Speaker Showerhead
Electrical & Computer Engineering

Group 19 - Manav, Bhavana, Abhi

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Introduction

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Problem

Use their phones to play music but can't hear it well due to the shower curtain and water noise

Lose track of time and use more water than needed

Struggle to set the right temperature
Eg: too hot could damage hair
What is our project and solution?

Enhance user experience by displaying

Temperature | Length | Average Length | Current Song
--- | --- | --- | ---
43°C 109°F | 5 mins | 6 mins 17 secs | Song: The Nights
Waterproof encasing on wall with the battery, speaker, the display, and the PCB

Battery

Bluetooth/ Speaker

Duration: Current Song: Current temp:

Microcontroller

Data Transfer

Temperature sensor

Shower head

Optical Level Sensor

Phone App (Spotify or another music app)
Areas of Design that Changed

**ORIGINAL DESIGN**

1. Box on pipe connected to showerhead
2. 3.7 Volt battery
3. Remote System
4. Raspberry PI

**NEW DESIGN**

1. Box on the wall
2. 9 Volt battery
3. No remote system
4. ESP 32 Microcontroller
1. Correctly displaying temperature of the water: one of the core requirements of our design is accurately measuring how hot or cold the water is for the user.

2. Correctly detecting if the shower is on: the display should accurately show the current shower duration as well as the average shower duration.

3. Speaker: Have the ability to connect a phone to the speaker through bluetooth and play music through a speaker.
Shower head System

Sensor Subsystem
- Temperature Sensor
- Optical Level Sensor

Power Subsystem
- Battery (9 V, 600 mA)

User Interface Subsystem
- Bluetooth Speaker

Display Subsystem
- Current temperature
- Shower Duration
- Current song

Control Subsystem
- Microcontroller ESP32-WROOM-32D

Smart Phone
- Any music source (Spotify)

Legend
- = Power
- = Data
- = Bluetooth
Sensor Subsystem

Optical Liquid Level Sensor

Waterproof Temperature Sensor
Control Subsystem

ESP32-WROOM-32D
Speaker Subsystem

Waterproof Bluetooth Speaker

Song Backend Demo
Speaker Subsystem
Power and Display Subsystem

9V Battery

OLED Display

front

back
Waterproofing

- Box IP67
- Speaker IP67
- Wire Encasing IP67
- Water Safety guide
Final Demo Video
Successes and Challenges

**SUCCESES**

- Web Server
  - Spotify API
- PCB Design
- Arduino Code

**CHALLENGES**

- Broken Sensors
- Voltage Regulators
- Physical Design
Failed Verifications

Problems:
1. 3.7 - 5 V voltage booster not working
2. WiFi and bluetooth on ESP32 not working

Solutions:
1. Use 9 V battery
2. Use ESP32-WROOM-32 DevKit
Redesign

- Bigger and more prominent display
- Pipe connection
- Better wire management
Skills We Learned for the Future

Creating a backend server and making API calls

PCB Design

"Kabira"

Designing a product

Cost Analysis: Placing value on our efforts and budgeting our expenses

3.1 Cost Analysis

We can expect a salary of $40/hr×5 hr/week×$1500 per team member. We need to multiply this answer with the number of team members, $15000×3 = $45,000 in labor cost.

The following is the table with the information of the parts we require:

<table>
<thead>
<tr>
<th>Description</th>
<th>Manufacturer</th>
<th>Quantity</th>
<th>Price ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature and Humidity Sensor, TH9002 Series</td>
<td>Advanced</td>
<td>1</td>
<td>29.37</td>
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<tr>
<td>IAGLE High-Pressure Shower Head with Hose, 3</td>
<td>IAGLE</td>
<td>1</td>
<td>10.99</td>
</tr>
<tr>
<td>Setting Filtered Water Saving Jet Hand Held Shower Heads Filter for Hard Water [1, 6gpm/200ml/Min Hose]</td>
<td>IAGLE</td>
<td>1</td>
<td>10.95</td>
</tr>
<tr>
<td>Temperature Sensor - Waterproof (DG18820)</td>
<td>ROHS</td>
<td>1</td>
<td>10.95</td>
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<tr>
<td>Raspberry Pi 3 – Model A+ (PLUS) – 512MB RAM</td>
<td>Raspberry Pi</td>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>Duracell – 9 Volt Battery</td>
<td>Duracell</td>
<td>2</td>
<td>14</td>
</tr>
<tr>
<td>2.8” TFT Display with Resistive Touchscreen</td>
<td>Adafruit</td>
<td>1</td>
<td>14.95</td>
</tr>
</tbody>
</table>

Total Parts: $130.26
Total Cost of Labor: $45,000
Total: $45,130.26
Future Considerations

- Add switch
- Save shower times
- Increase budget
- Measure amount of water
Thank You

Questions?