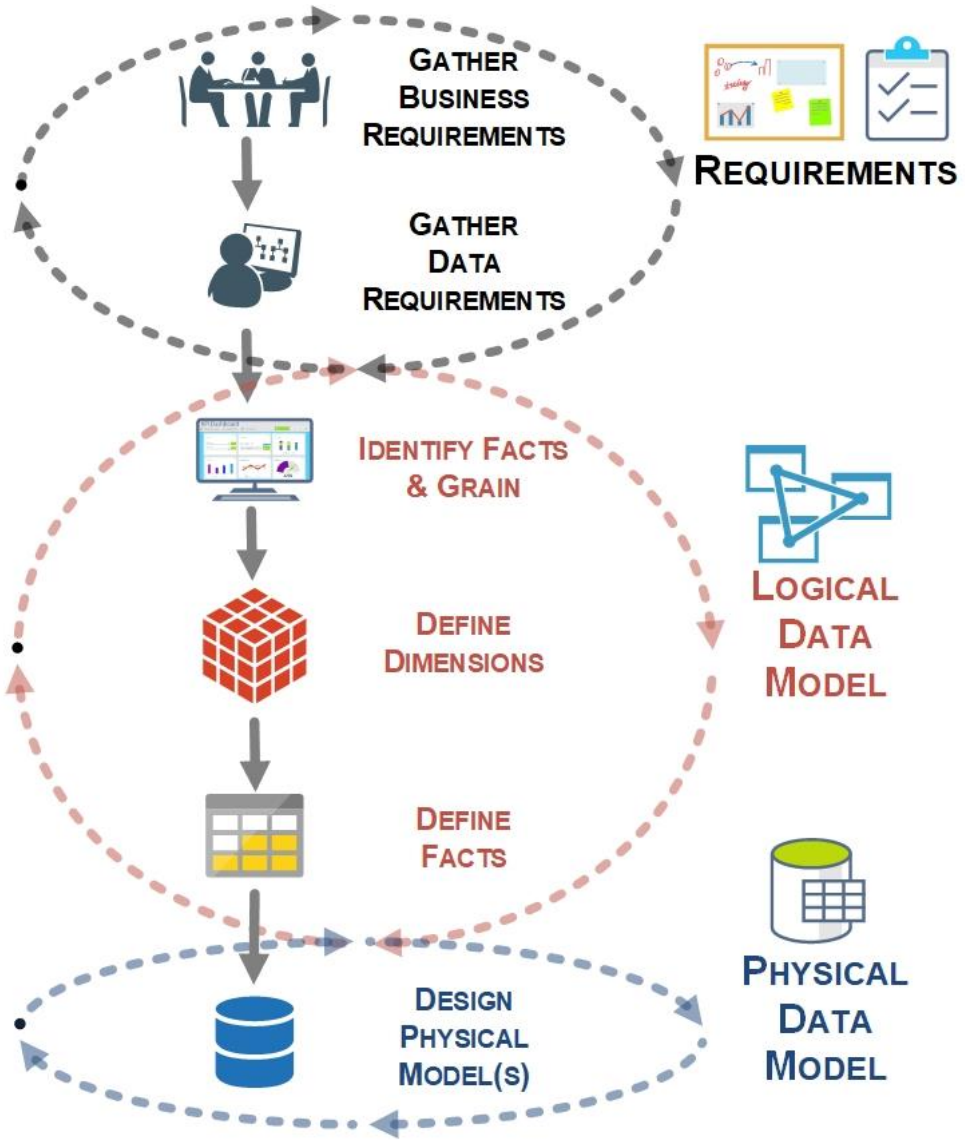
Data Modeling Samples

Graduate Student Data Model

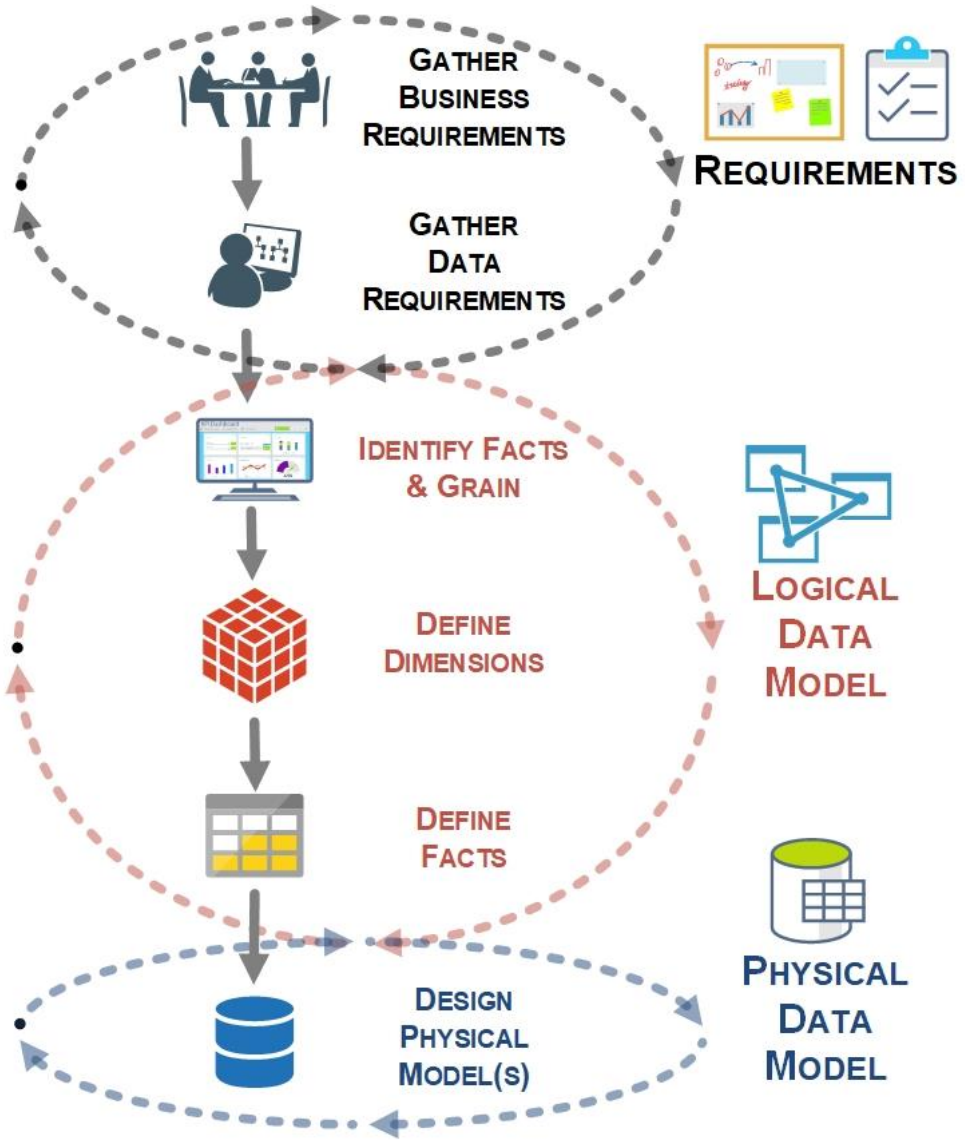
- Examine Northeastern University graduate student course enrollment and performance in following MS programs:
  - Information Systems
  - Data Architecture and Management

Data Modeling Lifecycle



- Three phases of data model design
  - Requirements
    - Business
    - Data
  - Logical Data Model
    - Identify Facts & Grain
    - Define Dimensions
    - Define Facts
  - Physical Data Model
    - Define SQL DDL to create tables & columns

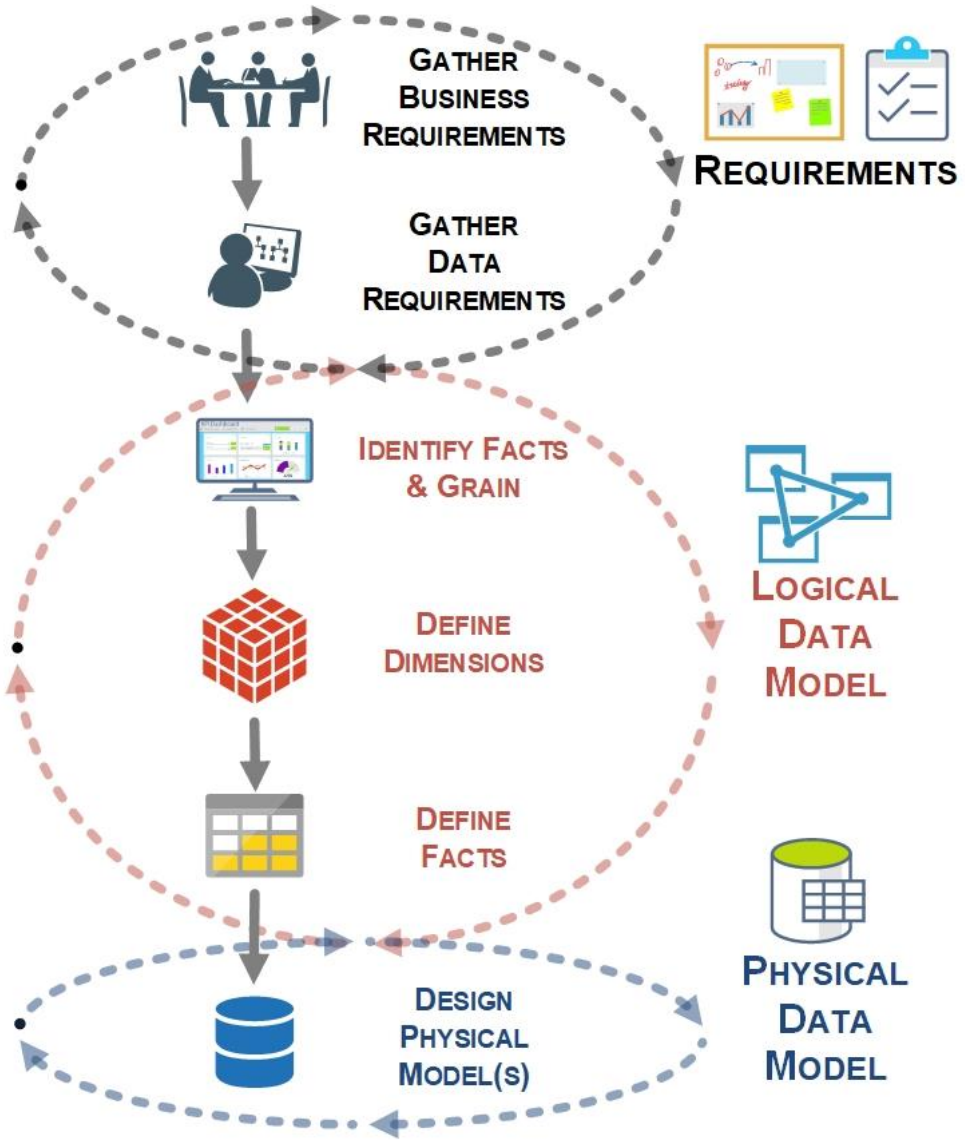
Data Modeling Lifecycle



Requirements

- Gather, analyze & prioritize business requirements
- Identify business processes
- Identify data sources
- Determine if data requirements is user-based or source-based
- If user-based (new business process)
  - Create conceptual model
- If source-based
  - Review existing data models
  - Perform Source systems analysis
  - Perform data profiling

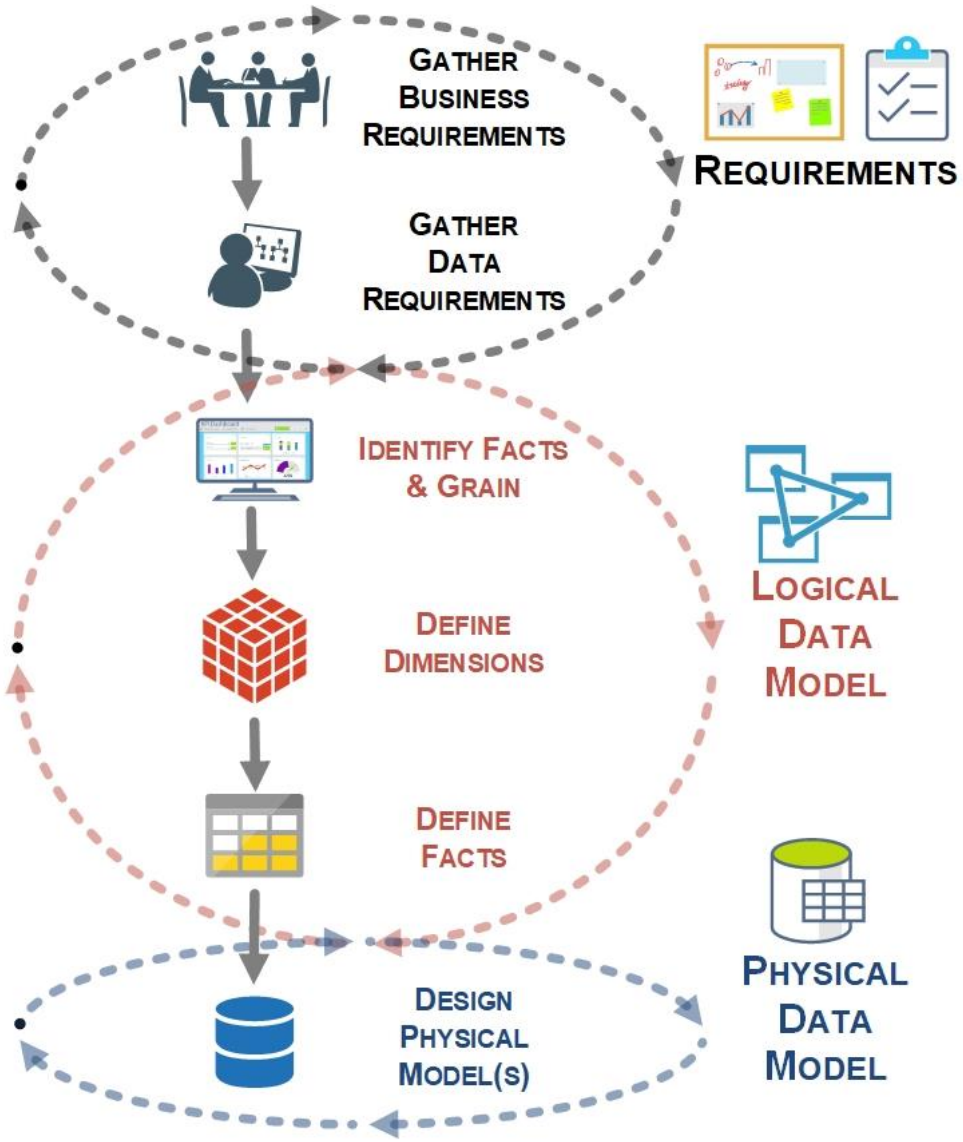
Data Modeling Lifecycle



Determine Grain

- Identify grain(s) in business processes
- Identify facts
- Identify fact table types
  - Transaction, Periodic & Accumulating
- Identify fact table granularity
- Identify preliminary dimensions

Data Modeling Lifecycle

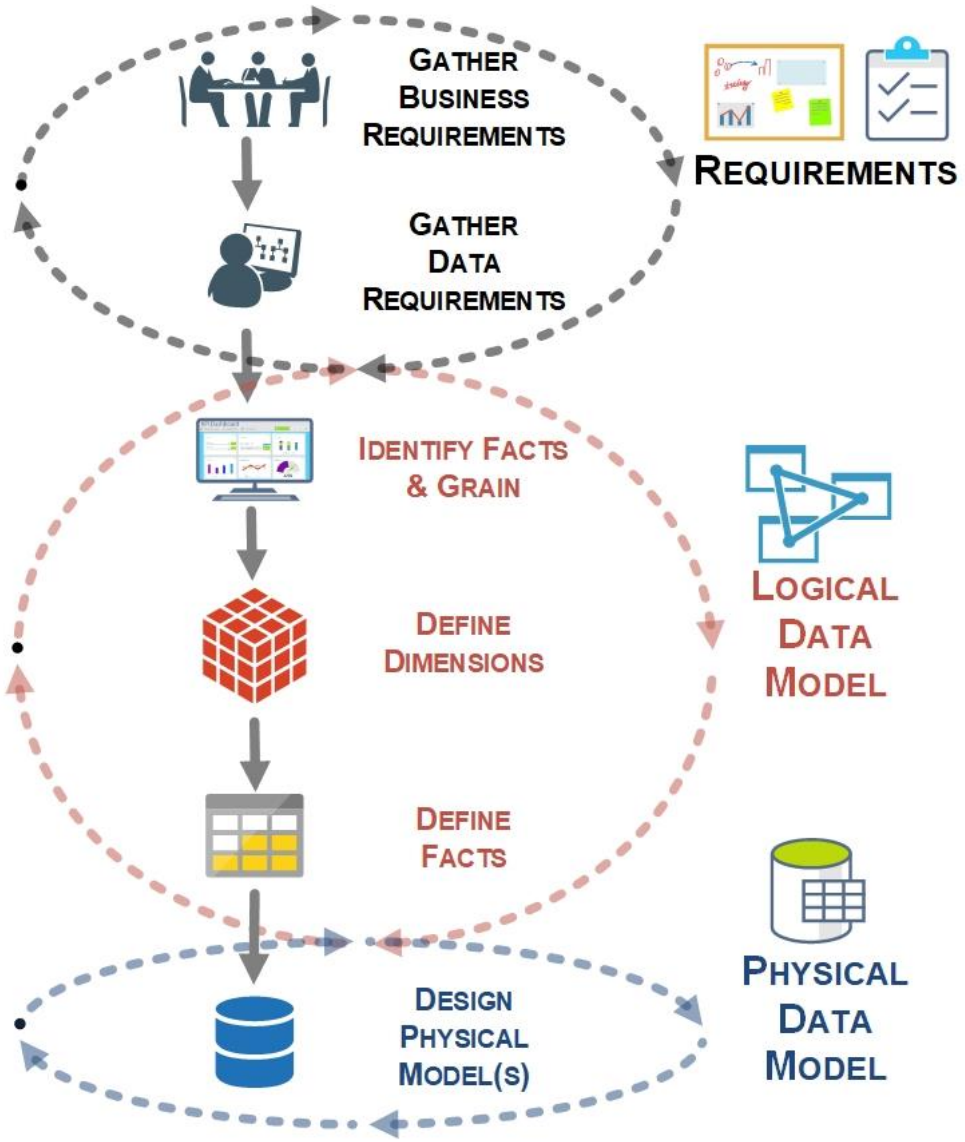


Define Dimensions

- Determine all dimensions
- Identify degenerate & conformed dimensions
- Identify dimensional attributes & validate granularity
- Identify hierarchies & attributes
- Identify date & time attributes
- Identify slowly changing dimensions (SCD) & types
- Identify multi-valued dimensions & define approach
- Identify role-playing dimensions
- Identify & classify specialized dimensions
  - Junk, Rapidly Changing, Hot Swappable, etc.
- Define keys & data relationships:
  - Surrogate keys (SKs), natural keys (NKs) and alternative keys (AKs)
  - Foreign keys (FKs)
- Define change data capture (CDC) attributes

Note: Not all listed may apply to a particular data model

Data Modeling Lifecycle



Define Facts

- Determine all facts
- Identify conformed facts
- Categorize fact table types & define approach
  - Transactional and event
  - Periodic
  - Accumulating
- Identify fact attribute types
  - Additive, semi-additive & non-additive
- Identify derived attributes & define approach
- Identify composite keys & design primary key (PK) approach
- Define dimensional hierarchies & define approach
  - Identify potential aggregates & define approach
- Identify composite keys & design PK approach

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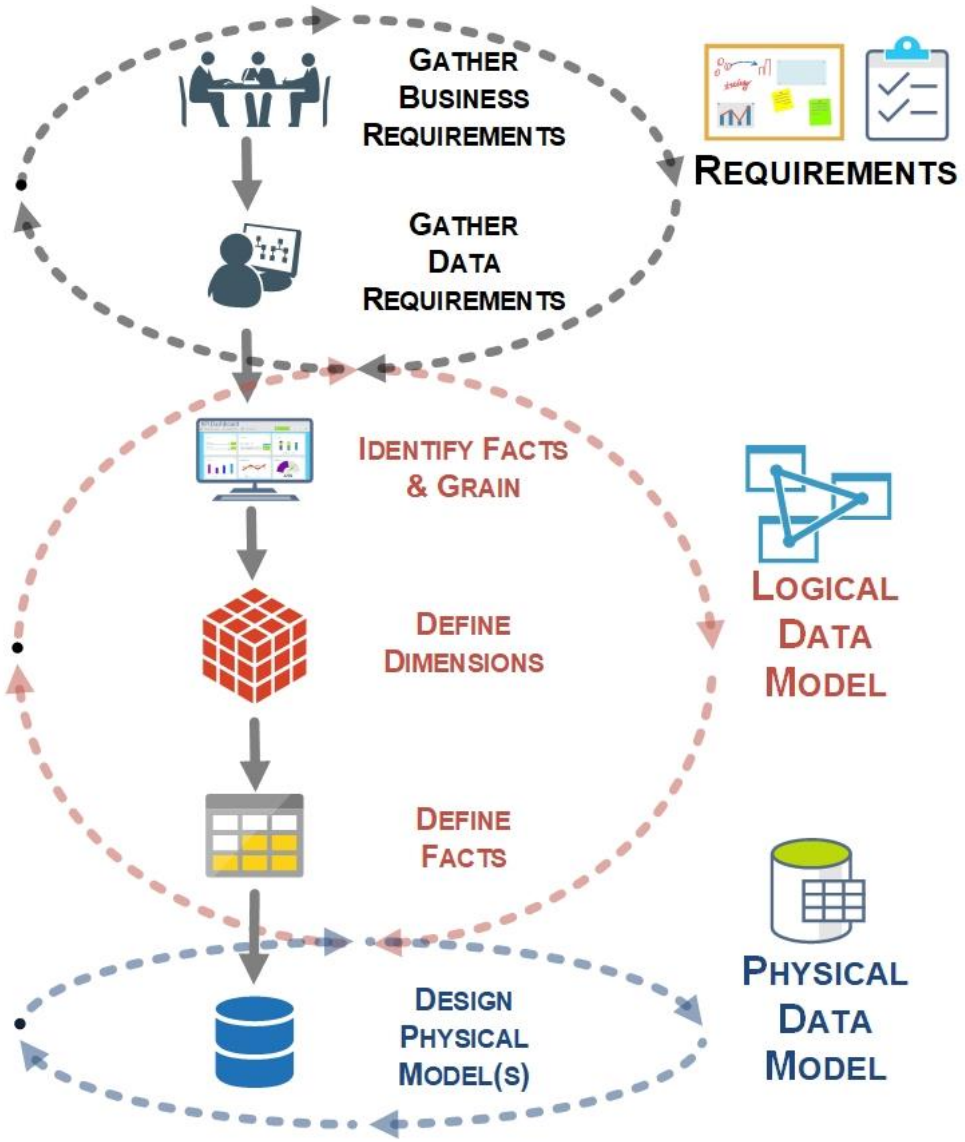
Data Modeling Lifecycle



Design Physical Data Model

- Estimate dimension & fact tables sizing & growth
- Determine target database(s)
  - DBMS type
  - Specific DBMS
- Define tables and attributes according to specific DBMS
- Define keys as appropriate - PKs, SKs, FKs
- Determine use cases for views and materialized views such as role-playing dimensions
- Define performance tuning approach
  - Different types of indexes, partitioning, etc.

Defining Dimensional Data Model

University Graduate Student

Data Modeling Lifecycle - Graduate Student Data Model

Data model design

- Requirements
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  - Data
- Logical Data Model
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  - Define Dimensions
  - Define Facts
- Physical Data Model
  - Define SQL DDL to create tables & columns

- Identify business analysis
  - Examine Northeastern University graduate student course enrollment and performance in following MS programs:
    - Data Architecture and Management
    - Information Systems
  - Analyze students' program performance
    - Courses taken including current enrolled, grades, GPA, etc.

Data Modeling Lifecycle - Graduate Student Data Model

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- Gather, analyze & prioritize business requirement
  - What are the core requirements and elective courses for these programs
  - What classes (course & section) did students complete in a semester & what were their grades
  - What were the enrollment and drop dates if applicable for students in each class in a semester
  - Who were the teachers in each class above
  - What were the classes taught each semester
  - What teachers taught classes in a degree program in a semester
  - Who are the students enrolled in a degree program and attributes such as ID, email, date of birth (DOB), hometown, campus/off-campus address if applicable, etc.

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- Identify high level entities and measures (metrics)
  - College, Department
  - Degree Programs
  - Semesters
  - Courses
  - Classes (course, section, semester)
  - Students
  - Teachers
  - Course grades
  - ???

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- Create dimensional data model using data modeling tool

- Create SQL DDL (data definition language) scripts
  - Create tables and columns with primary keys (PKs) and foreign keys (FKs) defined

- Out of scope:
  - Indexes, triggers, constraints and other physical attributes other than what is necessary to define PKs and FKs

Graduate Student Data Model

Deliverables:

- Create a list of dimensions & facts
- Create tables with a sample list of attributes for the above
- Create a dimensional model using ER/Studio
  - Upload data model
- Create sample data & store in Excel, csv or tsv files
  - Note: can use actual course related data *BUT students & grade data should be fictious*
- Create a SQL Server, MySQL, PostgreSQL or Oracle (on cloud or notebook) database with data model above - Upload SQL script
- Load the sample data using Alteryx data prep
- Create SQL queries answering some of the questions used for requirements
  - Upload SQL queries & results
- Bonus: Use PowerBI to display some of the data above
  - Upload PowerBI file