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TASK1

Databases Project

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Task One - Database Design

1. Clearly explain why each entity needs to be included. For example if you have a staff entity explain how this benefits the overall dataset.

For my lawnmower sales office database system, the following entities will be included:

- **Customer**: Customers are crucial for any business.
  This entity allows the system to store and manage information about the customers.

- Address: The Address entity stores addresses information. Including it in the database allows the reuse of address details across entities like Customer and potentially others, allowing data consistency and avoiding redundancy.

- Product: Products represent the items being sold, in this case, lawnmowers.
  This entity allows us to store details such as model, manufacturer, type, price.
  This is essential to manage inventory, track sales, and provide accurate product information to customers.

- **Stock**: Stock management is crucial to track inventory levels and ensure products are available for customers. The Stock entity allows the system to store and manage information about the quantity of each product in stock.

- **Order**: The Order entity is essential to tack and manage orders.
  Connects customers with the products they purchase, along with relevant details such as order date and total amount. This allows the business to fulfil orders, and generate invoices.

- OrderItem: allows a detailed breakdown of each order.
  It specifies the quantity and subtotal for each product within every order. It also serves as an intermediate table for normalisation.

- **Staff**: Staff members play a vital role in managing day-to-day operations, as customers, they are also a vital party of any business.
  Staff entity allows information about staff members, such as their roles, contact details, and performance, to be stored on the database.

- Role: The Role entity stores information about different staff. Adding it to the database allows for clear associations between staff members and their roles, assisting human resource management and assigning responsibilities.

- Supplier: Suppliers provide the lawnmowers that the sales office sells. This allows tracking and managing suppliers, including contact information and products supplied. This information is helpful for inventory management reordering;

- Payment: tracks the financial aspect of transactions. It includes details such as payment date, amount, and method. This information is essential for financial record-keeping, reconciliation, and ensuring that payments are properly recorded and processed.

- Store: Multiple locations or stores may exist for a lawnmower sales office. Including a Store entity helps manage information about different physical locations.

- **Delivery**: The Delivery entity tracks the process of delivering products to customers. It includes information such as delivery date and status. This is crucial for logistics, order fulfilment, and providing customers with accurate delivery information.

- Type: The Type entity represents different product types. Adding the Type entity allows for a structured organisation and categorisation, allowing clarity and consistency.

- Manufacturer: The Manufacturer entity captures information about the manufacturers of products. It is crucial for tracking and managing the origins of products, ensuring that the system has accurate data.

- Services: The Services entity manages information about various services offered by the lawnmower sales office. This includes details like service names, descriptions, monthly costs, and durations. Integrating the Services entity supports the comprehensive management of service-related data, enabling tracking and provision of all different services to customers.

- Category: The Category entity categorises products into distinct groups, providing a systematic way to organise and classify inventory items. By adding the Category entity, the system gains flexibility in managing different types of products .

- DeliveryMethod: The DeliveryMethod entity outlines the different methods or modes by which products are delivered to customers. Adding this entity allows the system to store and manage information about delivery options.

- Status: The Status entity represents the various statuses or states that orders, payments, deliveries, or other relevant entities may assume. Including this entity facilitates tracking the progress and current state of different processes.

- Leave: The Leave entity manages information about staff members' leave requests, including start and end dates and reasons for leave. By including the Leave entity, the system gains the capability to track and manage staff leave.

- DayOfWeek: The DayOfWeek entity represents the days of the week, providing a structured way to categorise and organise temporal information within the system.

- BusinessHours: The BusinessHours entity captures information about the operating hours of a store on different days of the week. Allowing customers to know at what time stores function.

- Services: The Services entity manages and categorises various services offered by the lawnmower sales office. It allows service management, including pricing, duration, and service-specific details.

- Subscriptions: The Subscriptions entity represents the subscriptions taken by customers for specific services. Allow tracking of customer subscriptions, facilitating billing, and ensuring accurate service provisioning.

2. Identify the relevant entities of the dataset with their respective attributes, entity types (strong or weak) and primary keys.

Type:
  Attributes:
  - TypeID (Primary Key)
  - TypeName
  Entity Type: Strong

Manufacturer:
  Attributes:
  - ManufacturerID (Primary Key)
  - ManufacturerName
  Entity Type: Strong

Services:
  Attributes:
  - ServiceID (Primary Key)
  - ServiceName,
  - Description,
  - MonthlyCost
  - DurationMonths
  Entity Type: Strong

Category:
    Attributes:
- CategoryID (Primary Key)
- CategoryName

    Entity Type: Strong

DeliveryMethod:
    Attributes:
- DeliveryMethodID (Primary Key)
- MethodName

    Entity Type: Strong

Status:
    Attributes:
- StatusID (Primary Key)
- StatusName

    Entity Type: Strong

Role:
    Attributes:
- RoleID (Primary Key)
- RoleName

    Entity Type: Strong

Address:
    Attributes:
- AddressID (Primary Key)
- Country
- City
- Street
- PostCode

    Entity Type: Strong

Supplier:
    Attributes:
- SupplierID (Primary Key)
- Name
- ContactNumber

    Entity Type: Strong

PaymentMethod:
    Attributes:
- PaymentMethodID (Primary Key),
- MethodName

    Entity Type: Strong

Store:
Attributes:
- StoreID (Primary Key)
- AddressID (Foreign Key)
- ContactNumber

Entity Type: Weak (Dependent on Address)

DayOfWeek:
Attributes:
- DayOfWeekID (Primary Key)
- DayOfWeek

Entity Type: Strong

BusinessHours:
Attributes:
- BusinessHours (Primary Key)
- StoreID (Foreign Key)
- DayOfWeekID (Foreign Key)
- OpenTime
- CloseTime

Entity Type: Weak (Dependent on Store and DayOfWeek)

Product:
Attributes:
- ProductID (Primary Key)
- SupplierID (Foreign Key)
- CategoryID (Foreign Key)
- StatusID (Foreign Key)
- ManufacturerID (Foreign Key)
- TypeID (Foreign Key)
- Model
- Price

Entity Type: Weak (Dependent on Supplier and Category)

Customer:
Attributes:
- CustomerID (Primary Key)
- AddressID (Foreign Key)
- FirstName
- LastName
- ContactNumber
- Email

Entity Type: Weak (Dependent on Address)

Subscriptions:
- Attributes:
    - SubscriptionID (Primary Key)
    - ServiceID (Foreign Key)
    - CustomerID (Foreign Key)
    - SubscriptionStartDate
    - SubscriptionEndDate

    Entity Type: Weak (Dependent on Service and Customer)

Staff:
- Attributes:
    - StaffID (Primary Key)
    - RoleID (Foreign Key)
    - StoreID (Foreign Key)
    - AddressID (Foreign Key)
    - FirstName
    - LastName
    - ContactNumber
    - AnnualLeave
    - Pay
    - StartDate
    - EndDate

    Entity Type: Weak (Dependent on Role, Store and Address)

Leave
- Attributes:
    - LeaveID (Primary Key)
    - StaffID (Foreign Key)
    - StartDate
    - EndDate
    - Reason

    Entity Type: Weak (Dependent on Staff)

OrderTable:
- Attributes:
    - OrderID (Primary Key)
    - CustomerID (Foreign Key)
    - AddressID (Foreign Key)
    - StoreID (Foreign Key)
    - StatusID(Foreign Key)
    - OrderDate
    - OrderTotalAmount

    Entity Type: Weak (Dependent on Customer, Address, Store and Status

OrderItem
    Attributes:
- OrderItemID (Primary Key)
- OrderID (Foreign Key)
- ProductID (Foreign Key)
- Quantity
- Subtotal

Entity Type: Weak (Dependent on Order and Product)

Payment:
    Attributes:
- PaymentID (Primary Key)
- PaymentMethodID (Foreign Key)
- OrderID (Foreign Key)
- PaymentDate
- Amount

    Entity Type: Weak (Dependent on Order and PaymentMethod)

Delivery:
    Attributes:
- DeliveryID (Primary Key)
- StatusID(Foreign Key)
- OrderID (Foreign Key)
- DeliveryMethodID (Foreign Key)
- DeliveryDate

    Entity Type: Weak (Dependent on Status and Order)

Stock:
    Attributes:
- StockID (Primary Key)
- StoreID (Foreign Key)
- ProductID (Foreign Key)
- StockLevel

    Entity Type: Weak (Dependent on Store and Product)

3. Identify the relationships, cardinalities and constraints with supporting business rules and assumptions.

1. Staff and Store:

   - Relationship: Many-to-One
   - Cardinality: Many Staff members can be associated with One Store.
   - Constraints: Multiple staff members can work at the same store, but each staff member is associated with only one store.
   - Business Rule: Staff members work in specific stores within the organisation.
   - Assumption: Staff members may transfer between stores, but at any given time, they are associated with one store.

2. Staff and Address:

   - Relationship: Many-to-One
   - Cardinality: Many Staff can be associated with One Address.
   - Constraints: A staff can have only one address, however each address can be associated with multiple staff.
   - Business Rule: Each customer should have a valid address for contact and correspondence. Staff might live at the same address.
   - Assumption: Staff members may share the same residential address.

3. Staff and Role:

   - Relationship: Many-to-One
   - Cardinality: Many Staff have One Role.
   - Constraints: A staff can have only one role, however each role may be associated with one role.
   - Business Rule: Each staff member should be associated with the role they carry out in the store they work for.
   - Assumption: Staff roles are specific to the store where the staff member is employed.

4. Staff and Leave

- Relationship: One-to-Many
- Cardinality: One Staff can have Many Leave entries.
- Constraints: A staff member can have multiple leave entries, but each leave entry is associated with only one staff member.
- Business Rule: Each staff member can take multiple leaves, and each leave entry should be linked to the staff member who is availing the leave.
- Assumption: Leave records are specific to individual staff members, and staff members may have multiple instances of leave associated with their records.

5. Stock and Product:

- Relationship: Many-to-One
- Cardinality: Many Stock entries can be associated with One Product.
- Constraints: Multiple stock entries can be linked to a single product, but each stock entry is specific to one product.
- Business Rule: Stock information is managed separately for each product, and multiple stock entries can be associated with a single product, representing the availability of that product in different stores.
- Assumption: Each stock entry corresponds to a specific product in a particular store.

6. Stock and Store:

- Relationship: Many-to-One
- Cardinality: Many Stock entries can belong to One Store.
- Constraints: Multiple stock entries can be associated with one store, but each stock entry is specific to one store.
- Business Rule: Stock information is managed separately for each store, and multiple stock entries can be associated with a single store, representing the availability of different products in that store.
- Assumption: Each stock entry corresponds to a specific store.

7. Product and Supplier:

    - Relationship: Many-to-One
    - Cardinality: Many Products can be supplied by One Supplier.
    - Constraints: Multiple products can be supplied by the same supplier, but each product is supplied by one supplier.
    - Business Rule: Each product is associated with a specific supplier.
    - Assumption: Each supplier supplies unique products.

8. Product and Status:
    - Relationship: Many-to-One
    - Cardinality: Many Products can have One Status.
    - Constraints: Multiple products can share the same status, indicating that various products may be at the same stage in their lifecycle or availability. However, each product is associated with one status.
    - Business Rule: Products go through different statuses in their lifecycle, such as 'In Stock,' 'Out of Stock,' or 'On Sale.'
    - Assumption: The status assigned to a product reflects its current state.

9. Product and Type:
    - Relationship: Many-to-One
    - Cardinality: Many Products can have One Type.
    - Constraints: Multiple products can share the same type, indicating that various products have the same type. However, each product is associated with one type.
    - Business Rule: All products have a type, like 'lawnmower'
    - Assumption: Every product has as type.

10. Product and Manufacturer
    - Relationship: Many-to-One
    - Cardinality: Many Products can have One Manufacturer.
    - Constraints: Multiple products can share the same manufacturer, indicating that various products are produced by the same manufacturer. However, each product is associated with only one manufacturer.
    - Business Rule: All products have a manufacturer.
    - Assumption: Every product has as manufacturer.

11. Store and Order:

    - Relationship: One-To-Many
    - Cardinality: One Store can be associated with Many Orders.
    - Constraints: Each order is associated with one store, but a store can have multiple orders.
    - Business Rule: Each order is placed at a specific store, and a store can have multiple orders.

- Assumption: Orders are placed for products available in a particular store.

12. Store and Address:

- Relationship: One-to-One
- Cardinality: One Store is associated with One Address.
- Constraints: Each store has a single address, and each address is specific to one store.
- Business Rule: Each store is uniquely identified by its address, ensuring a one-to-one relationship between a store and its location.
- Assumption: Each store has a unique address.

13. Store and BusinessHours:

- Relationship: One-to-Many
- Cardinality: One Store can have Many Business Hours entries.
- Constraints: Each store can have multiple entries in the BusinessHours table, one for each day of the week. However, each business hours entry is specific to one store.
- Business Rule: Each store has business hours, that may change depending on the day of the week.
- Assumption: Business hours for each day may vary across different stores.

14. Customer and Address:

- Relationship: One-to-One
- Cardinality: One Customer has One Address.
- Constraints: A customer can have only one address, and each address is associated with only one customer.
- Business Rule: Each customer should have a valid address for contact and correspondence.
- Assumption: Each customer has a unique address.

15. Order and Customer:

- Relationship: Many-to-One
- Cardinality: Many Orders can be placed by One Customer.
- Constraints: An order is placed by one customer, but a customer can place multiple orders.
- Business Rule: Customers can make multiple purchases, and each purchase is recorded as a separate order.
- Assumption: Customers can place multiple orders.

16. Order and Address:

- Relationship: Many-to-One
- Cardinality: Many Orders can be associated with One Address.
- Constraints: Multiple orders can share the same address, but each address is specific to one or more orders.
- Business Rule: Many orders can have the same address, reflecting scenarios where multiple orders are shipped to the same location, share a common billing address, or a customer re-orders from the store.
- Assumption: Multiple orders can share the same address.

17. Order and Store:

- Relationship: Many-to-One
- Cardinality: Many Orders can be associated with One Store.
- Constraints: Multiple orders can be linked to a single store, but each order is specific to one store.
- Business Rule: Orders are placed by customers for products available in a particular store. Multiple orders can be associated with a single store, representing the sales transactions occurring in that specific store.
- Assumption: Orders are store-specific.

18. Order and OrderItem:

- Relationship: One-to-Many
- Cardinality: One Order can have Many OrderItems.
- Constraints: An order can consist of multiple items, and each order item belongs to one order.
- Business Rule: Each order can contain multiple items (products), and each item is associated with a specific order.
- Assumption: Each order item corresponds to a product in a specific order.

19. Order and Status:

- Relationship: Many-to-One
- Cardinality: Many Orders can have One Status.
- Constraints: Multiple orders can share a common status, indicating that several orders may be in the same stage of the order fulfilment process.
- Business Rule: Orders have a status.
- Assumption: Each order has a specific status reflecting its stage in the fulfilment process.

20. Delivery and Order:

- Relationship: One-to-One
- Cardinality: One Delivery corresponds to one order.
- Constraints: Each delivery is related to a specific order and each order has a corresponding delivery.
- Business Rule: Each order should be associated with a delivery for fulfilment.
- Assumption: Each delivery requires a corresponding order.

21. Delivery and Status:

- Relationship: Many-to-One
- Cardinality: Many Deliveries can have One Status.
- Constraints: Multiple deliveries may share a common status, signifying that several deliveries are at the same stage in the fulfilment process.
- Business Rule: Each delivery must have a status.
- Assumption: Deliveries at similar stages share a common status.

22. Delivery and DeliveryMethod:

- Relationship: Many-to-One
- Cardinality: Many Deliveries can be associated with One Delivery Method.
- Constraints: Multiple deliveries may be linked to the same delivery method, indicating that various deliveries can share a common mode of transportation.
- Business Rule: Each delivery must be associated with a delivery method.
- Assumption: Multiple deliveries can use the same delivery method.

23. Payment and Order:

- Relationship: One-to-One
- Cardinality: One Payment is associated with One Order.
- Constraints: Each order has a corresponding payment, and each payment is linked to a specific order.
- Business Rule: Every order placed by a customer requires a payment transaction. Assumption: Each order has a corresponding payment.

24. Payment and PaymentMethod:

- Relationship: Many-to-One
- Cardinality: Many Payments can be associated with One Payment Method.
- Constraints: Multiple payments can use the same payment method, but each payment method is specific to one or more payments.
- Business Rule: Multiple payments can share the same payment method, reflecting scenarios where customers use a common payment method for multiple transactions.
- Assumption: Multiple payments can use the same payment method.

25. Store and BusinessHours:

- Relationship: One-to-Many
- Cardinality: One Store can have Many BusinessHours.
- Constraints: Each store can have multiple business hours entries, but each business hours entry is specific to one store.
- Business Rule: Stores have specific operating hours, and multiple business hours entries can be associated with a single store, representing the different time slots for each day.
- Assumption: Business hours entries are unique to each store and may vary for different days.

26. BusinessHours and DayOfWeek:

- Relationship: Many-to-One
- Cardinality: Many BusinessHours entries can be associated with One DayOfWeek.
- Constraints: Multiple business hours entries may share the same day of the week, but each entry is specific to one day.
- Business Rule: Business hours are defined for each day of the week, and multiple business hours entries can be associated with a single day of the week.
- Assumption: Business hours entries may have different time slots for the same day.

27. Services and Subscriptions:

- Relationship: One-to-Many
- Cardinality: One Service can have Many Subscriptions.
- Constraints: Each service can have multiple subscriptions, but each subscription is specific to one service.
- Business Rule: Customers subscribe to various services offered by the company, and each subscription is associated with a specific service.
- Assumption: Customers may subscribe to multiple services, and each subscription is unique to a particular service.

28. Subscriptions and Customer:

- Relationship: Many-to-One
- Cardinality: Many Subscriptions can be associated with One Customer.
- Constraints: Multiple subscriptions may belong to the same customer, but each subscription is specific to one customer.
- Business Rule: Customers can have multiple subscriptions for different services, and each subscription is linked to a specific customer.
- Assumption: Customers may have various subscriptions, and each subscription is unique to a specific customer.

4. Draw an ER diagram for the system depicting the entities, relationships, cardinalities, participations using your preferred ERD notation.
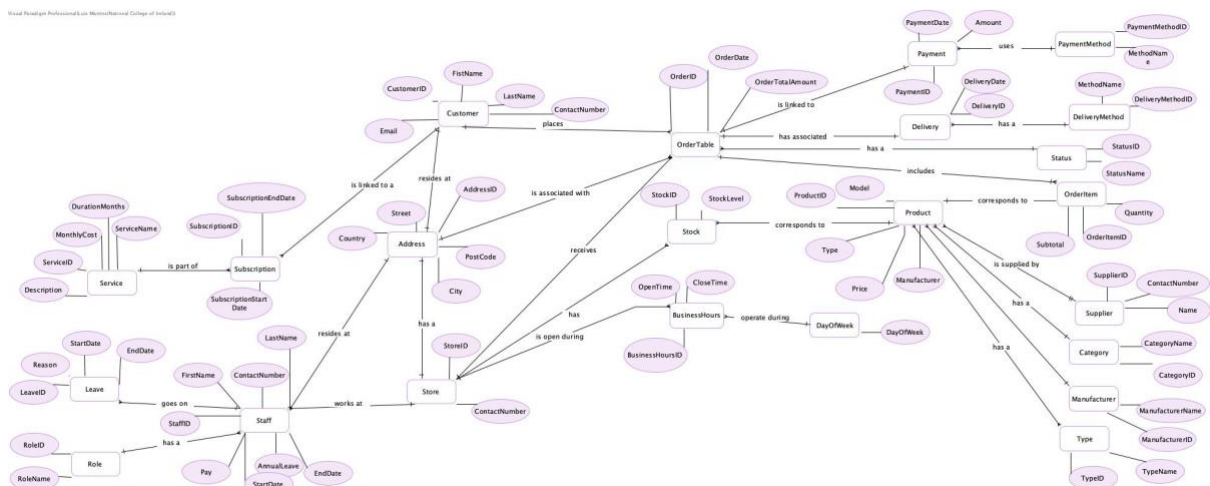
5. Convert the entities in the conceptual design into logical dataset(relational model). Use a logical layout of entities which is easily understood by any reader. Ensure that tables are in the correct format to allow for the best possible representation of data.