Project2

1. Derive relations from the conceptual model. (The original conceptual model from the part 1 is modified based on the feedback. The modifications including remove many to many relations such as major attributes in Student. since a student can have many majors, so major\_code cannot be included as an attribute in the student which lead to the creation of new table Student\_major.)

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| **Department** (Department\_id, Department\_name, Chair\_name, Num\_faculty)  **Primary key** Department\_id |
| **Student** (Student\_id, Student\_initials, Student\_name)  **Primary key** Student\_id |
| **Major** (Major\_code, Major\_name, Department\_id)  **Primary key** Major\_code  **Foreign key** Department\_id **references** Department (Department\_id) |
| **Event** (Event\_id, Event\_name, Start\_date, End\_date)  **Primary key** Event\_id |
| **Student\_event** (Student\_id, Event\_id)  **Primary key** Student\_id, Event\_id  **Foreign key** Student\_id **references** Student (Student\_id)  **Foreign key** Event\_id **references** Event (Event\_id) |
| **Student\_major** (Student\_id, Major\_code)  **Primary key** Student\_id, Major\_code  **Foreign key** Student\_id **references** Student (Student\_id)  **Foreign key** Major\_code **references** Major(Major\_code) |
| **Department\_Event** (Department\_id, Event\_id)  **Primary key**: Department\_id, Event\_id  **Foreign key**: Department\_id **references** Department (Department\_id)  **Foreign key**:Event\_id **references** Event (Event\_id) |

1. Validate the logical model using normalization to 3NF.

1.For **Department** (Department\_id, Department\_name, Chair\_name, Num\_faculty):

We can see there is no partial dependencies or transitive dependency in this table, therefore, it is in 3NF.

2. For **Student** (Student\_id, Student\_initials, Student\_name)

We can see there is no partial dependencies, However, there is a transitive dependency which is:

Student\_name --> Student\_initials

However, here it is best to keep 2NF because of the extra calculations joining the two tables would imply.

3.For **Major** (Major\_code, Major\_name, Department\_id)

We can see there is no partial dependencies or transitive dependency in this table, therefore, it is in 3NF.

4. For **Event** (Event\_id, Event\_name, Start\_date, End\_date)

We can see there is no partial dependencies or transitive dependency in this table, therefore, it is in 3NF.

5.For **Student\_major** (Student\_id, Major\_code)

We can see there is no partial dependencies or transitive dependency in this table, therefore, it is in 3NF.

6. For **Student\_event** (Student\_id, Event\_id)  
We can see there is no partial dependencies or transitive dependency in this table, therefore, it is in 3NF.

7. For **Department\_Event** (Department\_id, Event\_id)

We can see there is no partial dependencies or transitive dependency in this table, therefore, it is in 3NF.

c. Validate the logical model against user transactions.

Here I list five:

1. List the Student information including the Name, id who has major of computer science.

* We need to select the Student\_name, Student\_id from the student table S, select the major\_code and Student\_id from the student\_major table SM
* We need to set the conditions where the S.Student\_id == SM.Student\_id, M.major\_code == the code of computer science (if we don’t know the code, we may also need to refers to the Major table M.major\_code = SM.major\_code)

1. List the number of the Faculty in the Art department.

We need to select the Department\_name and Num\_faculty from the Department table and set the conditions where Department\_name == ‘Art’.

1. List the department information including the name, id, chair name belong to the computer science major.

We need to select the department name, department id from the department table D, select the major\_name, department\_id from the Major table M and set the conditions where D.department\_id = M.department\_id.

1. List the Start Date, End\_date of event named ‘ABC’

We need to select the Start Date, End\_date and Event\_name from the Event table and set the conditions where the Event name is equal to ‘ABC’

1. List the chair name of each department

We only need to select the chair name, department name From the Department table.

d. Define integrity constraints:

i. Primary key constraints.

1.Since the Primary key constraints including Not NULL and Unique constraints, therefore we don’t need to put extra not null or unique constrains for each primary key.

2. for all primary keys contains ‘id’ and ‘code’, the data type of primary key should only be varchar.

ii. Referential integrity/Foreign key constraints.

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| **Department** (Department\_id, Department\_name, Chair\_name, Num\_faculty)  **Primary key** Department\_id |
| **Student** (Student\_id, Student\_initials, Student\_name)  **Primary key** Student\_id |
| **Major** (Major\_code, Major\_name, Department\_id)  **Primary key** Major\_code  **Foreign key** Department\_id **references** Department (Department\_id) |
| **Event** (Event\_id, Event\_name, Start\_date, End\_date)  **Primary key** Event\_id |
| **Student\_event** (Student\_id, Event\_id)  **Primary key** Student\_id, Event\_id  **Foreign key** Student\_id **references** Student (Student\_id) ON UPDATE CASCADE ON DELETE NO ACTION  **Foreign key** Event\_id **references** Event (Event\_id) ON UPDATE CASCADE ON DELETE NO ACTION |
| **Student\_major** (Student\_id, Major\_code)  **Primary key** Student\_id, Major\_code  **Foreign key** Student\_id **references** Student (Student\_id) Student (Student\_id) ON UPDATE CASCADE ON DELETE NO ACTION  **Foreign key** Major\_code **references** Major(Major\_code) Student (Student\_id) ON UPDATE CASCADE ON DELETE NO ACTION |
| **Department\_Event** (Department\_id, Event\_id)  **Primary key**: Department\_id, Event\_id  **Foreign key**: Department\_id **references** Department(Department\_id) Student (Student\_id) ON UPDATE CASCADE ON DELETE NO ACTION  **Foreign key**:Event\_id **references** Event (Event\_id) Student (Student\_id) ON UPDATE CASCADE ON DELETE NO ACTION |

There is no alternate key constraints and general constraints.

1. Generate the E-R diagram for the logical level (contains FKs as attributes)

图示

中度可信度描述已自动生成