LABORATORY INFORMATION DATABASE

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DATABASES ASSIGNMENT 1

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System Description

A small contract analytical company carries out routine chemical analysis for client manufacturing companies (usually within pharmaceutical or agri-food industries). They wish to create their own *in-house* built laboratory information management system that utilises a relational database. In addition to tracking their data on laboratory samples they aim to use this to centrally store all information on clients, projects, suppliers, inventory, and staff.

The company records the company name of each client, their address and issues a unique clientID. Also recorded is the company name, address (street, city, country, post code), phone numbers (up to three).

The client will issue any number of batches of their product to be analysed. Each batch that is analysed must be either a raw material or a finished product, but cannot be both. Each batch will have its own unique batch number, as well as a product name and date of manufacture.

Samples are aliquoted from each batch to be run in the analysis. A batch can be sampled many times. Every sample gets a sample ID. The expiry date, storage conditions and progress status are recorded for every sample.

Each analysis can run any number of samples. A unique number (lab book number) is recorded (corresponding to the page in the laboratory notebook). In addition, analytical method type, and specification are recorded.

Every time an analysis is performed on a sample, a new resultID is recorded as well as the time and date the analysis is completed.

Multiple (maximum of ten) individual analytical instruments can be used to complete an analysis. For each lab instrument, equipmentID and the next calibration date are recorded. Every time a lab instrument is used the timestamp of measurement is recorded.

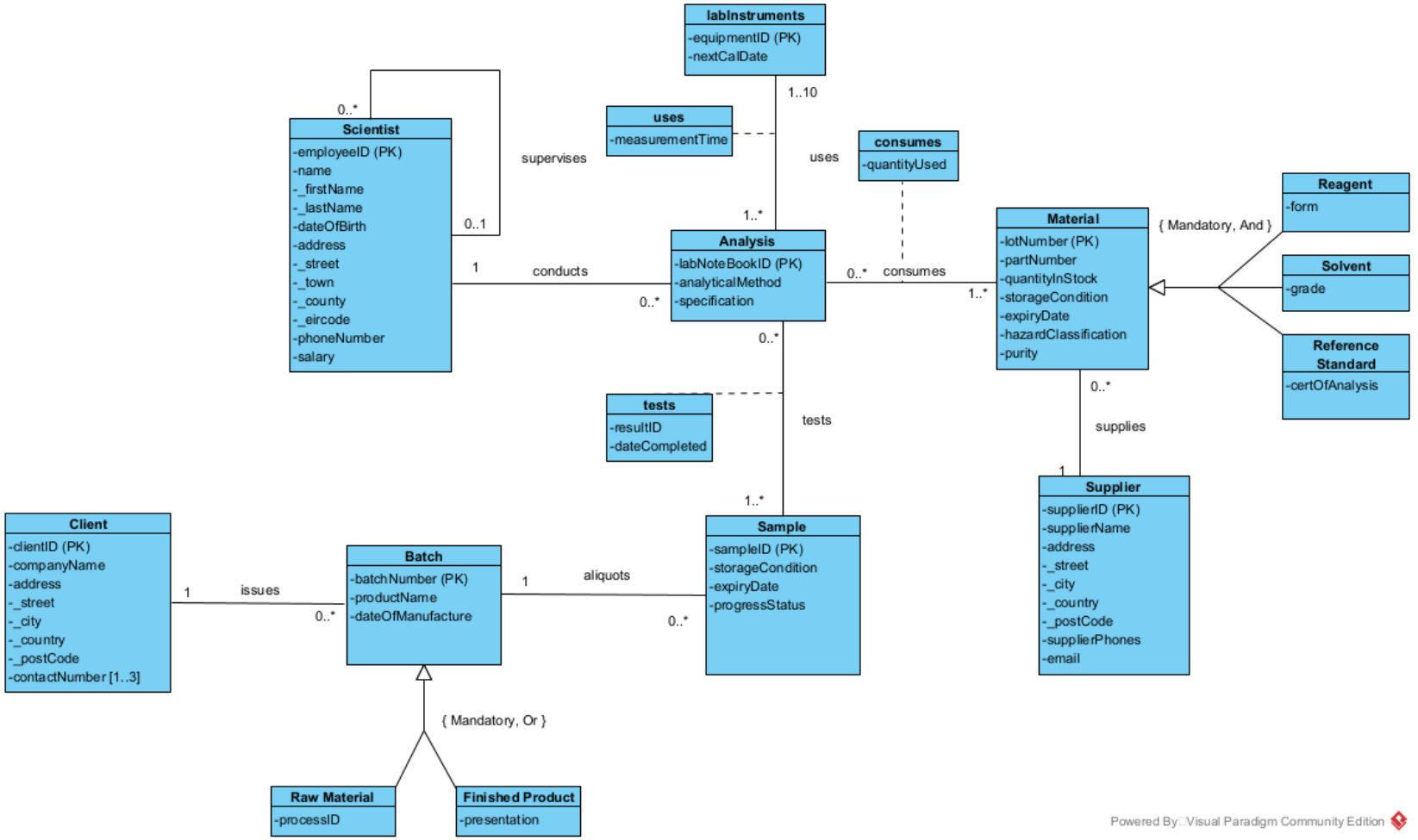
Each analysis will consume materials. The material can be either classed as a solvent, reagent or reference standard. The physical form (*i.e.* solid, liquid or gas) of reagents, the grade (*i.e.* HPLC grade, trace-metals-free) of solvent and the certificate of analysis must be recorded for reagents, solvents and reference standards respectively. Some materials that are solvents can also act as reagents, and vice versa. The quantity consumed of each material must be recorded – so that the system can alert staff when to re-order. Materials have their own lot number, product number, stock quantity, storage condition, expiry date, and hazard identification.

Each material has a supplier, with a supplier name, supplier ID (unique), address (street, city, country, post code), email address.

Each analysis is assigned one scientist to work on it, a scientist can carry out any number of analyses. Recorded are the scientist's employeeID, name (first and

last), email address, phone, address (street, town, county), and salary. One scientist is generally appointed to supervise the other scientists.

Enhanced ER Diagram



Logical Design

Scientist(employeeID, firstName, lastName, dateOfBirth, street, town, county, eircode, phoneNumber, salary, supervisor)
Primary Key employeeID
Foreign Key supervisor references Scientist(employeeID)

Analysis(labNoteBookID, analyticalMethod, specification, employeeID)
Primary Key labNoteBookID
Foreign Key employeeID references Scientist(employeeID)

LabInstruments(equipmentID, nextCalDate)
Primary Key equipmentID

Uses(equipmentID, labNotebookID, measurementTime)
Primary Key labNoteBookID, equipmentID
Foreign Key labNotebookID references Analysis(labNoteBookID)
Foreign Key equipmentID references labInstruments(equipmentID)

Reagent(lotNumber, partNumber, quantityInStock, storageCondition, expiryDate, hazardClassification, purity, form, supplierID)
Primary Key lotNumber
Foreign Key supplierID refererences Supplier(supplierID)

Solvent(lotNumber, partNumber, quantityInStock, storageCondition, expiryDate, hazardClassification, purity, grade, supplierID)
Primary Key lotNumber
Foreign Key supplierID refererences Supplier(supplierID)

ReferenceStandard(lotNumber, partNumber, quantityInStock, storageCondition, expiryDate, hazardClassification, purity, certOfAnalysis, supplierID)
Primary Key lotNumber
Foreign Key supplierID refererences Supplier(supplierID)

Client(clientID, companyName, street, city, country, postcode,)
Primary Key ClientID

ClientPhones(contactNumber, clientID)
Primary Key contactNumber
Foreign Key clientID references Client(ClientID)

Consumes(labNoteBookID, lotNumber, quantityUsed)
Primary Key labNotebookID, lotNumber
Foreign Key labNotebookID references Analysis(labNotebookID)
Foreign Key lotNumber references Material(lotNumber)

Supplier(supplierID, supplierName, street, city, country, postCode, supplierPhones, email)
Primary Key supplierID

Sample(sampleID, storageCondition, expiryDate, progressStatus, batchNumber)
Primary Key sampleID
Foreign Key batchNumber references Batch(batchNumber)

Tests(labNoteBookID, sampleID, resultID, dateCompleted)
Primary Key labNotebookID, sampleID
Foreign Key labNotebookID references Analysis(labNotebookID)
Foreign Key sampleID references Sample(sampleID)

RawMaterial(batchNumber, productName, dateOfManufacture, processID, clientID)
Primary Key batchNumber
Foreign Key ClientID references Client(ClientID)

FinishedProduct(batchNumber, productName, dateOfManufacture, presentation, clientID)
Primary Key batchNumber
Foreign Key ClientID references Client(ClientID)