University of Maryland

BUDT702_0502 Database Management Systems

07 Dragon Keepers

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Team Project Design

1. **Determine a meaningful brand name for your project or team.**

   Dragon Keepers: As keepers, we intend to protect and manage the valuable data of the UMD Smith program ranking database, similar to how dragons are seen as protectors of treasures.

2. **State mission statement(s) and mission objectives for the client.**

   Mission statement

   ● To design a database for the UMD Smith School program ranking website, providing comprehensive information on programs, faculty, rankings, and admission requirements for applicants. To analyze and track the historical rankings of the Smith School and build insights on their performance.

   Mission objective

   ● To find the top three programs at UMD Smith School based on their current ranking scores to provide prospective students with insights into the best-performing programs.

   ● To find the faculty members belonging to the highest-ranked programs and their supervisors.

   ● To find all the UMD Smith School programs with an improved rank compared to the previous year.

   ● To recommend UMD Smith School programs to applicants based on their academic backgrounds. For example, what are the programs that best fit a student with a GPA of 3.2, GRE of 315.

3. **Describe business terms, facts, attributes and identifiers in sentences**

   Every program has a unique identifier, the program ID, different programs have different program names, program types, program duration and program website. The faculty members are categorized by faculty ID, their names, their genders, their titles, email addresses and their director's ID if any. Faculty are also assigned to different programs, one faculty might be

assigned to different programs and each program can have many faculties in it. Each program also has their unique ranking every year, ranking are associated with ranking ID, a ranking of USNEWS, and a ranking of QS news. Also, each program has a requirement. The requirements are differentiate with the requirement Identifier, the required GPA, and GRE score.

4. **Perform database analysis on entities and relationships, i.e. ER schema.**

   Entities, Attributes and Primary Keys:

   Program(**programId**, programName, programType, programDuration, programWebsite)

   Faculty(**facultyId**, facultyName, -facultyFName, -facultyLName, facultyGender, facultyTitle, facultyDirector, facultyEmail)

   Rank(**rankId**, rankUSNews, rankQS)

   Requirement(**requirementId**, requirementGpa, requirementGRE)

   Relationships, Attributes, Degrees, Participating Entities and Constraints:

   Supervise:unary relationship

   1 Faculty(supervisor) to 0 or more Faculties

   1 Faculty to 0 or 1 Faculty(supervisor)

   Evaluate(year):binary relationship

   1 Rank to 1 Program

   1 Program to 1 or more Rank

   Satisfy: binary relationship

   1 Requirement to 1 or more Programs

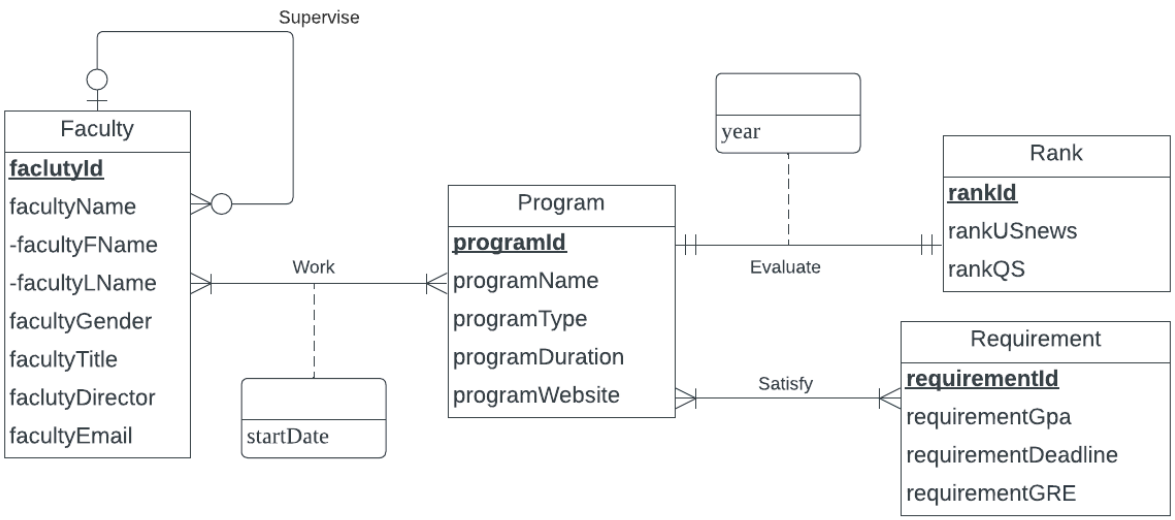
   1 Program to 1 Requirement

   Work(startDate): binary relationship

   1 Faculty to 1 or more Programs

   1 Program to 1 or more Faculties

5. **ER diagram - Project_0502_07_ERD.**



Project_0502_07_ERD
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6. **Determine functional dependencies and verify normalization to 3NF.**

Relational Schema converted from ERD

Program(**programId**, programName, programType, programDuration, programWebsite, *requirementId*)

Faculty(**facultyId**, facultyFName, facultyLName, facultyGender, facultyTitle, facultyEmail, *facultyIdSupervisor*)

Rank(**rankId**, rankUSNews, rankQS, year, *programId*)

Requirement(**requirementId**, requirementGpa, requirementGRE)

Work(***programId***, ***facultyId***, startDate)

Functional Dependencies

programId → programName, programType, programDuration, programWebsite, requirementId

facultyId → facultyFName, facultyLName, facultyGender, facultyTitle, facultyPhone, facultyIdDirector

rankId → rankUSNews, rankQS, programId

requirementId → requirementGpa, requirementGRE

programId, facultyId → startDate

Relational Schema in 3NF

Program(**programId**, programName, programType, programDuration, programWebsite, *requirementId*)

Faculty(**facultyId**, facultyFName, facultyLName, facultyGender, facultyTitle, facultyEmail, *facultyIdDirector*)

Rank(**rankId**, rankUSNews, rankQS, year, *programId*)

Requirement(**requirementId**, requirementGpa, requirementGRE)

Work(***programId***, ***facultyId***, startDate)

7. **Generate business rules and determine referential integrity actions.**

Business Rules

[R1] When a requirement is related to programs in the database, it should not be deleted from the database.

[R2] When requirement information is changed in the database, all related program requirements should be updated accordingly.

[R3] When a faculty member is also a supervisor, then the information of the employee cannot be changed or deleted.

[R4] When a program is deleted or changed in the database, all the related ranks should be deleted or changed accordingly.

[R5] When a faculty member is working in one program, the faculty should not be deleted from the database.

[R6] When the information of a faculty changes, the information of the faculty in the program should be changed accordingly.

[R7] When a program has one faculty member, the program should not be deleted from the database.

[R8] When the information of a program is changed, the related faculties' information should be changed accordingly.

Referential integrity:

Relation	Foreign Key	Base Relation	Primary Key	Business Rule	Constraint: ON DELETE	Business Rule	Constraint: ON UPDATE
Program	requirementId	Requirement	requirementId	R1	NO ACTION	R2	CASCADE
Faculty	facultyIdDirector	Faculty	facultyId	R3	NO ACTION	R3	NO ACTION
Rank	programId	Program	ProgramId	R4	CASCADE	R4	CASCADE
Work	facultyId	Faculty	facultyId	R5	NO ACTION	R6	CASCADE
Work	programId	Program	programId	R7	NO ACTION	R8	CASCADE

8. **Describe sample data for every relation.**

Program (‘131’, ‘Information Systems’, ’STEM’, 18, ‘https://www.rhsmith.umd.edu/programs/business-masters/academics/information-systems’, 857)

Faculty (‘129307389’, ‘Sujin’, ‘Kim’, ‘F’, ‘Associate Clinical Professor’, ‘kimsj22@umd.edu’, ‘178923894’)

Rank (‘234’, 11, 59, 2023, ‘131’)

Requirement (‘104’, 3.55, 322)

Work (‘131’, ‘129307389’, ‘2000-10-20’)