CSC 436 Assignment

Semester DB Project: Phase I

Overview

Your group will analyze suggestions and critiques, document specific revisions, address any identified weaknesses, and implement revisions of your database design. Through this process, you will enhance the quality and functionality of your project.

Part I: Review Feedback & Revisions

Carefully review the feedback provided during the Phase I presentations and peer reviews. Take note of any suggestions, critiques, or areas for improvement identified for your project.

1. Thoroughly document the specific revisions and improvements to be made to your group's project. Include explanations for each change, detailing why it was made and how it enhances the project.

    a. Change to usage_log's relationship with Inventory_Item entity set. Their relationship should match the current design of the two entity sets, which should become a many to one relationship. This revision is to ensure that our database design is aligned with the relationships of the entity sets. This will enhance the project by providing a clear relationship between the entity sets.

    b. Change to usage_log's relationship with the user entity set. Their relationship should match the current design of the two entity sets, which should become a many to one relationship. This is made to ensure that our database design is aligned with the relationships of the entity sets. It will enhance the project by setting a clear relationship between the two entity sets

    c. Change to usage_log's relationship with the Experiment entity set. Their relationship should match the current design of the two entity sets, which should become a many to one relationship instead of a many or many relationship. This is made to ensure that our database design is aligned with the relationships of the entity sets, allowing it to enhance the project by providing a clear relationship between the two entity sets when developing the database.

    d. The relationship between Document and Chemical entity set will change from a many to many relationship to a many to one relationship. So many documents

can record one chemical, and one chemical can be associated with multiple documents. This change is made to align the relationship with the database design. It enhanced the project by allowing retrieval of documents that utilize a certain chemical more easily.

e. Add connection between the Chemical and Batch relations via foreign key. This revision is made to add connection between the two relations so that each chemical can be associated with the batch it is from. This enhanced the project by allowing us to, for example, if a chemical is not reaching the expected quality multiple times, we can query to see if it is from a specific batch, which allows us to know that the whole batch could be not meeting the expected quality. Also, this change makes the substance identity flow cleanly through: Chemical → Batch → Inventory_Item → Usage_Log.

f. Add the relationship between the Chemical and Batch entity set. This revision is made to address the newly added connection between Chemical and Batch entity sets. It enhanced the project by ensuring the consistency of the database data flow.

2. Identify weaknesses or concerns raised in the feedback and explain how your group will address them. Prioritize revisions that will have the most significant impact on improving the overall quality and functionality of your project.

   Weaknesses and concerns that were raised during the presentation feedback was how our group is getting multiple sources of data from online, and user input. The concern was how we organize the data and connect all the foreign keys within our application. We standardized the data flow Chemical → Batch → Inventory_Item → Usage_Log using chemical_id in Batch. We removed redundant relationships and ensured usage_log uses foreign keys to enforce many-to-one connections. We will prioritize this feedback in order to have the correct structure in our ER diagram, and improve the quality of our database storage/input.

Work closely with your group members to discuss the feedback received and determine the best approach for making revisions.

Part II: Implementation Of Revisions

Implement the identified revisions and improvements into your project. Ensure that all changes are accurately reflected in your project materials. Your group must submit the following revised project materials based on the feedback you received:

3. Updated entity sets and their attributes with primary keys underlined.

   Lab: lab_id, lab_name, department_id, building_name, room_num
   User: user_id, first_name, last_name, email, role, lab_id

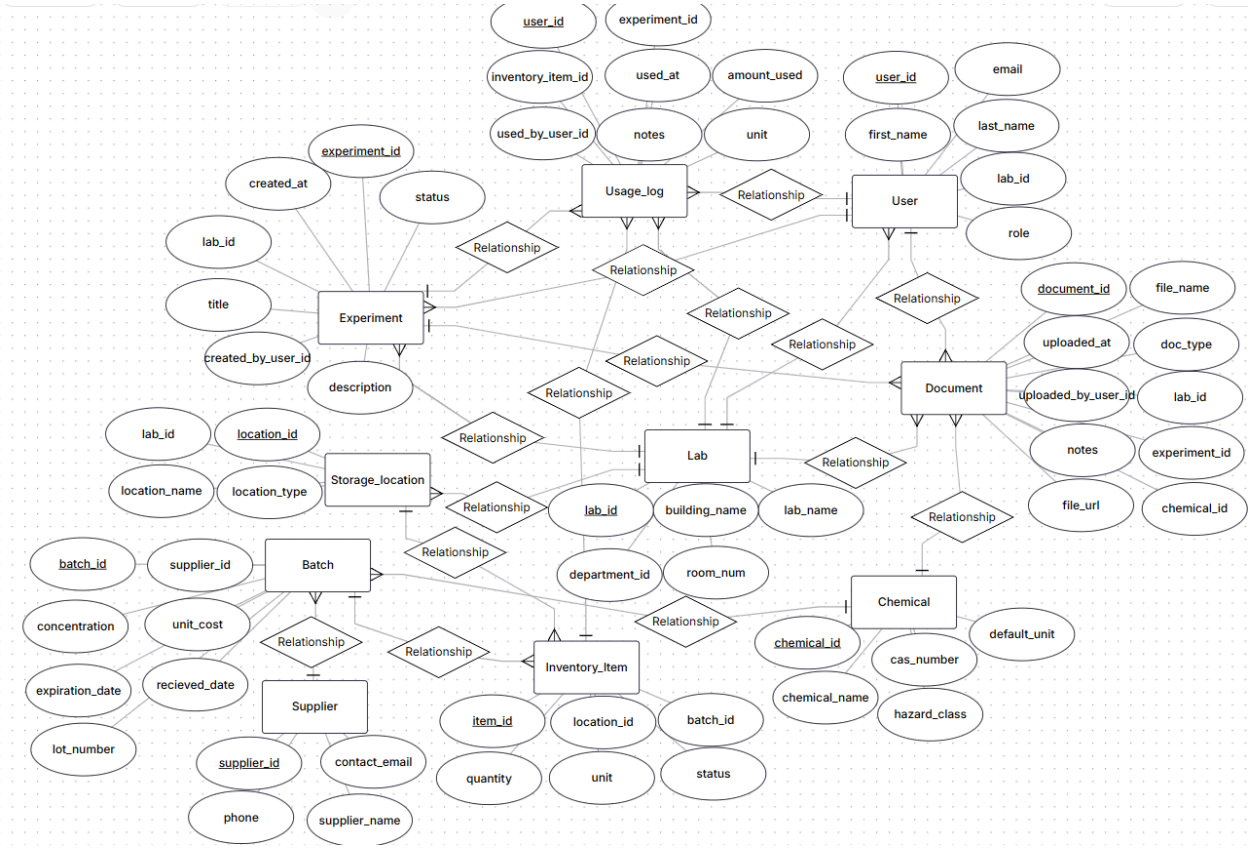
Chemical: chemical_id, chemical_name, cas_number, hazard_class, default_unit
Supplier: supplier_id, supplier_name, contact_email, phone
Batch: batch_id, supplier_id, chemical_id, lot_number, received_date, expiration_date, concentration, unit_cost
Storage_location: location_id, lab_id, location_name, location_type
Inventory_Item: item_id, batch_id, location_id, quantity, unit, status
Experiment: experiment_id, lab_id, created_by_user_id, title, description, created_at, status
Usage_Log: usage_id, experiment_id, inventory_item_id, used_by_user_id, used_at, amount_used, unit, notes
Document: document_id, lab_id, uploaded_by_user_id, doc_type, file_name, file_url, uploaded_at, notes, chemical_id, experiment_id

4. Updated relationships and constraints.

- **User** – **(N)** – <member_of> – **(1)** – **Lab**: A user can only be a member of one lab and a lab can contain multiple users.
- **Supplier** – **(1)** – <supplies> – **(N)** – **Batch**: A supplier can supply multiple batches but each batch will be associated with only one supplier.
- **Lab** – **(1)** – <contains> – **(N)** – **Storage_location** : Each lab can have multiple storage locations while each storage location needs to be associated with one lab only.
- **Inventory_Item** – **(N)** – <belongs_to> – **(1)** – **Batch**: A batch can contain multiple inventory items while each inventory item is associated with only one batch.
- **Inventory_Item** – **(N)** – <is_located_at> – **(1)** – **Storage_location**: Each inventory item is stored in exactly one storage location; each location can store many inventory items.
- **Experiment** – **(N)** – <conducted_in> – **(1)** – **Lab**: An experiment is associated with at most one lab but each lab can conduct multiple experiments.
- **Experiment** – **(M)** – <conducted_by> – **(N) – User**: A user can be associated with multiple experiments (participates in multiple experiments) and each experiment can be associated with multiple users (for collaboration experiment).
- **Experiment** – **(1)** – <create> – **(N) – Usage_Log**: An experiment can create many usage log entries, but each usage log entry belongs to exactly one experiment.
- **Usage_Log** – **(N)** – <record_item_used> – **(1) – Inventory_Item**: Many usage logs can record one inventory item and one inventory item can appear in many usage logs
- **Usage_Log** – **(N)** – <record_user> – **(1) – User**: Many usage logs belong to one user and one user can belong to multiple usage logs.
- **Document** – **(N)** – <upload_by_lab> – **(1) – Lab**: A document is associated with one lab but each lab can upload multiple documents.

- **Document** – **(N)** – <uploaded_by_user> – **(1) – User**: A document is associated with one user that uploaded the document, and each user can upload multiple documents.
- **Document** – **(N)** – <record_chemical> – **(1) – Chemical**: Many documents can record one chemical used in the experiment. And one chemical can belong to multiple documents.
- **Document** – **(N)** – <record_experiment> – **(1) – Experiment**: A document can record at most one experiment but each experiment can have multiple documents (because the same experiment can be conducted at different times).
- **Chemical** – **(1)** – <has_batches> – **(N) – Batch**: A chemical can have multiple batches, but each batch is for exactly one chemical.

5. Updated E-R Diagram reflecting the changes made to the project structure.



6. Descriptions of the sources from which you intend to collect data for your database, possible high-level data modification operations, and the types of questions your stored data will be able to answer.

   In terms of data sources, we plan to collect information for the application's database from two primary sources, direct user input and a government online dataset. User input will include manually entered data records such as experiment, documentation, User input and usage_log,etc.. The government online source will be used to simulate shipment and batch data, giving that realistic chemical shipment to supply the experiment data.

   At high level, the system will support any data modification operations such creating new experiment records, updating shipment or batch information, deleting outdated records, and querying chemical inventory level.

Submission

When you're finished, complete the following steps to submit your work:

- ☐ Export your document with responses as a **PDF file AND save** it **inside** your **documentation** folder. Refer to the following for documentation on how to do this:
  - Google Docs (*File → Download → PDF Document*)
  - Microsoft Word (*File → Save As / Export → PDF*)
  - Pages (*File → Export To → PDF*)
- ☐ Export your updated **E-R diagram** as an **image file** and save it **inside** your **documentation** folder. Be sure your file is clearly named (i.e., **er_diagram.png**).
- ☐ Upload all your changes to GitHub.
  - ☐ **If you're using GitHub Desktop (GUI)**, complete the Uploading Changes (GitHub Desktop) section to upload your changes from your local device to GitHub.
  - ☐ **If you're using Git (CLI)**, complete the Uploading Changes (GitHub CLI) section to upload your changes from your local device to GitHub.

ONE group member must paste the URL of your GitHub repository in the provided textbox in Brightspace. Click the blue *Submit* button to successfully submit your work for this assignment.

Grading Rubric

You can refer to the **Semester DB Project: Phase I grading rubric** given in Brightspace for this assignment to find details on how your submission will be graded.