DFD Level 1: System Decomposition

This diagram decomposes the single process from the Context Diagram (0. Emily Bakes Cakes Database System) into three key functional sub-processes and the major data stores they rely on.

Processes (P)

ID	Process Name	Description
1.0	**Manage Orders & Fulfillment**	Handles all order initiation, status updates, employee assignment, and fulfillment tracking. This process interacts heavily with the Staff and Customers.
2.0	**Manage Customer & Marketing**	Manages customer records, handles segmentation, and generates reports used for targeted marketing campaigns to increase returning customers.
3.0	**Manage Product Catalog**	Allows Staff to define, update, and categorize products, pricing, and customization options (e.g., flavors, sizes, tiers).

Data Stores (DS)

ID	Data Store Name	Description
D1	**Customer Records**	Stores all customer contact information, preferences, and segmentation data.
D2	**Order Log**	Stores historical and current order details, status, assigned employee, and final payment details.
D3	**Product & Customizations**	Stores the core catalog, pricing rules, and available options (e.g., flavor lists, decoration types).
D4	**Employee Assignments**	Stores employee records and links them to current order tasks.

Data Flows & Interactions

Flow ID	From	To	Description
DF-A	Customer	P1.0	New Order Request / Inquiry
DF-B	P1.0	D1	New Customer Data / Updated Contact Info
DF-C	D3	P1.0	Available Product Options (to validate order)
DF-D	P1.0	D2	New Order Creation / Status Update
DF-E	D2	P1.0	Order Details (for staff viewing/updating)
DF-F	P1.0	D4	Employee Assignment Request
DF-G	Staff	P1.0	Order Status Update / Task Completion
DF-H	P1.0	Customer	Order Confirmation / Ready Notification
DF-I	Staff	P3.0	New Product/Customization Entry
DF-J	P3.0	D3	Catalog Save/Update
DF-K	Owner/Manager	P2.0	Report Request Criteria (e.g., "All customers who ordered a wedding cake")
DF-L	D1, D2	P2.0	Customer and Order Data (for analysis)
DF-M	P2.0	Owner/Manager	Generated Marketing & Operations Report

DF-1.11	P1.3	D2	Update Order Fulfillment Status
DF-1.12	D2	P1.4	Order Status Change Notification Trigger
DF-1.13	P1.4	Customer (E1)	Order Confirmation/Status Update

Entity Relationship Diagram (ERD) - Conceptual Schema

This conceptual ERD defines the key entities, attributes, and relationships necessary to support the proposed system's functionality (customer tracking, order processing, and product catalog management).

Entities and Key Relationships (Crows Foot Notation)

Entity	Primary Key (PK)	Key Attributes	Relationships
CUSTOMER (D1)	Customer_ID (PK)	FirstName, LastName, Email, Phone, Address, Segment Type (Retail/Corp)	1-to-Many with ORDER (One Customer places many Orders)
ORDER (D2)	Order_ID (PK)	Customer_ID (FK), Order Date, Delivery Date, TotalPrice, Payment Status, Order Status	Many-to-1 with CUSTOMER (Many Orders belong to one Customer)
PRODUCT (D3)	Product_ID (PK)	ProductName, Base Price, Category (Cake, Cupcake, Cookie), Is Active	1-to-Many with ORDER_ITEM (One Product can be in many Order Items)
EMPLOYEE (D4)	Employee_ID (PK)	FirstName, LastName, Role, Contact Info	1-to-Many with ORDER (One Employee is assigned to many Orders)
ORDER_ITEM	OrderItem_ID (PK)	Order_ID (FK), Product_ID (FK), Quantity, Customization Details (JSON string)	Many-to-1 with ORDER (Many items belong to one Order)

CUSTOMIZATION_OPTION(D3)	Option_ID (PK)	Type (Flavor/Size/Topping), Value, Additional Cost	1-to-Many with PRODUCT (One Option can apply to many Products)

Key Relationship Summary

1. **CUSTOMER** ⟹ **ORDER**
   - **Cardinality:** 1:M (One customer places one or many orders.)
   - **Business Rule:** An order cannot exist without an associated customer.
2. **ORDER** ⟹ **EMPLOYEE**
   - **Cardinality:** 1:M (One employee can be assigned to manage the fulfillment of many orders.)
   - **Business Rule:** An order must be assigned to an employee for tracking (after initial creation).
3. **ORDER** ⟹ **PRODUCT** (via **ORDER_ITEM** Association Entity)
   - **Cardinality:** M: M (Many orders can contain many products, and many products can be in many orders.)
   - **Business Rule:** The Order Item entity stores critical customization data specific to that order (e.g., "Vanilla cake, blue frosting, 'Happy Birthday' inscription").

4. **Data Dictionary (Primary Data Stores)**
5. The following tables define the structure of the primary data stores (entities) used throughout the system.

6. D1: Customer Records (CUSTOMER Entity)

Data Element	Type	Length	Required	Description
Customer_ID	Integer (PK)	N/A	Yes	Unique identifier for each customer record.
FirstName	String	50	Yes	Customer's first name.
LastName	String	50	Yes	Customer's last name.
Email	String	100	Yes	Primary email address (unique login, marketing contact).
Phone	String	20	Yes	Primary contact phone number.
Address	String	255	No	Customer's delivery/billing address.
Segment Type	String	10	Yes	'Retail' or 'Corporate' (Used for P2.0 Marketing).

7. D2: Order Log (ORDER Entity)

Data Element	Type	Length	Required	Description
Order_ID	Integer (PK)	N/A	Yes	Unique identifier for each order.
Customer_ID	Integer (FK)	N/A	Yes	Links to D1: Customer Records.
Employee_ID	Integer (FK)	N/A	Yes	Links to D4: Employee Assignments (Staff member assigned to order).
Order Date	Date/Time	N/A	Yes	Date and time the order was placed.
Delivery Date	Date	N/A	Yes	Target date for order fulfillment/pickup.
TotalPrice	Decimal	10, 2	Yes	Calculated total cost of the order.
Order Status	String	20	Yes	Current status (e.g., 'Pending', 'In Progress', 'Ready', 'Completed').
Payment Status	String	20	Yes	'Paid', 'Pending', 'Failed', 'Refunded'.

8. D3: Product & Customizations (PRODUCT Entity)

Data Element	Type	Length	Required	Description
Product_ID	Integer (PK)	N/A	Yes	Unique identifier for the catalog item.
ProductName	String	100	Yes	Name of the cake/product.
Base Price	Decimal	10, 2	Yes	Starting price for the item.
Category	String	50	Yes	'Cake', 'Cupcake', 'Dessert'.
Is Active	Boolean	N/A	Yes	Flag to show/hide product on the website.