MICHIGAN STATE UNIVERSITY

Project Plan Presentation

Remote Energy Distribution Payment Platform

The Capstone Experience

Team Caxy Interactive

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From Students…
…to Professionals

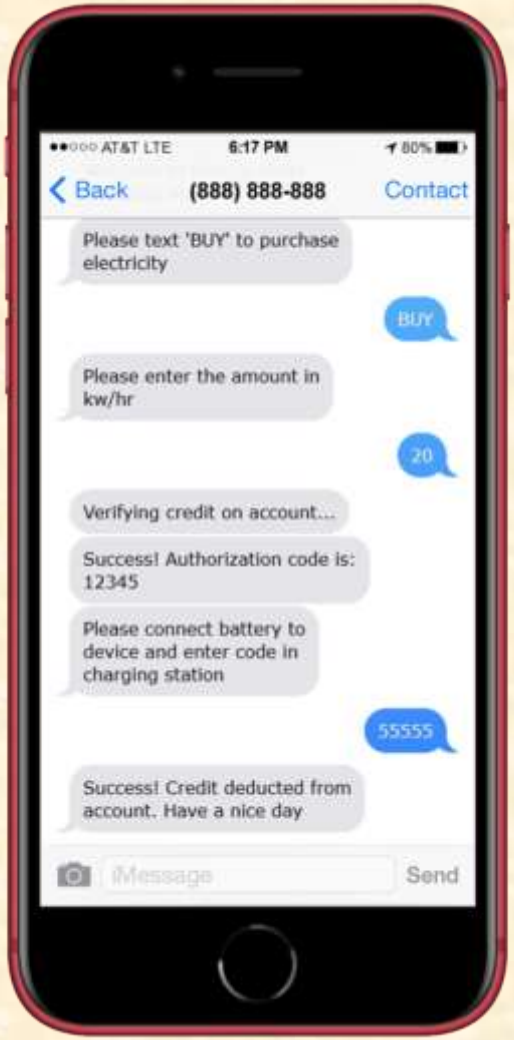
Functional Specifications

- Mediate issues of grid electricity in Cameroon and other African nations.
- Only 55% of the Cameroon population has access to the electrical grid, with only 17% in rural areas.
- Our project is an off-grid energy exchange marketplace to allow for the access of reliable, off-grid electricity.
- Phase 1 - Device Design and Prototype (Complete)
- Phase 2 - Payment System Design and Prototype

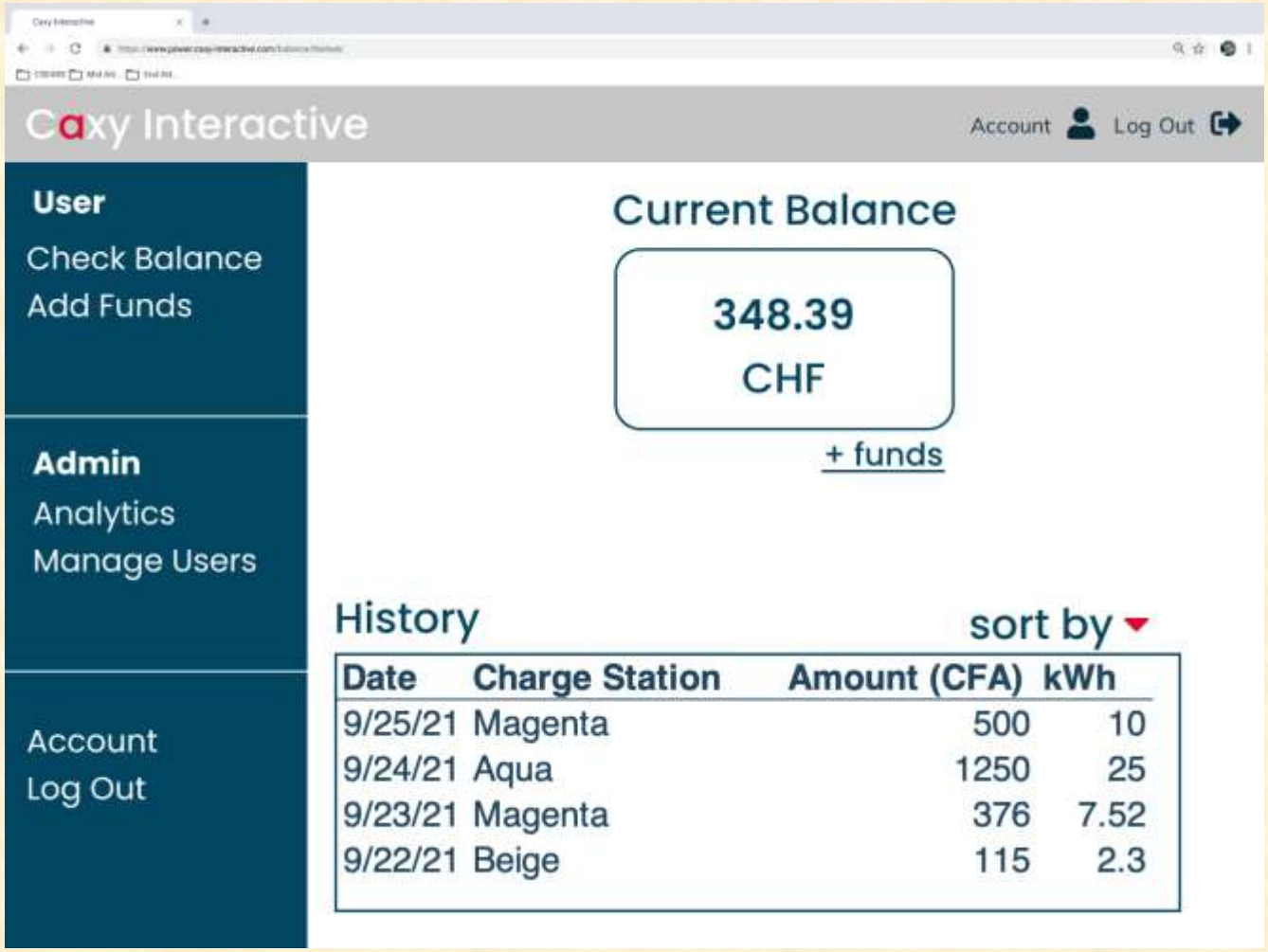
Design Specifications

- The design of our project can be divided into 2 broad categories:
- The SMS Chat
  - This will serve as the interface by which the user can request a code to input into the Arduino charging station to access the required amount of energy.
- The Web application
  - Users can access their accounts on the web application to add and view funds available
  - Administrators can view various analytics and statistics. They can also manage other users.

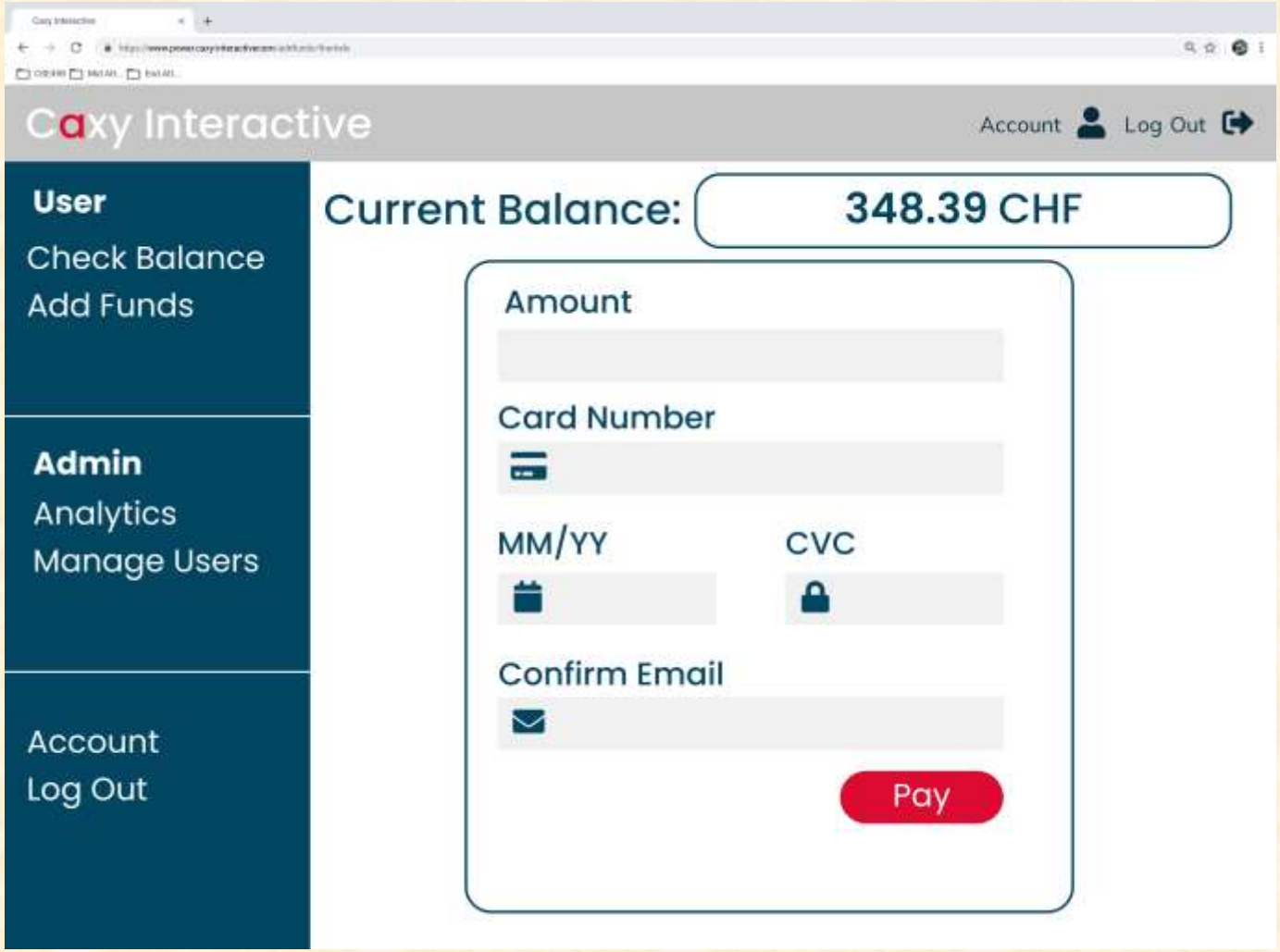
Screen Mockup: Messaging



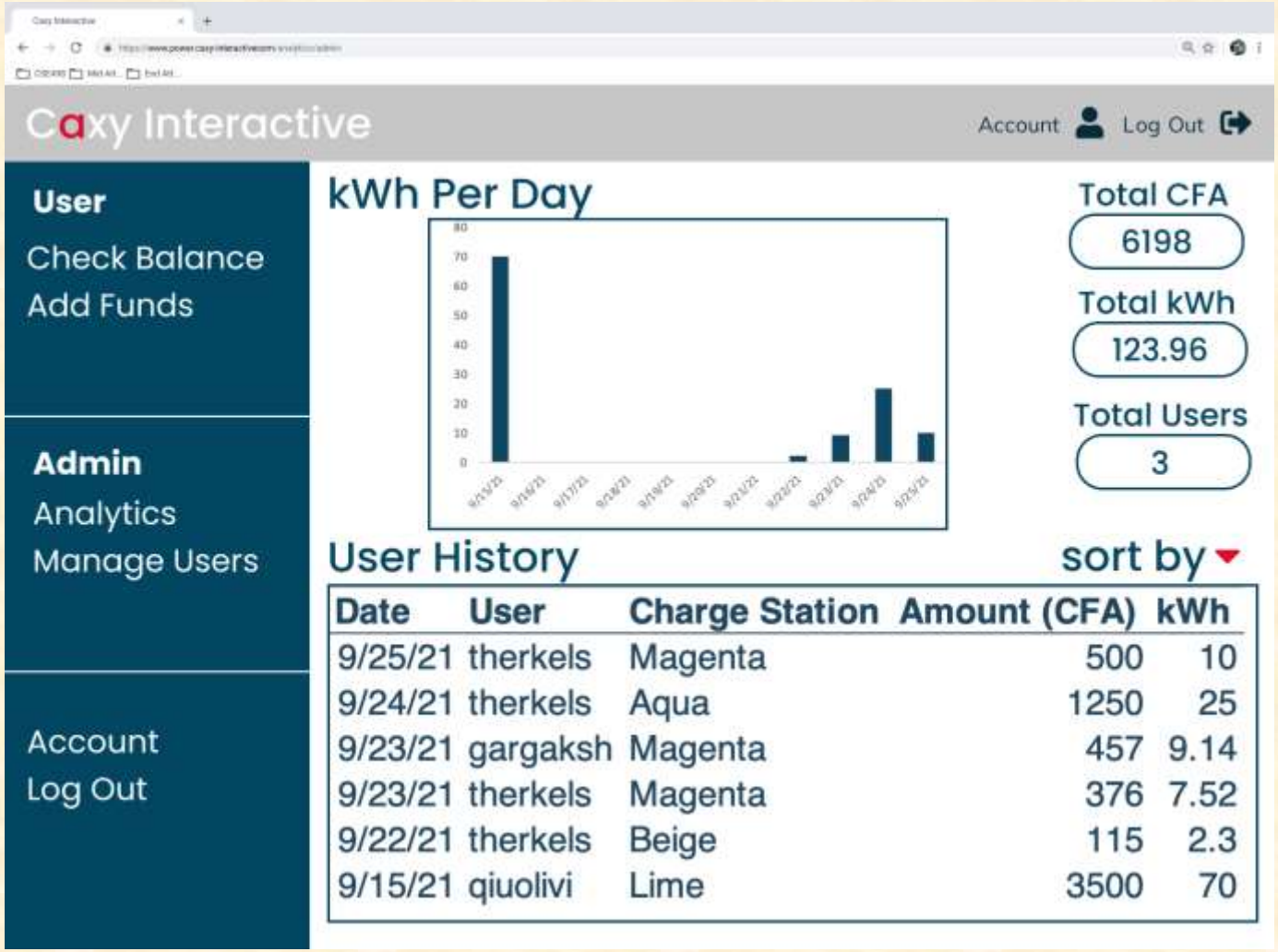
Screen Mockup: Check Balance



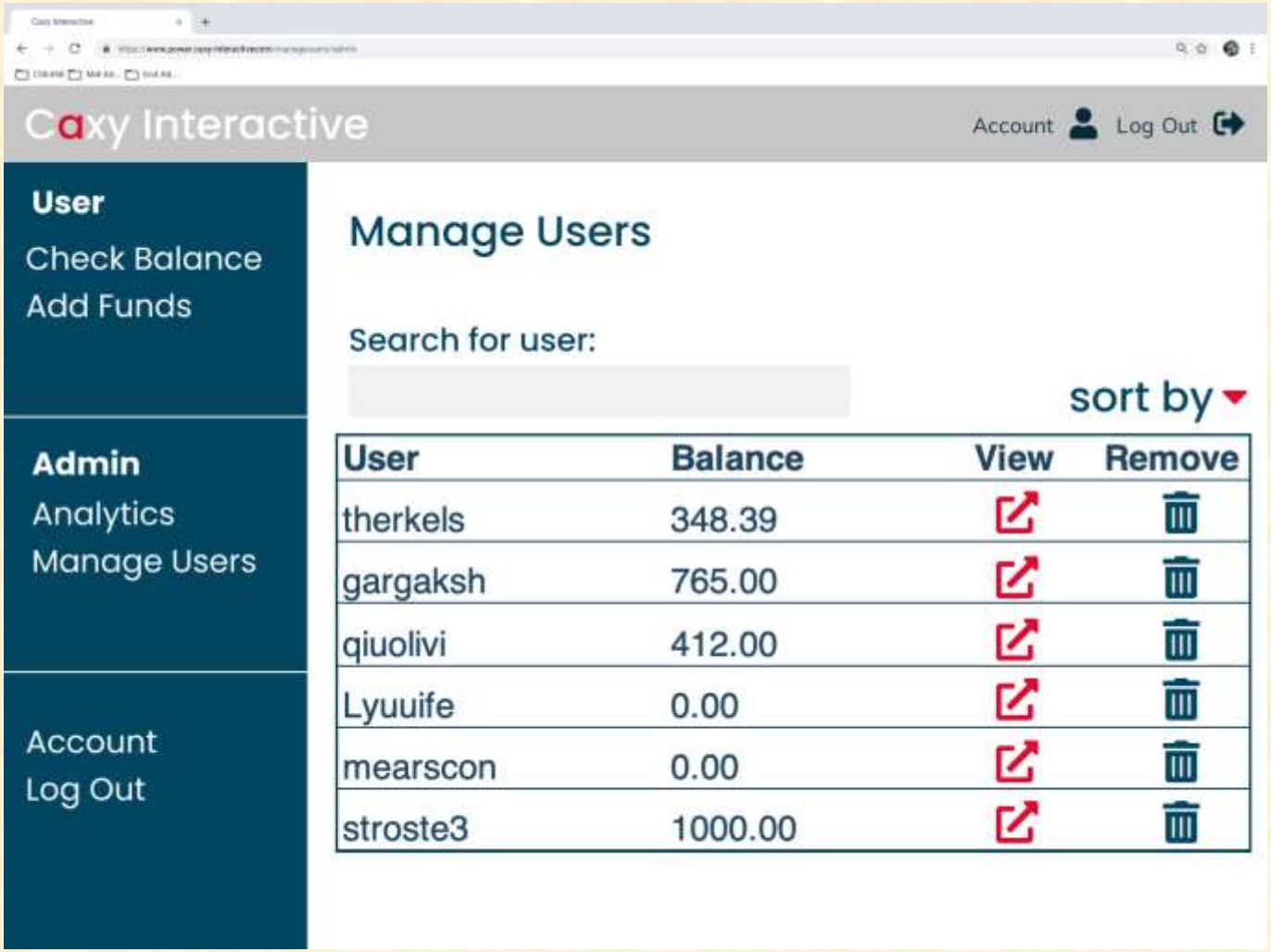
Screen Mockup: Add Funds



Screen Mockup: Analytics



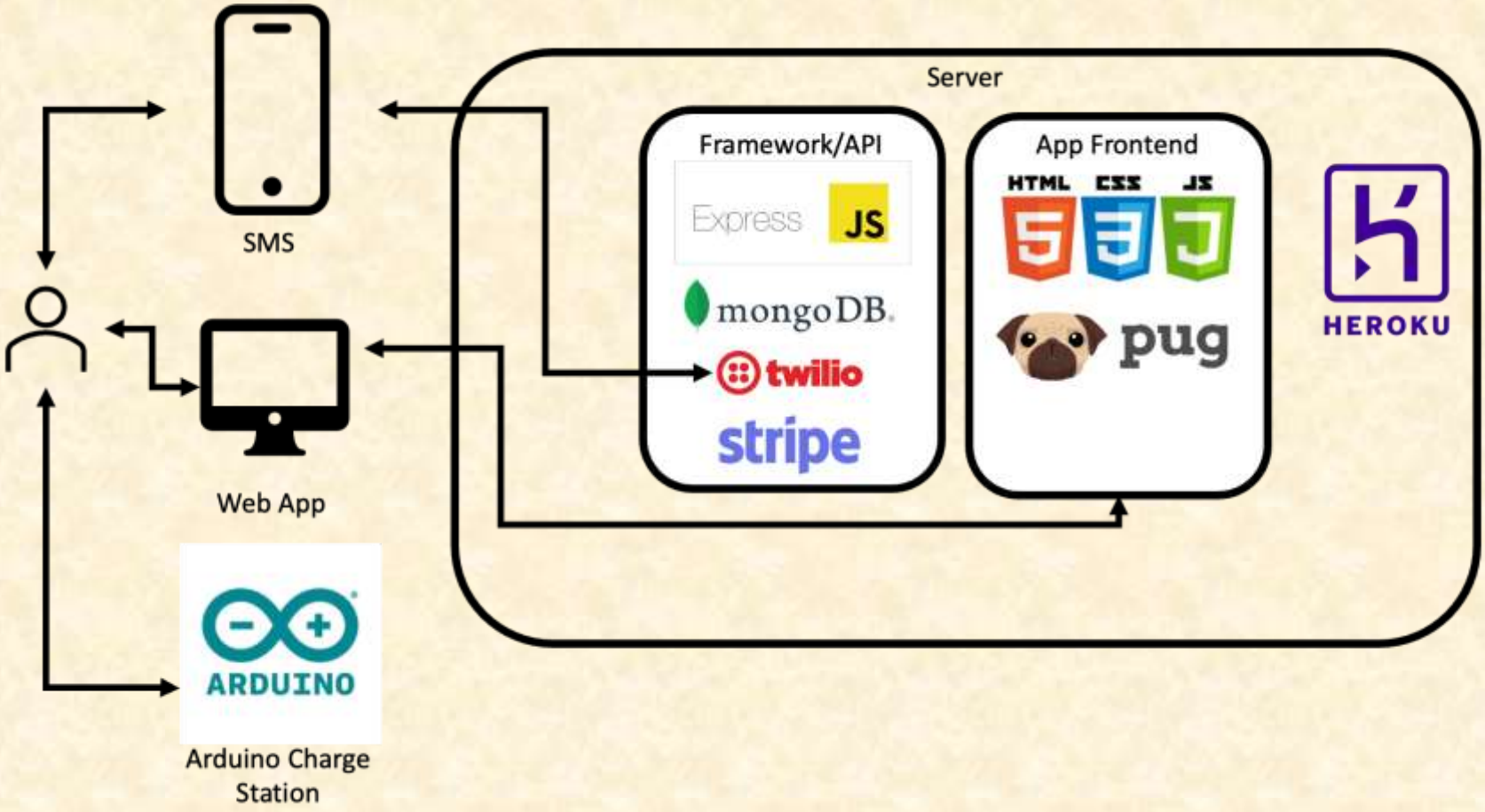
Screen Mockup: Manage Users



Technical Specifications

- Database
  - MongoDB for storing user transactions
- Backend
  - Express/NodeJS using MVC pattern
- Frontend
  - Pug html preprocessor for building dynamic HTML
  - HTML, CSS, and JS for supporting web application interface
- API Usage
  - Twilio communicates with user and server to process transactions via SMS
  - Stripe for payment updates and account balances
- Server
  - Heroku for cloud support
- Hardware - Arduino
  - Supports user 0–9-digit keypad
  - Process user codes for releasing energy

System Architecture



System Components

- Hardware Platforms
  - Arduino Charge Station
- Software Platforms / Technologies
  - Twilio
  - Node.js / Express
  - Heroku
  - MongoDB/Mongoose
  - Stripe
  - Pug

Risks

- Arduino Hardware Integrations
  - Wi-Fi connectivity, ability to receive HTTP POST/GET, hardware limitations
  - Design for simple data input and consider multiple processes/techniques
- Ambiguous User Accounts
  - There are uncertainty on the level of user data required
  - Build in flexibility, generalize a payment structure
- Payment Technology
  - SMS interactions will require users to withdrawal funds to afford energy
  - Design a "plug-and-play" server that can allow for different payment methods
- Data Encryption
  - Ensuring any sensitive data is either encrypted or protected
  - Data transfers between users, the Arduino, and server should be minimal and essential. Data stored should be labeled (ex. Is it PII?)

Questions?