Database CSC675-775-03 Fall 2023

Project Name: Construction Industry

Student Information:

Name – Rory McGinnis
Student ID – 921337245
GitHub username – rorymcginnis1
Email – rmcginnis@sfsu.edu

History Table:

Checkpoint #	Date Submitted
Milestone 1 checkpoint 1	9/18/2023
Milestone 1 checkpoint 2	10/6/2023

Table of Contents

Project Description

ConstructionPro is a solution to many challenges that plague the construction industry. An industry that has many different moving. Many traditional ways of organizing projects are often inefficient, and result in project delays and increased costs. This database focuses on enhancing the construction industry in a way that simplifies the typically complex process.

ConstructionPro is an easy-to-use tool that acts as a hub for project managers, contractors, clients, and even employees. It allows all the users to collaborate and manage resources in a way that makes it convenient for all users. This project integrates data across all aspects of the construction industry, from the starting process to completion, and increases the transparency of the industry.

Our database offers unique options that you cannot get anywhere else. We have weather integration, a feature that can tell the project manager how efficiently work gets done in certain conditions to allow them to make more efficient decisions. There is also a similar feature for supplier performance ratings, which tells the project manager how satisfied previous managers have been with a certain supplier. Furthermore, a client feedback portal adds additional information to the satisfaction with any project. These features build on the existing databases in the construction industry which simply stores data, our database does much more than that.

There are many existing software tools in the construction industry that could benefit from our product, but two of the most notable are Procore and Autodesk BIM 360. Both are construction management software's that need a system that can enhance their decision-making process. Specifically, our unique features offer an alternative to the traditional databases. With the ability to assess weather and suppliers in the database, using mathematical algorithms, these companies no longer have to rely on human decision. Instead, they can put their focus to more important things.

Main Use Cases

Use Case: ConstructionPro – Bad Weather
Actor: Project Manager (Billy), employees, client
Description: Billy is the project manager of a construction firm that has been tasked with building a bridge for a client. As Billy begins to make the schedule for his employees to work, he sees that in the upcoming days there is heavy raining, with a high likelihood of lightning. Taking a look at the ConstructionPro database, Billy sees that his employees are typically capable of working at a high level when it is raining, but for some reason they tend to be much less productive when there is lightning. For this reason, Billy postpones the start of the construction one day to avoid working in the unfavorable conditions of lightning.

Use Case: ConstructionPro – Insufficient materials
Actor: Project Manager (Sarah), Home Depot (Supplier)
Description: Sarah has been tasked with heading a project to build a building for an elementary school. Her and her team begin working on the project, after coordinating a plan and figuring out how much materials are necessary for the project, Sarah takes a look at the ConstructionPro database. She realizes that she in fact does not have the materials that she needs to complete the project, but thanks to the application she knows she needs to order more. She immediately is able to get on the phone and order the required materials from Home Depot her supplier at the moment. Shortly after she is able to begin construction without any hiccups.

Use Case: ConstructionPro – Cost forecasting
Actor: Client (Richard), Project Manager (Sophia)
Description: Richard is a recent beneficiary of a large inheritance. It has always been his dream to coordinate a plan to build his very own dream house. As a result of this Richard decided to call up Sophia the project manager for a successful construction company, who uses the ConstructionPro database. Although Richard has received a great deal of money, he does not have a desire to spend all of it, for this reason he asks Sophia how much his plan will cost. Sophia refers him to the ConstructionPro database, which shows previous projects, similar to what Richard may want, and how much it cost to finish, as well as how long it took. Richard is very happy with the cost and decides to move forward.

Use Case: ConstructionPro – Safety Incident tracking
Actor: Project Manager (Tom), Client (Alex)
Description: Alex a perspective client contacts Tom the project manager for a construction company. She asks him if his company would be willing to build her a house on a mountainside. Tom thinks about the liability issues, and as a result he decides to check the ConstructionPro database for similar projects they have done. He sees that there have been many more injuries than usual when operating in those conditions, which have resulted in over $50 million in lawsuits for Tom's company. As a result Tom decides that he will not be taking Alex's project on.

Use Case: ConstructionPro – Understaffed
Actor: Project Manager (Fred), Employees
Description: Fred a project manager is managing a construction project on a skyscraper, a project that he has overseen many times. After the first few weeks he is disappointed because the project is coming along slower than is expected. He takes a look at the ConstructionPro database and realizes the issue. Typically on previous projects he has had upwards of 150 workers, on this project he only has 84. The ConstructionPro database allowed him to realize that he needs to hire more workers immediately to get the project done by its promised date, if it were not for the application he would have never known.

Initial List of Functional Requirements

1. **User(Individual User)**
    1. A user shall be able to update their personal information
    2. A user shall be able to view specific tasks relevant to them
    3. A user shall be able to view the safety report of incident they were a part of
    4. A user shall be able to view previous projects that have been completed
    5. A user shall be able to delete their personal information
2. **User(Employee)**
    1. An employee shall be able to check their schedule
    2. An employee shall be able to see previous projects they have worked on
    3. An employee shall be able to see their incident reports
    4. An employee shall be able to remove themselves from the database
    5. An employee shall be allowed to check the weather report
    6. An employee shall be able to update their personal information
    7. An employee shall be able to submit a timesheet
3. **User(Client)**
    1. A client shall be able to check the status of their project
    2. A client shall be able to view previous projects that are public
    3. A client shall be able to check the weather report
    4. A client shall be able to remove themselves from the database
    5. A client shall be able to terminate their project if it is on going
    6. A client shall be able to check the expense report of a project they are funding
    7. A client shall be able to request specific materials be used
    8. A client shall be able to update their personal information
    9. A client shall be able to provide feedback about a project
    10. A client shall be able to hire for specifically Residential Projects
    11. A client shall be able to hire for specifically Commercial Projects
4. **User(Project Manager)**
    1. A project manager shall be able to create a new project
    2. A project manager shall be able to view an existing project
    3. A project manager shall be able to add other users to the database
    4. A project manager shall be able to update the information about an ongoing project
    5. A project manager shall be able to update the expense report
    6. A project manager shall be able to view the weather report
    7. A project manager shall be able to assign employees
    8. A project manager shall be able to view the incident reports
    9. A project manager shall be able to see client reviews
    10. A project manager shall be able to view suppliers
    11. A project manager shall be able to rate suppliers
    12. A project manager shall be able to fire suppliers
    13. A project manager shall be able to make work orders
    14. Project managers shall be able to view an aggregated expense report that combines timesheets, material costs etc.
    15. A project manager shall be able to view work orders

16. A project manager shall be able to view the analytics of a project to make decisions
17. A project manager shall be allowed to accept requests
18. A project manager shall be allowed to deny requests
19. Project managers may be able to assign roles to employees
20. Project managers may be able to assign tasks to employees

5. Suppliers

1. Suppliers shall be able to view work orders
2. Suppliers shall be able to provide a quote for certain materials
3. Suppliers shall be able to see whether their request is accepted denied or pending
4. Suppliers shall be able to display what materials they have available

6. Projects

1. A project shall contain a name
2. A project shall contain an incident report
3. A project shall contain a list of all members working on it
4. A project shall contain feedback
5. A project shall show the status of the project
6. A project shall contain the weather report
7. A project shall contain the schedule of the workers working on it
8. Projects shall be able to have a hierarchy

7. Weather

1. Weather shall be displayed if it affects a project
2. Weather report shall be sent to project manager weekly
3. Weather report shall be sent to project managers if it affects the performance of workers
4. Weather report shall be sent to employees if it is deemed to be a dangerous work environment
5. Weather report shall be sent to client if it postpones construction

8. Materials

1. Materials shall be tracked by the system
2. Materials shall be able to be added by project manager
3. Materials shall be able to be removed by an employee
4. Materials shall be viewable by suppliers

9. Work Orders

1. Work Orders shall be added by a project manager
2. Work Orders shall contain the project
3. Work Orders shall contain the needed materials
4. Work Orders shall be viewable by suppliers
5. Work Orders shall contain the expected price per unit

10. Safety Report

1. Safety report shall be viewable to all users connected to a project
2. Safety report shall keep track of all incidents
3. Safety report shall use an algorithm to determine how dangerous a certain project was
4. Safety report shall contain the weather
5. Safety report shall contain the affected individual(s)

6. Safety report shall contain the name of the project

List of Non-functional Requirements

1. **System**
    1. System shall provide warnings with hazardous weather conditions
    2. System shall allow for a project to be exported
    3. System shall allow for a project to be imported
    4. System shall allow project managers to edit the project
    5. System shall allow for many users
    6. System shall allow for additional information to be added
    7. System shall have a backup
    8. System shall adhere to usual privacy demands
2. **Performance**
    1. Database should be fairly quick to work with
    2. Database shall support multiple people using it at one time
    3. Database shall not experience critical failures
    4. Database shall be free to use
    5. Database shall be supported on many devices
3. **Storage**
    1. Database shall store personal information in MYSQL
    2. Database shall store project information in MYSQL
4. **Security**
    1. Database shall require no cost
    2. Database shall only let authorized users view data
    3. Database shall only let authorized users edit data
    4. Database shall be entirely read only to users not in the database
5. **Environment**
    1. Database shall be able to be used on Windows system
    2. Database shall be able to be used on Mac operation system
    3. Database shall be easy to use
    4. Database shall be organized and clean
    5. Database tables and columns shall be clear and descriptive
    6. Database shall support integration with other external systems
6. **Legal**
    1. Database shall not require any personal information
    2. Database shall not track any user
    3. Database shall allow any personal information to be deleted
    4. Database shall only be accessed through ConstructionPro server
    5. Database shall have terms and conditions able to be read
    6. Database shall have a security policy able to be read
7. **Content**
    1. Database shall be in English
    2. Database shall allow an id image to be uploaded with personal information
    3. Database shall be available at all times of the day
    4. Database shall not lose any user data
    5. Database shall not give away any user data

8. Privacy

1. Data shall be stored in database in MYSQL
2. Data shall only be seen by authorized users
3. Data that is deleted will never be recovered
4. Data shall be consistent throughout the system

Entities:

1. User
   - Shall have a Name
   - Shall have an Email
   - Shall have a Password
   - A user is a Client an Employee a Project Manager or a Supplier
   - A user shall be able to access their information on multiple devices

2. Employee
   - An employee shall be a user
   - Shall have a Schedule
   - Shall have worked on Projects
   - Shall have Incident Reports
   - Shall submit Timesheets
   - Shall be allowed to check the Weather Report

3. Guest
   - a guest is not a user
   - guest shall not have to pay
   - a guest shall not be able to change any data, be read only
   - a report shall be emailed to the guest of the projects they viewed

4. Payment Method
   - A payment method is a bank account, paypal, or cryptocurrency
   - A bank account payment method is a credit card, or debit card
   - A cryptocurrency payment method only accepts BTC, ETH or BNB
   - A cryptocurrency payment method is linked to only on wallet address

5. Client
   - A client shall be a user
   - Shall be able to check the status of their Project
   - Shall be able to view previous Projects
   - Shall be able to check the Weather Report
   - Shall be able to see specific Materials being used
   - Shall be able to provide feedback about a Project

6. Project Manager
   - A Project Manager shall be a user
   - Shall be able to create new Projects
   - Shall be able to view an existing Project
   - Shall be able to update the information about an ongoing Project
   - Shall be able to update the Expense Report
   - Shall be able to view the Weather Report
   - Shall be able to assign Employees
   - Shall be able to view Incident Reports

- Shall be able to see Client Reviews
- Shall be able to view Suppliers
- Shall be able to make Work Orders
- Shall be able to view Work Orders
- Shall be able to view the Analytics of a Project to make decisions
- Shall be able to assign Tasks to Employees

7. Supplier
- A Supplier shall be a user
- Shall be able to view Work Orders
- Shall be able to provide a quote for certain Materials
- Shall be able to see the status of their Requests
- Shall be able to display what Materials they have available

8. Project
- Shall contain Incident Reports
- Shall contain a list of all Members working on it
- Shall contain Feedback
- Shall show the Status of the Project
- Shall contain the Weather Report
- Shall contain the Schedule of the Workers working on it
- Shall be able to have a Hierarchy or sub project
- Shall be viewable by many users
- Shall be able to be created or modified only by a project manager

9. Weather
- Shall be displayed if it affects a Project
- Shall be sent to Employees if it is deemed to be a dangerous work environment
- Shall be sent to the Client if it postpones construction
- Weather shall be viewable by many users
- Weather report shall be able to be created only by the project manager

10. Materials
- Shall be tracked by the system
- Shall be able to be added by only a Project Manager
- Shall be able to be removed by only a Project Manager
- Shall be viewable by many Suppliers
- Shall be used in Projects

11. Work Orders
- Shall be added by a Project Manager
- Shall contain the Project
- Shall contain the needed Materials
- Shall be viewable by many Suppliers
- Shall be able to be added by only a Project Manager
- Shall be able to be removed by only a Project Manager

12. Safety Report
    - Shall be viewable to all Users connected to a Project
    - Shall keep track of all Incidents
    - Shall use an algorithm to determine how dangerous a certain Project was
    - Shall contain the affected Individual(s)
    - Shall contain the Name of the Project
    - Shall be able to be modified by only the employees involved and the project manager

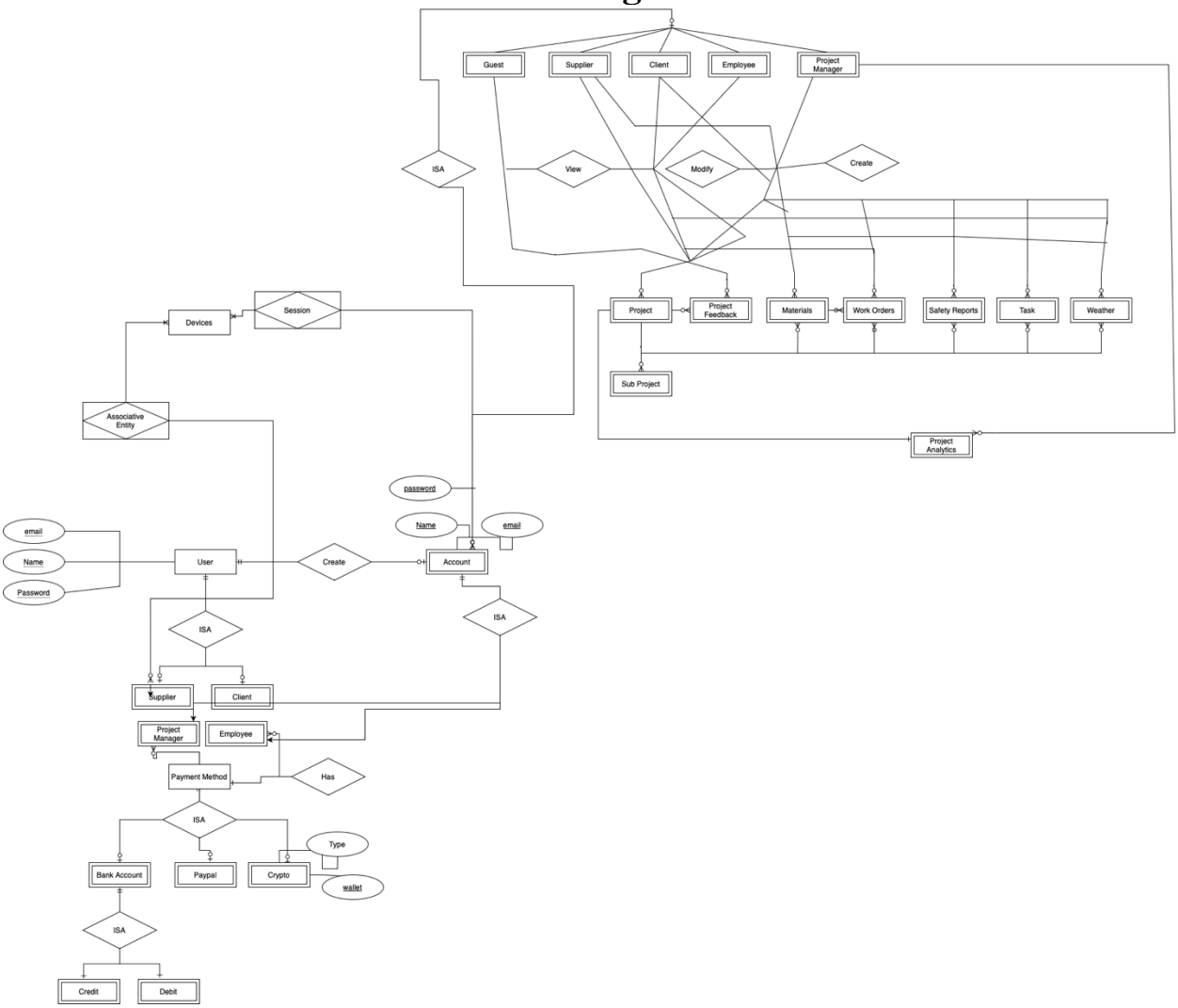
13. Task
    - Shall be relevant to each Employee
    - Shall be viewable only by the Employees assigned to the task
    - Shall be assigned by the project manager

14. Project Feedback
    - Shall contain Client Feedback
    - Shall contain Project Manager Feedback
    - Shall be associated with a Project
    - Shall be viewable by all users

15. Project Analytics
    - Shall contain Project Decision Metrics
    - Shall be associated with a Project Manager
    - Shall only be viewable by the project manager
    - Shall be created with an algorithm based on the results of the project

16. Subproject
    - Shall contain a Subproject Name
    - Shall be associated with a Parent Project
    - Shall be viewable by all users who can view a project

ERD Diagram


Guest
Supplier
Client
Employee
Project Manager
ISA
View
Modify
Create
Project
Project Feedback
Materials
Work Orders
Safety Reports
Task
Weather
Sub Project
Project Analytics
Devices
Session
Associative Entity
password
Name
email
email
Name
Password
User
Create
Account
ISA
ISA
Supplier
Client
Project Manager
Employee
Payment Method
Has
ISA
Type
Bank Account
Paypal
Crypto
wallet
ISA
Credit
Debit

Entity description

1. User (Strong)
    * UserID: Key, Numeric
    * Name: Alphanumeric
    * Email: Alphanumeric
    * Password: Alphanumeric
    * UserType: Alphanumeric
    * PersonalInformation: Alphanumeric

2. Employee (Strong)
    * EmployeeID: Key, Numeric
    * Schedule: Alphanumeric
    * IncidentReports: Alphanumeric
    * Timesheets: Alphanumeric
    * WeatherReport: Alphanumeric
    * ProjectsWorkedOn: Alphanumeric

3. Guest (Strong)
    * GuestID: Key, Numeric
    * Description: Alphanumeric
    * Email: Alphanumeric
    * Viewed Reports: Alphanumeric

4. Payment Method (Strong)
    * PaymentMethodID: Key, Numeric
    * Type: Alphanumeric
    * LinkedWalletAddress: Alphanumeric
    * Cost: Numeric

5. Client (Strong)
    * ClientID: Key, Numeric
    * ProjectRequirements: Alphanumeric
    * ProjectFeedback: Alphanumeric
    * ProjectStatus: Alphanumeric
    * RequestedMaterials: Alphanumeric
    * ExpenseReports: Alphanumeric
    * HiredForResidentialOrCommericalProjects: Numeric

6. Project Manager (Strong)
    * ProjectManagerID: Key, Numeric
    * CreatedProjects: Alphanumeric
    * UpdatedProjects: Alphanumeric

    * AssignedEmployees: Alphanumeric
    * ExpenseReports: Alphanumeric
    * ClientReviews: Alphanumeric
    * Suppliers: Alphanumeric
    * RateSuppliers: Alphanumeric
    * FireSuppliers: Alphanumeric
    * WorkOrders: Alphanumeric
    * Analytics: Alphanumeric

7. Supplier (Strong)
    * SupplierID: Key, Numeric
    * WorkOrders: Alphanumeric
    * Quotes: Alphanumeric
    * MaterialsAvailable: Alphanumeric
    * OrderFilled: Alphanumeric
    * Reviews: Alphanumeric

8. Project (Strong)
    * ProjectID: Key, Numeric
    * Name: Alphanumeric
    * IncidentReports: Alphanumeric
    * ProjectMembers: Alphanumeric
    * Feedback: Alphanumeric
    * Status: Alphanumeric
    * WeatherReport: Alphanumeric
    * Schedule: Alphanumeric
    * Hierarchy: Alphanumeric

9. Weather (Strong)
    * WeatherID: Key, Numeric
    * Conditions: Alphanumeric
    * ProjectsAffected: Alphanumeric

10. Materials (Strong)
    * MaterialID: Key, Numeric
    * Name: Alphanumeric
    * AddedBy: Alphanumeric
    * ProjectUsedFor: Alphanumeric
    * MaterialsNeeded: Alphanumeric

11. Work Orders (Strong)
    * WorkOrderID: Key, Numeric
    * MaterialName: Alphanumeric
    * ExpectedPricePerUnit: Alphanumeric
    * OtherQuotes: Alphanumeric

12. Safety Report (Strong)
    * SafetyReportID: Key, Numeric
    * Incidents: Alphanumeric
    * DangerousProjectAlgorithm: Alphanumeric
    * AffectedIndividuals: Alphanumeric
    * AffectedProjects: Alphanumeric

13. Task (Strong)
    * TaskID: Key, Numeric
    * TaskDescription: Alphanumeric
    * EmployeeAssignedToTask: Alphanumeric
    * TaskComopletionStatus: Alphanumeric

14. Project Feedback (Strong)
    * FeedbackID: Key, Numeric
    * ClientFeedback: Alphanumeric
    * ProjectManagerFeedback: Alphanumeric

15. Project Analytics (Strong)
    * AnalyticsID: Key, Numeric
    * Description: Alphanumeric
    * ProjectDecisionMetrics: Alphanumeric

16. Sub Project (Strong)
    * SubProjectID: Key, Numeric
    * SubProjectName: Alphanumeric
    * SubProjectStatus: Alphanumeric