLogin" value="LOGIN" id="submit">
27
28       <a href="#">Forget Password?</a>
29     </form>
30   <div class="side" style="width: 400px;">
31     
32   </div>
33 </div>
34 </body>
35 </html>

```

Figure 7: Code segment for user login

Each user has their own dashboard. Figure 8 displays the interface of admin’s dashboard, and Figure 9 shows the interface of staff’s dashboard.

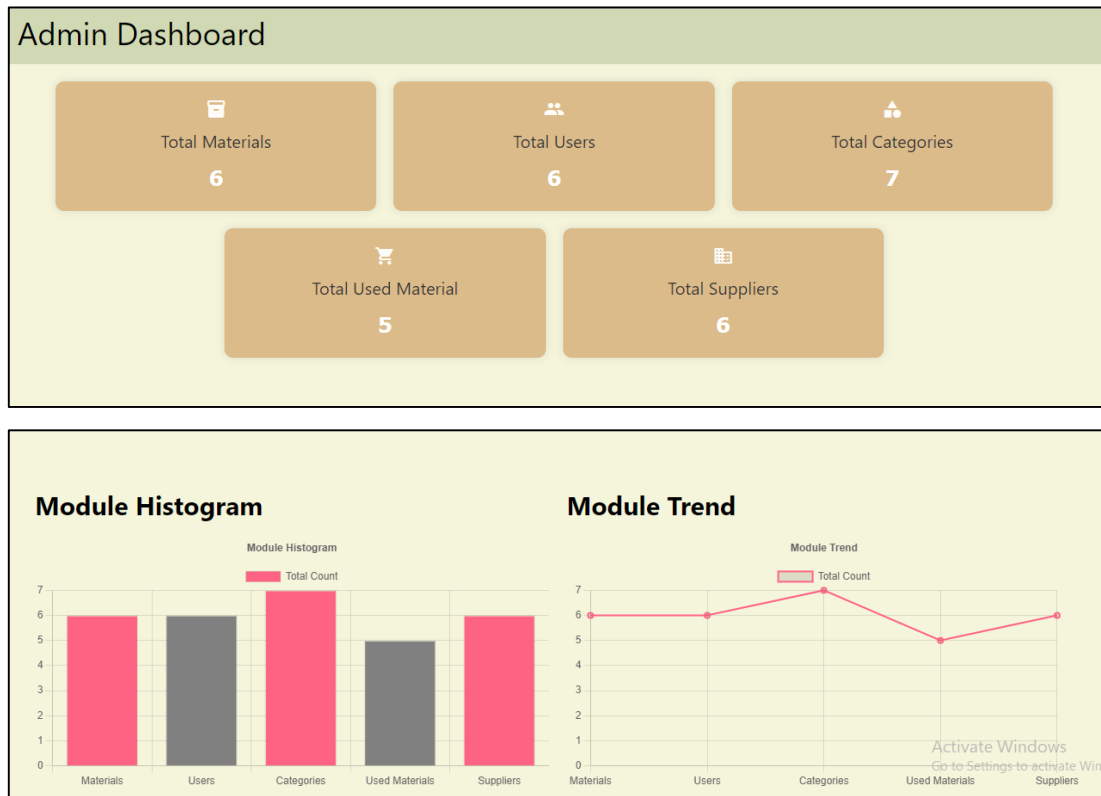


Figure 8: Interface of admin’s dashboard

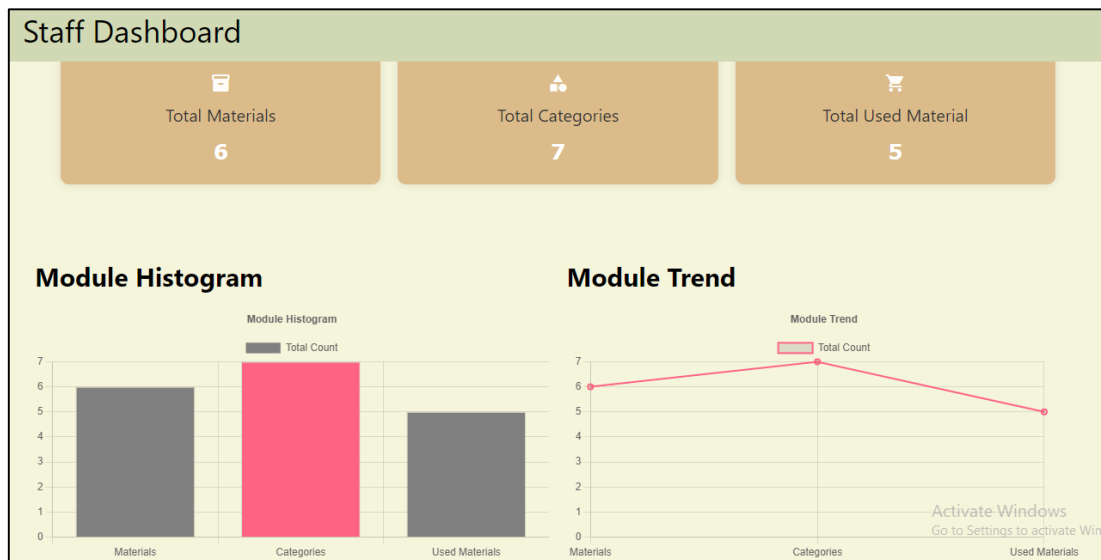


Figure 9: Interface of staff’s dashboard

The user registration module is only accessible by the administrator. Figure 10 displays the interface of user registration module, and Figure 11 shows the code of the module for CRUD process.

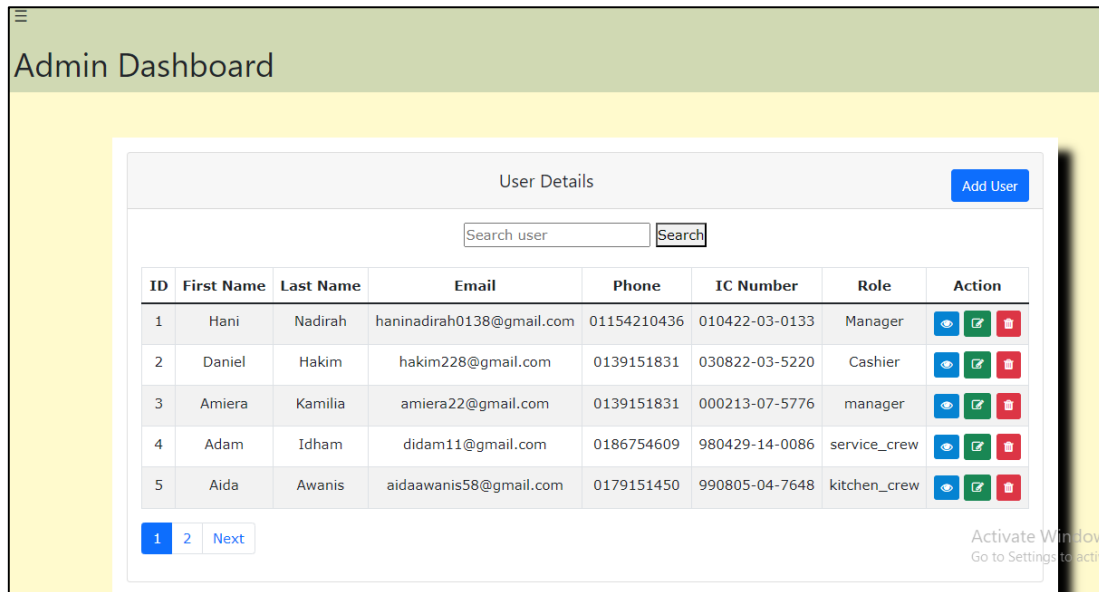


Figure 10: User registration interface

```

1  <?php
2  session_start();
3  require '../php/dbcon.php';
4
5  if(isset($_POST['delete_user']))
6  {
7      $user_id = mysqli_real_escape_string($con, $_POST['delete_user']);
8
9      $query = "DELETE FROM user WHERE id='$user_id' ";
10     $query_run = mysqli_query($con, $query);
11
12     if($query_run)
13     {
14         $_SESSION['message'] = "User Deleted Successfully";
15         header("Location: ../php/userlist.php");
16         exit(0);
17     }
18     else
19     {
20         $_SESSION['message'] = "User Not Deleted";
21         header("Location: ../php/userlist.php");
22         exit(0);
23     }
24 }
25

```

```

1  <?php
2  session_start();
3  require '../php/dbcon.php';
4
5  if(isset($_POST['delete_user']))
6  {
7      $user_id = mysqli_real_escape_string($con, $_POST['delete_user']);
8
9      $query = "DELETE FROM user WHERE id='$user_id' ";
10     $query_run = mysqli_query($con, $query);
11
12     if($query_run)
13     {
14         $_SESSION['message'] = "User Deleted Successfully";
15         header("Location: ../php/userlist.php");
16         exit(0);
17     }
18     else
19     {
20         $_SESSION['message'] = "User Not Deleted";
21         header("Location: ../php/userlist.php");
22         exit(0);
23     }
24 }
25

```

```

62
63 if(isset($_POST['save_user']))
64 {
65     $fname = mysqli_real_escape_string($con, $_POST['fname']);
66     $lname = mysqli_real_escape_string($con, $_POST['lname']);
67     $email = mysqli_real_escape_string($con, $_POST['email']);
68     $gender = mysqli_real_escape_string($con, $_POST['gender']);
69     $phone = mysqli_real_escape_string($con, $_POST['phone']);
70     $ic_num = mysqli_real_escape_string($con, $_POST['ic_num']);
71     $address = mysqli_real_escape_string($con, $_POST['address']);
72     $zipcode = mysqli_real_escape_string($con, $_POST['zipcode']);
73     $city = mysqli_real_escape_string($con, $_POST['city']);
74     $state = mysqli_real_escape_string($con, $_POST['state']);
75     $hired_date = mysqli_real_escape_string($con, $_POST['hired_date']);
76     $password = mysqli_real_escape_string($con, $_POST['password']);
77     $role = mysqli_real_escape_string($con, $_POST['role']);
78     $query = "INSERT INTO `user` (`email`, `fname`, `lname`, `phone`, `ic_num`, `address`, `zipcode`, `city`, `state`, `role`, `gender`, `hired_date`, `password`)
79     | VALUES ('$email', '$fname', '$lname', '$phone', '$ic_num', '$address', '$zipcode', '$city', '$state', '$role', '$gender', '$hired_date', '$password')";
80     $query_run = mysqli_query($con, $query);
81
82     if($query_run)
83     {
84         $_SESSION['message'] = "User Created Successfully";
85         header("Location: ../php/userlist.php");
86         exit(0);
87     }
88     else
89     {
90         $_SESSION['message'] = "User Not Created";
91         header("Location: ../php/userlist.php");
92         exit(0);
93     }
94 }
95
96
97 ?>

```

Figure 11: Code segment for user registration CRUD process

The report module can be accessed by admin only. Figure 12 displays the low stock material report interface which is material name and current available quantity in stock (kg) meanwhile Figure 13 shows code segment for low stock material report.

☰

Admin Dashboard

Select Report:

Low Stock Material ▼

Low Stock Material

Low Stock Materials

Material Name	Quantity in Stock (kg)
Mocha Powder	2.0

Print Report

Figure 12: Low stock material interface report

```

205 function generateLowStockReport() {
206     global $con;
207
208     echo "<br>";
209     echo "<h2><b>Low Stock Material</b>";
210
211     $query_low_stock = "SELECT name, quantity
212                       FROM material
213                       WHERE status != '2' AND quantity < 4
214                       ORDER BY quantity ASC";
215     $result_low_stock = mysqli_query($con, $query_low_stock);
216
217     // Check if any low stock materials were found
218     if (mysqli_num_rows($result_low_stock) > 0) {
219         echo "<h2 style='font-weight:bold;color:red;'>Low Stock Materials</h2>";
220         echo "<br>";
221         echo "<table class='table'>";
222         echo "<thead><tr><th style='border: 1px solid black;background-color: #dbbb8a;'>Material Name</th>
223             <th style='border: 1px solid black;background-color: #dbbb8a;'>Quantity in Stock (kg)</th></tr></thead>";
224         echo "<tbody>";
225         while ($row_low_stock = mysqli_fetch_assoc($result_low_stock)) {
226             echo "<tr><td style='color:red;border: 1px solid black;background-color: beige;' . $row_low_stock['name'] . "</td>
227                 <td style='color:red;border: 1px solid black;background-color: beige;' . number_format($row_low_stock['quantity'], 1) . "</td></tr>";
228         }
229         echo "</tbody></table>";
230
231         // Add a print button
232         echo "<br>";
233         echo "<button class='report-button' onclick='window.print()'>Print Report</button>";
234     } else {
235         echo "<p>No low stock materials found.</p>";
236     }
237 }
238
239

```

Figure 13: Code segment for low stock material report

Based on Figure 14 below, the expense report interface displays material name and total cost (RM).

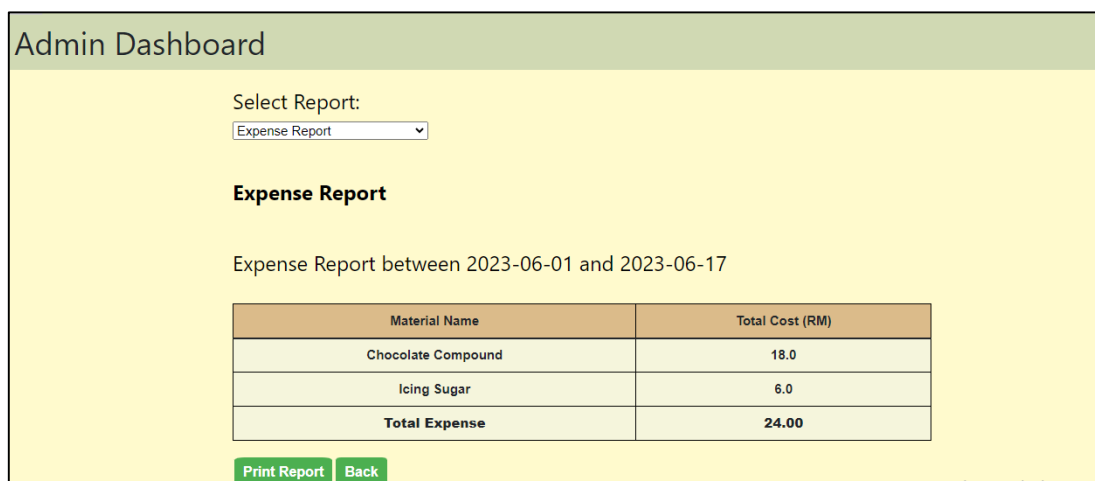


Figure 14: Expense interface report

5.2 Functional Testing

Functional testing runs tests in accordance with test cases, which are divided up according to modules. Each of the functional parts of the system is put through functional testing by the system developer. Finding the functional modules that need to be tested, producing input data for the function being tested, predicting the ideal system output, running the test case, comparing the expected output with the actual system output, and finally changing the system code if errors are discovered or the ideal system output differs from the expected system output are all steps in the functional testing process. Functional tests are carried out by the developer to determine if the developed system achieved the requirements or not. This testing was tested based on the test plan and the results were listed in Table 5 until Table 6.

Table 5: Functional test category of the SDI

Test Category	Description
1	<ul style="list-style-type: none"> Test the functionality of the proposed system by admin.
2	<ul style="list-style-type: none"> Test the functionality of the proposed system by staff.

Table 6: Software development activities and the output

Module	Test Category	Description	Expected Result	Actual Result
Login	1,2	Login into system: 1. Insert username 2. Insert password 3. Click login button	1. System log the user in if the input is valid, else it should display error message and cannot log the user in.	Pass
User Registration	1	Manage user: 1.Add/view/update/delete user details.	1.Pop up message will appear if user details are successfully added/updated/deleted. 2.User details are deleted from the database after clicking on the confirmation message.	Pass
Manage Supplier	1	Manage supplier: 1.Add/view/update/delete supplier details.	Pop up message will appear if supplier details are successfully added/updated/deleted. 2.Supplier details are deleted from the database after clicking on the confirmation message.	Pass
Profile	1,2	View user profile: 1.User need to click on the profile module if they want to view their profile. 2.If user wants to add profile image, click on the choose image button, then upload image button.	1.User profile will be displayed automatically. 2. Default profile image will be displayed if user click on the “reset image” button.	Pass

Table 6: (cont)

Material's Category Registration	1,2	Manage category: 1.Add/view/update/ delete category details.	1. Pop up message will appear if category details are successfully added/updated/deleted. 2.Category details are deleted from the database after clicking on the confirmation message.	Pass
Used Material Registration	1,2	Manage used material: 1.Add/view/update/delete used material details.	1. Pop up message will appear if used material details are successfully added/updated/deleted. 2.Used material details are deleted from the database after clicking on the confirmation message.	Pass
Material Registration	1,2	Manage material: 1.Add/view/update/delete material details.	1. Pop up message will appear if material details are successfully added/updated/deleted. 2.Material details are deleted from the database after clicking on the confirmation message.	Pass
Report	1	View low-stock material/ Most used material/ available material in the inventory/expense report: 1.Select report to be generated. 2.Select start date and end date. 2.Click generate button	1.Pop up alert message will be displayed if user did not select the date. 2.Report will be displayed once the user successfully input correct data and click on search button.	Pass

6. Conclusion

In conclusion, Superdough Inventory System (SDI) is developed to help Superdough Bakery to improve their stock system drastically that will help to smooth the business even more. This system helps to cover everything needed so that the business can still operate in the toughest times. In addition, the inventory system is to help the bakery manage their stock ingredients as it is the most crucial thing to be able to operate. However, there are some limitations of this system such as the system does not provide user a push notification for the material that is going to expire. The bakery will face losses since some of the menus are temporarily unavailable due to shortage of the ingredients. Furthermore, the system does not provide two factor authentication for better security such as through email, or Transaction Authorisation Code (TAC) via mobile. Hence, some recommendations of improvement in the future can be made such as a push notification of material expiring soon should be placed at the dashboard, or it can be included in the report module so it can easily alert the user. In addition, some improvement must be considered in terms of the security of the system where it should have the ability to offer a two-factor authentication by sending TAC via mobile or email code. Finally, sincerely hope that this system can be further enhanced and improved so that it can be used for a long time by the bakery.

Acknowledgment

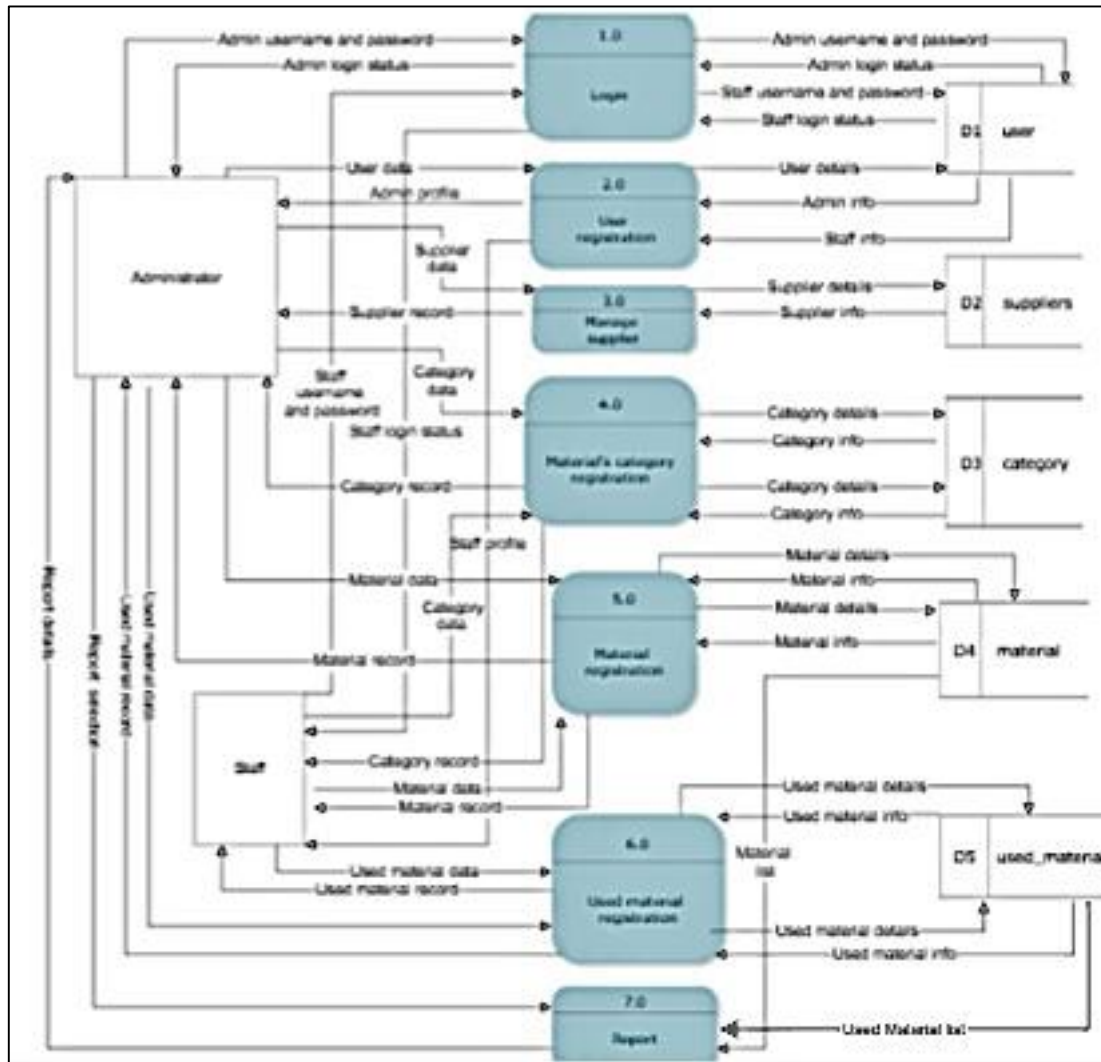
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Appendices

APPENDIX A



Data Flow Diagram od SDI