User Needs, Benchmarking, and Requirements

Voice of the Customer Benchmarking

Table 1. Current, commercial designs that align with the project.

Number	Name	Link	Description
1	Tempest Weather Station	Link	Reads outdoor temp, relative humidity, dew point, “feels like” temp, station pressure, barometric pressure, wind (speed, direction), lightning activity, rain (onset, intensity, duration, accumulation) Has an app, personal weather page, auto-calibration, and AI compatibility (smart home devices) $339.00
2	WS-2902	Link	Reads temp, rain rate, humidity, wind speed, and pressure Solar Powered and wireless WiFi connection $189.99
3	Home Temperature Humidity Sensor	Link	Wireless Temperature Humidity Monitor with App Alert. Smart Indoor Thermometer Hygrometer Compatible with Alexa Google Assistant. $12.96
4	Eve Weather	Link	Apple HomeKit Smart Home, Connected Outdoor Weather Station for Tracking Temperature, Humidity & Barometric Pressure, Precision Sensors, Wireless. $57.95
5	YoLink	Link	Weatherproof temperature sensor, LoRa based, works on all element states, outdoor use, alerts via app integration $28.79

Develop User Needs

1. Product - Tempest Weather Station
    a. Positive Reviews
        i. The customer service is reliable and generally a pleasant experience.
        ii. The device provides generally accurate data without being invasive.
        iii. The device was easy to install and configuration was made easy by pairing it with the app.
    b. Negative Reviews
        i. Rain measurement and alerts are not satisfactory in timing and accuracy.
        ii. The longevity of the device does not live up to the price tag.
        iii. The integration with other products is a hit or miss, and most users' ability to read the data is made difficult by the app’s layout.
    c. User Needs
        i. (Explicit) The device shall maintain an easily accessible, and simple structure for telecommuted troubleshooting.

ii. (Latent) The device shall produce accurate data without access to non-proprietary information.
iii. (Explicit) The device shall have a clear method for set up and use.
iv. (Explicit) The communications shall prioritize accuracy and timely alerts in relation to rain measurements by focusing on sprinkling applications.
v. (Explicit) The device shall be built to last for at least 10 years without detrimental decay.
vi. (Explicit) The communications shall prioritize readability in the visual representation of the data.

2. Product - WS-2902
    a. Positive Reviews
        i. The data is highly accurate and provides highly applicable data at a reasonable price.
        ii. Relatively easy setup and connection that allows the user to check out information regardless of where they are.
        iii. While the digital gauge might not read accurately at all times, the information uploaded to the website is always accurate.
    b. Negative Reviews
        i. It is difficult to find a place to properly mount the unit so that it stays put and provides quality data.
        ii. There is a minor issue of it jumping ahead by an hour in places where daylight savings time is a concern.
        iii. Directions for WiFi setup are not elderly-friendly.
    c. User Needs
        i. (Explicit) The device will stay within the target budget of $240.
        ii. (Latent) The device shall aim for a market price of $160 or lower.
        iii. (Latent) The communications shall be consistently available up to a distance of 100 meters.
        iv. (Explicit) The digital gauge shall accurately communicate measurements.
        v. (Explicit) The device shall contain a secure method of placement.
        vi. (Latent) The device shall contain an actuator that moves it to a better position in cases where the original placement prevents it from gathering data.
        vii. (Explicit) Instructions for use and setup shall be clear and concise.
        viii. (Latent) The device shall have a clock that is manually set up.
3. Product - Home Temperature Humidity Sensor
    a. Positive Reviews
        i. Very easy to set up and user-friendly
        ii. Cheap and easy to set up multiple devices in a lot of different locations. All the devices can easily be found in the same app.
        iii. Connects to the existing Amazon Alexa system for ease of use to other smart home items.
    b. Negative Reviews
        i. Can break somewhat easily and quickly with a short lifespan on occasion
        ii. Small battery lifespan, have to change batteries fairly often.

iii. Have to be in the range of a wifi router.

c. User Needs
   i. (Explicit)The device shall cost under 20
   ii. (Latent)The device should cost 12$ to keep it adorable.
   iii. (Explicit)The device shall connect to your phone to show the data.
   iv. (Latent)The device should be able to have a lifespan of longer than 5 years
   v. (Explicit)The device shall be able to be set up very easily so anyone can do it with minimal instructions.
   vi. (Explicit)The device shall be able to be mounted anywhere for ease of use

4. Product - Eve Weather
   a. Positive Reviews
      i. A smart app that shows all the weather data gathered
      ii. Easily able to place the device anywhere that you want the weather data gathered.
      iii. Outdoor weather history visible through the Eve app helps look at local trends.
   b. Negative Reviews
      i. Poor range of use of the device.
      ii. Very often disconnects from the app or from the wifi.
      iii. Very dim light, not easy to read the screen.
   c. User Needs
      i. (Explicit)The device shall connect to a home smart app for ease of use.
      ii. (Latent)The device shall have a screen that is easily readable in strong sunlight.
      iii. (Latent)The device should cost less than $60 and be affordable.
      iv. (Explicit)The device shall connect to wifi and have a long range of over 100m.
      v. (Latent)The device should give weather data trends and try to predict future weather events.
      vi. (Latent)The device should be able to be placed anywhere for easy weather data gathering.

5. Product - YoLink
   a. Positive Reviews
      i. Works in a variety of environments.
      ii. Alerts can be set depending on what is set in the app.
      iii. Extremely high battery life.
   b. Negative Reviews
      i. Sensor accuracy degrades over time.
      ii. Requires iCloud access to read/write which causes privacy concerns.
      iii. Poor quality control.
   c. User Needs
      i. (Explicit) The device should not require iCloud read/write access to function.
      ii. (Latent) The device shall have durable and lasting sensors.
      iii. (Latent) The device should have consistent quality in production
      iv. (Explicit) The device should be integrated into an app that allows users to configure notifications.

v. (Latent) The device should work in a variety of environments
vi. (Latent) The device should have a high battery life.

Organization of User Needs

Figure 1. A picture of the disorganized user needs statements on sticky notes.

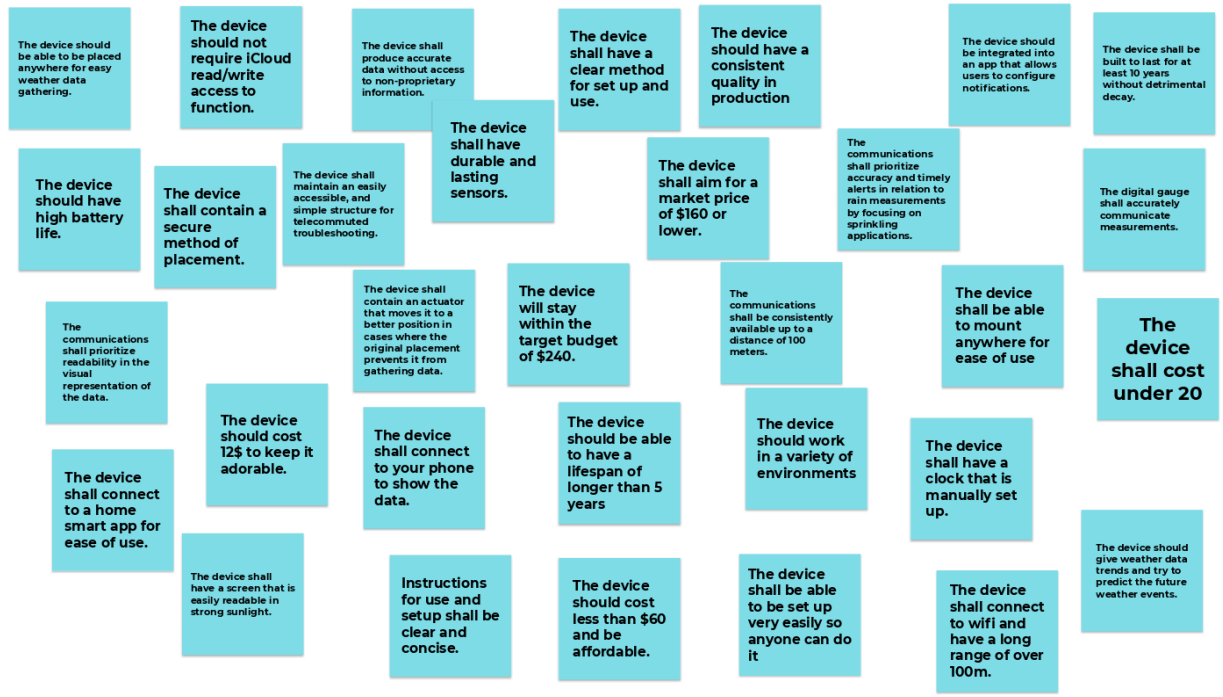


Figure 2. A picture of the categorized user needs statements with similar ones reworded into a single statement.

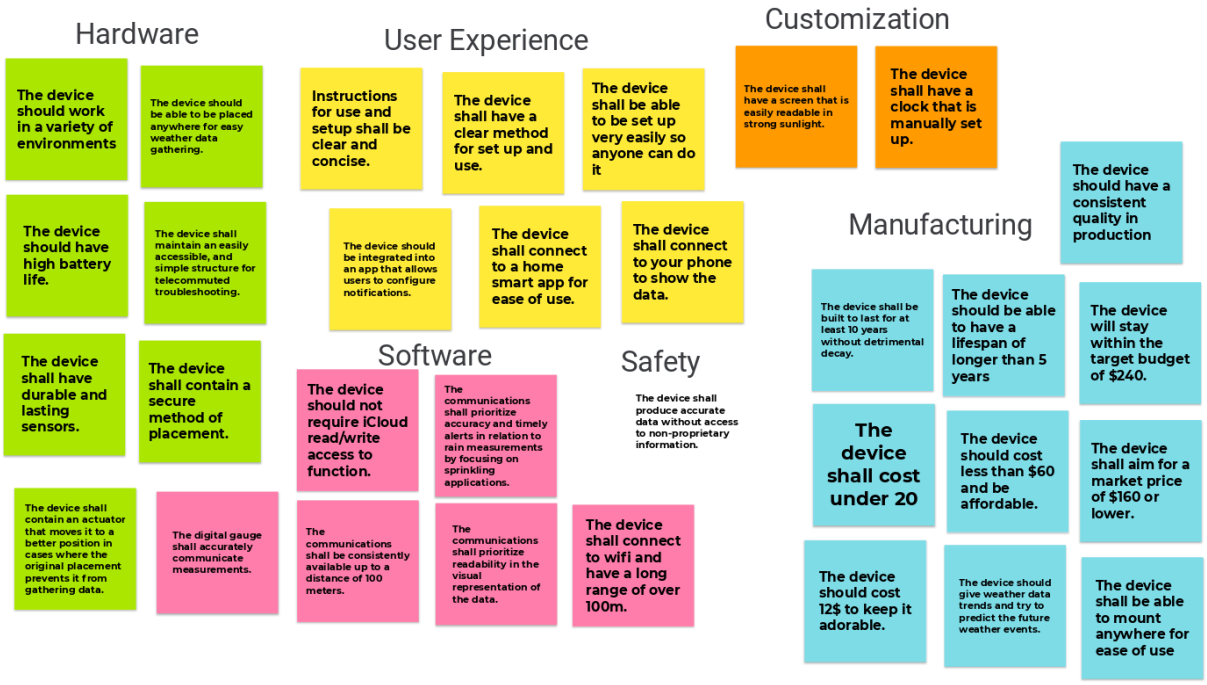
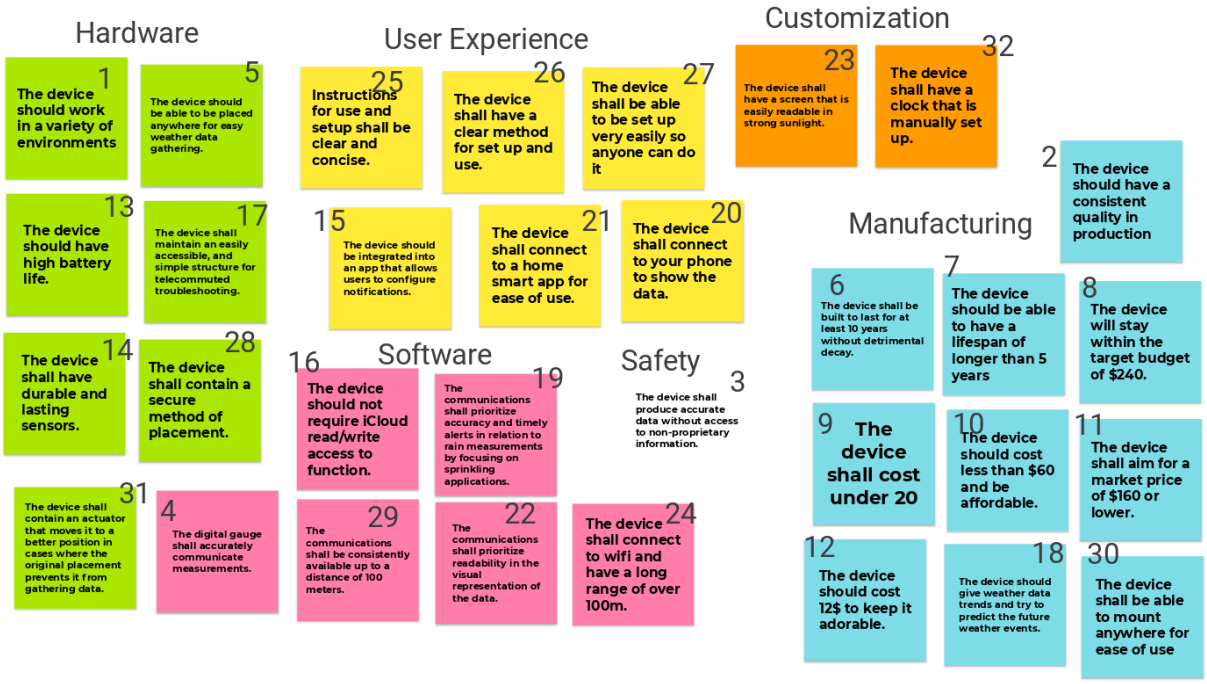


Figure 3. A picture of the categorized and ranked user needs statements.



Compiled List of User Needs

1. The device should work in a variety of environments
2. The device should have consistent quality in production
3. The device shall produce accurate data without access to non-proprietary information.
4. The digital gauge shall accurately communicate measurements.
5. The device should be able to be placed anywhere for easy weather data gathering.
6. The device shall be built to last for at least 10 years without detrimental decay.
7. The device should be able to have a lifespan of longer than 5 years
8. The device will stay within the target budget of $240.
9. The device shall cost under 20
10. The device should cost less than $60 and be affordable.
11. The device shall aim for a market price of $160 or lower.
12. The device should cost 12$ to keep it adorable.
13. The device should have a high battery life.
14. The device shall have durable and lasting sensors.
15. The device should be integrated into an app that allows users to configure notifications.
16. The device should not require iCloud read/write access to function.
17. The device shall maintain an easily accessible, and simple structure for telecommuted troubleshooting.
18. The device should give weather data trends and try to predict future weather events.
19. The communications shall prioritize accuracy and timely alerts in relation to rain measurements by focusing on sprinkling applications.
20. The device shall connect to your phone to show the data.

21. The device shall connect to a home smart app for ease of use.
22. The communications shall prioritize readability in the visual representation of the data.
23. The device shall have a screen that is easily readable in strong sunlight.
24. The device shall connect to wifi and have a long range of over 100m.
25. Instructions for use and setup shall be clear and concise.
26. The device shall have a clear method for set up and use.
27. The device shall be able to be set up very easily so anyone can do it
28. The device shall contain a secure method of placement.
29. The communications shall be consistently available up to a distance of 100 meters.
30. The device shall be able to be mounted anywhere for ease of use
31. The device shall contain an actuator that moves it to a better position in cases where the original placement prevents it from gathering data.
32. The device shall have a clock that is manually set up.