

Development of IoT-Based E-ticket Selling and Management System with QR code Scanner (Tickets.now)

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Abstract: Tickets.now is an e-ticket selling and management system with QR code scanner that designed to help any university students in Malaysia that would like to sell their event tickets easily. The main reason this system to be developed is because most of the university students in Malaysia faced a problem when selling their event tickets. The only way for them to sell the tickets is by using Google Form and any messaging application. This system lets the users able to register as organizer to sell the tickets of their events or as a customer which able to buy the tickets of the event from it. The significance of this project is to facilitate businesses' usage of the internet for marketing purposes by making it more straightforward for them to do so.

Keywords: E-ticket, QR code, event, organizer, customer

1. Introduction

Most of the university in Malaysia no matter it was local, private, foreign or a college, there will always be a lot of activities or small events that are held by the students. Students are given opportunities to hold and manage an event by themselves without any help from lecturers or the staff of the university. For the events, tickets are needed to make easier the management of the events. A ticket can be also a document that confirms someone's right to access a specific location or event or their ability to travel on a specific form of transportation. But in this era of scientific and technological progress, paper, plastic, or card tickets were eliminated, and they had changed into electronic tickets whether in barcode or QR code form.

Ticket fraud and ticket scalping activities often cause high costs as well as trust concerns for fans buying event tickets, especially in the secondary ticketing market [1]. Nowadays, tickets that are in e-tickets form such as barcode or QR code form can easily be remade or faked because they can be randomly generated online. There are plenty of QR code generators on the internet and it is very easy to copy and paste something through the internet. The objectives of this project are to design a platform that gathers all kind of event tickets that sells by the any university students in Malaysia. Besides, the

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second objective is to develop an efficient database system for the ticket-selling process and avoid fake ticket incidents from happening. Next is to perform a testing for the developed e-ticketing system.

In order to make the users that want to sell their events ticket or the users that want to buy for an event ticket, the system able to access by multiple users which are admin, organizers, and customers. The scope of this project was modules that are separated for different users. The admin able to manage the data of the whole system, the organizer able to sell the tickets of the event they created and the customer able to buy the tickets of the event they desire to participate in.

The article is organized as follows. In section 2, it is going to be about the literature review and the analysis of related works. Next is section 3 which is about the methodology used in developing the system. Section 4 is going to be about the analysis and design of the system.

2. Literature Review

2.1 QR Code Technology

A Quick Response (QR) code is a type of matrix barcode or two-dimensional barcode [2] invented in 1994 by the Japanese company Denso Wave. It is simple for digital devices to scan and encode data as a series of pixels in a square grid. To track information about items in a supply chain, QR codes are frequently employed in marketing and promotional campaigns. A barcode is an optical label that a computer can scan and can be used to access information about the item it is attached to. In fact, a tracker, location, or identifier that links visitors to a website or application is typically included in QR codes. The four encoding modes that QR codes use to store data effectively are numeric, alphanumeric, binary, and kanji. QR codes are useful due to their ability to represent alpha and numeric data [3].

2.2 E-ticketing

Although it is not fair to argue that e-tickets have become ubiquitous, it is evident that the proliferation of e-tickets represents a change in the way that traditional ticket purchasing occurs [4]. E-ticketing is far better than traditional methods in many ways of the payment. Users can also easily buy tickets online and make payments without using cash. In fact, cost savings, such as those related to ticket costs, are the principal benefits of implementing e-ticketing. Another benefit is that unless they are delivered to the wrong email address, the tickets cannot be lost or damaged. It can also cut down on the amount of time spent in line at the desk to buy tickets. An e-ticket will be delivered to the customer's email after the purchase is complete to incorporate the new system's e-ticketing. The customer has already paid for the privilege to use the e-ticket.

2.3 Internet of Things (IoT)

The Internet of Things (IoT) is an emerging paradigm that enables the communication between electronic devices and sensors through the internet to facilitate our lives [5]. A network of networked computers, electronic devices, mechanical devices, materials, living things, and people makes up the Internet of Things (IoT). Without the need for direct connection between people or between computers and people, it allows for the seamless interchange of information. As businesses seek to improve operational efficiency, better understand their customers to provide better customer service, enhance decision-making, and boost the value of their organizations, IoT adoption is expanding across a wide range of industries. The use of web-enabled intelligent devices with embedded systems, such as CPUs, sensors, and communication hardware, forms the basis of an Internet of Things (IoT) system. These gadgets can receive, transmit, and react to information gleaned from their surroundings. The ESP32-CAM is a miniature version of the ESP32 Wireless IoT Vision Development Board. It is intended for use in a range of IoT projects, including smart home appliances, commercial wireless control, wireless monitoring, QR wireless identification, and others.

2.4 Existing System

There are three existing online ticket selling and management systems on the internet which are Ticket2U [6], TicketCharge [7] and TicketHotline [8]. The comparison of the difference between these three systems with the proposed system is made in Table 1 below.

Table 1: Comparison between existing system and the proposed system

System Characteristics	Ticket2U	TicketCharge	TicketHotline	Tickets.now
Online ticketing & registration	✓	✓	✓	✓
Events create function	✓	X	X	✓
QR e-tickets	✓	✓	✓	✓
Create own seating chart	✓	X	X	✓
Payment history	✓	✓	X	✓
Status checker for organizers	✓	X	X	✓
Events for university students	X	X	X	✓
E-ticket scanner function	X	X	X	✓
Separate platform for customers and organizers	✓	X	X	✓
Report produces for organizer site	✓	X	X	✓

3. Methodology/Framework

Software Development Life Cycle Methodologies are processes and practices used by software development teams to successfully navigate the SDLC [9]. There are several model types for SDLC methodology, such as Agile model, Waterfall model, Iterative model, V-model, Incremental model, RAD model, and Spiral model. The method used in this project is the Waterfall model.

3.1 Waterfall model

The waterfall model is one of the earliest models of software development introduced by Winston Royce in 1970 in which tasks are executed sequentially, starting from the top with feasibility and flowing down through various tasks with implementation into the live environment [10]. The waterfall model is a sequential process model that separates the many stages of the development process. Unlike iterative models, each phase is only carried out once. The outcomes from each phase that comes before it are used as inputs for the phase that follows. The waterfall method is frequently used, particularly in the creation of software. By this technique the program designer assures that the software will not fail because of storage, timing, and data flux reasons [11].

3.2 Requirement Analysis Phase

The main goal of this requirements analysis phase is to find out and solve the problems met by all the students from different university that are available in Malaysia when they held an event and selling the tickets. A study about the existing system has been carry out to find the improvement for the proposed system. From the project scope, there are several modules of the proposed system that are going to be implemented to solve the problem such as ticket QR code scanner module for organizer site, report

generator module in organizer site, and payment module in customer site. In addition, there are several security features needed in this proposed system which are authentication, parameterized query, login session, data validation and sanitization.

3.3 System Design Phase

The user interface and database design are carried out in this phase. To have a good connection of the data, the database structures are designed using MySQL according to database table such as admin, organizer, customers, QR code and more. The user interface design is the most important part because a good and responsive interface design is able to encourage users to stay on the system and increase the user engagement and retention [12]. Therefore, the user interface should be easy to use and understandable for any kind of user. Besides, all the diagrams such as Flow Chart, Context Diagram, Data Flow Diagram (DFD), Entity Relationship Diagram (ERD), IoT Node Diagram, test plan, and the wireframe are also being prepared in this phase.

3.4 Implementation Phase

In this phase, the development tasks are carried out according to the user interface and the database design that have been mentioned in system design phase. The interface design of the system will be implemented through HTML and CSS by using Visual Studio Code based on the wireframe that had been designed. All the implementation of the database will be using MySQL and all the connection between the database and the system will be coded by using PHP programming language. The connection of the database will be undergone according to the Entity Relationship Diagram (ERD) that had been designed at the previous phase.

For the implementation of scanner for the proposed system, the Arduino IDE is used to connect to the Arduino hardware that had been used in this project which is ESP32-CAM. It is able to write code in the C or C++ programming language and upload the programs to communicate with the hardware.

3.5 Verification Phase

The verification phase involves thorough testing and evaluation of the entire system to detect any potential errors or bugs. During this phase, the code is meticulously examined and adjusted as necessary. Initially, individual modules are tested independently, followed by the examination of the connections between these modules and the flow of intermediate output by incorporating additional code. Moreover, functionality and usability tests are conducted in this phase to ensure that the system satisfies all the specified requirements.

3.6 Maintenance Phase

Maintenance is the phase that the developer needs to fix and enhance the system if the errors or bugs issues are being found when the end-user is using it. To fix those issues, new version updates or patches need to be released in this phase. Besides, the developer also done the modification of the system during this phase due to the user request. Due to the fact that this project is a final year project, and the developed system is not meant for commercial use, it is not made available to the public and no upkeep is done once it is launched.

3.7 Project Planning

The project planning is to estimate and schedule the time needed to complete each task in this whole project. The requirements analysis phase, system design phase, implementation phase, testing phase, and verification phase are all included in the project planning process. It will also include the duties related to each of these phases. The whole total time spent completing the whole project is estimated to be about two semesters and the plan will be shown in the form of Gantt chart using Projectlibre.

4. Analysis and Design

System analysis and design are concerned with organizing the development of information systems through the precise definition of the tasks that a system should do as well as the interactions between its numerous components.

4.1 Requirements Analysis

Requirements analysis is a method for locating and outlining the specifications and anticipated outcomes of a novel product. In order to define clear expectations, settle any conflicts, and gather data, this approach aims to meticulously document all significant demands while continuing communication with stakeholders and end users. Table 2 below shows the Functional Requirements of the proposed system and Table 3 shows the Non-Functional Requirements of the proposed system.

Table 2: Functional Requirements

Module	Functionalities
Login and registration	- Users can choose which role there are going to be register and login into the system.
Logout	- Users able to logout the system.
Forgot & Password Reset	- Users able to reset their password using the verification code through email if they forgot
Dashboard	- For the organizers' part, they can have an overview of their tickets' selling status. - Customer able to view all the events created in the system. - Admin able to view the traffic of the internet and view all the overview of the organizers.
Event Management	- Able to execute the CRUD operation to the events.
Create event	- The organizers can create the events and edit the details or the contents of the events. - They can set the price and generate the QR code tickets according to the number of the tickets they want. - The events that created will be show at the dashboard for customers' site.
Ticket scanner	- Organizers can use the scanner to scan the QR code tickets shown by the customers when they attend the events. - This can verify the validity of the tickets.
Report	- Organizers able to generate the report of the total sales of their created events.
Category	- The events that have been created will be allocated according to the type of events set by the organizers. - Customers can easily find the events they are interested in according to the events type category.
Ticket Booking	- Customers are able to book the event tickets they want. - Customers will receive the email of the tickets after completing the payment.
Payment	- Customers will bring to the payment pages after they done choosing the events ticket they want.
History	- Customers can view back their search, payment, or the events participated history.
Contact Us	- Customers can give the comment through the feedback form for the organizers about the events. - Give the comment feedback about the system for the admin.
User management	- Admin can do the CRUD operation to all the user's account. - Organizers are able to view the accounts of the customers. - Organizers able to add and delete the organizers second account.

Module	Functionalities
Feedback management	- Admin able to perform the CRUD operation to manage the feedback data that receive from the customers.
Analytics	- Admin able to view the graph or chart of the analytics data for the system.

Table 3: Non-functional requirements

Requirements	Functionalities
Operational	- The system should be able to use in any web browser when connected to the internet.
Security	- The system is only able to access when the user registers an account with their information that required. - All the users' passwords are encrypted with hashing. - Users need to enter a correct username and password to login into the system. - During the registration, users are required to set up their password with the combinations of an uppercase letter, a lowercase letter, a digit, and a special character.
Usability	- The system is user-friendly.

4.2 IoT Node Diagram

An Internet of Things (IoT) node diagram is a graphic representation that shows the organization and connectivity of IoT nodes within an IoT system. It offers a graphic overview of the many IoT nodes, their connections, and their interactions with other network elements. Figure 1 below shows how the ESP32-cam sends the data scanned to the database using HTTP/HTTPS request to do the data validation inside the MySQL database.

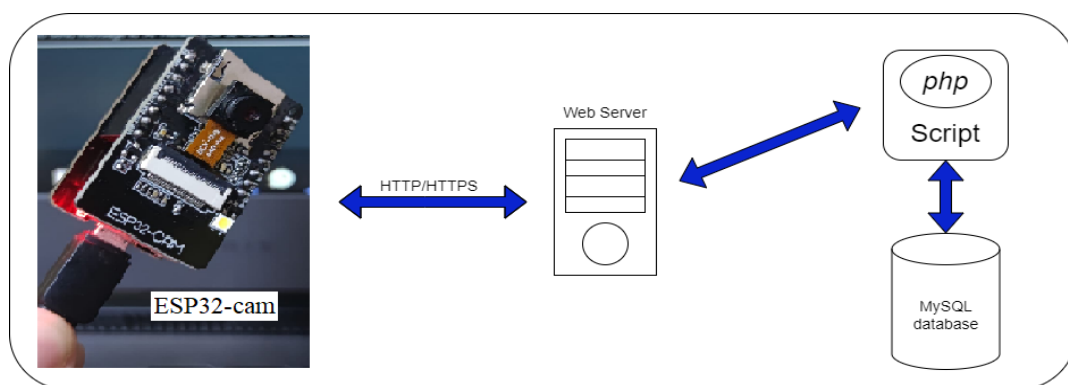


Figure 1: IoT Node Diagram of ESP32-cam send data to the database

4.3 Flowchart

A flowchart is a graphic depiction that demonstrates how a process, computer algorithm, or system operates. It is widely used across many different fields to analyze, organize, optimize, and effectively convey complex processes using simple graphics. Figure 2 shows the flowchart of the system with the process of all three types of users which are admin, organizer, and customer.

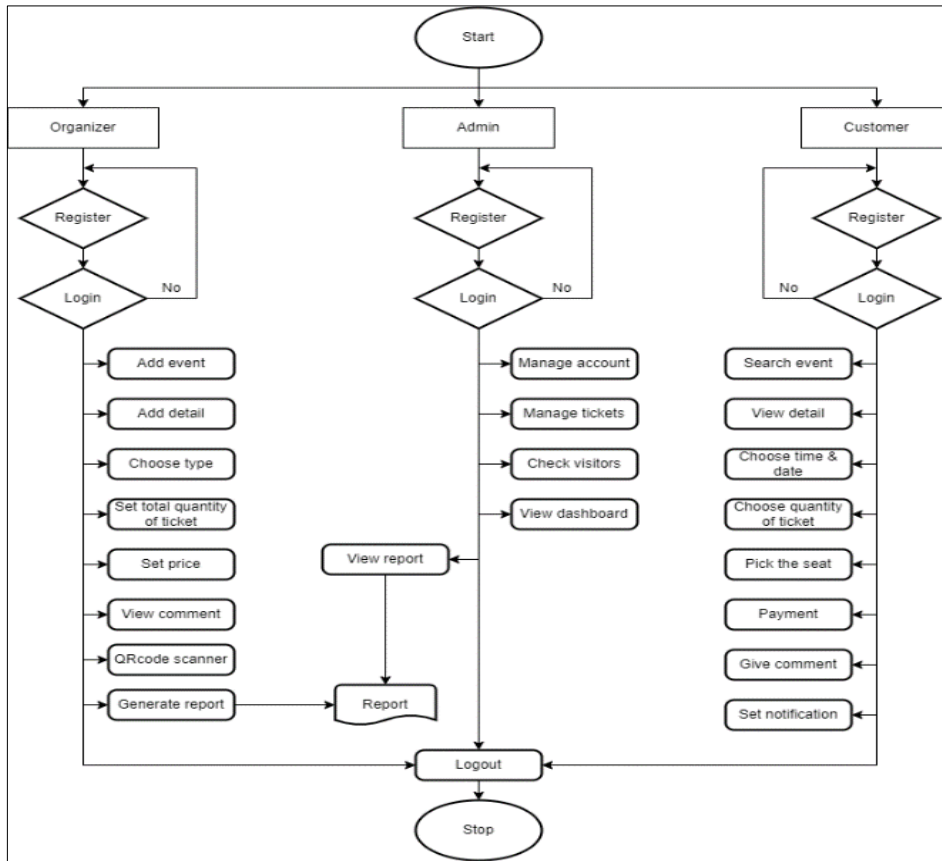


Figure 2: Flowchart

4.4 Context Diagram

Context diagram displays how a system interacts with other entities that is designed to interact with. This diagram might be useful in understanding the context in which the system will operate. In a context diagram, the entire system is represented as a single process. Figure 3 below shows the context diagram of the proposed system.

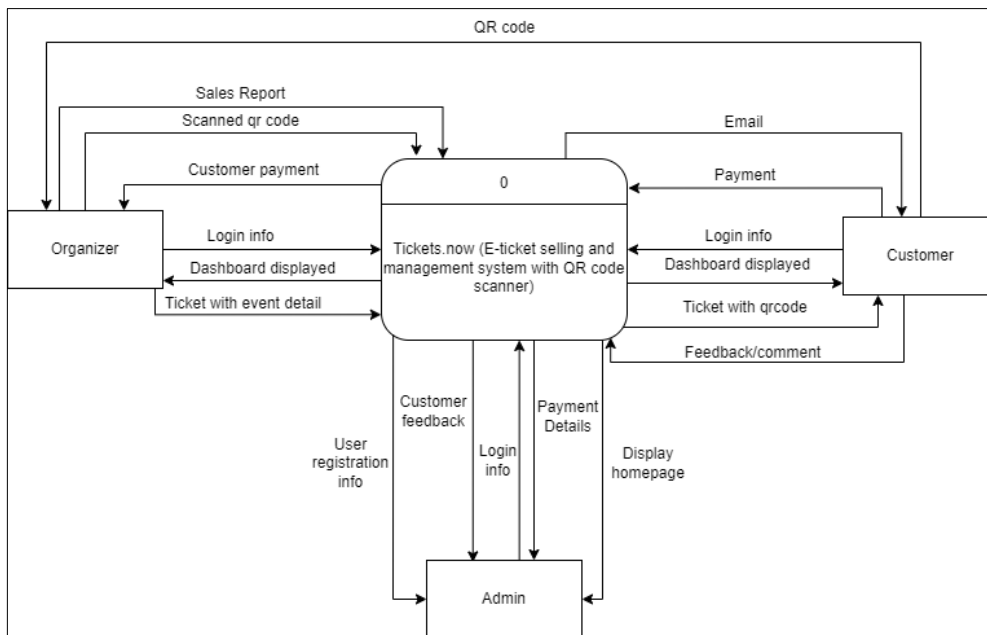


Figure 3: Context Diagram

4.5 Data Flow Diagram (DFD)

Data flow diagrams are visual depictions used to show how data moves through an organisational information system. They show how information is moved from input sources to file storage and then used to produce reports. Systems use this procedure, also known as DFD (Data Flow Diagram), to make sure that data flows smoothly throughout the system's lifecycle. Figure 4 below shows the Data Flow Diagram Level 0 of the proposed system.

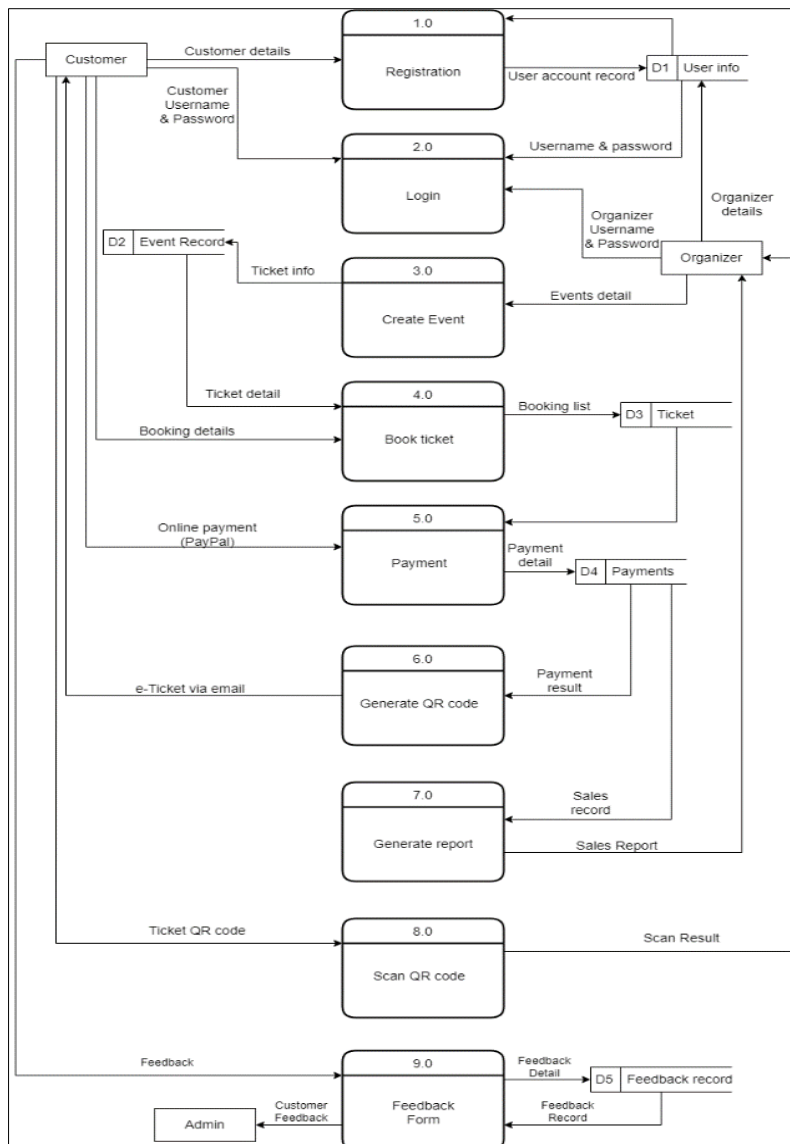


Figure 4: Data Flow Diagram Level 0

4.6 Entity Relationship Diagram (ERD)

An Entity Relationship Diagram (ERD) is a specialized visual representation that illustrates the connections among "entities" within a system, including individuals, objects, or abstract concepts. ER diagrams find extensive usage in various fields such as software engineering, business information systems, education, and research. They are particularly valuable for designing and managing relational databases. Figure 5 below shows the Entity Relationship Diagram of the proposed system.

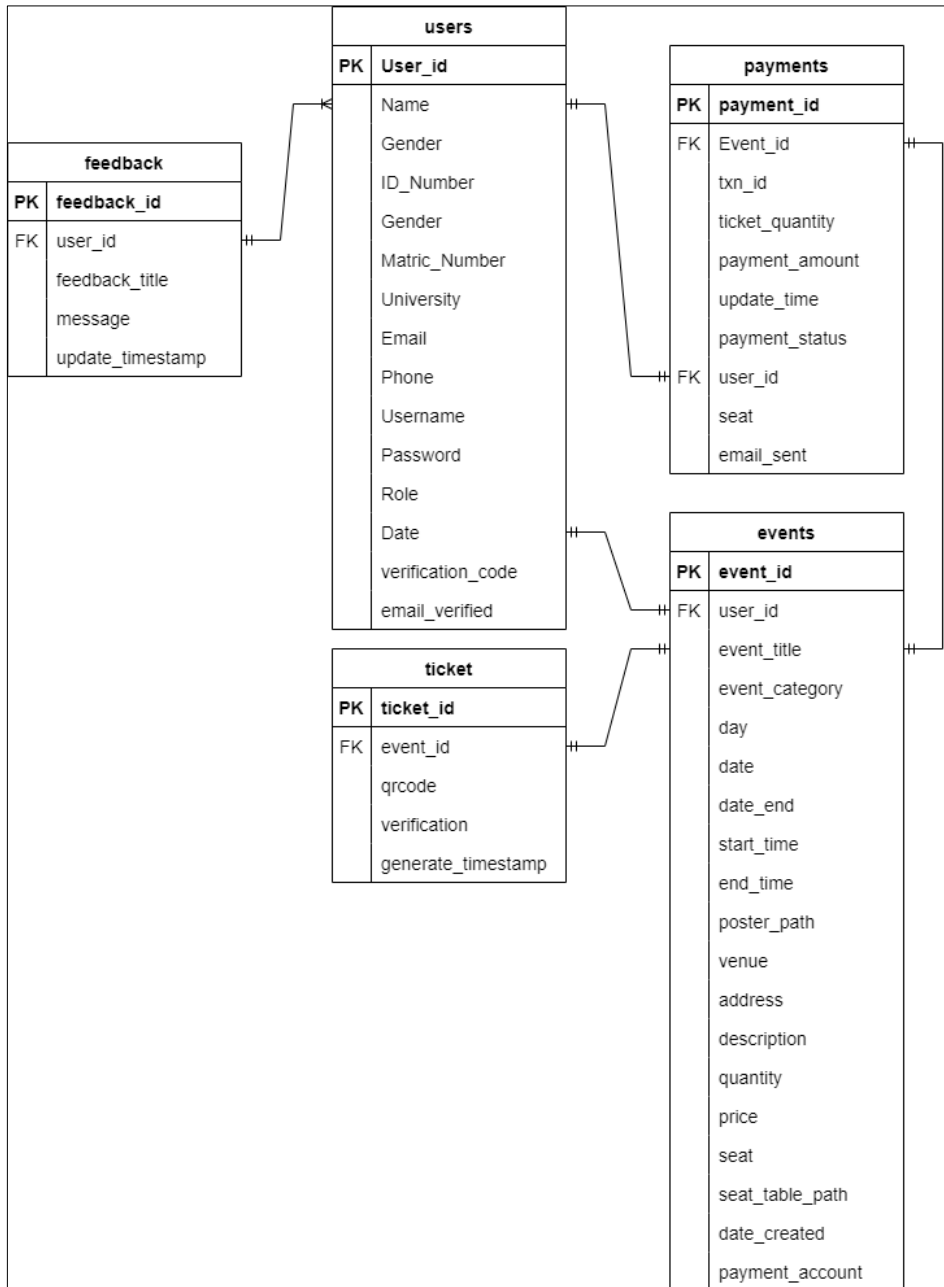


Figure 5: Entity Relationship Diagram of the proposed system

5. System implementation and testing

In this section, the user interface of the system implementation will be shown along with the code segment. The system testing of functional test and user acceptance test (UAT) will also be discussed in this section. Programming languages including PHP, HTML, CSS, and JavaScript are utilized to create the Tickets.now system, while MySQL is used as the system's database.

5.1 System Implementation

In this system implementation section, the interface of the system and the code segment will be shown. Figure 6 shows the interface of the login page for the user and Figure 7 shows the code segment for the login module. All the users that register in the system need to input their username and password in order to login to the system.

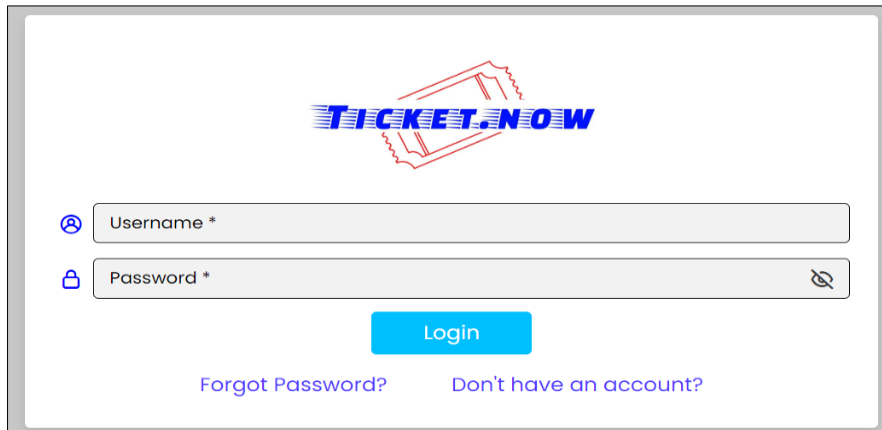


Figure 6: User interface of the login module

```

11  if ($_SERVER["REQUEST_METHOD"] == "POST") {
12      $Username = mysqli_real_escape_string($conn, $_POST['username']);
13      $Pass = md5($_POST['password']);
14      $Date = date("Y-m-d H:i:s");
15
16      $select = "SELECT * FROM users WHERE Username = '$Username' AND Password = '$Pass' ";
17      $result = mysqli_query($conn, $select);
18
19      if (mysqli_num_rows($result) > 0) {
20          $row = mysqli_fetch_array($result);
21
22          if ($row['email_verified'] == 1) {
23              // Email is verified
24
25              if ($row['Role'] == 'Organizer') {
26                  $_SESSION['organizer_name'] = $row['Username'];
27                  header('location: organizer.php');
28              } elseif ($row['Role'] == 'Customer') {
29                  $_SESSION['customer_name'] = $row['Username'];
30                  header('location: cust.php');
31              } elseif ($row['Role'] == 'Admin') {
32                  $_SESSION['admin_name'] = $row['Username'];
33                  header('location: admin.php');
34              }
35          } else {
36              // Email is not verified
37              $error = 'Email not verified. Please check your email and verify your account.';
38          }
39      } else {
40          $error = 'Incorrect username or password!';
41      }
42  }

```

Figure 7: Code segment of the login module

Figure 8 shows the interface of forgot password page for the user if they forgot and want to reset their password for the system. Figure 9 shows the code segment of the sending verification code via email to the user to enter before resetting their password.

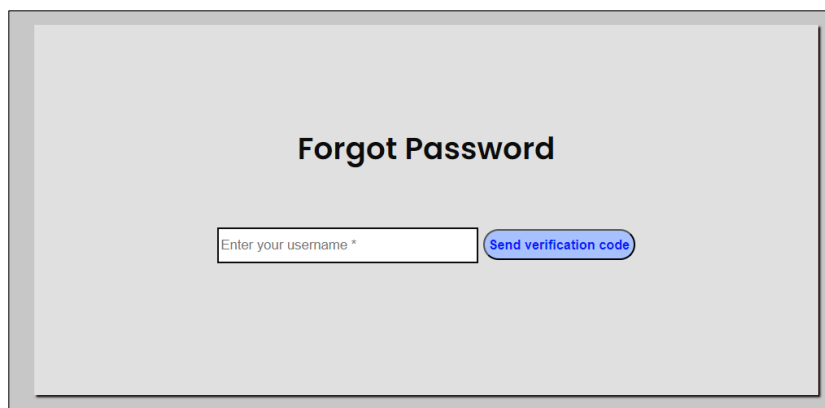


Figure 8: User Interface of Forgot Password Page

```

4  if ($_SERVER["REQUEST_METHOD"] == "POST") {
5      $username = mysqli_real_escape_string($conn, $_POST['username']);
6      // Check if the username exists in your database
7      $query = "SELECT * FROM users WHERE Username = '$username'";
8      $result = mysqli_query($conn, $query);
9      if (mysqli_num_rows($result) > 0) {
10         $row = mysqli_fetch_assoc($result);
11         $email = $row['Email'];
12         $verificationCode = $row['verification_code'];
13
14         if (isset($_POST['send_code'])) {
15             // Send verification code to the email address
16             $to = $email;
17             $subject = "Tickets.now Email Verification";
18             $message = "Here is your email verification code: $verificationCode";
19             $headers = "From: tickets.now5@gmail.com" . "\r\n" .
20                 "Content-type: text/html; charset=UTF-8" . "\r\n";
21             mail($to, $subject, $message, $headers);
22
23             echo "<script>alert('Verification code has been sent to your email.')</script>";
24         } elseif (isset($_POST['submit_code'])) {
25             // Process the submitted verification code
26             $submittedCode = mysqli_real_escape_string($conn, $_POST['verification_code']);
27             if ($submittedCode == $verificationCode) {
28                 // Verification code is correct, redirect to reset_password.php
29                 header("Location: reset_password.php?username=".$username);
30                 exit;
31             } else {
32                 $invalidCodeMessage = "<script>alert('Invalid verification code. Please try again.')</script>";
33             }
34         }
35     } else {
36         echo "<script>alert('The provided username does not exist.')</script>";
37     }
38 }

```

Figure 9: Code segment of the email verification for reset password

Figure 10 shows the dashboard interface for the admin. Admin able to view all the data such as total users registered, and total events created in the system.

Latest Events		
Created by	Title	Date Created
Jack	Art Exhibition	10 Jun 2023, 12:48:45 AM
hanjie1	Back To School Party	12 May 2023, 04:45:49 P...
hanjie1	Thanks Giving Day Cele...	10 May 2023, 04:11:42 PM
hanjie1	Game Day - Barcelona ...	30 Apr 2023, 08:54:02 AM
hanjie1	Aaron Kwok Amazing K...	30 Apr 2023, 08:53:49 AM

New Users		
Username	Role	Date Joined
hanjie2	Customer	18 Jun 2023, 12:13:19 AM
Jacklyn	Customer	10 Jun 2023, 08:57:29 PM
hanjie1	Organizer	9 Jun 2023, 04:54:55 PM
Jack	Organizer	8 Jun 2023, 10:51:54 PM

Latest Feedbacks		
Username	Feedback Title	Update Time
hanjie2	QR code of the e-ticket	18 Jun 2023, 11:40:09 AM
Jacklyn	Hi	18 Jun 2023, 11:40:39 AM

Figure 10: Dashboard interface for the admin site

Figure 11 shows the interface for creating events function for organizers. The organizer is able to create events by filling in the form and the events will then be displayed in customers dashboard for selection.

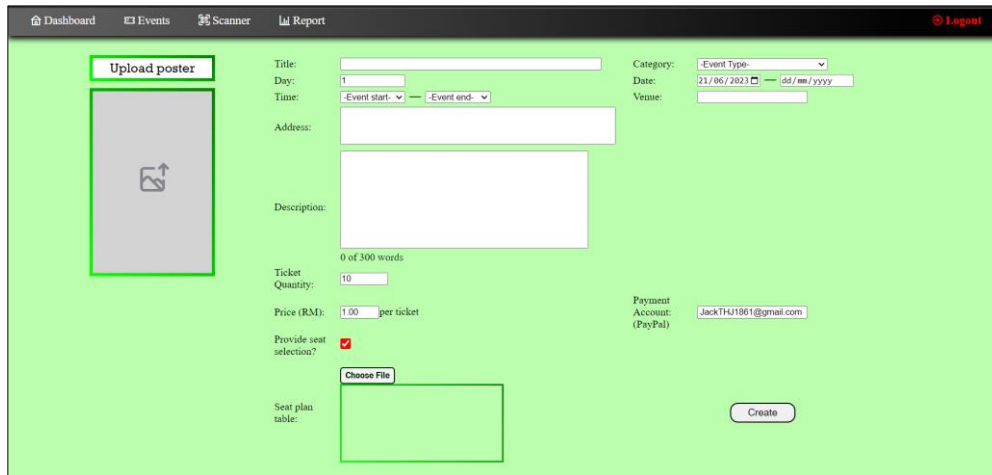


Figure 11: Interface for creating event function

Figure 12 shows the interface of the report module for organizer. In this page, organizer can view and print the sales report of a particular event in PDF file. Figure 13 shows the example of the sales report pdf.



Figure 12: Interface of report module

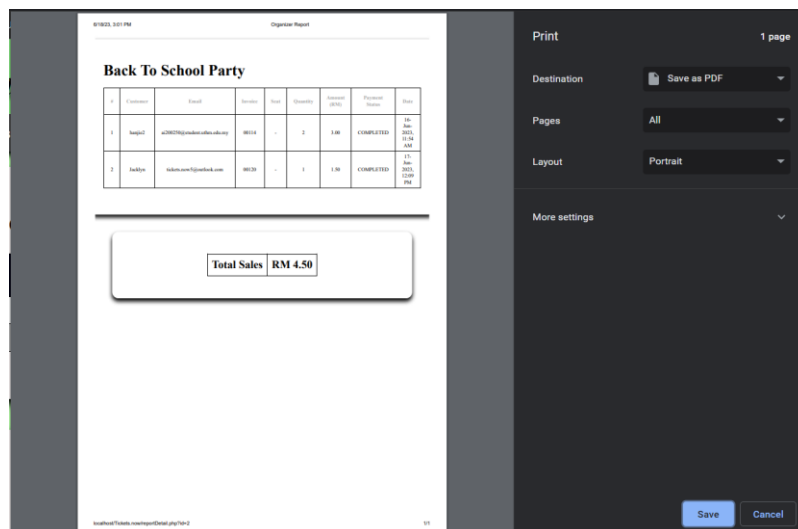


Figure 13: Example PDF of the sales report

Figure 14 shows the interface of the ticket booking page for the customer site. Customers are able to book their event tickets by adjusting the quantity of tickets they want and entering the seat position number they want if the event provided. Figure 15 shows the code segment of the quantity adjusting and limiting function in ticket booking page.

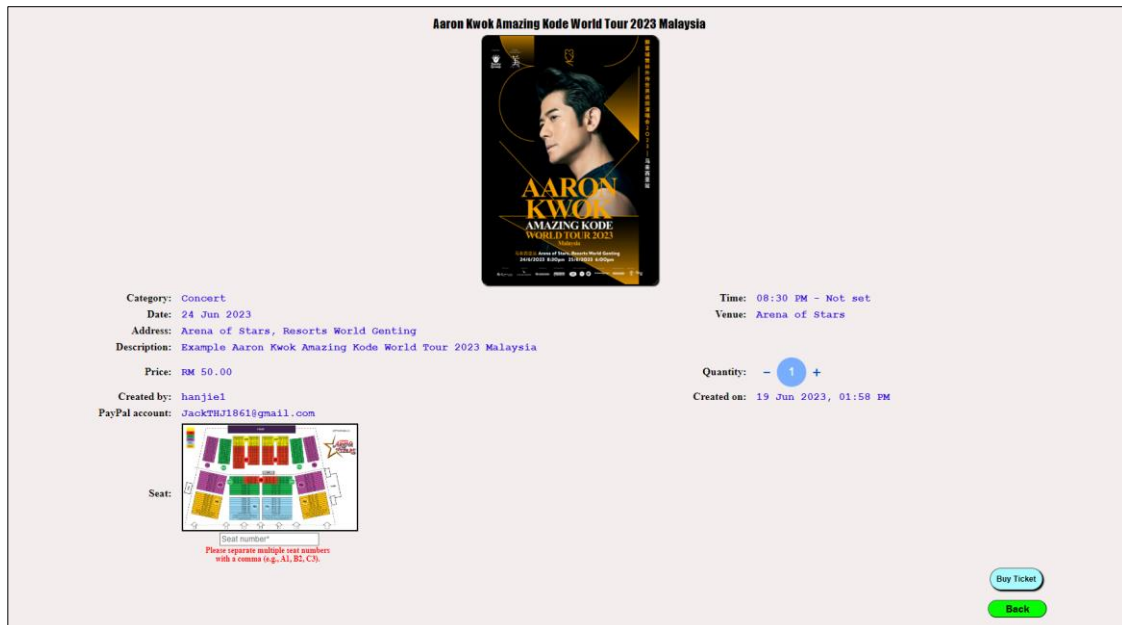


Figure 14: Interface of ticket booking module

```

<tr>
<td>Price:</td>
<td><?php echo "RM " . $formatted_price; ?></td>
<td>Quantity:</td>
<td>
<div class="counter">
<span class="down" <?php if ($total_tickets_bought == $quantity) {
echo "style='pointer-events: none;'";
} else {
} ?> onClick='decreaseCount(event, this)'></span>
<input type="text" value="<?php if ($total_tickets_bought == $quantity) {
echo 'Sold';
} else {
echo '1';
} ?>" id="a" max="<?php echo $remaining_tickets; ?>" <?php if ($total_tickets_bought == $quantity) {
echo "disabled";
} ?>>
<span class="up" <?php if ($total_tickets_bought == $quantity) {
echo "style='pointer-events: none;'";
} else {
} ?> onClick='increaseCount(event, this)'></span>
</div>
</td>
</tr>
    
```

Figure 15: Code segment for the quantity control and limiting function

Figure 16 shows the interface of the booking summary page before redirecting to payment gateway. After the payment, the tickets QR code generated will be sent to the customer via email. Figure 17 shows an example of the email received by the customer.



Figure 16: Interface of booking summary page before go to payment gateway

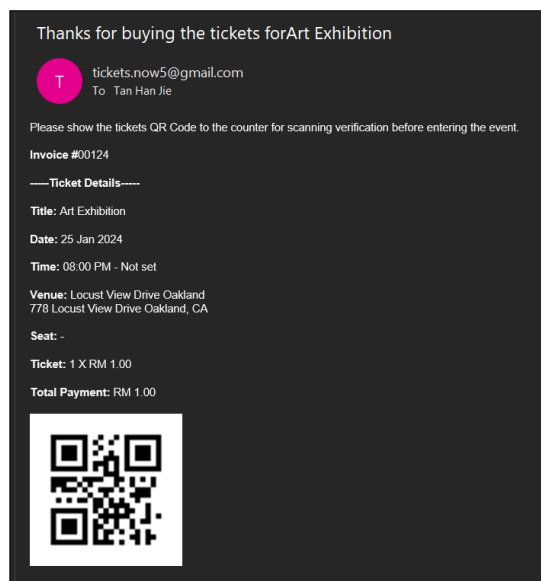


Figure 17: Example email received by the customer

Figure 18 shows the ticket QR code scanner using the ESP32-cam and Figure 19 shows the code segment for the ESP32-cam using Arduino IDE. The ESP32-cam is used for the organizer to scan the QR code shown by the customer to verify the validation of the tickets.

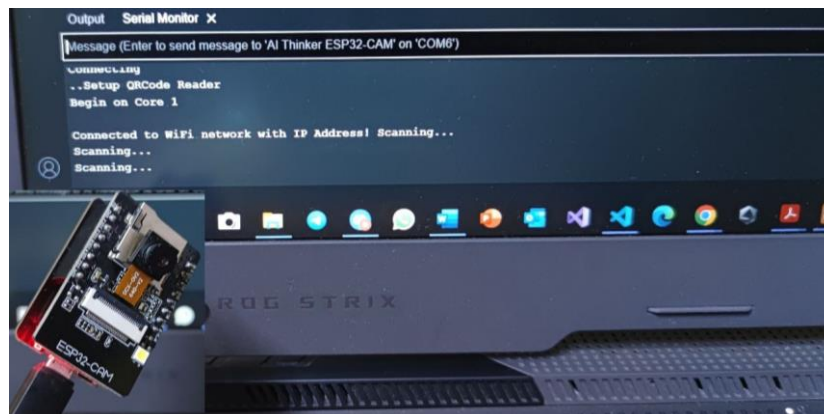


Figure 18: QR code scanner using ESP32-cam

```

1  #include <Arduino.h>
2  #include <WiFi.h>
3  #include <HTTPClient.h>
4  #include <ESP32QRCodeReader.h>
5
6  ESP32QRCodeReader reader(CAMERA_MODEL_AI_THINKER);
7
8  String HOST_NAME = "http://192.168.140.211";
9  String PHP_FILE_NAME = "/tickets.now/save_qrcode.php";
10
11  WiFiClient client;
12  HTTPClient http;
13
14  String scannedData = "";
15  bool qrCodeScanned = false;

```

Figure 19: Code segment for ESP32-cam using Arduino IDE

5.2 System Testing

Functional testing and user acceptance testing are both done during system testing. These tests' main goal is to determine whether the produced system successfully achieves its intended goals, complies with anticipated requirements, and lives up to user expectations.

5.2.1 Functional Test

Functional testing involves running tests based on previously created module-based test cases. Each functional component of the system must be put through functional testing by the system developer. Table 4 below shows the functional testing for the three different types of users in the system. Table 5 shows the functional testing of the certain function for each type of user.

Table 4: Functional Test of the system by 3 different roles

No	Module	Expected Result	Actual Result
1	Login and registration	- If the user's input is correct, the system should log the user in; otherwise, it should not.	PASS
2	Logout	- When a user clicks the logout button, the system logs them out.	PASS
3	Forgot & Reset Password	- User resets a new password after entering the confirmation code receive from email.	PASS
4	Dashboard	- Admin can read and view all the details about the system. - The event created by organizer will automatically display in this page and can be clicked to redirect to its information page. - Customer can view all the event created in this system and can be redirect to its booking page after clicked.	PASS

Table 5: Functional Test of the system by different types of users

No	Module	Users Type	Expected Result	Actual Result
1	Create Event	Organizer	- Event form shown. - Event data stored and display on dashboard after submitting the form.	PASS
2	Report	Organizer	- The sales report is shown based on the event title. - The report can be printed in PDF files.	PASS
3	Scanner	Organizer	- System read and validate the tickets. - Update the data of QR code scan in database.	PASS
4	Ticket Booking	Customer	- All the details and information about the events shown. - Increase or decrease the quantity ticket of the desire event. - Booking summary appear before proceeds to payment.	PASS
5	Payment	Customer	- The purchase details are display correctly in booking summary. - Redirect customer to the payment page. - Purchase receipt is shown after the payment completed. - The receipt can be print in PDF file. - The QR code tickets is sent to customer via email.	PASS

From the result of the functional test, it can be concluded that the expected output is met after the test. For example, the login and registration module function correctly so that the user is able to login to the system when the user inputs their username and password correctly.

5.2.2 User Acceptance Test (UAT)

Through the User Acceptance Testing (UAT) procedure, the organizer or customer will test and approve the software system before it goes live in the production environment. User acceptability testing (UAT), which comes after functional, integration, and system testing, is typically carried out. There is total 11 respondents participate in the user acceptance test which is 1 of them as admin and each 5 of them as organizers and customers.

Figure 20 shows the user acceptance result for the basic login, logout, register and forgot password testing. For the login and register part, the admin feels good about the function, 3 of the organizers also feel good about it and 2 of the customers also feel the same. There are 2 of the organizers and 3 of the customers feel very good about the login and register function. For the logout, the admin vote for very good, 2 of both customers and organizers vote for good and 3 of them both vote for very good. Next, the admin chooses very good about the forgot password function. There are 1 of both organizers and customers choose fair about it. For the rest of them, there are 1 organizer chooses good and 3 of them choose very good, at the same time, there are 2 of the customers choose for good and very good each.

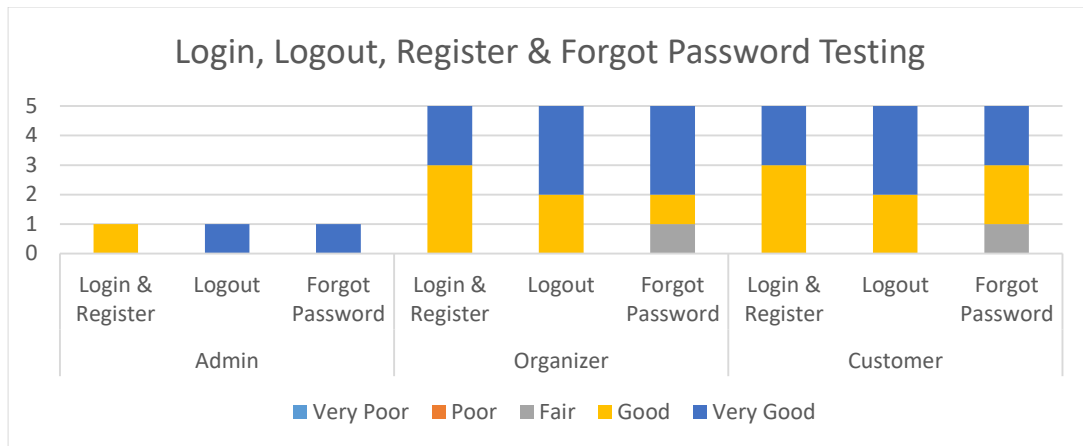


Figure 20: Result of Login, Logout, Register & Forgot Password Testing

Figure 21 shows the system testing for the admin role. The admin feels good about the dashboard page and the analytics page, but the admin also voted fair for the user account management function and the feedback management function.

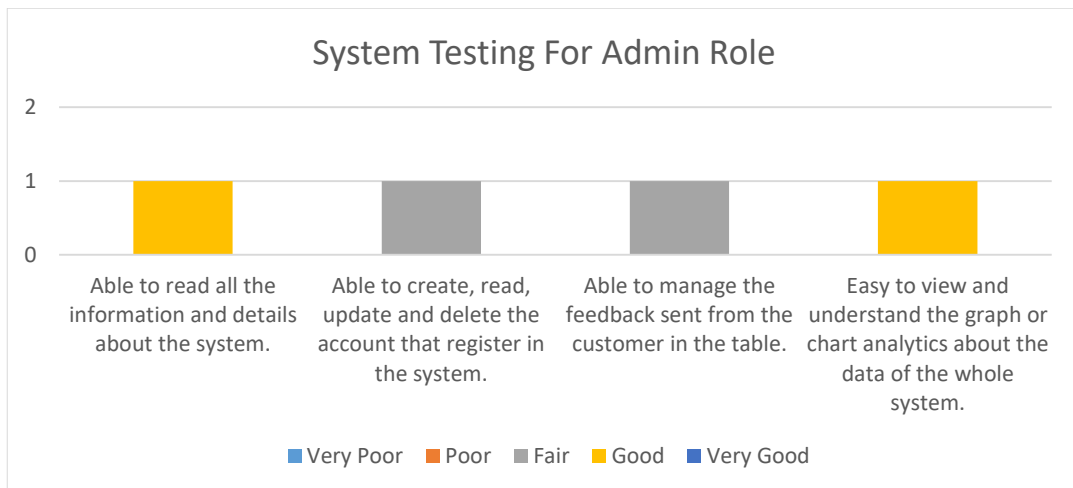


Figure 21: Result of System Testing for Admin Role

Figure 22 shows the system testing for the customer role. For the category page module, there are 2 of them voted for fair, 1 for good and 2 for very good. For the payment, 1 of the customers voted for good and 4 of them voted for very good. There are 1 of the customers who voted fair for the purchase history module and there are 2 votes for both good and very good. There are 2 customers who voted for good and 3 of them voted for very good to the customers dashboard, ticket booking, receive QR code via email function and the contact us module.

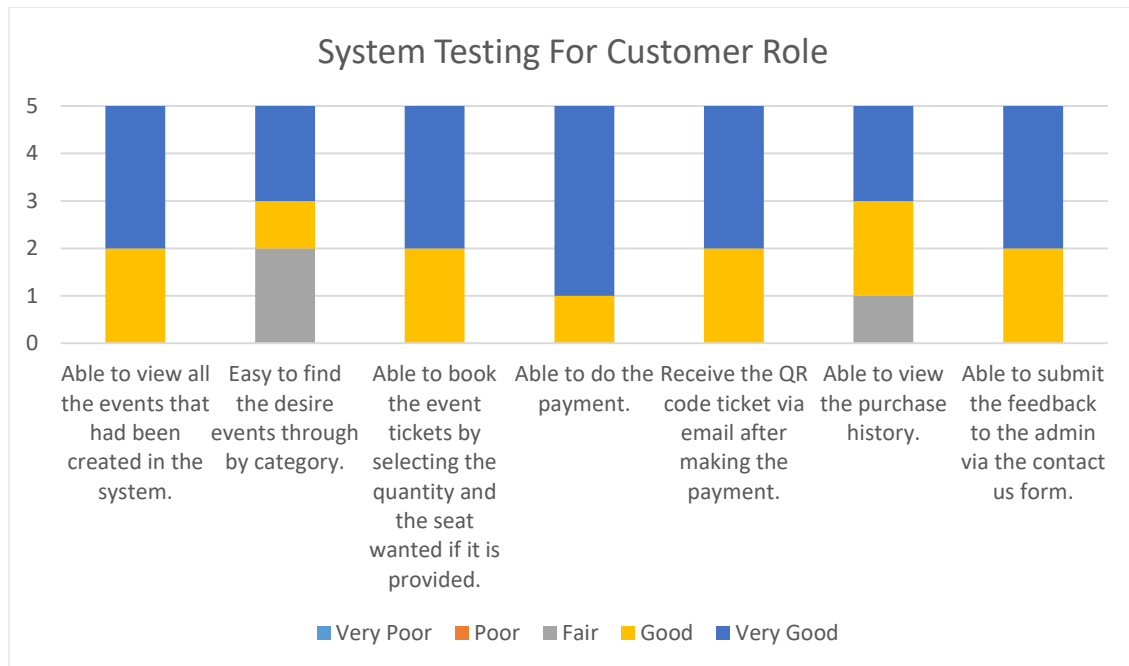


Figure 22: Result of System Testing for Customer Role

Figure 23 shows the system testing for the organizer role. There are 1 of the organizers choose fair and very good for the dashboard page module and 3 of them choose good about it. For the create event function, there is 1 vote each for fair and very good but there are 3 votes from organizers for good only. About the QR code scan through web cam, there are 2 votes for good and 3 votes for very good but compared to the QR code scan using ESP32-cam, there are 1 vote for fair and 2 votes for good and very good each. For the events management module and the sales report module, there is 1 vote each for the fair and good also there are 3 of them choose very good about it.

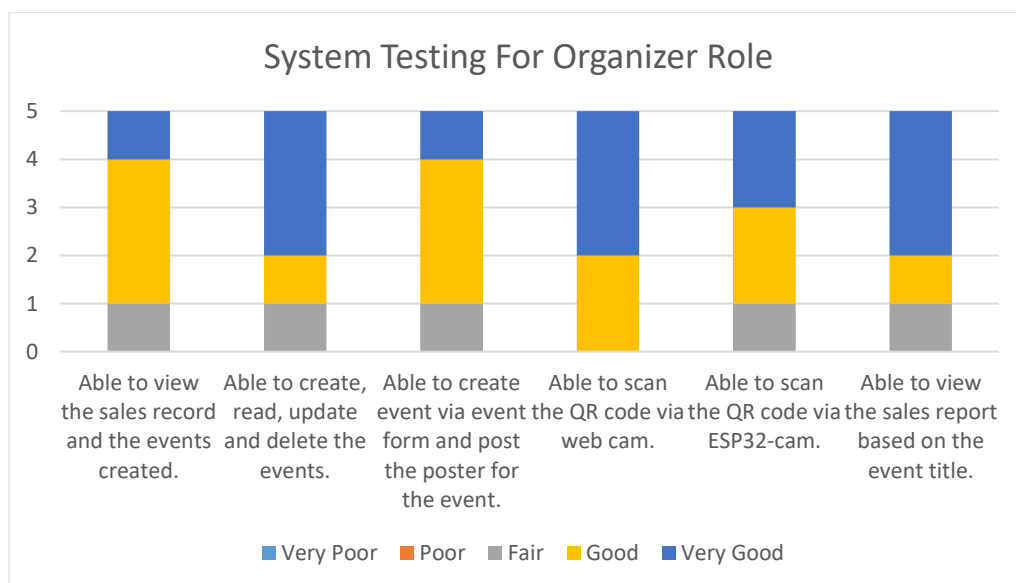


Figure 23: Result of System Testing for Organizer Role

6. Conclusion

This system project's goal is to make event ticketing easier for university students organizing it. Organizers may streamline the ticket selling process and save time by putting this technology in place. By completing an event form, which creates and displays event details on the customer page, they may simply promote events. Through the system, individuals who are interested may easily search for and purchase tickets. Customers receive a QR code through email after making a purchase, doing away with the need for paper tickets. Customers simply present their QR code to a scanner at the event, saving organizers time and streamlining the ticket confirmation procedure.

Acknowledgment

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Appendix

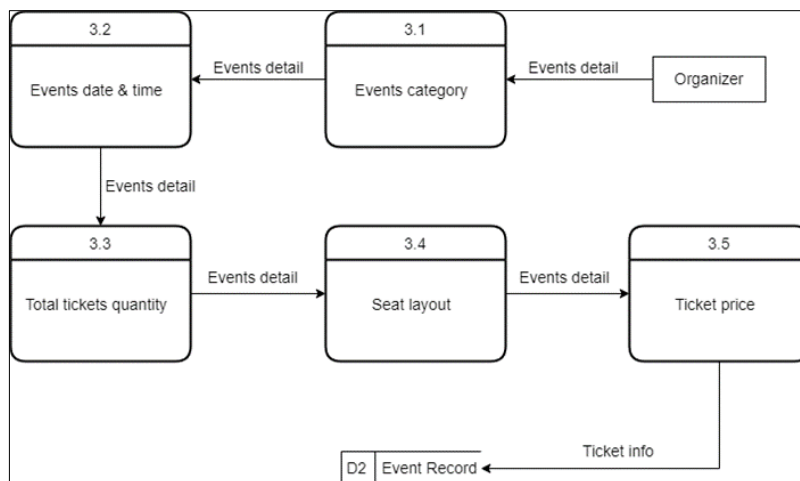


Figure 24: Data Flow Diagram Level 1 for events setting process at the organizer site

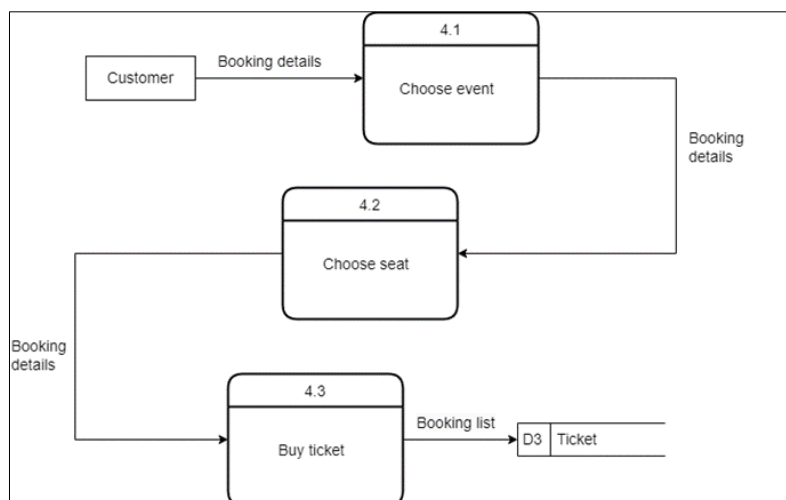


Figure 25: Data Flow Diagram Level 1 for tickets booking process at the customer site

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