## Data Structure

**Customer Information**

Attributes: Customer ID

Name

Contact Information

Project History

**Building Projects**

Attributes:

Project ID

Customer ID (linked to Customer)

Start Date

End Date

Project Supervisor ID

Status (e.g., In Progress, Completed)

**Materials**

Attributes:

Material ID

Name

Supplier ID (linked to Supplier)

Quantity in Stock

Reorder Level

**Suppliers**

Attributes:

Supplier ID

Name

Contact Information

Materials Supplied (linked to Materials)

**Staff Members**

Attributes:

Staff ID

Name

Areas of Expertise

Level of Expertise

Availability

**Tasks**

Attributes:

Task ID

Project ID (linked to Building Projects)

Description

Date

Duration

Materials Used (list of Material IDs with quantities)

Labour Hours (linked to Staff Members)

**Task Allocations**

Attributes:

Allocation ID

Task ID (linked to Tasks)

Staff ID (linked to Staff Members)

Hours Worked

**Example Project Data**

**Project A**

* Customer: John Doe
* Supervisor: ST7 Fred Bloggs
* Tasks:

1. Task 1: Laying Drive

* Date: 10/11/24
* Duration: 14 hours
* Materials:
  + Hardcore: 5 tons
  + Gravel: 2 tons
* Staff:
* ST1 L. Jones: 14 hours
* ST2 L. Morgan: 14 hours

1. Task 2: Excavating Area

* Date: 12/11/24
* Duration: 7 hours
* Materials:
  + None (only labour)
* Staff:
* ST3 B. Smith: 7 hours
* ST4 G. Samuel: 7 hours

1. Task 3: Laying Patio

* Date: 12/11/24
* Duration: 21 hours
* Materials:
  + Patio Slabs: 30 slabs
  + Cement: 1 ton
* Staff:
  + ST1 L. Jones: 21 hours
  + ST2 L. Morgan: 21 hours

### Process Flow

1. **Project Creation**:
   * A customer requests a project. Gather all necessary details and create a new entry in the Building Projects.
2. **Material Management**:
   * Track stock levels for each material. Trigger orders with suppliers when stock falls below reorder levels.
3. **Staff Allocation**:
   * Assign a supervisor and staff members based on their expertise and availability.
4. **Task Management**:
   * Create tasks for the project, linking to allocated staff and required materials.
5. **Tracking and Reporting**:
   * Record the hours worked by each staff member per task. Monitor project progress and material usage for future reference.

### Considerations

* **Future Enhancements**: Consider integrating a system for tracking invoices, payments, and customer feedback.
* **User Interface**: If this system will be used by multiple staff, designing an intuitive interface will be crucial for usability.
* **Data Integrity**: Ensure that updates to stock levels, staff hours, and project statuses are easily auditable.

1. **Project**
   * **Attributes**:
     + projectID: int
     + startDate: Date
     + endDate: Date
     + status: String
   * **Operations**:
     + assignSupervisor(supervisor: Supervisor)
     + addTask(task: Task)
     + getMaterialsUsed()
   * **Associations**:
     + **1 to 1** with **Supervisor**
     + **1 to many** with **Task**
     + **1 to 1** with **Customer**
2. **Supervisor**
   * **Attributes**:
     + supervisorID: int
     + name: String
   * **Operations**:
     + superviseProject(project: Project)
   * **Associations**:
     + **1 to many** with **Task**
3. **Staff**
   * **Attributes**:
     + staffID: int
     + name: String
     + areasOfExpertise: List<String>
     + levelOfExpertise: String
   * **Operations**:
     + assignToTask(task: Task, hours: int)
   * **Associations**:
     + **many to many** with **Task**
4. **Task**
   * **Attributes**:
     + taskID: int
     + description: String
     + date: Date
     + duration: int
   * **Operations**:
     + addMaterial(material: Material, quantity: int)
     + recordLabourHours(staff: Staff, hours: int)
   * **Associations**:
     + **many to many** with **Material**
     + **1 to many** with **Staff**
     + **1 to 1** with **Project**
5. **Material**
   * **Attributes**:
     + materialID: int
     + name: String
     + quantityInStock: int
     + reorderLevel: int
   * **Operations**:
     + orderMaterial(quantity: int)
   * **Associations**:
     + **many to many** with **Task**
     + **1 to many** with **Supplier**
6. **Supplier**
   * **Attributes**:
     + supplierID: int
     + name: String
     + contactInfo: String
   * **Operations**:
     + supplyMaterial(material: Material, quantity: int)
   * **Associations**:
     + **1 to many** with **Material**

### Relationships and Multiplicities

* **Customer** ↔ **Project**
  + **1 to many** (1 customer can have multiple projects)
* **Project** ↔ **Supervisor**
  + **1 to 1** (1 project has 1 supervisor)
* **Project** ↔ **Task**
  + **1 to many** (1 project can have multiple tasks)
* **Task** ↔ **Staff**
  + **many to many** (many staff can work on many tasks)
* **Task** ↔ **Material**
  + **many to many** (many tasks can require many materials)
* **Material** ↔ **Supplier**
  + **1 to many** (1 supplier can supply multiple materials)