UTM
UNIVERSITI TEKNOLOGI MALAYSIA

COURSE CODE

SECD2613 – Analisa Dan Rekabentuk Sistem

LECTURE'S NAME

Dr Rozilawati Binti Dollah @ Md zain

TITLE

Project - Phase 3

Student Name	Matrics No
MUHAMMAD SALMAN BIN SULEIMAN	SX240229ECJHS01
MOHD AMYRUL ASRAF BIN NGISA	SX240273ECRHS01
THARMEINDRAN A/L CHANDRAN	SX241900ECJHF01

1.0 Overview of the Project

The Online Custom T-Shirt Printing System is a web-based application designed to simplify and automate the process of customizing, ordering, and delivering personalized t-shirts. This system is developed to address the growing demand for personalized merchandise in both individual and corporate markets.

The system enables users to design their own t-shirts by selecting shirt types, sizes, colors, and uploading custom artwork or text. Users can preview their designs in real time and place orders directly through the platform. The system handles everything from order placement, design submission, and secure online payment, to processing the order and coordinating with the printing and delivery vendors.

This project aims to digitally transform the traditional manual process of ordering customized t-shirts by integrating various features into a unified system that benefits both customers and the business. By automating most steps in the order lifecycle, the system helps reduce errors, improves turnaround time, and enhances customer satisfaction.

The system will also provide an administrative backend for the vendor to manage:

- Customer orders
- Design verification
- Payment tracking
- Printing coordination
- Shipping updates

Key Stakeholders:

- Customers: Individuals or companies who want to customize and purchase t-shirts.
- System Administrator: Manages system data, orders, and overall platform operations.
- Printing Vendor: Responsible for producing the custom-designed t-shirts.
- Delivery Provider: Ensures the finished products are shipped to the customers.

Technologies Used:

- Frontend: HTML, CSS, JavaScript

- Backend: PHP / Node.js / Python (depending on preference)
- Database: MySQL / MongoDB
- Hosting: Web server with cloud-based storage
- Integration: Payment gateway (e.g., PayPal, Fpx payment online banking), Email notifications

2.0 Problem Statement

In the current business environment, the process of ordering custom t-shirts is largely manual and fragmented. Customers who wish to create personalized t-shirts typically have to reach out to vendors via social media, messaging apps (e.g., WhatsApp, Instagram DMs), or email to communicate their design ideas and order preferences. This results in a disorganized workflow that is both time-consuming and prone to errors.

The main problems faced by both customers and vendors include:

1. Lack of Real-Time Design Tools

Customers cannot visualize their custom t-shirts before ordering. They rely on back-and-forth communication to confirm the look of their design, which leads to miscommunication, unclear expectations, and frequent redesign requests.

2. Manual Order Processing

All order information, including sizes, colors, quantities, and delivery addresses, must be recorded manually by the vendor. This often leads to errors in data entry, especially when handling multiple orders at once.

3. Payment and Confirmation Delays

Payments are often made via bank transfer or e-wallets and confirmed manually by sending receipts. This introduces delays in order verification, and sometimes payments go unnoticed or untracked, affecting customer trust.

4. Lack of Order Transparency and Tracking

Customers have limited visibility into their order status once it has been placed. They must constantly follow up with the vendor to get updates on printing and delivery, which consumes time and causes frustration.

5. Inefficient Communication with Printing and Delivery Vendors

The vendor manually relays information to third-party printing and delivery providers. This can result in misprints, missed deadlines, or delivery errors due to poor coordination.

6. No Centralized Database or Reporting Tools

There is no centralized system to track orders, sales, inventory, or customer data. This makes it difficult for the business to generate reports, analyze trends, or scale operations efficiently.

Summary of the Issues:

- **Customer-side problems:** Poor user experience, lack of self-service tools, no order tracking
- **Vendor-side problems:** Manual data handling, inefficient workflows, communication breakdowns
- **Operational problems:** Delay in processes, higher error rates, low scalabilit

This project addresses these pain points by developing an online system that centralizes, automates, and simplifies the entire custom t-shirt ordering process enhancing customer satisfaction while improving business efficiency.

3.0 Problem statement

3.0 Proposed Solutions

To overcome the limitations in the current manual t-shirt ordering process, we propose the development of a comprehensive Online Custom T-Shirt Printing System, which will fully digitize and automate the design, order, payment, production, and delivery pipeline.

This system will be web-based and designed with modular functionality, catering to different user roles such as customers, administrators, and printing vendors.

Functional Features

1. Online T-Shirt Designer

- Drag-and-drop interface for adding images, clipart, text, logos.
- Live preview showing placement and alignment on the shirt.
- Design templates for faster customization (e.g., birthday, company events, team shirts).
- Option to save and edit designs before checkout.

2. Product Catalogue and Selection

- A dynamic product catalog displaying available shirt types (e.g., short sleeve, polo, long sleeve).
- Filter by size, color, material, price, and availability.
- Real-time inventory sync to prevent overselling.

3. Seamless Order Placement

- Guided ordering steps: Design → Size & Quantity → Payment → Confirmation.
- Order summary and confirmation page before final submission.
- Unique order ID generation.

4. Secure Payment Integration

- Support for various payment options: credit/debit card, e-wallets, FPX online banking.
- Automatic payment validation.
- Immediate receipt generation and email confirmation.

5. Order Tracking System

- Real-time order status (e.g., *Processing*, *Printing*, *Ready to Ship*, *Delivered*).
- Tracking number linked to delivery provider's API.
- Customers can log in to view order history and track ongoing orders.

6. Admin Management Panel

- Dashboard with key performance metrics (KPIs).
- Manage and update catalog items, pricing, and inventory.
- Approve or reject user-submitted designs.
- Assign or schedule printing jobs.

7. Vendor Integration Module

- Interface for printing vendors to:
    - View assigned print jobs
    - Mark job status (e.g., *In Production*, *Completed*)
    - Upload proof of production if needed
- Integration with delivery partners for smooth logistics handling.

8. Customer Support Tools

- Built-in live chat or contact form for support.
- FAQs and design guidelines to help new users.

Non-Functional Features

1. Usability

- Responsive design for desktop and mobile users.
- Clean UI with tooltips, error prompts, and help sections.
- Minimal clicks for critical tasks (3-click checkout path goal).

2. Security

- HTTPS encryption
- Role-based access control (RBAC)
- Input validation and protection from SQL injection, XSS
- Secure session management and user authentication

3. Availability and Scalability

- Cloud-hosted for 99.9% uptime.
- Scalable architecture using microservices to handle large user volumes.
- CDN-enabled for faster content delivery (especially for design previews).

4. Maintainability

- Modular code structure (MVC or MVVM architecture).
- Admin panel for managing most dynamic content without developer intervention.
- Comprehensive logging and error tracking for debugging.

5. Performance

- Optimized image handling for quick rendering of shirt previews.
- Caching frequently accessed data (e.g., catalog).
- Background processing for heavy tasks like image rendering and report generation

4.0 Current Business Process / Workflow

The current business process for custom t-shirt ordering is primarily manual, with no centralized system to handle design submissions, payments, or order tracking. This results in operational inefficiencies, increased workload, and poor customer experience.

Workflow Description

1. **Order Inquiry**

   The customer initiates the process by contacting the vendor through social media, messaging apps (e.g., WhatsApp, Instagram), or phone calls to ask about product availability, pricing, and customization options.

2. **Design and Pricing Confirmation**

   The vendor shares available shirt types, sizes, and prices. The customer then sends their preferred design or customization (image or text), and the vendor confirms if the design can be printed. There's no tool for real-time design preview.

3. **Manual Payment Process**

   The customer makes payment via online banking or e-wallet transfer. The payment receipt is shared manually with the vendor (e.g., via WhatsApp). The vendor manually verifies and records the payment.

4. **Order Forwarded to Printing Vendor**

   After confirming payment and finalizing the design, the vendor sends the order details to the printing vendor manually, usually through messaging or email.

5. **Delivery Arrangement**

   Once the t-shirt is printed, the vendor either contacts a courier service to deliver the item or arranges the delivery themselves. There is no automated system to track the delivery or update the customer.

6. **Order Completion**

   The customer receives the t-shirt. If there are any issues (wrong design, wrong size), the resolution is handled manually through customer support.

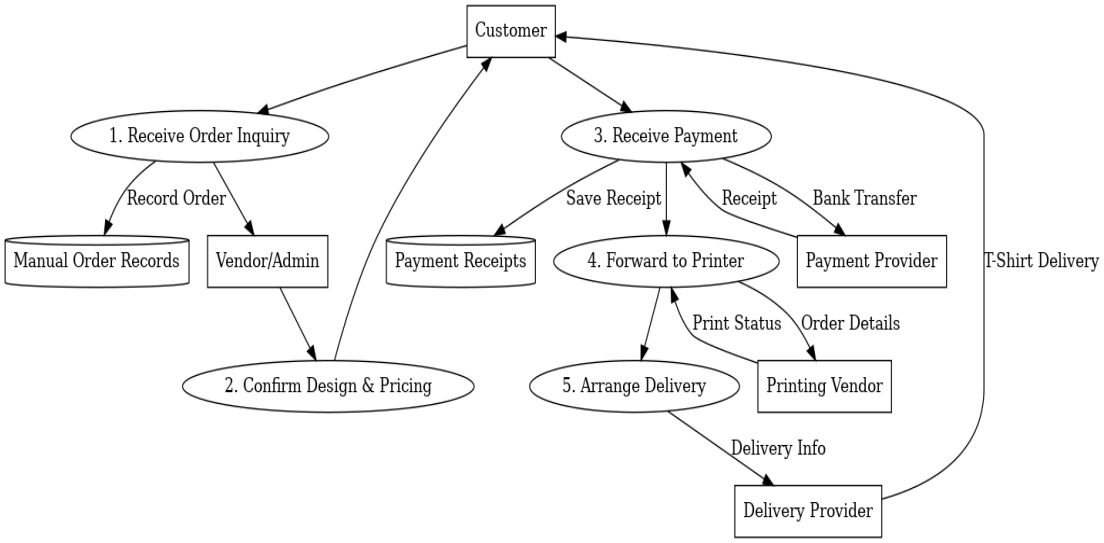
Problems Identified in the Current Workflow

- **No automation**: Every process (design, payment, confirmation, forwarding, delivery) is done manually.
- **Time-consuming communication**: Multiple rounds of message exchange to finalize details.
- **Error-prone**: High chance of miscommunication, incorrect sizes/designs, or lost records.
- **Lack of order tracking**: Customers do not receive real-time updates on their order status.
- **Scattered data**: Order and payment information are stored informally (messages, screenshots, notebooks).
- **No reporting**: Vendor cannot easily track business performance or manage customer data.

Why a System Is Needed

The current process is not scalable. As customer demand grows, manual tracking becomes harder, errors increase, and customer satisfaction drops. A system is needed to:

- Centralize data
- Automate order handling
- Provide customers with design tools and live updates
- Support vendors with real-time dashboards and reporting


Customer
1. Receive Order Inquiry
3. Receive Payment
Record Order
Save Receipt
Receipt
Bank Transfer
Manual Order Records
Vendor/Admin
Payment Receipts
4. Forward to Printer
Payment Provider
T-Shirt Delivery
Print Status
Order Details
2. Confirm Design & Pricing
5. Arrange Delivery
Printing Vendor
Delivery Info
Delivery Provider

5.0 Logical DFD (AS-IS)

The Logical Data Flow Diagram (DFD) of the current system illustrates how data flows through the existing manual t-shirt ordering process. This AS-IS DFD reflects how different entities (customer, vendor, printer, delivery, payment provider) interact with each other, highlighting the current system's informal, non-automated structure.

The AS-IS DFD helps to:

- Understand the current state of operations.
- Identify inefficiencies and areas for improvement.
- Provide a baseline for designing the TO-BE (future) system.

AS-IS DFD Overview

The AS-IS system consists of the following external entities, processes, and data stores:

External Entities:

1. Customer – Sends design requests, payments, and receives deliveries.
2. Payment Provider – Processes the payment transactions.
3. Printing Vendor – Prints t-shirts based on the order details.
4. Delivery Provider – Delivers finished t-shirts to customers.

Processes:

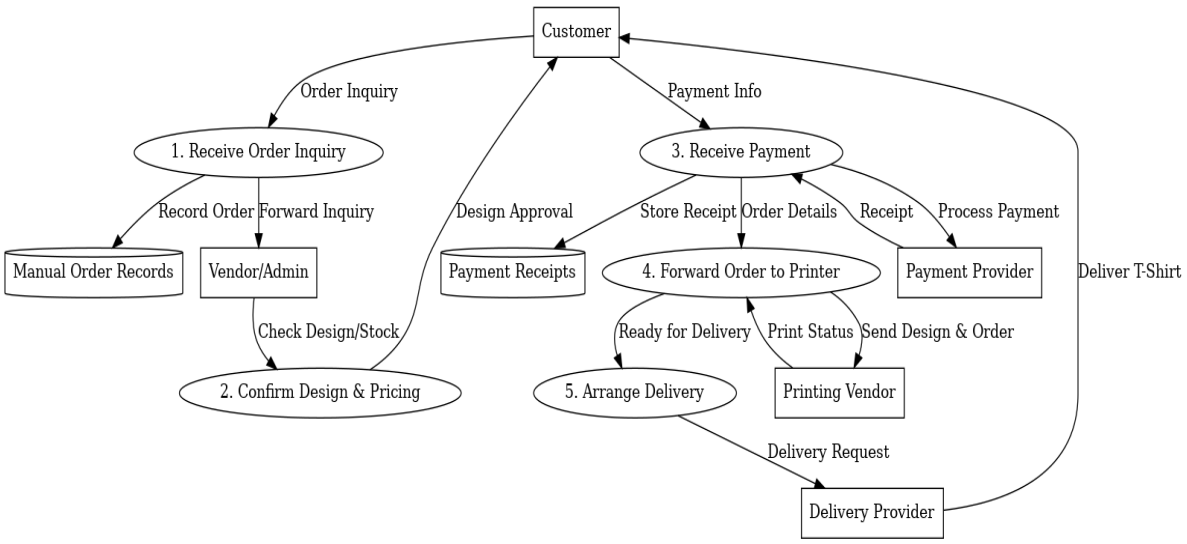
1. Receive Order Inquiry – Customer contacts vendor to start the process.
2. Confirm Design and Pricing – Vendor confirms shirt availability, pricing, and design.
3. Receive Payment – Customer makes payment and sends receipt.
4. Forward Order to Printer – Vendor communicates order and design to printer.
5. Arrange Delivery – Vendor contacts courier and confirms delivery with customer.

Data Stores (Manual):

- Manual Order Records – Orders are recorded manually in notebooks, spreadsheets, or messages.
- Payment Receipts – Screenshots or image files of payments shared via messaging apps.

Explanation of Data Flows

1. The Customer sends an inquiry and design to the Vendor (Process 1 and 2).
2. The Vendor replies with confirmation, pricing, and availability.
3. The Customer then proceeds with manual payment, and sends proof to the vendor.
4. The Vendor manually verifies payment with the Payment Provider and stores the receipt.
5. Once confirmed, the Vendor shares order details with the Printing Vendor, often via email or chat.
6. When the product is ready, the Vendor contacts a Delivery Provider to ship the t-shirt.
7. The Customer receives the order with no formal tracking system involved.



6.0 System Analysis and Specification

This section outlines the **future state** of the system—referred to as the **TO-BE system**—based on analysis of current processes and identified inefficiencies. The goal is to develop a new, automated, and web-based system that addresses all existing problems and introduces new capabilities for better user experience, data accuracy, and operational efficiency.

6.1 Logical DFD (TO-BE System)

The TO-BE system is designed to digitize and automate all stages of the custom t-shirt ordering process—from design to delivery—through an integrated online platform. The DFDs represent how the new system will logically handle data and interactions.

6.1.1 Context Diagram

- A **high-level view** of the entire system as a single process.
- Identifies all **external entities** interacting with the system and the **data flows** between them.

External Entities:

- **Customer** – Uploads design, places order, makes payment, receives product
- **Admin** – Oversees order management, printing, delivery, and user queries
- **Printing Vendor** – Receives finalized order details and uploads status
- **Payment Gateway** – Verifies and confirms payment transactions
- **Delivery Provider** – Handles product shipment and status updates

Main Data Flows:

- Design Submission, Payment Info, Order Status, Order Confirmation, Delivery Updates, etc.

6.1.2 Diagram 0 (Level 0 DFD)

- Breaks the single context-level process into **major subprocesses**:
    1. **Submit Design & Place Order**
    2. **Make Payment**
    3. **Process Order**
    4. **Forward to Printing Vendor**
    5. **Arrange Delivery**
    6. **Notify Customer**

Data Stores:

- **Order Database** – All placed orders with status history
- **User Database** – Registered customers and their profiles
- **Design Repository** – Uploaded artwork
- **Transaction Records** – Payment receipts and confirmations

Each subprocess includes its own inputs and outputs, describing how the system internally transforms and routes data.

6.1.3 Child Diagrams (Level 1 or Level 2)

- These expand selected processes from Diagram 0 into more detail.
- For example:
    - **Process Order** can be broken into:
        - Validate order info
        - Confirm stock availability
        - Assign to printer
    - **Notify Customer** can be expanded to:
        - Send email confirmation
        - Generate tracking link
        - Update order dashboard

6.2 Process Specifications

For each major process identified in the DFDs, specifications define:

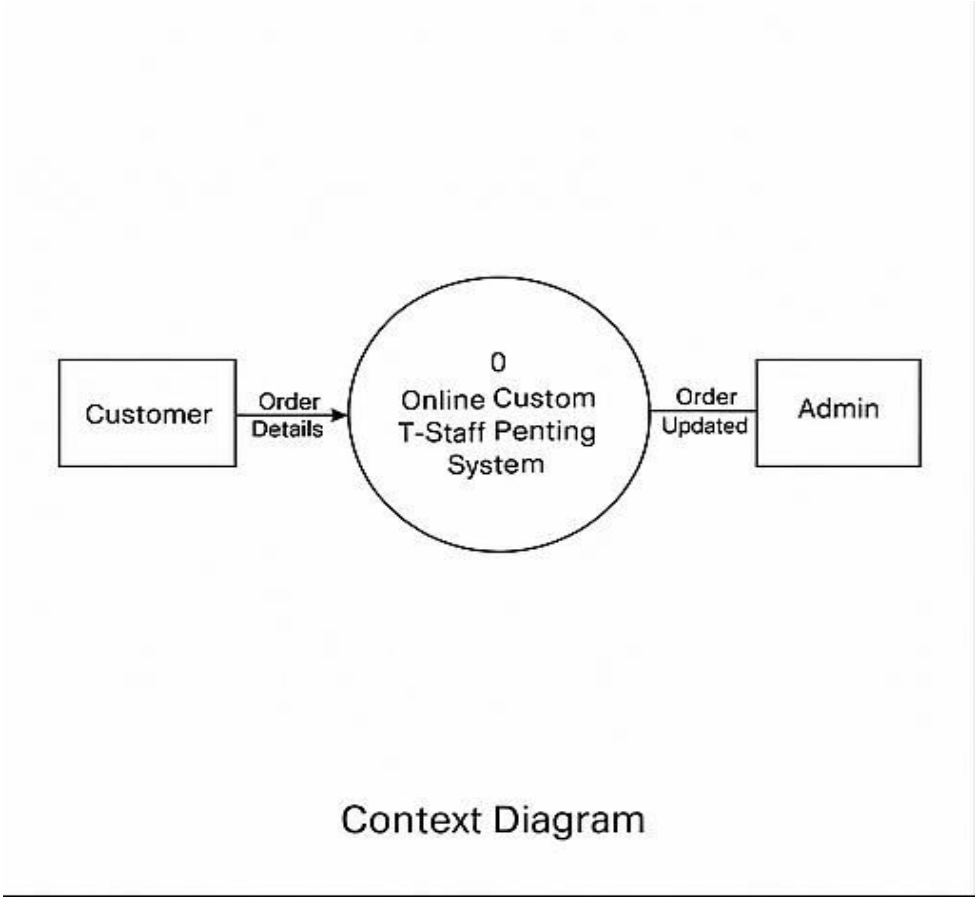
- **Purpose** of the process
- **Input data** (e.g., user design, payment info)
- **Output data** (e.g., order confirmation, invoice, tracking ID)
- **Conditions or rules** applied (e.g., design format check, stock check)
- Can be written in **Structured English**, **decision tables**, or **pseudocode**.

Example:

Process Name: Submit Design & Place Order
Input: T-shirt type, size, quantity, design image/text
Processing:

- Validate input fields
- Save design to repository
- Generate unique order ID

  Output: Order record stored; confirmation page shown to user



Context Diagram

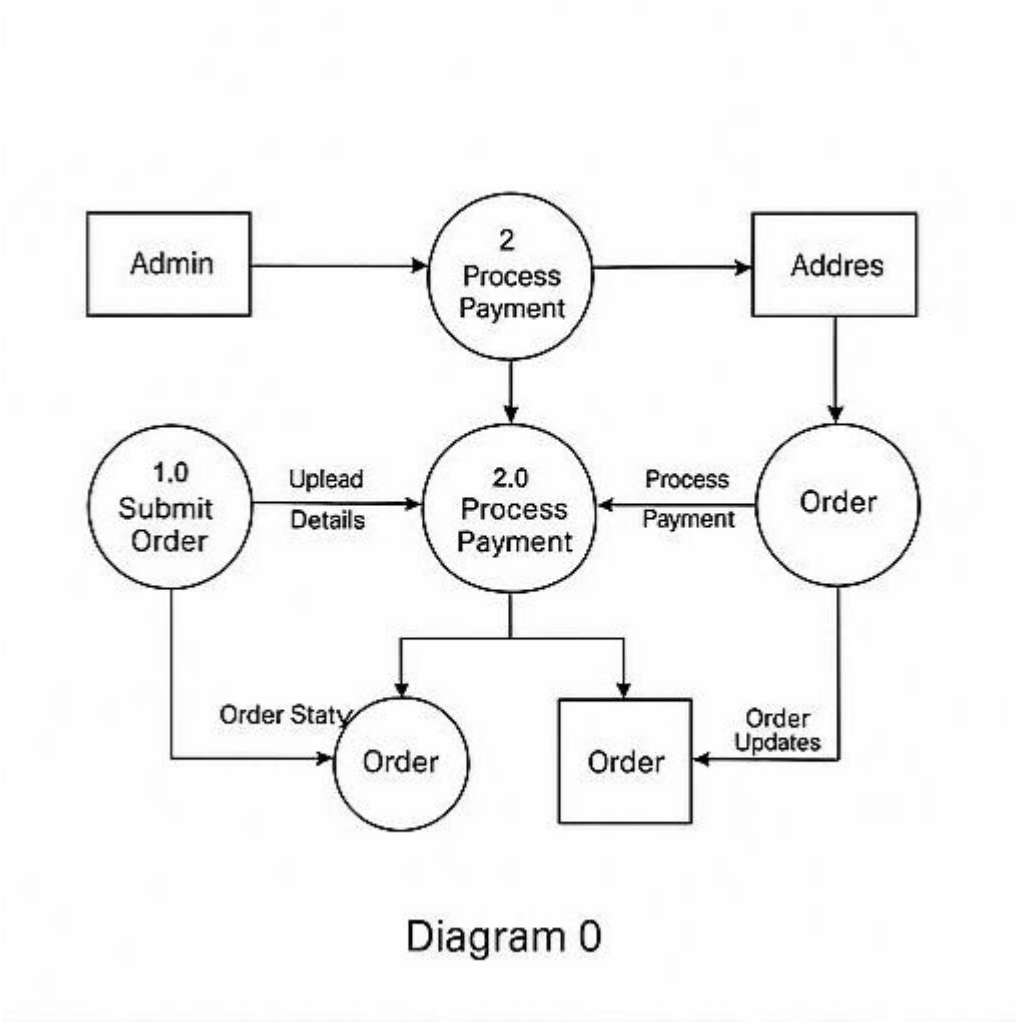
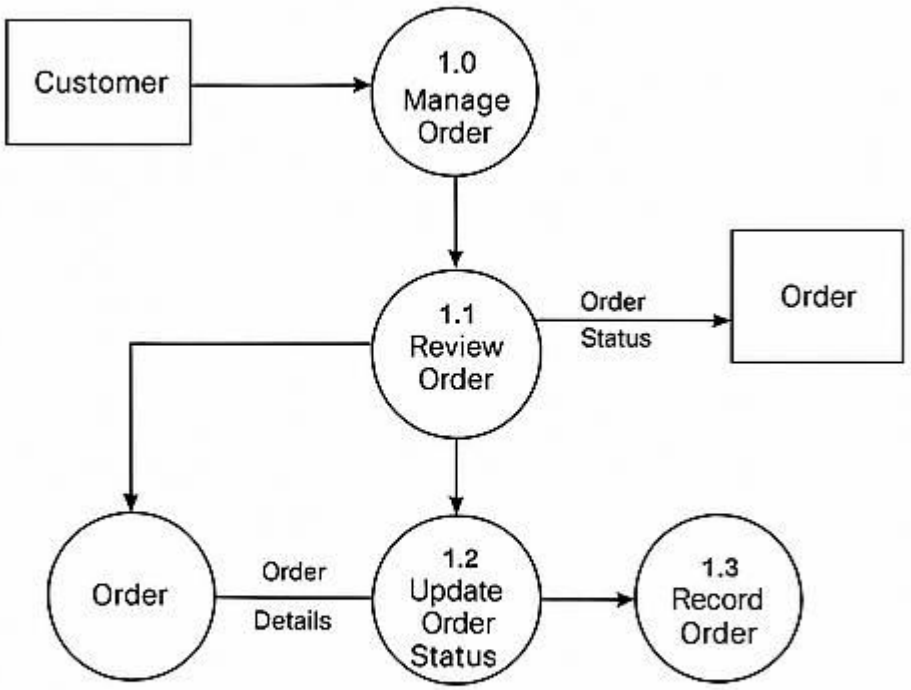
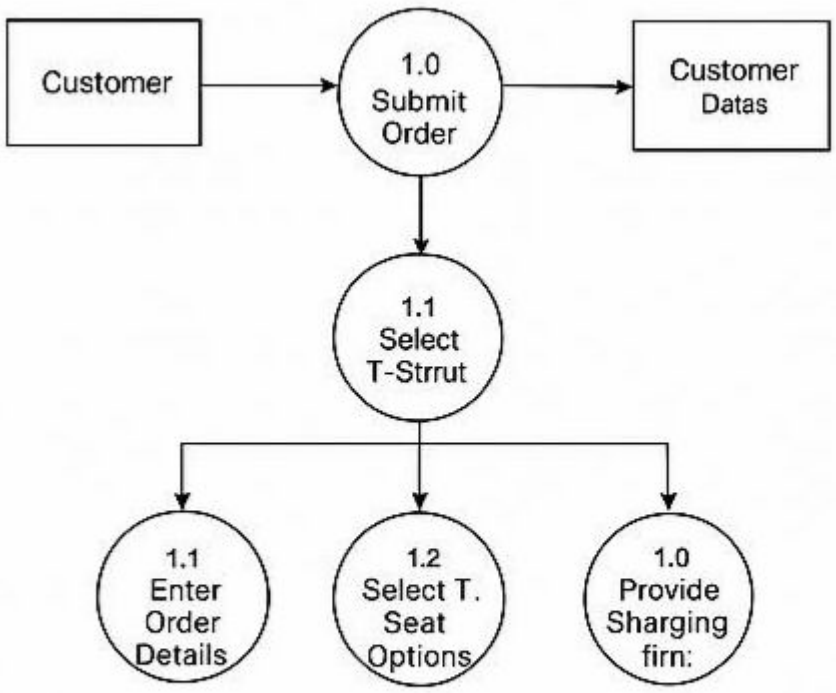

Admin
2
Process
Payment
Addres
1.0
Submit
Order
Uplead
Details
2.0
Process
Payment
Process
Payment
Order
Order Staty
Order
Order
Order
Updates

Diagram 0



Child Diagram



Child Diagram

7.0 Physical System Design

7.1 Physical DFD (TO-BE System)

Diagram 0 (Physical)

Entities:

- Customer (External)
- Admin (External)
- Payment Gateway (External)

Processes:

1.0 Receive Order (Web Form - Automated)

2.0 Confirm Order Details (Admin – Manual)

3.0 Process Payment (Payment Gateway – Automated)

4.0 Print Order (Printer System – Semi-Automated)

5.0 Ship Order (Shipping Provider – Manual)

Data Stores:

- D1: Customer Database (Automated)
- D2: Order Records (Automated)
- D3: Payment Logs (Automated)

Child Diagram (For Process 1.0: Receive Order)

- 1.1 Customer Inputs Design
- 1.2 System Saves Design to DB
- 1.3 System Sends Confirmation Email

Partitioning

Process	Done By	Type
Receive Order	System	Automated
Confirm Order Details	Admin	Manual
Process Payment	System/Gateway	Automated
Print Order	Vendor	Semi-Automated
Ship Order	Delivery Staff	Manual

CRUD Matrix

Entity / Process	Create	Read	Update	Delete
Customer	✓	✓	✓	✓
Order	✓	✓	✓	✓
Payment Record	✓	✓		
Product (T-shirt type)	✓	✓	✓	✓
Shipping Info	✓	✓	✓	✓

Event Response Table

Event	Trigger	System Response
New Order Submitted	Customer submits design	Save order, notify admin, send confirmation
Payment Confirmed	Gateway approves transaction	Update order status, log payment
Admin Approves Design	Admin verifies uploaded design	Mark order as ready for print
Order Printed	Vendor completes printing	Update status, notify shipping team
Order Shipped	Shipping team dispatches package	Update tracking, notify customer

8.0 System Wireframe

System wireframes represent the visual layout of screens users will interact with. This includes Input Designs (where data is entered) and Output Designs (where information is displayed). These wireframes serve as the blueprint for your system's user interface (UI) and are important for ensuring usability, functionality, and logical flow.

- **Input Design**

Input designs focus on how users will enter data into the system. It should:

- Be simple, clear, and user-friendly
- Minimize user errors
- Include appropriate fields, labels, buttons, and validations

- **Sample Input Screens:**

1. Customer Registration Form
   - Fields: Full Name, Email, Password, Confirm Password, Phone Number
   - Features: Field validation (e.g., email format, required fields)
   - Buttons: [Register], [Reset]
2. Login Screen
   - Fields: Email, Password
   - Buttons: [Login], [Forgot Password]
3. Custom T-Shirt Order Page
   - Dropdowns: T-shirt Type (e.g., Round Neck, Polo), Size, Color

- File Upload: Upload custom design (PNG/JPG)
- Text Field: Custom Text (optional)
- Buttons: [Preview], [Add to Cart]

4. Admin - Add Product Page

- Fields: Product Name, Description, Price, Available Sizes, Image Upload
- Buttons: [Save Product], [Cancel]

- **Output Design**

Output designs show how data is presented back to the user. The design must:

- Be clear, structured, and easy to read
- Allow users to quickly understand key information

- **Sample Output Screens:**

1. Order Summary (Customer)

- Displays: Order ID, Product Details, Price, Status
- Buttons: [Download Receipt], [Track Order]

2. Design Preview Screen

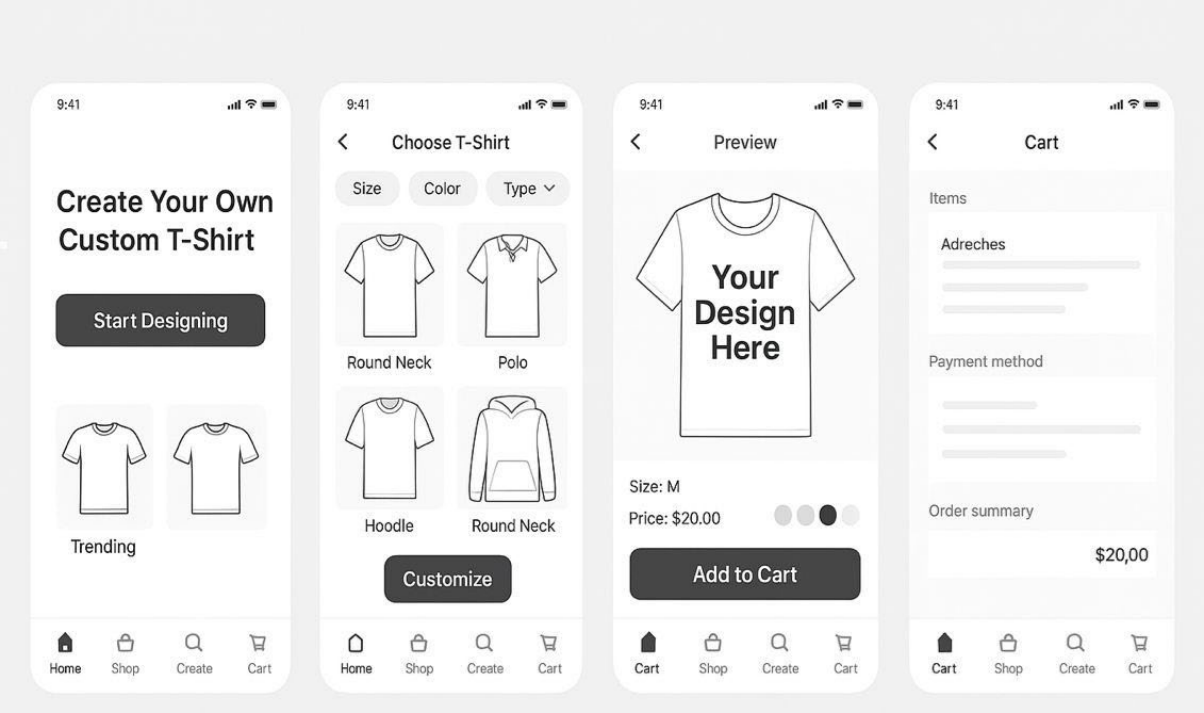
- Shows: A mockup of the selected shirt with uploaded design
- Allows: Back or confirm to proceed with order

3. Admin Dashboard

- Displays: Total Orders, Pending Orders, Sales Statistics
- Charts: Bar chart for weekly sales, pie chart for shirt types sold

4. Receipt Page

- Includes: Customer name, items purchased, order date, total amount
- Button: [Print Receipt], [Email Receipt]



Choose T-Shirt

Start Designing

Round Neck

Polo

Hoodie

Home Shop Create Cart

Fiiter

Customize

Done

Cart Shop Create Cart

4:41

Cart

Your Design Here
Size, M
$20.00
Edit

Total $20.00

Procedd to Checkout

4:40

Checkout

Shipping Address

Payment Method

Order Summary $20.00

Place Order

Home Shop Create Cart

9.0 Summary of the Proposed System

Key Achievements

- Developed a user-friendly online interface for customers to select t-shirt styles, upload designs, add custom text, and place orders.
- Integrated a payment processing feature using third-party gateway APIs for secure online transactions.
- Built an admin module for managing orders, updating order statuses, and tracking inventory.
- Designed structured data flows and system diagrams (AS-IS, TO-BE) for clear understanding of system operations and transformations.
- Implemented physical design components such as partitioning, CRUD matrix, and system architecture suited for a cloud-based deployment.
- Created interactive system wireframes to guide UI/UX implementation and provide visual clarity on the input-output process.

System Benefits

- Customers can order from anywhere at any time, reducing the need for in-person visits.
- Real-time order tracking and design previews improve user satisfaction and reduce errors.
- Admins gain control over order management, product updates, and performance insights via the admin dashboard.
- Paper-based records are replaced with a centralized, secure database, enhancing data integrity and reducing duplication.
- The system is scalable, with room for future modules such as promo codes, bulk ordering, or customer feedback.

System Limitations

- Requires stable internet connection for full functionality.
- Dependent on third-party APIs (e.g., payment gateway) which may cause service delays during outages.

- Initial deployment may require training for admin users unfamiliar with digital interfaces.

Future Improvements

- Mobile app version for both customers and admin for easier access on-the-go.
- Implementation of AI-based design suggestions and live design previews.
- Live chat support or chatbot to assist customers instantly.
- Integration with social media sharing to promote user-generated designs.
- Advanced analytics module for sales trends and customer behavior insights.