BUDT 703 Database Management Systems
Team Project Guidelines

UNIVERSITY OF MARYLAND

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Project

You are providing information systems (IS) consulting to:

- Smith School on the historical program rankings:
  - Bloomberg Businessweek, Economist, Financial Times, U.S. News & World Report, …
- Restaurant Reviews in College Park:
  - Google, Yelps, Tripadvisor, …
- Housing (leasing and rental) Reviews around College Park:
  - Google, Apartments, Apartmentlist, …

Project Description

- Your group project is to play multiple team roles of information systems analysts, database designers, database developers and application developers.
- Will have five intermediate deliverables, one presentation and one final deliverable suite.
- Final deliverable suite will be a working IS package with a graphical user interface frontend, a database backend, and a set of data and queries.
- Limit to one submission of every deliverable by the team leader of each group.

Project Timeline

1. Project analysis and design **(due 11/2)**.

   Submit a Microsoft Word in Project_050#_##_Design.docx

   - Determine a meaningful brand name for your project.
   - Describe business processes/transactions in sentences.
   - Identify at least four entity types.
   - Identify relationship types including at least one many-to-many binary or higher-degree relationship type - no singleton entity type.
   - Perform database analysis on entity and relationship types, i.e. ER schema.
   - Design an ER diagram on Lucidchart – sharable to adamlee@umd.edu

2. Project proposal and data **(due 11/9)**.
3. Project SQL DDL **(due 11/16)**.
4. Project SQL DML **(due 11/23)**.
5. Project slides **(due 12/3)** and presentation **(on 12/6,8,10)**.
6. Project final deliverable suite **(due 12/11)**.

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Entity-Relationship (ER) Model

- No foreign keys (FKs), because relationships in ER model will be converted into FKs in relational model.
- Text descriptions (i.e. business requirements defining entity and relationship types) are optional.
- Entity and relationship names in Pascal casing (i.e. initial uppercase by concatenating capitalized words).
- Attributes in Camel/Hungarian casing (i.e. initial lowercase by concatenating capitalized words):
  - Component under a composite attribute: -componentName
  - Multi-valued attribute: multiValAttName[{range}]
  - Derived attribute: =derivedAttName
- Primary key (PK): **attName**; partial PK (PPK): **attName**

ER Model as ER Schema and ER Diagram

- ER Schema:

  Entities, Attributes and Primary Keys (PKs)

  $Entity_1$ (PK_1, ...)

  ...

  Relationships, Degrees and Participating Entities

  $Relationship_1$ ([if any attribute(s)]): $degree_1$

  {at least two structure constraints in the format of:} 1 $Entity_1$ ... to ... $Entity_{...}$

  ...

- ER Diagram:
  - [if any] weak entity: in double-lined border
    - Identifying relationship to its strong entity: in double-line
  - [if any] attributes to relationship: in regular shape
    - Connecting to the relationship: in broken line

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Project Timeline

1. Project analysis and design **(due 11/2)**.
2. Project proposal and data **(due 11/9)**.

   Submit a Microsoft Word in Project_050#_##_Proposal.docx

   - Expand from the design document.
   - State mission statement(s) and mission objectives for the client.
   - Finalize ER schema and diagram.
   - Convert ER model into relational schema and identify primary and foreign keys.
   - Determine functional dependencies and verify normalization to 3NF.
   - Generate business rules and determine referential integrity actions.
   - Describe sample data for every relation.
3. Project SQL DDL **(due 11/16)**.
4. Project SQL DML **(due 11/23)**.
5. Project slides **(due 12/3)** and presentation **(on 12/6,8,10)**.
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Mission Statement

- States what your project will do for/to your client.
- Should defines a scope or boundaries.
- Should be brief in one to three sentences.
- Samples:
  - To improve McKeldin Library's online database to enhance member's experience with transparent records of activities and real-time availability of items.
  - To analyze past games for Terrapins Women's Basketball Team. To build insights on game results among opponents and arenas.

Mission Objectives

- Tasks supported by the data maintained in the database.
- Will be converted into Business Transactions.
  - As WH-questions to be answered by SQL queries and Tableau.
- At least four tasks that your project will develop for/to your client, for examples:
  - To research possible typos by analyzing online library searches yielded no results.
  - To find the top ten library items that students searched online.
  - To find the top ten textbooks on hold at the library, so library can budget to purchase.
  - To find the top ten students that used the online library system most often to assign possible awards.

Convert ER Diagram to Relational Schema

- Create a relation for each entity type:
  - Include all simple attributes, i.e. no composite attribute, no multi-valued attribute, no derived attribute
  - Identify **PK** (or partial **PK** for weak entity)
- Convert each one-to-many or one-to-one unary/binary relationship type to a *FK* into an existing relation:
  - [if any] attributes of relationship should go into same relation
- Create a relation for each many-to-many unary/binary or higher degree relationship type:
  - Identify *FK*s [and if any attributes] in the newly created relation
- Create a relation for each multi-valued attribute:
  - Relation name by compounding EntityNameMultiValAttName ()
  - Identify *FK*; then identify simple (or composite) **PK**

Relational Model as Relational Schema

- Relational Schema, for example:
  Relation$_1$(**PK$_1$**, ...)
  Relation$_2$(**PK$_2$**, ...[, *FK$_1$*])
  ...
- Business Rules, for example:
  [R1] Rule on ON DELETE action for FK$_1$
  [R2] Rule on ON UPDATE action for FK$_1$
  ...
- Referential Integrity Rule/Action Table, for example:

Foreign Key	Relation Name	Matching Primary Key	Base Relation Name	Business Rule on Deletion	ON DELETE	Business Rule on Modification	ON UPDATE
FK$_1$	Relation$_2$	PK$_1$	Relation$_1$	R1	...	R2	...
...	...	...	...	...	...	...	...

Project Timeline

1. Project analysis and design **(due 11/2)**.
2. Project proposal and data **(due 11/9)**.
3. Project SQL DDL **(due 11/16)**.

   Submit a set of SQL files in Project_050#_##_{purpose}.sql:

   - Implement SQL CREATE TABLE and corresponding DROP TABLE statements.
   - Implement SQL CREATE VIEW and DROP VIEW if any.
   - Implement SQL INSERT INTO statements.
4. Project SQL DML **(due 11/23)**.
5. Project slides **(due 12/3)** and presentation **(on 12/6,8,10)**.
6. Project final deliverable suite **(due 12/11)**.

SQL Data Definition and Data Manipulation

- In each .sql file: **USE Project_050#_##**
- CREATE TABLE:
  - PK attribute should be : NOT NULL
  - PK/FK should define : CONSTRAINT ?k_Table_att[_atts]
  - FK should define : REFERENCES BaseTable (PK)
    ON DELETE action ON UPDATE action
- DROP TABLE
- [optional] CREATE VIEW, DROP VIEW
- INSERT INTO
- [optional] SELECT FROM, UPDATE SET or DELETE FROM

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4. Project SQL DML **(due 11/23)**.

   Submit a set of SQL files in Project_050#_##_{purpose}.sql:

   - Identify at least four business transactions, in WH-questions, to implement mission objectives.
   - Implement SQL SELECT and CREATE VIEW statements to answer business transactions.

5. Project slides **(due 12/3)** and presentation **(on 12/6,8,10)**.
6. Project final deliverable suite **(due 12/11)**.

Business Transactions

- Convert each business transaction as a WH-style-question:
  - Implement SQL SELECT statement to answer business transaction
- Develop at least four business transactions in one or multiple .sql files, for example:
  - What was the most frequently search term yielded no results?
    SELECT … FROM …
  - What were the top 10 library items that were searched online?
    SELECT … FROM …
  - What were the top 10 textbooks that were on hold online?
    SELECT … FROM …
  - Who were the top 10 students that searched online most often?
    SELECT … FROM …

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   Submit Microsoft PowerPoint in Project_050#_##_Presentation.pptx

   - Title: project name, group information, date
   - Background: who users are and what data/sources it includes
   - Introduction: mission statement(s) and mission objectives
   - Conceptual Database Design: ER diagram
   - Logical Database Design: relational schema
   - Physical Database Design: one SQL CREATE TABLE containing foreign key(s)
   - Use Cases: two business transactions with VIEW solution statements
   - Application: screenshots on the results of the above two use cases
6. Project final deliverable suite **(due 12/11)**.

User Application

- Complete every business transaction:
  - WH-style-question
  - Implement SQL VIEW statement to answer the WH-question
  - Implement SQL SEELECT FROM view to answer the WH-question
- Report two business transactions using downloaded or screenshot images on presentation slides.
- Note: to complete at least four business transactions in the final deliverable suite

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10pts: Correctly shared ERD from Lucidchart to adamlee@umd.edu

30pts: A finalized Microsoft Word in Project_050#_##_Proposal.docx

40pts: A set of finalized SQL files in Project_050#_##_{purpose}.sql

40pts: A finalized Microsoft PowerPoint in Project_050#_##_Presentation.pptx

40pts: A documentation on data sources, references, how to test your project with screenshots in Project_050#_##_Readme.docx

20pts: Team work, punctualness, filenames, presentations, etc.

20pts: Overall quality exceeds all baseline requirements listed above

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Consistencies across Models

ER Schema	Entities	Connected by relationships
ER Diagram	Rectangles	Connected by lines
Relational Schema	Relations	Connected by foreign keys
SQL DDL	Tables	Connected by foreign key constraints

Attribute	**Simple**	**Composite**	**Multivalued**	**Derived**
ER Schema	yes	yes, -components	yes[]	=yes
ER Diagram	yes	yes, -components	yes[]	=yes
Relational Schema	yes	no	no but as new relation	no
SQL DDL	yes	no but VIEW	no but as new table	no but VIEW

Comparison across Models

	Name	**Attribute** camelCase	**Primary Key** **camelCase**
Entity	PascalCase	1 or more	1 (strong), partial or none (weak)
Entity as rectangle	PascalCase	1 or more	1 (strong), partial or none (weak)
Relation	PascalCase	1 or more	1
SQL Table	PascalCase	1 or more	1

	Name	**Attribute** camelCase	**Degree**	**Structural Constraints**
Relationship	PascalCase	0 or more	1 or higher	2 or more
Relationship as line	PascalCase	0 or more	1 or higher	2 or more
Foreign key	*camelCase*	n/a	n/a	n/a
Foreign key	fk_Table_attributes + camelCase	n/a	n/a	n/a, but ON DELETE ON UPDATE

Suite Submission Should be in Multiple Files (i.e. do NOT compress your files)

- two .docx:
  - one from merging and enhancing your Design and Proposal
  - one README to explain your data sources, installation if any, setting if any, your results and outputs; step-by-step screenshots are highly welcomed
- multiple .sql:
  - for CREATE TABLEs, ALTER TABLE if any, DROP TABLEs, CREATE VIEWs, DROP VIEWs, INSERT INTOs, SELECT FROMs, UPDATE SET if any, DELETE FROM if any
- one .pptx:
  - from correcting and improving your presentation Slides to include all your business transactions