

The Development of E-Commerce Web Analytics for BB Master Baby Products Trading

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Abstract: In parallel with the increasing demand for baby products in the world market, it is the right time for baby product companies to undoubtedly gain the most beneficial benefit of online shopping in comparison to conventional establishments with precisely set operating hours. A baby product retailer named BB Master Baby Products Trading encountered some problems in its business, including the need for customers to buy products from its only physical store, a small selling area, low service quality and poor business decisions. Thus, an e-commerce website is developed driven by waterfall methodology and employs courier services and the Google Analytics Application Programming Interface (API). It allows stakeholders to login, manage profile, settings orders, reviews products, shopping carts, and generate web analytic reports. The testing outcome demonstrates that all website features function well. In conclusion, this website has the potential to aid companies in increasing their marketability and making sound business decisions.

Keywords: E-Commerce, Baby Products, Web Analytics

1. Introduction

Nowadays, the application of e-commerce in business has become a trend and is widely used by most big companies because of its convenience. According to Malaysia Digital Economy 2021, the gross value of e-commerce rose a total of RM 34.1 billion from RM 129.2 billion in 2019 to RM163.3 billion in 2020 [1]. The use of an e-commerce website especially for baby products is widely welcomed by many consumers and big companies in recent years. This is because the use of e-commerce in the business allows them to interact with their customers easily while the customers can buy their needed products easily without going out of their houses. Other than that, a web analytics plugin that is commonly implemented in e-commerce websites allows companies to make business decisions based on business data and statistics that are collected from user behavior and the business environment.

The application of e-commerce websites in the baby products sector has also become more popular recently. According to an analysis report created by Grand View Research, the global baby products market size will rise by about 5.7% every year from 2021 to 2030 [2]. Due to the large demand for baby products that will increase continuously for the next several years, many baby product companies, such as Johnson & Johnson have planned to start investing in e-commerce market. For example, Nestlé S.A.,

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one of the biggest baby product companies in the world, outlined an ambitious plan to have 25% of all sales come from online sales by the year 2025 [3].

BB Master Baby Products Trading is a baby product store that specializes in selling baby products. The shop is located in Menglembu, Ipoh and currently, the organization only has one physical store and does not have any e-commerce website or online business. Meanwhile, the organization had met some problems in its business, including customers only being able to buy their desired products in their physical store, a small selling area in the store, low service quality, the need to expand its business online, and a lack of web analytics tools to help the organization make business decisions based on reliable business data. To solve the problems faced by the organization, an e-commerce website that sells baby products based on an object-oriented approach is designed, developed, and tested.

The website enables customers to log in, change their account personal details, view the catalog, manage their shopping cart, track parcel status, and add a review to their bought products. Other than that, the website enables staff to log in, manage personal details, manage customers, manage reviews, and manage products on the website. Lastly, admin of the website can do all the activities that staff can do on the website, manage staff, and generate reports on the website. The website is expected to make customers of the organization convenient, increase the sales and competitiveness of the organization in the market, allow the organization to expand its business online in the future and help the organization to make effective business decisions based on reliable business data and statistics.

The following section will be separated into 5 sections, they are the introduction part which introduces the background of the project, the related work part which explains the website or concept that is related to the website, the methodology part which explains the software development life cycle and its workflow in this project as well as the use case diagram, class diagram, requirements definition, use case specification, system design, schema data and user interface designed. Lastly, section 4 will include the implementation and testing of the website while section 5 is the conclusion of the project.

2. Related Work

In this section, the concept of e-commerce and a comparison of similar systems will be discussed.

2.1 E-commerce

As explained by the United States Census Bureau, e-commerce is defined as the trading of products and services when the buyer submits an order, or both the buyer and seller discuss details of the trading by using the internet or any online system [4]. Generally, e-commerce can be classified into 4 types, they are Business-to-business (B2B) which involves sales between companies and companies, Business-to-consumer (B2C) which define an individual user as a buyer, Consumer-to-consumer (C2C) which implies that sales between an individual with another individual and lastly Consumer-to-business (C2B) which happens when companies pay for an individual to propagate their business online [5].

2.2 Comparison with the Existing Systems

This paper conducted a literature review on three e-commerce websites that focus on selling baby products. These websites include Johnson's e-commerce website [6], BabyDash.com [7], and Oh Baby Store [8]. Table 1 shows a comparison between the other e-commerce websites and BB Master Baby Products Trading e-commerce website.

Table 1: Comparison of the systems

| Features | Johnson's e-commerce website [6] | BabyDash.com [7] | Oh Baby Store [8] | BB Master Baby Products Trading e-commerce website |
|--------------------------|--|--|---|---|
| Login Module | No need to login | Login by using email and password, can also login by using Google and Facebook | Login by using email and password, can also login by using Facebook | Login by using email and password. |
| Search Products Method | <ul style="list-style-type: none"> • Direct searching of product's name • Filter by ritual • Filter by product category • Filter by life stage | <ul style="list-style-type: none"> • Direct searching of product name. • Filter by product category • Filter by product price • Filter by product brands | <ul style="list-style-type: none"> • Direct searching of product name. • Filter by product category | <ul style="list-style-type: none"> • Direct searching of product name. • Filter by product category • Filter by life stage |
| Payment Getaway | Payment getaway is not prepared, the website redirects users to other e-commerce websites after the user clicks the "Buy Online" button on the product's detail page. | Payment getaway is prepared. Supported payment methods are bank cards, MAE, FPX, stripe, Touch 'n Go e-wallet, and Grab Pay. | Payment getaway is prepared. Supported payment methods are bank cards and online banking only. | Payment getaway is implemented. The supported payment methods are bank card. |
| Parcel Delivery Process | Deliver by the partner of other e-commerce platforms. | Deliver by selected courier company. | Deliver by selected courier company. | Deliver by selected courier company. |
| Web Analytics Technology | Google Tag Manager is implemented to track the conversion of visitors. | Smartlook, Mouse Flow, Hotjar, Google Analytics 4, Google Ads Conversion | Google Analytics 4 is implemented. | Google Analytics 4 is implemented. |

| | | | | |
|---|----------------------------------|------------------|-------------------|--|
| Features | Johnson’s e-commerce website [6] | BabyDash.com [7] | Oh Baby Store [8] | BB Master Baby Products Trading e-commerce website |
| Tracking and Facebook Pixel is implemented. | | | | |

In comparison, BB Master Baby Products Trading e-commerce website implements a login function by using email and password. Customers can search for products directly using the product name, category, and life stage. The website supports payment through bank cards, and once the customers make a payment, the delivery of the items is handled by the courier company called Pgeon. Lastly, the website also supports the use of web analytics tools named Google Analytics 4 to analyze the traffic sources and conversion of the visitors.

3. Methodology/Framework

The activities in the waterfall model as shown in Figure 1 are used as a guide to develop this website. The waterfall model is used in this project because the requirement of the website is clearly defined, straightforward, easy to implement, and simple [9]. There are a total of four (4) main activities in the project and the tasks as well as output of each activity are tabled in Table 2.

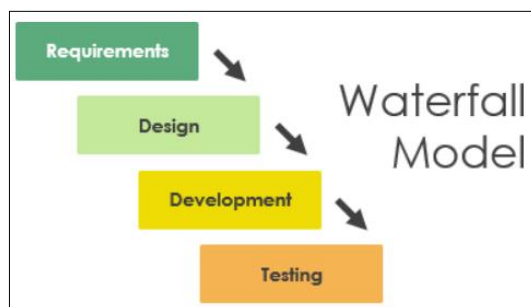


Figure 1: Waterfall model [10]

Table 2: System development workflow

| Phase | Task | Output |
|-------------|---|---|
| Requirement | <ul style="list-style-type: none"> Discuss the title with the supervisor. Plan the project. Find organization as a case study. Gather requirements from the organization. Analyze the requirements gathered. Research and review topics related to the website. Compare existing similar websites. | <ul style="list-style-type: none"> Background of the organization Literature review related to the system Use case diagram Activity diagram Sequence diagram |

| Phase | Task | Output |
|-------------|--|--|
| | <ul style="list-style-type: none"> Document the analyzed requirements in the use case diagram, class diagram, use case specification, activity diagram, and sequence diagram. Document literature review into the report. | <ul style="list-style-type: none"> Class diagram Use case specification Requirement definition of the system |
| Design | <ul style="list-style-type: none"> Determine the architecture of the system. Design the user interface of the system. Design the schema table and data dictionary of the database. Document all system designs. | <ul style="list-style-type: none"> Architecture diagram UI design of the website Data schema Data dictionary |
| Development | <ul style="list-style-type: none"> Coding and implementation of the system. Create business logic of the system. Connect the database with the system. Minimized bug that was found in the developing system. Create the user interface of the system. Connect the user interface of the system with their business logic. Document detail of each system's function in the report. | <ul style="list-style-type: none"> Complete system |
| Testing | <ul style="list-style-type: none"> Run alpha test on the system. Check system errors and bugs that are found in the final system. Test functionality of the final system. Fixed system errors and bugs found. Document test case and requirements traceability matrix in the report | <ul style="list-style-type: none"> Test cases Requirements traceability matrix |

3.1 Requirement

The following section shows the outcome of the requirement phases of this system. The outcome will be represented in the form of a use case diagram and its associated details, a class diagram, and the list of requirements.

3.1.1 Use Case Diagram

Figure 2 shows the use case diagram of the system. The use case diagram includes four (4) stakeholders, there are customer, staff, admin, and Pgeon Delivery Courier. There are a total of eight (8) main use cases in the use case diagram. The sequence diagram, activity diagram, overview and description of the main use cases is created and documented.

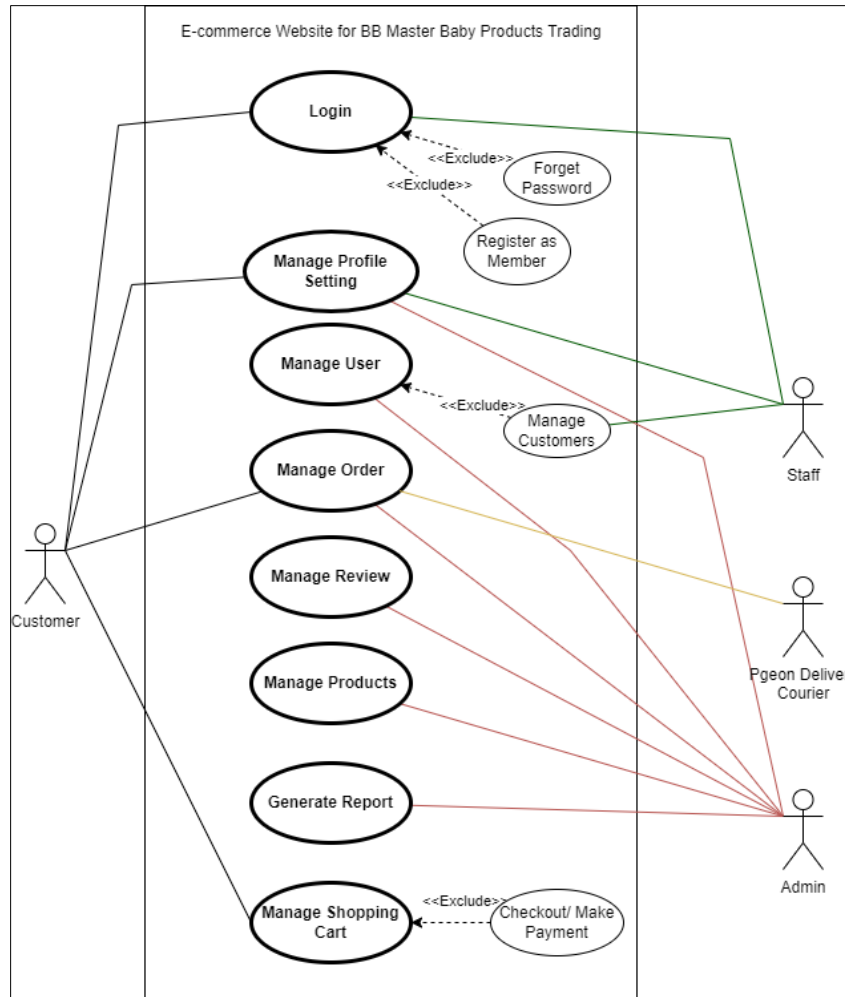


Figure 2: Use case diagram of the system

3.1.2 Class Diagram

Figure 3 shows the class diagram of the system. The class diagram contains fifteen (15) classes that store data and each connection between the classes is labeled with their relationship and multiplicity.

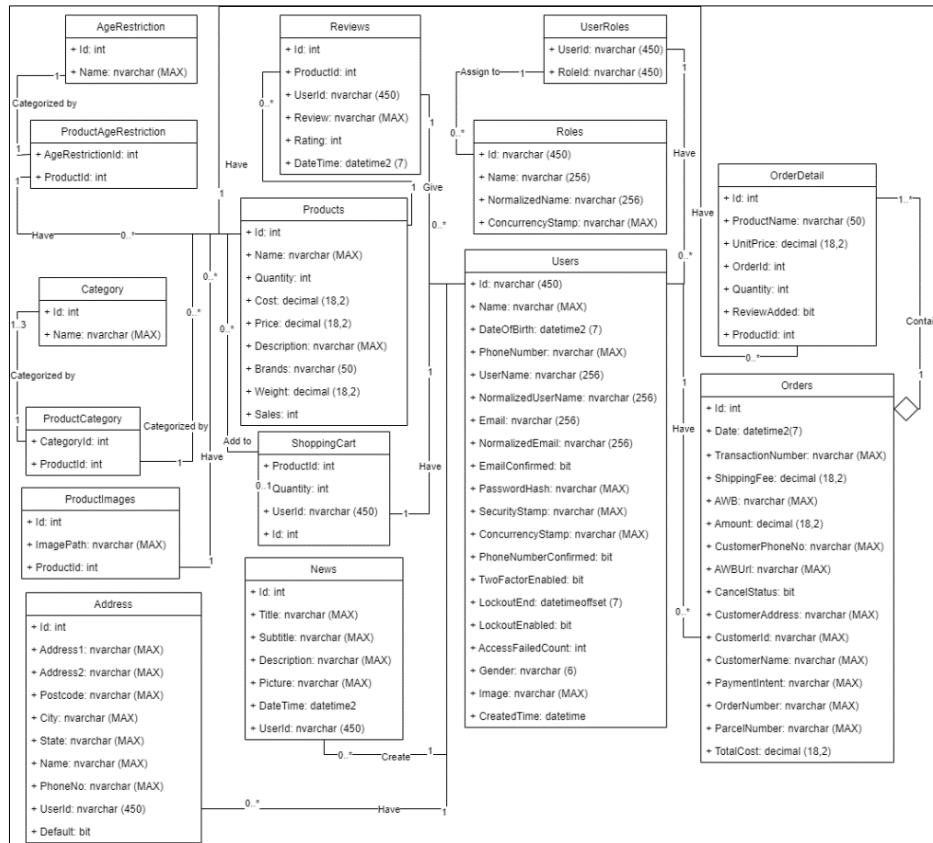


Figure 3: Class diagram of the system

3.1.3 Requirements Definition

A system requirement is a property or function that must be present in an information system to meet its business needs and user expectations [11]. Table 3 shows all system requirements that should be in the system. The use case specification of the system is included in Appendix A.

Table 3: Requirement definition

| Requirement ID | Descriptions |
|----------------|--|
| REQ_100 | Login |
| REQ_101 | The system shall allow customers, staff, and admin to log in to the system by using email and password. |
| REQ_102 | The system shall allow customers, staff, and admin to reset their password through email. |
| REQ_103 | The system shall allow customers to create as new members. |
| REQ_104 | The system shall send a confirmation email to the registered new user. |
| REQ_NF101 | The system shall only allow customers, staff, and admin with the correct email and password to log in to the system. |
| REQ_NF102 | The system shall be able to disable the login function for 5 minutes if customers, staff, and admin log in failed for 5 times. |

| Requirement ID | Descriptions |
|----------------|--|
| REQ_NF103 | The system shall only allow customers, staff, and admin that had confirmed email to log in. |
| REQ_200 | Manage User |
| REQ_201 | The system shall allow staff and admin to view the details of customers. |
| REQ_202 | The system shall allow staff and admin to delete customers. |
| REQ_203 | The system shall allow admin to create new staff or admin. |
| REQ_204 | The system shall allow admin to view staff or admin details. |
| REQ_205 | The system shall allow admin to delete staff or admin. |
| REQ_300 | Manage Profile Setting |
| REQ_301 | The system shall allow customers, staff, and admin to edit their profiles. |
| REQ_302 | The system shall allow customers, staff, and admin to reset their password. |
| REQ_303 | The system shall allow customers, staff, and admin to change their email addresses. |
| REQ_304 | The system shall be able to send a confirmation email to change the email address of the users. |
| REQ_305 | The system shall allow customers, staff, and admin to add new addresses. |
| REQ_306 | The system shall allow customers, staff, and admin to update existing addresses. |
| REQ_307 | The system shall allow customers, staff, and admin to delete specific addresses. |
| REQ_NF301 | The system shall only allow passwords that contain at least 8 characters, different letter cases, numbers, and special characters to be saved. |
| REQ_400 | Manage Order |
| REQ_401 | The system shall allow customers, staff, and admin to view all orders. |
| REQ_402 | The system shall allow customers to view their own order list. |
| REQ_403 | The system shall allow customers, staff, and admin to check order details. |
| REQ_404 | The system shall allow customers, staff, and admin to print orders. |
| REQ_405 | The system shall allow customers, staff, and admin to track parcels by using tracking numbers. |
| REQ_406 | The system shall allow customers to add reviews to bought products. |
| REQ_407 | The system shall allow staff and admin to cancel orders. |
| REQ_408 | The system shall allow staff and admin to print AWB of specific order. |
| REQ_500 | Manage Review |
| REQ_501 | The system shall allow staff and admin to view all reviews given by the customers. |
| REQ_502 | The system shall allow staff and admin to delete the reviews of specific products. |
| REQ_600 | Manage Shopping Cart |

| Requirement ID | Descriptions |
|----------------|--|
| REQ_601 | The system shall allow customers to browse product catalog. |
| REQ_602 | The system shall allow customers to view the details of products. |
| REQ_603 | The system shall allow customers to choose the quantity of products. |
| REQ_604 | The system shall allow customers to add new products into the shopping cart. |
| REQ_605 | The system shall allow customers to delete products in the shopping cart. |
| REQ_606 | The system shall allow customers to change the quantity of products in the shopping cart. |
| REQ_607 | The system shall allow customers to view all checkout products. |
| REQ_608 | The system shall be able to calculate the shipping fee. |
| REQ_609 | The system shall be able to calculate the total amount of all checkout products and shipping fees. |
| REQ_610 | The system shall allow customers to choose the payment method. |
| REQ_611 | The system shall allow customers to make payments. |
| REQ_612 | The system shall be able to show payment status after the payment is made. |
| REQ_700 | Manage Products |
| REQ_701 | The system shall allow staff and admin to add new products. |
| REQ_702 | The system shall allow staff and admin to update existing products. |
| REQ_703 | The system shall allow staff and admin to delete products. |
| REQ_704 | The system shall allow staff and admin to view product details. |
| REQ_800 | Generate Reports |
| REQ_801 | The system shall only allow admin to generate sales reports. |
| REQ_802 | The system shall only allow admin to generate inventory report. |
| REQ_803 | The system shall only allow admin to generate web analytic report. |
| REQ_804 | The system shall only allow admin to generate payment report. |

3.2 System Design

This section will describe the system architecture, schema data, and user interface design that was implemented in the system.

3.2.1 System Architecture

In this project, Model-View-Controller (MVC) architecture is used. The system can be separated into 3 parts, the model that is responsible for the data management, views related to user interface (UI), and the controller that manage the event handling in the system [12]. Figure 4 shows the package diagram of the system that shows the model, view, and controller of the system.

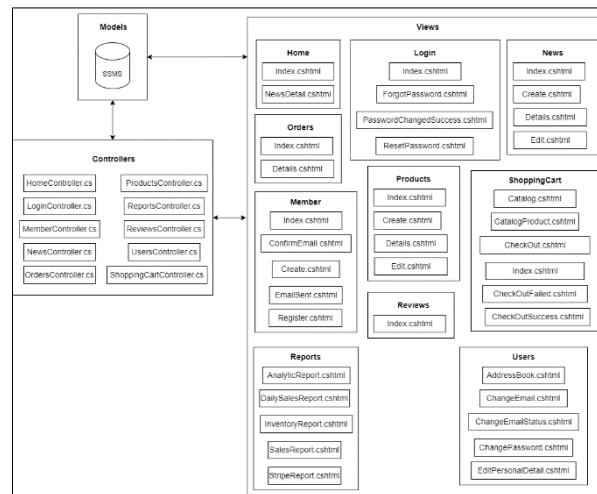


Figure 4: Model-View-controller

3.2.2 Schema Data

In this section, the data schema used to build the database is listed. The schema contains a total of 15 tables, each with its unique set of attributes and corresponding data type. The schema data is needed to set up the database of the system.

- i. Users (Id (nvarchar), Name (nvarchar), DateOfBirth (datetime2), PhoneNumber (nvarchar), UserName (nvarchar), NormalizedUserName (nvarchar), Email (nvarchar), NormalizedEmail (nvarchar), EmailConfirmed (bit), PasswordHash (nvarchar), SecurityStamp (nvarchar), ConcurrencyStamp (nvarchar), PhoneNumberConfirmed (bit), TwoFactorEnabled (bit), LockoutEnd (datetimeoffset), LockOutEnabled (bit), AccessFailedCount (int), Gender (nvarchar), Image (nvarchar), CreatedTime (datetime))
- ii. UserRoles (UserId (nvarchar), RoleId (nvarchar))
- iii. Roles (Id (nvarchar), Name (nvarchar), NormalizedName (nvarchar), ConcurrencyStamp (nvarchar))
- iv. Orders (Id (int), Date (datetime2), TransactionNumber (nvarchar), CustomerId (nvarchar), ShippingFee (decimal), AWB (nvarchar), Amount (decimal), CancelStatus (bit), CustomerPhoneNo (nvarchar), AwbUrl (nvarchar), CustomerAddress (nvarchar), CustomerName (nvarchar), PaymentIntent (nvarchar), OrderNumber (nvarchar), ParcelNumber (nvarchar), TotalCost (decimal))
- v. OrderDetails (Id (int), ProductName (nvarchar), UnitPrice (decimal), OrderId (int), Quantity (int), ReviewAdded (bit), ProductId (int))
- vi. News (Id (int), Title (nvarchar), Subtitle (nvarchar), Description (nvarchar), Picture (nvarchar), DateTime (datetime), UserId (nvarchar))
- vii. Address (Id (int), Address1 (nvarchar), Address2 (nvarchar), Postcode (nvarchar), City (nvarchar), State (nvarchar), Name (nvarchar), PhoneNo (nvarchar), UserId (nvarchar), Default (bit))
- viii. Reviews (Id (int), ProductId (int), UserId (nvarchar), Review (nvarchar), Rating (int), DateTime (datetime2))
- ix. Products (Id (int), Name (nvarchar), Quantity (int), Cost (decimal), Price (decimal), Description (nvarchar), Brands (nvarchar), Weight (decimal), Sales (int))
- x. ShoppingCart (Id (int), ProductId (int), Quantity (int), UserId (nvarchar))
- xi. ProductCategory (ProductId (int), CategoryId (int))
- xii. Category (Id (int), Name (nvarchar))
- xiii. ProductAgeRestriction (ProductId (int), AgeRestrictionId (int))

- xiv. AgeRestriction (Id (int), Name (nvarchar))
- xv. ProductImages (Id (int), ImagePath (nvarchar), ProductId (int))

3.2.3 Interface Design

In this section, the user interface (UI) design of each main module in the system is listed and discussed. The included UI design of the system are login page that allow all users to login as shown in Figure 5, manage profile setting that allows users to change their personal information as shown in Figure 6, list of users that enable admin to manage the staff and admin list as shown in Figure 7, order detail that shows all the information of the related order as shown in Figure 8, review list that print all the product review in the system as shown in Figure 9, shopping cart that allow customer to manage their shopping cart as shown in Figure 10, product list that list all the products as shown in Figure 11 and web analytic report that can be generated by admin only that used to analyze the traffic sources of the website as shown in Figure 12.

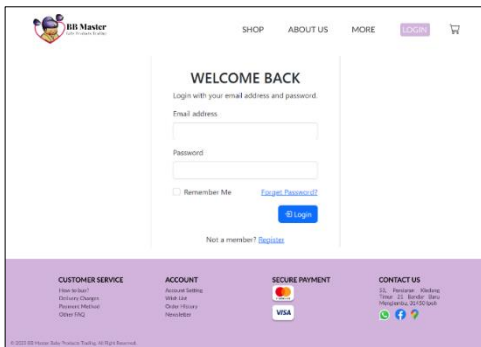


Figure 5: UI of login page

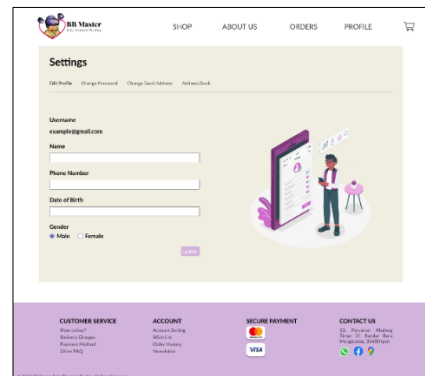


Figure 6: UI of manage profile setting

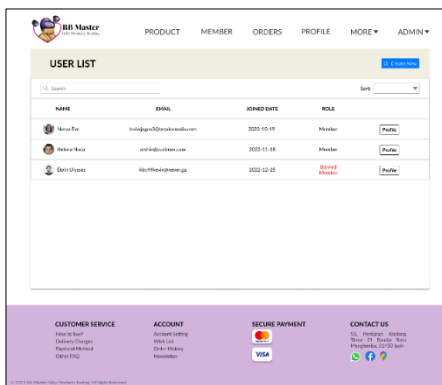


Figure 7: UI of user list

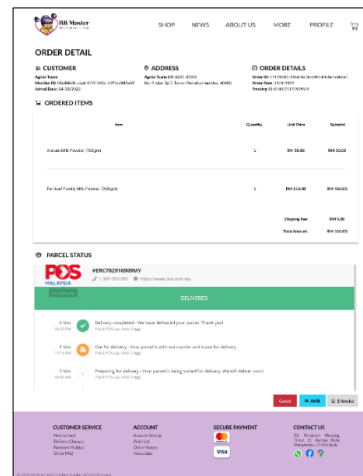


Figure 8: UI of order detail

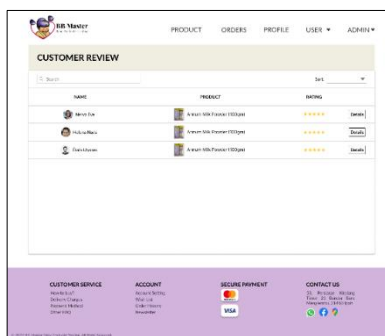


Figure 9: UI for review list

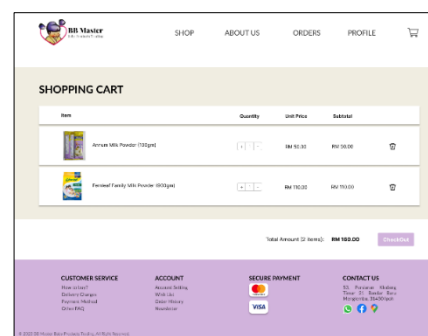


Figure 10: UI of shopping cart

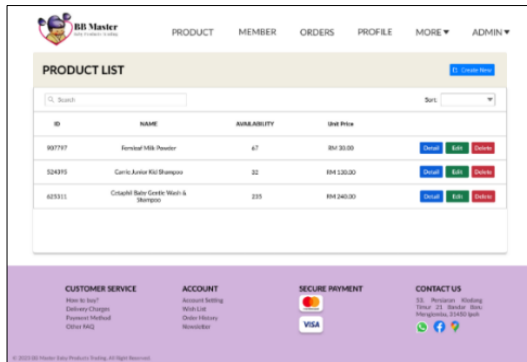


Figure 11: UI for products list

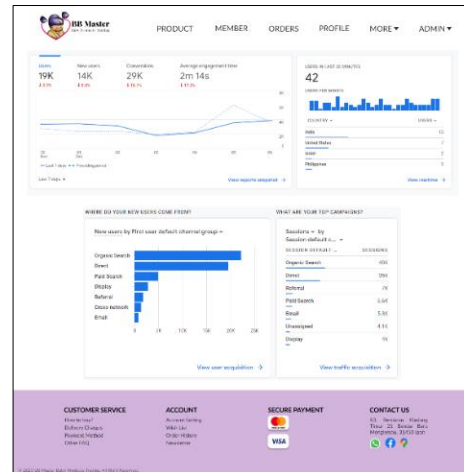


Figure 12: UI of web analytics report

4. Result and Discussion

This section is separated into two parts, the implementation part that shows all webpage created and code segment used in the system while testing part that summarizes the test results of the system.

4.1 Implementation

In this section, the webpage created and code segment of each module in the system is illustrated and explained.

4.1.1 Login Module

In the login webpage of the system, all system users need to enter their email address, password and click the “Login” button to login into the system. The system will authenticate the identity of the user and allow users to access the system.

4.1.2 Manage Profile Module

Managing profile module in the system allows all users to change their password. The system will update the current user’s password when user enter their old password and new password in this module. Not only that, but the system also allows users to change their email address by entering their new email address and confirm their new email address. To change personal information, the user can change their personal detail in a webform, and the system will update the personal detail stored in the system as shown in the code segment in Figure 13. Lastly, the user can also manage their address on the webpage as shown in Figure 14.

```

51 [HttpPost, ActionName("EditPersonalDetail")]
52 controller
53 public Async.Task<ActionResult> EditPersonalDetail(EditPersonalDetail model)
54 {
55     if (ModelState.IsValid)
56     {
57         var user = await userManager.FindByIdAsync(User.FindFirstValue(ClaimTypes.NameIdentifier));
58         var profilePicturePath = user.Image;
59         if (model.ProfilePicture != null)
60         {
61             string webHostPath = webHostEnvironment.WebHostPath;
62             System.IO.File.Delete(webHostPath + profilePicturePath);
63             profilePicturePath = await UploadImage(model.ProfilePicture);
64         }
65         user.DateOfBirth = model.Dob;
66         user.Gender = model.Gender;
67         user.Name = model.Name;
68         user.PhoneNumber = model.NpNo;
69         user.Image = profilePicturePath;
70         var result = await userManager.UpdateAsync(user);
71         if (result.Succeeded)
72         {
73             ViewBag.IsSuccess = true;
74             ModelState.Clear();
75             return View(model);
76         }
77         foreach (var error in result.Errors)
78         {
79             ModelState.AddModelError("", error.Description);
80         }
81     }
82     return View(model);
83 }
    
```

Figure 13: Code segment to edit profile

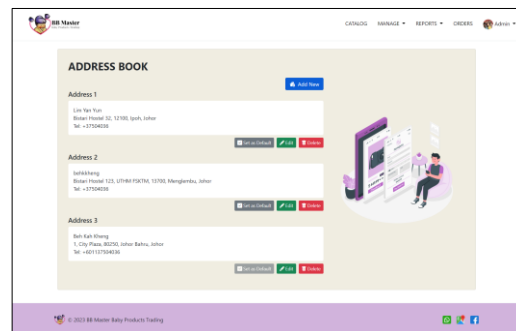


Figure 14: Address book webpage

4.1.3 Manage User Module

To manage the user in the system, the webpage as shown in Figure 15 allows staff and admin to manage the user register in the system. If the admin wanted to create a new staff, the admin needed to fill and submit a webform as illustrated in Figure 16 to the system. Other than that, the system also allows staff or admin to delete a customer while admin to delete anyone excluding himself in this module.

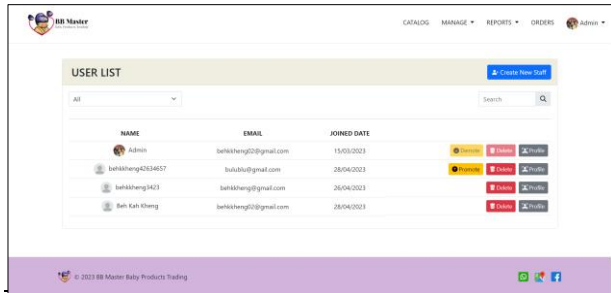


Figure 15: User list webpage

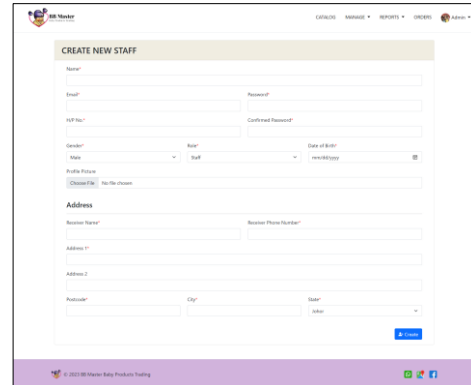


Figure 16: Create new staff webpage

4.1.4 Manage Order Module

For the manage order module, the module will show list of order to all system users in a webpage. If the system user clicks the “Detail” button of a specific order, an order detail webpage that contains all related information of the order as illustrated in Figure 17 will be shown. The order detail webpage allows customers to add review to their bought product in a modal. The system will store the review as shown in the code segment in Figure 18. Lastly, the module also allows staff and admin to print an AWB and cancel specific orders.

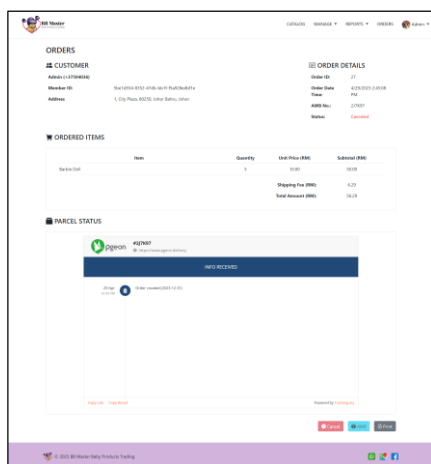


Figure 17: Order detail webpage

```

32 [HttpPost]
33 [ValidateAntiForgeryToken]
34 public async Task<ActionResult> AddReview(string review, int rating, int productId, int orderId)
35 {
36     Reviews reviews = new Reviews()
37     {
38         Review = review,
39         Rating = rating,
40         UserId = _httpContextAccessor.HttpContext.User.FindFirstValue(ClaimTypes.NameIdentifier),
41         ProductId = productId,
42     };
43     await _context.AddAsync(reviews);
44
45     var orderDetail = await _context.OrderDetails.FindAsync(orderId);
46     orderDetail.ReviewAdded = true;
47     _context.Update(orderDetail);
48
49     var result = _context.SaveChanges();
50     if(result > 0)
51     {
52         return StatusCode(201);
53     }
54     else
55     {
56         return BadRequest();
57     }
58 }

```

Figure 18: Code segment to add review

4.1.5 Manage Review Module

In the manage review module, the admin and staff can browse all reviews in the system and the details of each review in a modal after the admin or staff click the “Detail” button in the webpage as shown in Figure 19. Other than that, admin and staff can also delete a specific review by using the code segment as shown in Figure 20.

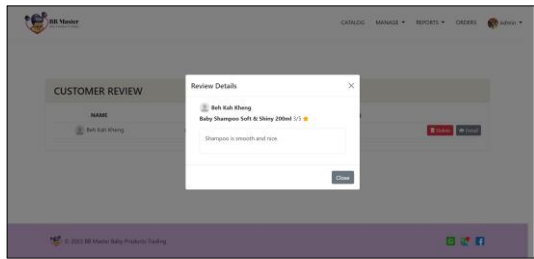


Figure 19: Review detail modal

```

19 [HttpPost]
20 [ValidateAntiForgeryToken]
21 public async Task<ActionResult> DeleteReview(int id)
22 {
23     var review = await _context.Reviews.FindAsync(id);
24     if (review != null)
25     {
26         _context.Reviews.Remove(review);
27     }
28     var result = await _context.SaveChangesAsync();
29     if (result > 0)
30     {
31         var response = new
32         {
33             success = true,
34             responseText = "Review had been deleted successfully."
35         };
36         return Content(Newtonsoft.Json.JsonConvert.SerializeObject(response), "application/json");
37     }
38     else
39     {
40         var response = new
41         {
42             success = false,
43             responseText = "Review is not deleted."
44         };
45         return Content(Newtonsoft.Json.JsonConvert.SerializeObject(response), "application/json");
46     }
47 }
    
```

Figure 20: Code segment to delete review

4.1.6 Manage Product Module

The system also allows staff and admin to see all valid products and manages them. To create a new product, the staff and admin would need to enter the required message into the web form as shown in Figure 21. The staff or admin also can view the detail of specific product in a webpage as shown in Figure 22 or delete a specific product from the system.

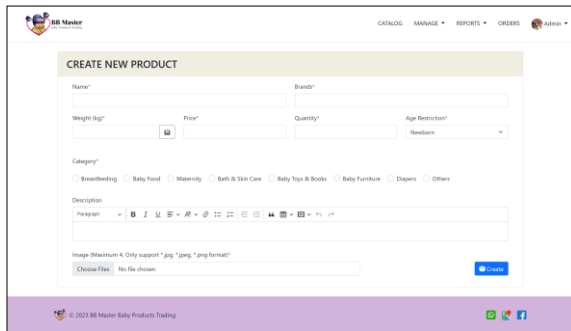


Figure 21: Create new product webpage

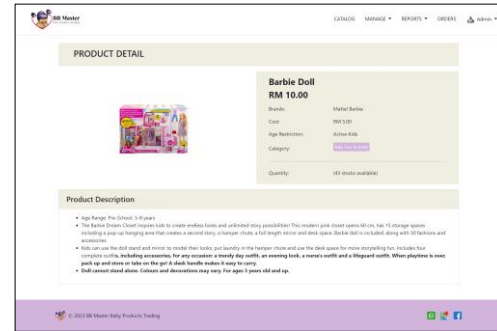


Figure 22: Product detail webpage

4.1.7 Generate Report Module

The admin in the system can view some critical reports that would help improve the business, for example the sales report as shown in Figure 23 that produced by code segment in Figure 24. It shows the total sales of the website in a specific date range. Besides that, the system also produces inventory reports that show the current quantity of products in the warehouse and a payment report that lists the payment status of all customers. Finally, the analytic report as shown in Figure 25 will allow admin to see the attribute of website on the internet. The web analytics reports will list the traffic sources, devices used by customers and most viewed webpage of the website. The report is generated by the code segment in Figure 26.

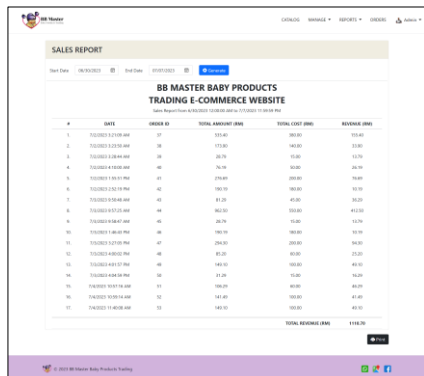


Figure 23: Sales report webpage

```

121 [HttpPost]
122 [ValidateAntiForgeryToken]
123 public async Task<PartialViewResult> SalesReport(DateTime startDate, DateTime endDate)
124 {
125     endDate = endDate.AddDays(1).AddSeconds(-1);
126     var orders = await _context.Orders.Where(x => x.Date >= startDate && x.Date <= endDate).ToListAsync();
127     SalesReportViewModel model = new SalesReportViewModel()
128     {
129         OrderList = orders,
130         StartDate = startDate,
131         EndDate = endDate,
132         Total = CalculateTotal(orders),
133     };
134     return PartialView("SalesReport", model);
135 }
    
```

Figure 24: Code segment generate sales report

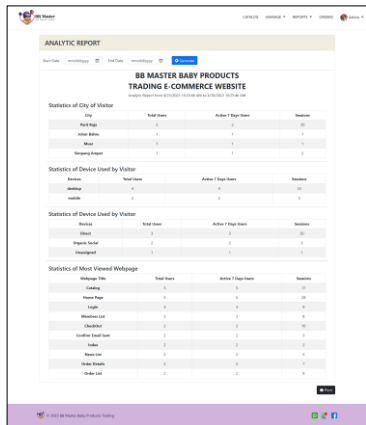


Figure 25: Web analytics report webpage

```

25: public async Task

```

Figure 26: Code segment to generate analytic report

4.1.8 Shopping Cart Module

The catalog webpage will list all products that can be bought on the website as shown in Figure 27. Customer can check the details of a products when they click the item shown in catalog and add the product into the shopping cart after they choose the quantity of products. After customers add an item into the shopping cart, they can check their shopping cart at the webpage shown in Figure 28. The shopping cart webpage will list all the products that customers add into the cart and customers can change the quantity of products in the webpage. Once the customer checkout at the webpage visualized in Figure 29, the code segment in Figure 30 will be executed to complete the payment process.

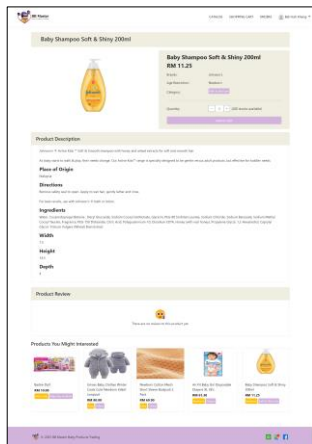


Figure 27: Catalog product webpage

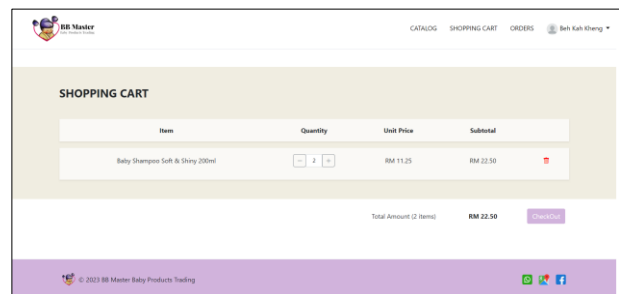


Figure 28: Shopping cart webpage

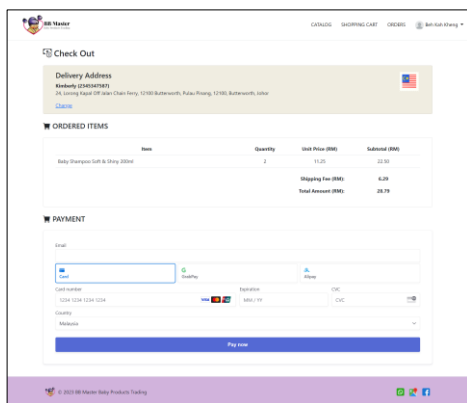


Figure 29: Checkout webpage

```

535: public async Task

```

Figure 30: Code segment for payment

4.2 System Testing

In this section, the test cases and test results of all website requirements are summarized in Table 4. The test cases id, requirements id, descriptions and test results will be described in the table. The system testing was conducted with the stakeholder and user acceptance testing was performed to make sure the system is reviewed and approved by the stakeholder.

Table 4: Test Cases for the website

| Test Cases ID | Requirements ID | Descriptions | Status |
|---------------|-----------------|--|--------|
| TC_100 | REQ_100 | Login | |
| TC_100_01 | REQ_101 | The system shall allow customers, staff, and admin to log in to the system by using email and password. | PASS |
| TC_100_02 | REQ_102 | The system shall allow customers, staff, and admin to reset their password through email. | PASS |
| TC_100_03 | REQ_103 | The system shall allow customers to create as new members. | PASS |
| TC_100_04 | REQ_104 | The system shall send a confirmation email to the registered new user. | PASS |
| TC_100_05 | REQ_NF101 | The system shall only allow customers, staff, and admin with the correct email and password to log in to the system. | PASS |
| TC_100_06 | REQ_NF102 | The system shall be able to disable the login function for 5 minutes if customers, staff, and admin log in failed for 5 times. | PASS |
| TC_100_07 | REQ_NF103 | The system shall only allow customers, staff, and admin that had confirmed email to log in. | PASS |
| TC_200 | REQ_200 | Manage User | |
| TC_200_01 | REQ_201 | The system shall allow staff and admin to view the details of customers. | PASS |
| TC_200_02 | REQ_202 | The system shall allow staff and admin to delete customers. | PASS |
| TC_200_03 | REQ_203 | The system shall allow admin to create new staff or admin. | PASS |
| TC_200_04 | REQ_204 | The system shall allow admin to view staff or admin details. | PASS |
| TC_200_05 | REQ_205 | The system shall allow admin to delete staff or admin. | PASS |
| TC_300 | REQ_300 | Manage Profile Setting | |
| TC_300_01 | REQ_301 | The system shall allow customers, staff, and admin to edit their profiles. | PASS |

| Test Cases ID | Requirements ID | Descriptions | Status |
|---------------|-----------------|--|--------|
| TC_300_02 | REQ_302 | The system shall allow customers, staff, and admin to reset their password. | PASS |
| TC_300_03 | REQ_303 | The system shall allow customers, staff, and admin to change their email addresses. | PASS |
| TC_300_04 | REQ_304 | The system shall be able to send a confirmation email to change the email address of the users. | PASS |
| TC_300_05 | REQ_305 | The system shall allow customers, staff, and admin to add new addresses. | PASS |
| TC_300_06 | REQ_306 | The system shall allow customers, staff, and admin to update existing addresses. | PASS |
| TC_300_07 | REQ_307 | The system shall allow customers, staff, and admin to delete specific addresses. | PASS |
| TC_300_08 | REQ_NF301 | The system shall only allow passwords that contain at least 8 characters, different letter cases, numbers, and special characters to be saved. | PASS |
| TC_400 | REQ_400 | Manage Order | |
| TC_400_01 | REQ_401 | The system shall allow customers, staff, and admin to view all orders. | PASS |
| TC_400_02 | REQ_402 | The system shall allow customers to view their own order list. | PASS |
| TC_400_03 | REQ_403 | The system shall allow customers, staff, and admin to check order details. | PASS |
| TC_400_04 | REQ_404 | The system shall allow customers, staff, and admin to print orders. | PASS |
| TC_400_05 | REQ_405 | The system shall allow customers, staff, and admin to track parcels by using tracking numbers. | PASS |
| TC_400_06 | REQ_406 | The system shall allow customers to add reviews to bought products. | PASS |
| TC_400_07 | REQ_407 | The system shall allow staff and admin to cancel orders. | PASS |
| TC_400_08 | REQ_408 | The system shall allow staff and admin to print AWB of specific order. | PASS |
| TC_500 | REQ_500 | Manage Review | |
| TC_500_01 | REQ_501 | The system shall allow staff and admin to view all reviews given by the customers. | PASS |

| Test Cases ID | Requirements ID | Descriptions | Status |
|---------------|-----------------|--|--------|
| TC_500_02 | REQ_502 | The system shall allow staff and admin to delete the reviews of specific products. | PASS |
| TC_600 | REQ_600 | Manage Shopping Cart | |
| TC_600_01 | REQ_601 | The system shall allow customers to browse product catalog. | PASS |
| TC_600_02 | REQ_602 | The system shall allow customers to view the details of products. | PASS |
| TC_600_03 | REQ_603 | The system shall allow customers to choose the quantity of products. | PASS |
| TC_600_04 | REQ_604 | The system shall allow customers to add new products into the shopping cart. | PASS |
| TC_600_05 | REQ_605 | The system shall allow customers to delete products in the shopping cart. | PASS |
| TC_600_06 | REQ_606 | The system shall allow customers to change the quantity of products in the shopping cart. | PASS |
| TC_600_07 | REQ_607 | The system shall allow customers to view all checkout products. | PASS |
| TC_600_08 | REQ_608 | The system shall be able to calculate the shipping fee. | PASS |
| TC_600_09 | REQ_609 | The system shall be able to calculate the total amount of all checkout products and shipping fees. | PASS |
| TC_600_10 | REQ_610 | The system shall allow customers to choose the payment method. | PASS |
| TC_600_11 | REQ_611 | The system shall allow customers to make payments. | PASS |
| TC_600_12 | REQ_612 | The system shall be able to show payment status after the payment is made. | PASS |
| TC_700 | REQ_700 | Manage Products | |
| TC_700_01 | REQ_701 | The system shall allow staff and admin to add new products. | PASS |
| TC_700_02 | REQ_702 | The system shall allow staff and admin to update existing products. | PASS |
| TC_700_03 | REQ_703 | The system shall allow staff and admin to delete products. | PASS |
| TC_700_04 | REQ_704 | The system shall allow staff and admin to view product details. | PASS |
| TC_800 | REQ_800 | Generate Reports | |

| Test Cases ID | Requirements ID | Descriptions | Status |
|---------------|-----------------|---|--------|
| TC_800_01 | REQ_801 | The system shall only allow admin to generate sales reports. | PASS |
| TC_800_02 | REQ_802 | The system shall only allow admin to generate inventory report. | PASS |
| TC_800_03 | REQ_803 | The system shall only allow admin to generate analytic report. | PASS |
| TC_800_04 | REQ_804 | The system shall only allow admin to generate payment report. | PASS |

4.2.1 Overall Result of Test Cases

In overall, there are a total of 50 test cases for the system and the test results is summarized in Table 5 and pie chart in Figure 31. All of the test cases passed successfully.

Table 5: Test results of test cases

| Test Cases | Total Test Cases | Total Success | Total Failed |
|------------|------------------|---------------|--------------|
| TC_100 | 7 | 7 | - |
| TC_200 | 5 | 5 | - |
| TC_300 | 8 | 8 | - |
| TC_400 | 8 | 8 | - |
| TC_500 | 2 | 2 | - |
| TC_600 | 12 | 12 | - |
| TC_700 | 4 | 4 | - |
| TC_800 | 4 | 4 | - |
| Total: | 50 | 50 | 0 |

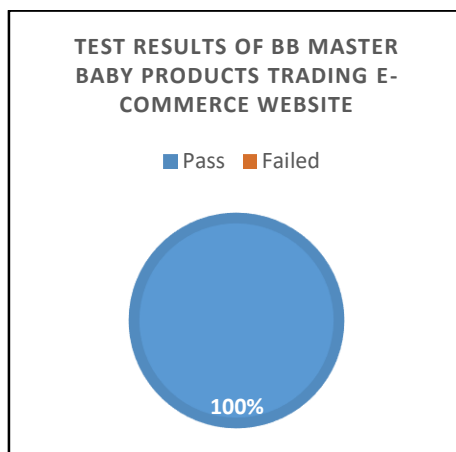


Figure 31: Test results of test cases

5. Conclusion

In conclusion, the e-commerce website has overcome the problems met by BB Master Baby Products Trading. The system has some advantages in generating various web analytics reports to admin of the system. However, the system also has some limitation for example the website is not responsive and only suitable to use on desktop browser. The website can still be improved by implementing a parcel status notification module into the system so that the admin, staff, and customers of the system can receive notifications when the parcel is delivered or met with some problems.

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