

Initial Project Documentation

# The SMOCK Lock



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# Table of Contents

<b>Project Narrative:</b> .....	3
<b>Requirements:</b> .....	4
<b>Table 1.1: Hardware Requirements</b> .....	4
<b>Table 1.2: Software Requirements</b> .....	5
<b>Project Block Diagrams:</b> .....	6
<b>Figure 1: Project Block Diagram</b> .....	6
<b>Financing:</b> .....	7
<b>Table 2: Estimated Price of Materials</b> .....	7
<b>House of Quality:</b> .....	8
<b>Figure 2: House of Quality</b> .....	8
<b>Initial Project Timeline:</b> .....	9
<b>Table 3: Project Timeline</b> .....	9

## **Project Narrative:**

Our Project Narrative consists of our motivation goal and functionality of our Senior Design Project.

The motivation behind our project is that we as a group value safety in our homes. With this lock we would essentially provide that. The lock would contain a camera that can provide us a view of the visitor. After the user evaluates who is at the door, the user is then able to accept or deny entry into the home. This can even be done if the user is not home. The lock would be connected to the home network and with the use of an app the user can communicate with our lock from anywhere. With the speakers and microphones the user would also be able to get auditorial confirmation of who is at the door as well as being able to communicate with the visitor. We hope to use this lock in any scenario whether it be hotels, commercial properties, or a private residence.

The goal of our project is to create a lock that provides multiple secure ways of entry. The lock would provide owners an option to allow visitors entry to their home without the need of having to be there personally, all of this could be done from any location as long as you have your phone and are given owner privileges in the app. We are aiming to create a reasonably priced lock that includes biometric features to unlock such as face recognition, voice recognition, and fingerprint scanning. We also want to allow for the lock to communicate with the owner. An app would be required that would provide access to the lock via Wi-Fi, that can be downloaded onto a mobile device to configure settings and provide notifications to the owner.

The lock will have many functionalities, allowing for multiple tiers of security. The lock will have a regular key which would provide access in case of a network or power failure, voice recognition, facial recognition, as well as a fingerprint scanner. Depending on the level of security the owner wishes to use, it can require one or more methods of verification, such as a key and fingerprint scan being required for entry. This will all be configurable in an app that communicates with the lock. The app will not only let users configure the level of security, but also provide a way to designate other people who are authorized to unlock the lock (such as family members, or close friends.) The app will also provide notifications to the owner regarding important events, such as an unrecognized person who is attempting to enter. In order to ensure a customer's safety, the door can be set to auto-lock after it has been unlocked and can be set by the customer using the locks app.

This concludes the project narrative of our SMOCK Lock. The SMOCK Lock should provide easy to use and secure technology that will allow people to feel safe at their homes, travels, or commercial properties.

## Requirements:

Listed below are all the requirements that are required and set by the group to design and build a smart lock.

**Table 1.1: Hardware Requirements**

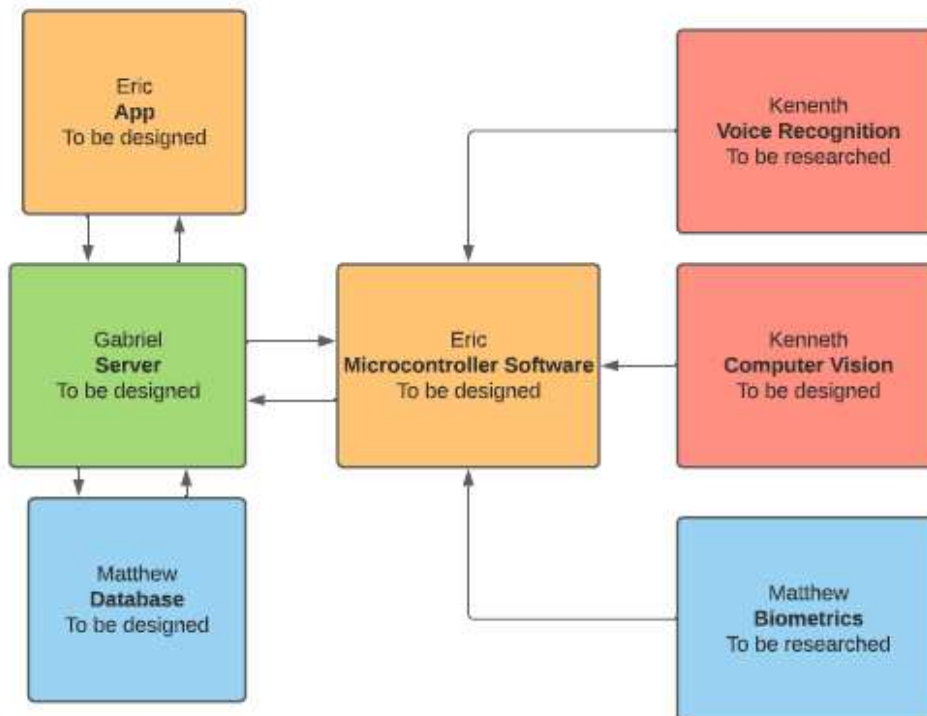
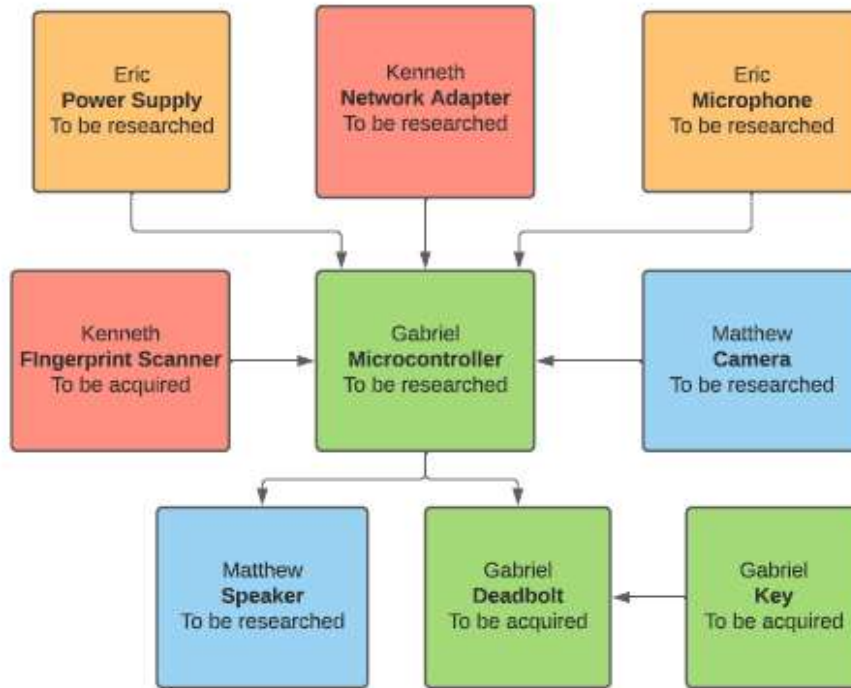
#	Requirement	Description
1.1	Size	The system shall be able to fit into a to be designed casing that will be mounted on a door. Targeted at 10"x6"x4".
1.2	Ease of Use	The system shall be user friendly so that anyone can use the lock, set up time should be less than 10 minutes (not including installation of actual lock).
1.3	Power Usage	The system shall provide power for at least 2-3 months. Output Power Targeted for 10W.
1.4	Network Capability	The system shall be able to communicate with server through network adapter
1.5	Microphone	The system shall have a microphone to be used for voice recognition (90% accuracy) as well as communication between visitors and the owner of the lock
1.6	Camera	The system shall have a camera to identify a person's face (1080p)
1.7	Speaker	The system shall include a speaker to welcome the visitor as well as to hear the owner of the lock.
1.8	Fingerprint Scanner	The system shall include a fingerprint scanner to be used to unlock the door by accepted fingerprints (95% accuracy)
1.9	Key	The system shall include a key to be used to unlock the door in case of network or power failure.
1.10	Power Supply	The system shall include a power supply capable of holding charge that will allow us to not need recharging or replacing for at least 2-3 months.
1.11	Microcontroller	The system shall include a microcontroller to communicate with each hardware component as well as to supply power to them.
1.12	Casing	Big enough to fit all the components of the lock. Targeted at 10"x6"x4".
1.13	Motor	The system shall include a motor to lock and unlock the deadbolt. Will be reactivated to lock the door after a specified amount of time set up by the owner.

**Table 1.2: Software Requirements**

#	Requirement	Description
2.1	Voice Recognition	The software shall have a voice recognition module with an estimated accuracy of 90%
2.2	Server	The software shall include a server to communicate between the app and the microcontroller.
2.3	Database	The software shall include a database to store data like facial scans, audio files, fingerprints, names, etc.
2.4	Computer Vision	The software shall include a computer vision module to allow for facial recognition with an estimated accuracy of at least 75%
2.5	Fingerprint Detection	The software shall include a fingerprint detection module to scan and detect users fingerprints with an estimated accuracy of 95%.
2.6	App	The software shall include an app that will allow the user to manage and customize their SMOCK

# Project Block Diagrams:

Figure 1: Project Block Diagram



## Financing:

We have set the initial estimated budget to be around \$125 with a maximum budget of \$200. The project will not be funded and will be paid for out of pocket. We plan to group the money into one account and only purchase supplies and materials from that account. This way each group member can have an even split.

Below is an initial estimated cost for supplies and materials to build the smart lock. These estimates were made by basing the price of common materials that will fit for our specifications and taking the mean average price of each item compared.

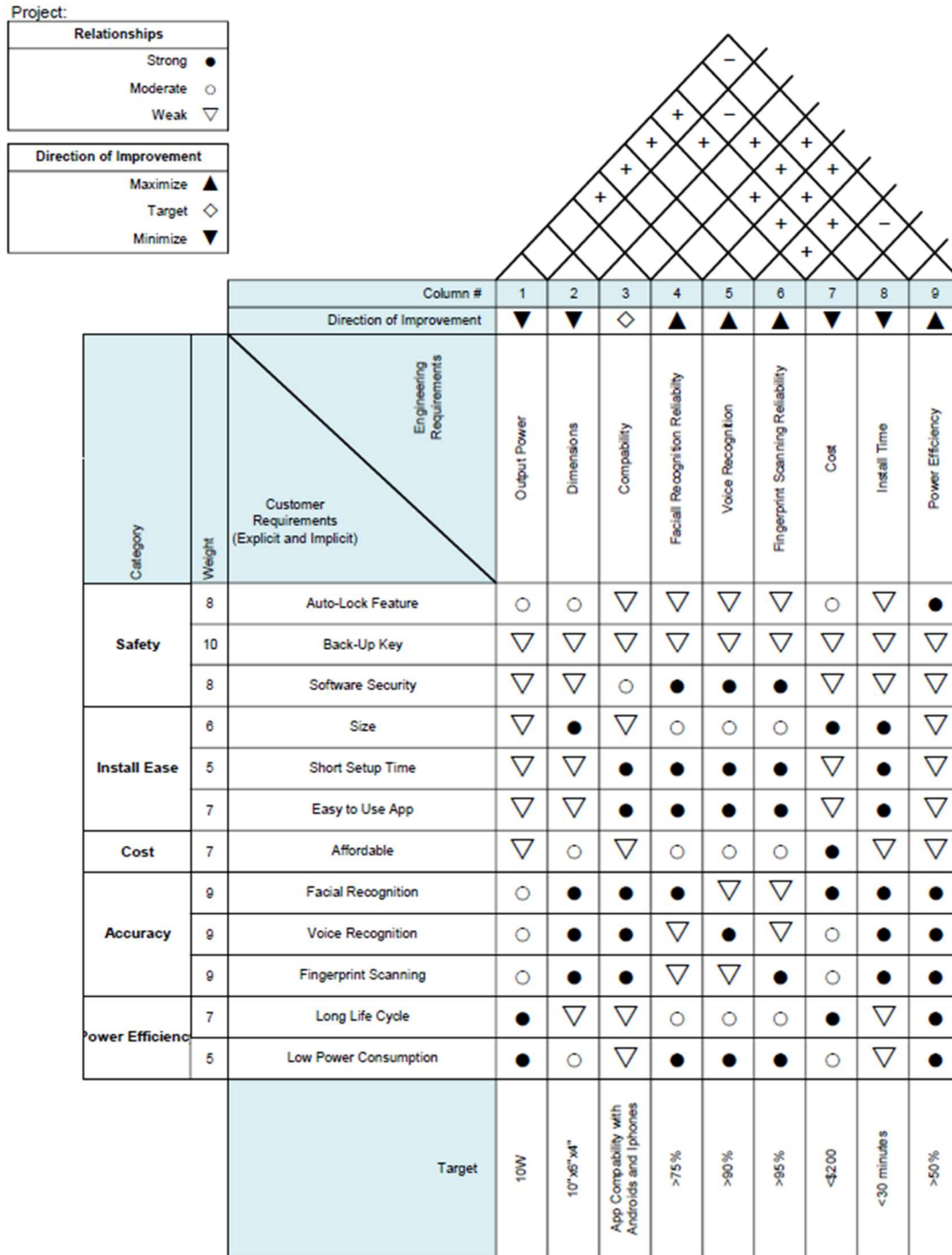
**Table 2: Estimated Price of Materials**

Item	Price (Estimated)	Quantity
Power Supply	\$6.00 - \$10.00	1
Network Adapter	\$3.00 - \$5.00	1
Microphone	\$8.00 - \$12.00	1
Camera	\$20.00 - \$30.00	1
Deadbolt Lock	\$15.00 - \$30.00	1
Speaker	\$8.00 - \$16.00	1
Casing	\$15.00 - \$30.00	1
Motor	\$6.00 - \$12.00	1
Fingerprint Scanner	\$20.00 - \$30.00	1
Total	\$101.00 - \$175.00	9

From this rough estimate, we can say that each group member will pay between \$25.25 and \$43.75 for a 4-way split of \$101.00 - \$175.00. This \$101.00 - \$175.00 estimate is a great price for other common products on the market that are priced in the range of \$150-300 for a smart lock. The smart locks in this range also do not contain all the features that our smart lock will contain.

# House of Quality:

Figure 2: House of Quality





## Initial Project Timeline:

**Table 3: Project Timeline**

<b>Time</b>	<b>Tasks</b>
August	Create Group and discuss potential project Ideas
September	Finish the divide and conquer, meet with Dr. Wei to discuss the idea and begin designing key systems
October	Begin working on the SD1 paper and continue working on the key systems for the project
November	Continue working on the SD1 paper and on key systems while beginning the design on the hardware component of the system
December	Finalize the SD1 paper and the design of the project in preparation for the construction of the project
January	Begin Construction of the test environment and lock, start developing the server side of the project and establishing the database and implementing the fingerprint scanner
February	Begin training and testing the voice and facial recognition systems, continue developing the server side of the system, begin working on the microcontroller systems
March	Continue working on the microcontroller portion of the project ensuring all components of the physical lock are working and creating the app to interface with the system.
April	Final testing of all components and aspects of the project. Any implementation that has not been completed should be completed by the end of the month.
May	Presentation of our SMOCK lock Senior Design Project.