Background

During the past two phases of this project, we have been analyzing the problem of Project Planning. During Phase I, we started the process by identifying a few modest goals for an intelligent planning system that allows department managers the ability to manage their projects, their personnel and their resources. Later we interviewed several department chairs (or other administrators to gain additional insight about the process). You may have realized that many units can benefit from such a system, as several of your interviews revealed a semi ad hoc approach to planning and managing projects. Although, this might have been expected in an academic setting, where most projects depend on faculty participation, and as such they are performed as voluntary service to the university. Yet, serious and complex projects do move forward in such settings. In general university projects are completed by volunteer committees, and their committee’s work is usually highly dependent on the chair of the committee, his or her organization, people skills, and management stills and style.

During phase II we further defined the scope and requirements of the system and you were asked to develop an ER diagram that captures the data infrastructure for the system. Furthermore, you were asked to identify the attributes of each entity. During phase III, we will unify the scope of the project by providing an ER diagram (see Appendix A) to be used as the starting point for this phase. We will also construct a unified EAT as a class exercise to be used during this phase.

Phase III

The goal of phase III is to develop a series of useful queries (expressed in relational algebra) which can be implemented in the final solution. The queries often extract the data requirements for a given function (box) in the functional decomposition diagram (see Appendix B). In a properly designed system, the database queries can be used to satisfy nearly all the data-access requirements of the system. By doing so, a significant amount of programming is avoided. Given the proper database design, and a proper set of queries, the job of the programmer will be to retrieve the data using the queries, and manipulate it so that it can be rendered in an effective and user friendly interface.

Part - 1 Update Operations: (insert, modify, delete)

Using the ERD and entity attribute table provide 6 examples (2 Insert, 2 Delete and 2 Modify) of relational algebra update operations. For each operation, identify the 5 relational constraints discussed in class. (total of 6 queries)

Note: To clarify, when you submit an example of the Insert operation, indicated what relational constraints may be violated, and what must be done to avoid those potential problems.

Part - 2 Retrieval Operations: (Queries)

Using the functions in the decomposition diagram, develop at least 2 trivial and 2 non-trivial questions for each sub-system below:

1) Project Manager Services
2) Administrative Services
3) Employee (team member) Services
Note: (FYI, Trivial questions means using 2 or 3 relations, and simple conditions to answer the question. In contrast, non-trivial questions require more than 3 tables and require more complex conditions. They may also require more relational algebra operators to arrive at a solution).

Once again, to clarify, you need to develop a total of 12 questions: (3 subsystem X 4 questions per subsystem)

Once the questions have been crafted, use relational algebra operations such as Select, Project, Cartesian Product, Union, Intersection, Difference, Division, Left Outer Join, Right Outer Join and Join, etc, to develop solutions for the above (12) queries. Make sure to use at least 6 of the operations in your queries.

Example Queries:

- **Trivial (2 or 3 tables):** List the task activities relate to project “Selection of Excellence Award Winners”. Also show the task leader for each task. The result should provide Project name, Project ID, Task Name, Task Description, Start Date, End Date, Task Status, Task Leader’s Last Name and Email. (note that this query will require project, task, and employee)

- **Non-Trivial (more than 3 tables):** List all the organizations that have a “Checklist” associated with their projects. (List the organization name, Project Name, and the check list for the project)

What to hand in:

1) 6 Update operations (Part 1), along with the 5 relations constraint for each operation.
2) 12 retrieval operations (Part 2), and their answers provided in Relational Algebra.
3) Identify any shortcomings in the unified ERD. In other words, did you create a question that was within the scope of our problem (see Phase II), but the unified ERD and the unified (EAT) was not able to sufficiently provide answers to your question? If so, document the missing (entity, relationship, or attribute)
4) If the ERD or the EAT needs to be modified, included the modified ERD and EAT.

**NOTE:** Unlike the last two phases, this phase is an individual-only phase.

Start Early and Have Fun!!
Possible questions that need to be answered by the system

As an organizational administrator, a project manager, a team leader, or an employee, one may need to know the answer to the following questions:

- Q1) What are the set of known projects that occur on a yearly basis for a given organization?
- Q2) How long does it take to complete a given project?
- Q3) Which projects have fallen behind? Why?
- Q4) What resources are needed for each project? (Personnel, equipment, space, skills, etc.)
- Q5) What is the desired outcome of each project (what are the expected artifacts)
- Q6) List of employees who have a given skill (needed for a given task)
- Q7) Who oversees the project? (the administrative staff for the project, including the owner, PM, task leaders)
- Q8) What is the predicted cost of the project?
- Q9) What are the constituent parts (tasks and activities) of the project?
- Q10) Which projects cross organizational boundaries? (projects that have multiple owners from different organizations, or have team-members belonging to multiple organizations)
- Q11) Who (which employees) is currently “not” assign to a project (or task)?
- Q12) List the projects, their tasks, and the resources needed for each task.
- Q13) Which tasks require external contractors? (show the tasks, their requisitions, quotes, contracts and the name of the contractor)
- Q14) List of individuals employees who have expertise in performing a task? (have done the task one or more times in the past)
- Q15) List of PMs who have expertise in performing a given type of project? (have done the project one or more times in the past)
- Q16) Which projects has Mary Gonzalez has worked on during 2017? Which tasks did she work on? Which tasks has she lead?
- Q17) How many unsuccessful login attempts were made by Mary Gonzalez, what was the IPs from which these attempts were made?
- Q18) Which organizations have the largest number of projects with “High” priority?
- Q19) What is the checklist for the CS Assessment Project?
- Q20) List the project goals of the projects managed by PMs who were designated by Jay Zarif
Appendix – B (Functional Decomposition)

iPlanner Decomposition Diagram

Intelligent Planner

Project Manager Services
- Create New Projects
- Assign PM to Project
- View Project Progress
- Create Tasks/Activities
- Assign Task to Team Member (based on skills)
- Assign Task Leader
- Set Task Deliverables
- Identify Task Resources

SU Services
- Set Project Deliverables
- View Project Progress
- Share Project with Other Admins

Administrative Services
- Define / Approve External Contractors
- View Reports
- Cancel Projects
- Set Project Resources
- Set Project Requirements
- Set Project Checklist

Employee (team member) Services
- View My Tasks
- Add/Edit Skills
- View Project Progress
- Add/Edit Availability Schedule
- Upload Task Deliverables
- Designate Employee as PM

User Services
- Authenticate
- Login
- Register as New User
- Create User Profile
- Request Admin Role
- Request Admin Role
- Request Admin Role
Appendix – C (Entity Attribute Table)

Please see Final Copy on our class web site