

Oregon State University

BTS Sales Management System Project Proposal

Project Group 11

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BANA 470: Data Management

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Due: 2/4/2023

## **Background**

Business Technology Solutions (BTS) is a rapidly growing firm that provides IT support to businesses throughout Oregon. Since the Covid-19 epidemic, the firm has seen a significant increase in income as more individuals work from home and require IT help. The existing shared Google spreadsheet arrangement at BTS is causing a variety of problems such as data inconsistencies, limited data storage and analysis capabilities, little security, and lack of any automation. Furthermore, It is becoming more complex and difficult to manage with the number of projects and individuals growing. Therefore, BTS has requested us to build a database to assist them in better managing these projects and staff, as well as dealing with any other issues they are undergoing.

## **Problem/Opportunity**

BTS's current shared Google spreadsheet system presents various flaws. To begin with, as the number of projects rise, office managers find it increasingly challenging to find the best match between employee abilities and project requirements while also keeping all projects and employees' schedule constraints in mind. Second, BTS employs far more people than ever before, making it difficult for office managers to keep track of staff performance. Third, BTS is thinking about expanding its operations to other locations in Oregon and wants to examine its project data to make educated decisions about where to create new offices and what skills new workers would need. Finally, BTS wishes to investigate methods for improving customer service, such as delivering weekly project updates.

## **Information Needs**

To help BTS better manage its projects and employees, the following information needs have been identified: reports, continuous technical support after a project is completed, and payment plans.

1. Reports: Reports offer insights towards project progression, and let managers know what is going on. This is crucial in spotting where mistakes have been made, or for when needing to make an informed decision based on the project.
2. Technical support: Helps to ensure that a project is and remains successful following completion. Small issues and bugs can be dealt with quickly. This builds trust with clients, and can increase their loyalty.
3. Payment plans: payment plans are self explanatory. It is a plan that increases the likelihood the customer will truly pay you for your work. This brings benefits for both parties too, because the client has time to gather and sort their financial resources.
4. Project Status: BTS should be able to know the status of each project in real time. This includes projects that are in progress and those that are not and are running behind schedule. This can be done with a quick query.
5. Resource Allocation: BTS should and will be able to know which resources or “employees” are being assigned to what project and how long an employee manages to complete a project.
6. Performance data- BTS can track performance of employees. They can track project completion rates, client satisfaction based on each employee, and employee productivity.

This can help BTS make data informed decisions about employees and clients with a simple query.

As an office manager, it is important to have strong skills in project and employee management. The manager should be able to oversee the schedule of all projects, match employee skills with project requirements, and track employee performance. Furthermore, the manager should be able to allocate resources successfully to guarantee that employees are not overworked. Additionally, the company is looking to expand its business by analyzing project data to make informed decisions about opening new offices and hiring new employees with the necessary skills. Improving customer service is of course a priority for the company, so they aim to provide weekly project progress reports, continuous technical support after project completion, and flexible payment plans. All these initiatives will help the company provide better customer service as well as retain customers.

### **Data Description**

The data available for analysis can be divided into six categories: project data, task data, employee data, office data, business expansion data, and customer service data. Project data involves information such as project ID, description, city, company, contract date, budget, start date, end date, and employee assignments. Actual start date, actual end date, actual cost, and Manager ID columns are also included in Project Data. Task data includes task ID, task description, start date, end date, skills required, number of employees required, and Project ID as a foreign key. Employee data includes details such as employee ID, name, skill, and project

assignments. Office data includes Office ID, city, state, street, and zip code. Business expansion data contains information about potential locations for new offices including office\_id and city and state columns, and the skills needed for new employees in each location. Finally, customer service data includes information about customer feedback, payment plans, and support requests. All this data may be exploited to make sound decisions about project and personnel management, business development/expansion, and customer service.

### **Data Processing**

Data processing is critical in project management, workforce management, corporate development, and customer service. The database will be utilized to process data efficiently in all six of these domains. In terms of project management, the database will be utilized to match people with the relevant abilities to each project, ensure that projects are completed within budget and timeline constraints, and finally, track the progress of each project. The task data table will contain information about the tasks needed for each project, such as task ID, task description, start date, end date, type of skills required, number of employees necessary, and project ID. The project ID will function as a foreign key that links the task data table to the project data table, making it simple to identify which tasks correspond to which projects. The database will be utilized in personnel management to track employee abilities and performance. This includes the amount of tasks given to each employee, their talents, and the timeframe of each project. The office data table will include company office information such as office ID, city, state, street, and zip code. This table will also serve as a source for the business expansion data, providing information about the locations of the company's current offices. The office ID

will serve as a primary key for this table. For business expansion, the database will be used to analyze project data and make new informed decisions about where to open new offices and what skills are needed from new employees. Finally, for customer service improvement, the database will be used to track support requests and customer feedback as well as generate weekly project progress reports and payment plans. The use of the database in these ways will hopefully improve the overall efficiency and success of the company.

## **Metadata**

In this scenario, eight forms of metadata are employed to manage and organize various sorts of data within a system. Employee data, department data, customer data, project data, project employee assignment data, assets data, tickets data, and service data are examples of these. Each metadata group comprises different data subcategories that provide specific information about each component of the system.

Employee data metadata, for example, contains five subcategories of data: employee ID (Integer primary key), employee FName (text cannot be null), employee LName (text must be null), employee title (text cannot be blank), and department ID (text cannot be null) (Integer foreign key). Similarly, the departments data information has four data subcategories: department ID (Integer primary key), department name (text not null), manager ID (integer foreign key), and department location (text cannot be null). Client ID (integer primary key), client FName (text, cannot be null), client LName (text, must be null), client phone (text, cannot be null), and client email are also included in the client data metadata (text cannot be null unique). Project ID (integer primary key), project name (text cannot be null), project status (text cannot be null),

project due date (date must be null) and customer ID are also included in the project data metadata (integer foreign key). There are three types of data in the project employee assignment data metadata: assignment ID (integer primary key), assignment ID (integer foreign key), and employee ID (integer foreign key). Asset ID (integer primary key), asset type (text cannot be null), asset name (text cannot be null), and project ID are the four subcategories of data in the assets data metadata (integer foreign key). Ticket ID (integer primary key), ticket description (text cannot be null), ticket status (text cannot be null), project description (text cannot be null), and employee ID are all data subcategories in the tickets data metadata (integer foreign key). Ultimately, there are three types of data in the service data metadata: service type (text primary key, unique), service name (text cannot be null), and ticket ID (integer foreign key).

### **Collaboration Plan**

Effective communication and collaboration are critical to our project's success. Therefore, our team has designed a clear collaboration strategy that involves frequent meetings, communication channels, and well-defined duties for each team member whilst completing each major step. Our team will use an iterative approach in which the database architecture may be modified throughout the implementation stage and of course again as we develop the SQL queries. Each job will be directed by both members of the group. All team members will be required to contribute in order to guarantee that all team members are involved in important activities such as ERD design, database implementation, and SQL design. That being said, individual changes

are allowed and encouraged as long as the group is consulted afterwards and agrees with said changes. Regular team meetings will be held to discuss project progress and handle any issues that emerge. For regular updates and discussion, we will use mainly text, but also email and video chatting to set up official meetings.

### **Team Contracts**

Open communication, respect, and teamwork are important to our staff. We have formed a series of agreements to ensure that we have a high-performing and happy crew. Among these agreements are:

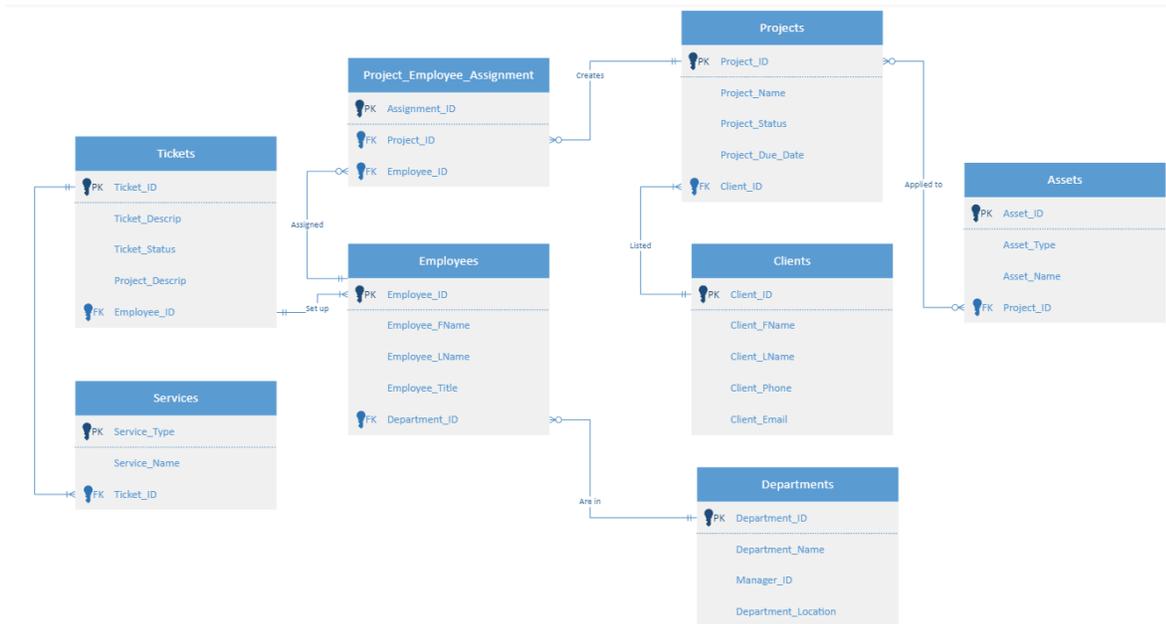
- Being on time for team meetings
- Replying to texts or emails within 2 days
- Valuing diversity and inviting and allowing multiple points of view
- Solving disagreements through discussion
- Completing individual tasks 3 days before the submission deadline.

By adhering to these agreements, we aim to create a positive and productive work environment where all team members can contribute to the success of the project.

### **Business Rules**

1. A project must be associated with a client.
2. A ticket must be associated with a project and an employee.
3. An employee can work on multiple projects, and a project can have multiple employees working on it.
4. An employee must belong to a department.
5. A department can have multiple employees.
6. A manager must be an employee and belong to a department.

7. A project can have multiple assets and services associated with it.
8. A client can have multiple projects associated with it.
9. An employee can work on multiple tickets, and a ticket can have multiple employees working on it.



**ERD Narrative:**

This database design is a great option for managing data in an organized and efficient way for BTS. The design includes several separate entities that are essential for a business to operate effectively. The entities included in this design are employee, department, project, asset, service, ticket, and client.

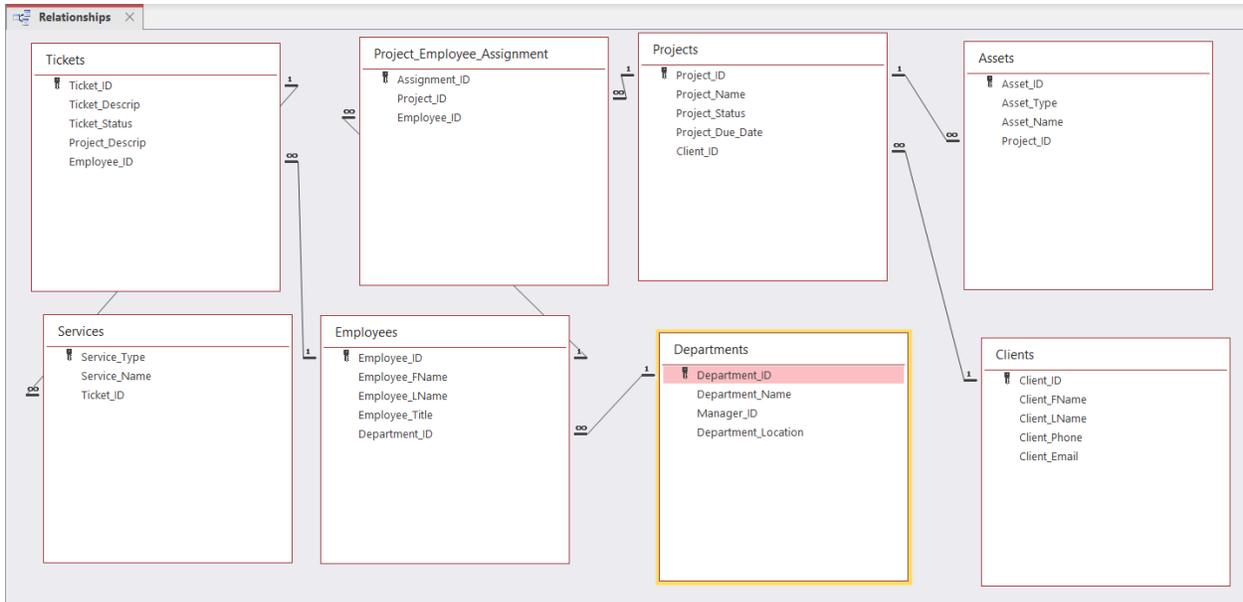
The employee entity allows for the tracking of employee information, such as job position and contact details, which is critical for ensuring the correct allocation of resources. The department entity provides an efficient way to manage department-specific resources and ensures that the organization's structure is well-defined. The project entity includes project details such as name, timeline, and budget, which are crucial for tracking project progress and ensuring timely completion.

The asset entity allows for management of an organization's assets and includes details such as asset type, name, and project application.. The service entity includes details such as service type, description, and service provider contact information, enabling efficient management of service providers. The ticket entity allows for the tracking of customer issues and ensures that they are resolved satisfactorily. The client entity includes details such as client name, contact information, and history, which is essential for tracking customer interactions and providing high-quality customer service.

Overall, this database design is well-structured and focuses on specific entities for efficient data management. It provides an organized approach to managing and tracking resources, projects, and services, making it a great choice for any business looking to improve its operations.

The two most important tables: Bridge (Project\_Employee\_Assignment) and Employees. The bridge table focuses on BTS's main problem, tracking of projects and employees assigned. The employee table has the most relationships with other entities. For these reasons, they make up the two most important tables of this database.

**Implementation of the Database in Access:**



## Most Important Table Metadata Explanation

We believe that the Employees table and the Project\_Employee\_Assignment table are among the most important tables in this ERD design. The Employee table is crucial to the management of the workforce. It contains important information about each employee, such as their name, title, department, and employee ID. This table is also connected to other tables in the database, such as the Projects and Tickets tables, through foreign keys. This can allow for easy intel on what employee is assigned to what project and what ticket each employee is working on. Additionally, the Employee table is connected to the Departments table, which allows employee assignments within different departments to be managed efficiently. Furthermore, The Project\_Employee\_Assignment table is also crucial to the workforce because it links the Projects table to the Employee table. To know which employees are assigned to which project, this table is detrimental, furthermore, it also allows for the management of employee assignments within different projects. This is important for project management, as it helps to ensure that the right

employees are assigned to the right projects based on their skills, availability and more. Both tables provide valuable information to the management team, allowing them to make informed decisions about scheduling and project management.

The Employees table has the following attributes: **Employee\_ID**: This is the primary key column of the Employees table. A primary key column uniquely identifies each row in a table. This column is of the Integer data type and has no length specified. It has no constraints attached to it. **Employee\_FName**: This column represents the first name of the employee. It is of the Text data type. It cannot be null so it must have a value for each row in the table. **Employee\_LName**: This column represents the last name of the employee. It is of the Text data type. It cannot be null. **Employee\_Title**: This column represents the title of the employee. It is of the Text. It cannot be null. **Department\_ID**: This column represents the department that the employee belongs to. It is of the Integer data type and has no length specified. It is a foreign key referencing the **Department\_ID** column in the Departments table. It has a many-to-one relationship with the Departments table.

The metadata choices in the Employees table have been made with the objective of ensuring data accuracy, completeness, and consistency. The primary key column ensures that each row in the table is uniquely identified. The first name, last name, and title columns are all set to not null, which means that they must have a value for each row in the table. The foreign key constraint in the **Department\_ID** column ensures that the department specified for each employee is valid and it exists in the Departments table. The relationship metadata between the Employees and Departments tables ensures that there is a many-to-one relationship between the two tables.

We then have the Project\_Employee\_Assignment table containing the following attributes:

Assignment\_ID: This column serves as the primary key and uniquely identifies each employee assignment in the system. It is an integer data type and has no length constraints. Project\_ID:

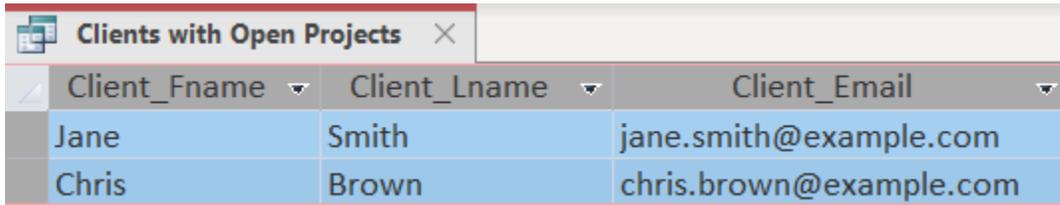
This column stores the foreign key reference to the Projects table. It establishes a many-to-one relationship between the Project\_Employee\_Assignment and Projects tables. It is an integer data type with no length constraints. Employee\_ID: This column stores the foreign key reference to the Employee table. It establishes a many-to-one relationship between the

Project\_Employee\_Assignment and Employee tables. It is an integer data type with no length constraints.

The choice of metadata for these columns is appropriate as it ensures that each assignment is uniquely identified, and the relationships between the Project\_Employee\_Assignment, Projects, and Employee tables are maintained. The foreign key constraints ensure that the data is accurate and that the relationships between the tables are valid. The absence of length constraints on the integer columns ensures that the data is stored appropriately. The metadata chosen for the attributes in the Employee and Project\_Employee\_Assignment tables is appropriate and ensures that the data is accurate, complete, and valid. This is important because as we know, the Employee table and Project\_Employee\_Assignment table are crucial components of the design of the database and represent the core entities of the system.

**Business Report 1:** Find the names and email addresses of clients with a project status “in progress”

Result:



Client_Fname	Client_Lname	Client_Email
Jane	Smith	jane.smith@example.com
Chris	Brown	chris.brown@example.com

List of Clients with a project that is “in progress” and their contact information.

Short Narrative:

Queries are used to retrieve information needed immediately. One example of this is simply needing to see which projects are still in progress in order to reconnect with the clients. In our example dataset, there are only 2 out of 5 clients who still have projects open. However, if BTS’s data was placed in this system, they would see all their open projects across the state.

Query SQL:

```
SELECT Client_Fname, Client_Lname, Client_Email  
FROM Clients, Projects  
WHERE Projects.Project_Status = 'in progress' AND Clients.Client_ID = Projects.Client_ID;
```

Example Data:

Clients Table -



Client_ID	Client_FName	Client_LName	Client_Phone	Client_Email
3001	Jane	Smith	(555) 555-1234	jane.smith@exa
3002	Mark	Johnson	(555) 555-2345	mark.johnson@
3003	Laura	Williams	(555) 555-3456	laura.williams@
3004	Chris	Brown	(555) 555-4567	chris.brown@e
3005	Alex	Davis	(555) 555-5678	alex.davis@exa

This table has all of the information about clients, and gives each client an identifier to easily connect them to other entities in the database. The primary key is “Client\_ID” and has no foreign keys.

Projects Table -

Project_ID	Project_Nam	Project_Statu	Project_Due_	Client_ID
1001	Website redesign	In progress	6/30/2023	3001
1002	Server migration	Completed	12/31/2022	3002
1003	Payment system	Open	8/15/2023	3003
1004	Mobile app dev	In progress	4/30/2023	3004
1005	Network infrastr	Completed	10/31/2022	3005

This table includes all of the necessary information about each project. It also links each project to a specific client, who ordered for a specific service. The primary key is “Project\_ID” and the foreign key is “Client\_ID” (from the entity above).

Data Sources:

Clients - Contains information about the Clients and how to contact them when needed. In this case, it involves contacting clients who still have a project in progress. Since BTS is struggling to keep track of their projects currently, this is a great example query.

Projects - Identifies each project and assigns it to a specific client. Also includes all of the important details of the project, such as the status, and date due. This adds additional layers of accuracy to the database and the other entities related.

**Business Report 2:** Find all projects assigned to a specific employee by Employee\_ID.

Result:

Project_ID	Project_Name	Project_Statu	Project_Due_
1002	Server migration	Completed	12/31/2022
*			

Specific to employee\_102, this generates that specific employee’s assigned projects and in this case it is Project\_1002. It also shows the status of this project as well as the due date.

Short Narrative:

Queries are used to retrieve information needed immediately. One example of this is simply needing to see which projects are assigned to which employees. In our example dataset, there is one project assigned to employee “102” However, if BTS’s data was placed in this system, they would see all their assigned projects to the specific Employee\_ID specified in the query.

Query SQL:

```
SELECT Projects.Project_ID, Projects.Project_Name, Projects.Project_Status,
Projects.Project_Due_Date
FROM Projects
INNER JOIN Project_Employee_Assignment
ON Projects.Project_ID = Project_Employee_Assignment.Project_ID
WHERE Project_Employee_Assignment.Employee_ID = 102;
```

Example Data:

Projects Table -

Projects						
	Project_ID	Project_Nam	Project_Statu	Project_Due_	Client_ID	Click to Add
+	1001	Website redesi	In progress	6/30/2023	3001	
+	1002	Server migratio	Completed	12/31/2022	3002	
+	1003	Payment system	Open	8/15/2023	3003	
+	1004	Mobile app dev	In progress	4/30/2023	3004	
+	1005	Network infrast	Completed	10/31/2022	3005	
*						

This table has all of the information about ongoing projects, and gives each project a unique primary key identifier to easily connect them to other entities in the database. The primary key is “Project\_ID” and has a foreign key of “Client\_ID”.

Project\_Employee\_Assignment Table -

Project_Employee_Assignment				
Assignment_ID	Project_ID	Employee_ID	Click to Add	
1	1001	101		
2	1002	102		
3	1003	103		
4	1004	104		
5	1005	105		
*				

This is our bridge table and includes a primary key named “Assignment\_ID” as well as two more foreign keys named: Project\_ID (from the Projects table) and Employee\_ID (from the Employee table).

Data Sources:

Project\_Employee\_Assignment - The Project\_Employee\_Assignment table contains information about which employees are assigned to each project. This table serves as a bridge between the Projects and Employees tables, allowing for a many-to-many relationship between these two entities. By querying this table, we can gather insights into which projects each employee is currently assigned to and which employees are working on a particular project. This information can help BTS better manage their resources and make informed decisions regarding project staffing and timelines.

Projects - Identifies each project and assigns it to a specific client. Also includes all of the important details of the project, such as the status, and date due. This adds additional layers of accuracy to the database and the other entities related.