

## NARRATIVE

A good Indoor Environmental Quality (IEQ) in healthcare facilities can enhance patient recovery, mitigate stress levels, reduce the length of hospital stays, and improve the effectiveness of staff in delivering care (Ackley et al., 2024). Despite these factors, many hospitals do not actively monitor deviations in IEQ conditions.

As a low-cost, real-time IEQ monitoring device, the SAMBA can be easily implemented in healthcare settings to allow healthcare professionals, such as nurses and doctors, to manage the IEQ of their patient's rooms. I have developed an accompanying dashboard, which allows healthcare professionals to quickly identify IEQ deviations in their wards, thus supporting better patient care, and creating a more comfortable working environment for staff.

This visualisation will focus on five variables: Temperature, Humidity, Light, Sound and CO<sub>2</sub>. These variables were chosen as they are essential to patient comfort, health, and wellbeing. Deviations in temperature, humidity, and CO<sub>2</sub> will contribute to patient discomfort, whilst also increasing the risk of infection and microbial growth (Vijaykrishna G. & Balaji, 2023). High light and sound levels at night will disturb the patient's circadian rhythm and disrupt their sleep, which can prolong recovery and worsen wellbeing (Hillman, 2021).

### Use of SAMBA data

For this product, I decided to use SAMBA datasets with 1-minute intervals between timestamps as this would more accurately simulate real-time data collection. As most of the provided data were incremented by 5-minute intervals, I combined the data from 5 consecutive days (with data from 12:00AM to 11:59PM) to then construct a continuous, 24-hour dataset.

As this data was taken from an office building, some values were unreflective of a hospital environment. To address this, specific measurements, particularly the light levels, were modified according to Engwall et al. (2015), as this would more accurately replicate a hospital environment. Certain values were intentionally adjusted to fall outside the optimal range for their respective values to show the product's application.

### Concept development

In this project, AI was used both to debug errors in my code, and to develop the mathematical functions used to produce a numbered IEQ rating (see *Appendix 1*).

For this concept, I have used a simple typeface and colour palette to create a professional, modern, and easily understandable aesthetic. Green and red were used to indicate positive and negative conditions respectively, as these colours are commonly recognised and quickly interpreted by users.

My initial concept was a dashboard, displaying all the current IEQ levels alongside the patient information on the left.

## DECO3100 A2 DOCUMENTATION

Room 1  
John Smith

**Staff**  
Doctor: Sabrina Peters  
Charge Nurse: Noah Johns

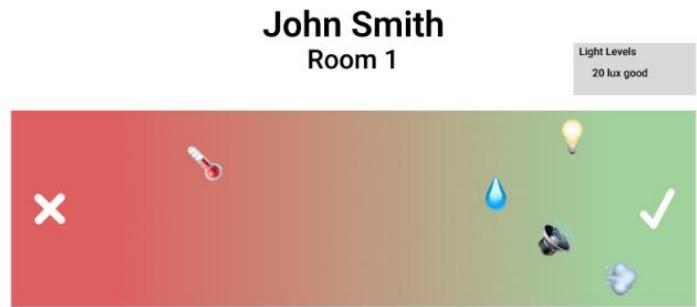
**Patient Information**  
DOB: 20/04/2025  
Sex: Male  
Admission Date: 27/04/2025  
Parent Contact: +61 412 345 678

**Current Status**

Light	Sound	CO <sub>2</sub> Levels	Humidity	Temperature
<span style="color: red;">X</span>	<span style="color: green;">✓</span>	<span style="color: green;">✓</span>	<span style="color: green;">✓</span>	<span style="color: green;">✓</span>

**Measurements:**

- Light**: Lights are too bright- dim wherever possible (gauge chart)
- CO<sub>2</sub> Levels**: Good (406 ppm) (chart)
- Humidity**: (chart)
- Sound**: Sound levels are within range. (gauge chart)
- Temperature**: 24°C (Low: 22°C High: 26°C) (chart)



Following from my A1 feedback, I simplified my design to reduce information overload for the users (top right). See *Appendix 2* for clearer photos of all iterations.

I then developed this and the product page in HTML, CSS and JS. Below is the prototype that I used for my first stage of usability testing (See *Appendix 2, Iteration 2* for a larger version). Throughout further iterations, I have used similar colours, an Arial typeface, and iconography to develop a stronger, more recognisable brand identity.

**IEQ Dashboard for Healthcare Facilities**

Manage and improve patient wellbeing and health using SAMBA technology

[See the Dashboard](#)

**Boost Patient Recovery and Wellbeing.**

A quick indoor Environmental Quality (IEQ) assessment monitors patient recovery, reduces stress levels, and promotes better overall care. Our technology streamlines the IEQ management process for healthcare professionals.

**1** See real-time IEQ monitoring of every room in one place

**2** Use our dashboard to quickly identify what's disturbing the crucial IEQ

**3** Adjust the room to improve IEQ and see happier patients

**What is SAMBA?**

A quick indoor Environmental Quality (IEQ) monitoring system which provides accurate, real-time measurements of IEQ indicators. This device allows us to conveniently measure, monitor and report offering healthcare facilities to respond to quickly to deviations.

**What are we measuring?**

- Temperature**: Provides accurate temperature readings. Helps to keep patients cool during hot weather and comfortable during cold weather.
- Humidity**: Helps to keep patients cool during hot weather and comfortable during cold weather.
- Light**: Helps to keep patients cool during hot weather and comfortable during cold weather.
- Sound**: Helps to keep patients cool during hot weather and comfortable during cold weather.
- CO<sub>2</sub>**: Helps to keep patients cool during hot weather and comfortable during cold weather.

[Try it out now!](#)

Hero image and title to catch the user's attention and convey a short description

Short, positive titles to improve the user's initial impression of the product

Gradient used between red, orange, and green as these are commonly used to elicit positive or negative conditions (like traffic lights)

**Ward Monitoring**

**Ward 1**

Room 1	10	Room 2	10
--------	----	--------	----

**Room 1**

Light, Sound, Humidity, Temperature

## USER TESTING

To test the narrative and functionality of this product demo, I used a three-step approach: the Think-Aloud protocol, semi-structured interviews, and the System Usability Scale (SUS). This combination of methods allowed me to gain a deep insight into users' thought processes, feelings, and frustrations, thus allowing for more targeted improvements.

To guide my user testing, I developed a set of tasks and interview questions (see *Appendix 3.1*). I conducted 2 rounds of testing, each with 4 different users. Between the rounds, I implemented changes based upon feedback, before testing the updated version before producing my final product.

Following the first four testers, I found that whilst people liked the overall feel and functionality of the webpages, they struggled to understand what the product's narrative and use. Users 3 and 4 struggled to understand what certain terms meant, such as *IEQ* and *SAMBA*, meaning that I needed to refine the layout, titles, and content of the product screen (see *Appendix 3.4 & 3.5*). I also needed to add a more immediate way for users to see the IEQ parameter values, to improve efficiency and ease of use.

Following this, I developed the third iteration (See *Appendix 2, Iteration 3*):

The figure consists of three vertically stacked screenshots of a web-based monitoring system for patient rooms. Each screenshot includes a callout arrow pointing to a specific feature or layout improvement.

- Screenshot 1 (Top):** Shows a hero section with four healthcare professionals and a title "Control patient room environments". A callout arrow points to the title and description area, stating: "A clearer and simpler hero title and description. I have omitted or explained technical jargon to improve clarity."
- Screenshot 2 (Middle):** Shows a section titled "What do we measure?" with five icons: Temperature, Humidity, Light, Sound, and CO2. A callout arrow points to this section, stating: "A refined layout helps users to understand the product's use and narrative easier."
- Screenshot 3 (Bottom):** Shows a "Ward Monitoring" dashboard with a heatmap of a ward layout and detailed data for Room 1. A callout arrow points to the data callouts, stating: "In this iteration, I added annotations to the right of the icons, so that users could identify the current levels of each variable quickly."

**Annotations for Screenshot 3:**

- Heatmap Callout:** Points to the heatmap of the ward layout, which shows color-coded levels for various parameters across multiple rooms.
- Data Callouts:** Points to two callouts for Room 1: "Sound 70 dB" and "Light 300 lux".
- Right Panel Data:** Points to a panel on the right side displaying real-time data for CO2 (474 ppm), Sound (41 dB), Light (2 lux), Humidity (51%), and Temperature (24.3°C).

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Using this third iteration, the next four testers were more efficient when completing the tasks and were able to understand the product use and narrative. All four testers found that the interface was easy to navigate and responsive. Small changes were made to headings in the dashboard to improve understandability, as both users 6 and 7 struggled to find the overall room rating (see *Appendix 3.7 & 3.8*).

Following this, developed my final iteration (see *Appendix 2, Final Iteration*).

These testers tended to visualise product use on a larger scale: both users 7 and 8 mentioned how this product can be useful to hospital staff or building owners when there are more rooms added to the dashboard (see *Appendix 3.8 & 3.9*).

In future, this product should be expanded to include more rooms, or to include a map of the hospital ward, allowing healthcare professionals to easily monitor the ward's IEQ from one place. This can also help to identify areas with consistently poor IEQ levels, thus allowing them to implement preventative measures to improve IEQ levels.

## References

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## APPENDIX 1 AI Use

### AI USED

<https://chatgpt.com/share/68440eac-d754-8004-9321-2f1209c216be>

- This chat was used in the comfort and cycleComfort functions to create a non-linear scale which defines what good or bad was. This was as non-linear scales more closely mimics how we tolerate temperature, humidity, etc..

Transcript:

create a function in javascript that calculates whether the temperature is good or bad using a logarithmic graph. if the temperature is good then give it a value of 10, and if the temperature is bad then give it a value of 0. if the temperature between 22 and 26 degrees celsius then it is good. when the temperature gets degrees lower or higher than that then change the values based upon how far the temperature is away from the target temperature.

ChatGPT said:

Great! Here's a **JavaScript function** that uses a **logarithmic curve** to smoothly map how "good" a temperature is, with:

- 10 for **perfect comfort** (within 22–26°C),
- A decreasing value toward 0 as the temperature moves away from that range (either lower or higher),
- Based on the **logarithm of the distance** from the ideal range.

---

#### JavaScript Function Using Logarithmic Mapping

javascript

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```
function temperatureComfortValue(temp) {  
    const minComfort = 22;  
    const maxComfort = 26;  
  
    // Perfect temperature range → score of 10  
    if (temp >= minComfort && temp <= maxComfort) {  
        return 10;  
    }  
}
```

```
// Calculate how far away the temperature is from the nearest comfort bound
const distance = temp < minComfort
    ? minComfort - temp
    : temp - maxComfort;

// Use logarithmic decay: higher distance → lower score
// log(1) = 0 → score = 10, log grows slowly
const score = 10 - Math.log(distance + 1) * 3;

// Clamp score between 0 and 10
return Math.max(0, Math.min(10, score));
}
```

---

### Examples

javascript

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```
console.log(temperatureComfortValue(24)); // 10 (within ideal range)
console.log(temperatureComfortValue(20)); // ~6.7
console.log(temperatureComfortValue(18)); // ~4.4
console.log(temperatureComfortValue(28)); // ~6.7
console.log(temperatureComfortValue(35)); // ~2.0
console.log(temperatureComfortValue(10)); // ~0.0 (bad)
```

---

### Why Logarithmic?

The  $\log(\text{distance} + 1)$  curve grows slowly, which simulates how we tolerate temperatures that are *slightly* outside the ideal range but feel worse as they get further.

You can adjust the multiplier (\* 3 here) to make the drop-off steeper or gentler.

Would you like this visualized or adjusted for Fahrenheit too?

**You said:**

if the value is more than 5 degrees more than the ideal range then the value should be 0

**ChatGPT said:**

Got it! You want a **logarithmic comfort score** that:

- Returns 10 if the temperature is between **22°C and 26°C** (inclusive),
  - Returns a decreasing score from 10 → 0 for temps up to **5°C outside** that range,
  - Returns 0 if the temp is **more than 5°C below 22°C or above 26°C**.
- 

### Updated JavaScript Function

javascript

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```
function temperatureComfortValue(temp) {  
    const minComfort = 22;  
    const maxComfort = 26;  
    const maxDeviation = 5; // maximum distance allowed before score becomes 0  
  
    // Inside the ideal range → perfect score  
    if (temp >= minComfort && temp <= maxComfort) {  
        return 10;  
    }  
  
    // Calculate how far the temperature is from the nearest bound  
    const distance = temp < minComfort  
        ? minComfort - temp  
        : temp - maxComfort;  
  
    // If it's more than 5 degrees off, it's bad  
    if (distance > maxDeviation) {  
        return 0;  
    }
```

```
// Logarithmic decay (inverse scale): farther = lower score  
// Example: log(1) = 0, log(6) ≈ 1.79 (max)  
  
const decay = Math.log(distance + 1) / Math.log(maxDeviation + 1); // normalize to  
0–1  
  
const score = 10 * (1 - decay); // invert so close = high score  
  
  
return Math.round(score * 10) / 10; // round to 1 decimal place  
}
```

---

### Example Outputs

javascript

CopyEdit

```
temperatureComfortValue(24); // 10 (perfect)  
temperatureComfortValue(21); // ~7.7  
temperatureComfortValue(20); // ~6.2  
temperatureComfortValue(18); // ~3.8  
temperatureComfortValue(17); // ~2.4  
temperatureComfortValue(16); // ~1.3  
temperatureComfortValue(15.9); // ~1.2  
temperatureComfortValue(15.0); // 0 (too far)  
temperatureComfortValue(32); // 0 (too hot)
```

---

### Behavior Summary

- **22–26°C:** Score = 10
- **17–21.99 or 26.01–31°C:** Score decreases logarithmically from 10 to 0
- **<17°C or >31°C:** Score = 0

Let me know if you'd like a graph of this, or if you want to tweak the curve further (e.g. polynomial or sigmoid drop-off).

You said:

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what does this part mean const distance = temp < minComfort ? minComfort - temp : temp - maxComfort;

**ChatGPT said:**

Great question!

This part of the code:

javascript

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```
const distance = temp < minComfort
```

```
    ? minComfort - temp
```

```
    : temp - maxComfort;
```

is using a **ternary operator** to compute how far the temperature (temp) is from the **nearest edge** of the comfort range.

---

### Explanation:

- The comfort range is defined as:

javascript

CopyEdit

```
const minComfort = 22;
```

```
const maxComfort = 26;
```

- Now, if the temperature is **below 22**, the distance is:

javascript

CopyEdit

```
minComfort - temp
```

This tells us **how far below 22** it is.

- If the temperature is **above 26**, the distance is:

javascript

CopyEdit

```
temp - maxComfort
```

This tells us **how far above 26** it is.

---

### Ternary Operator Breakdown:

javascript

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```
const distance = condition ? valueIfTrue : valueIfFalse;
```

So in this case:

- If  $\text{temp} < \text{minComfort}$  (i.e. temp is too cold), then  $\text{distance} = \text{minComfort} - \text{temp}$
  - Otherwise (temp is too hot), then  $\text{distance} = \text{temp} - \text{maxComfort}$
- 

### 🔍 Example:

- $\text{temp} = 20$ :  
 $\text{temp} < \text{minComfort}$  is true, so  
 $\text{distance} = 22 - 20 = 2$
  - $\text{temp} = 29$ :  
 $\text{temp} < \text{minComfort}$  is false, so  
 $\text{distance} = 29 - 26 = 3$
- 

So this line ensures you're always calculating the **positive distance** from the nearest boundary of the ideal range, regardless of whether the temperature is too hot or too cold.

You said:

what is this part doing `const decay = Math.log(distance + 1) / Math.log(maxDeviation + 1);` // normalize to 0–1

ChatGPT said:

Excellent question again!

This line:

javascript

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```
const decay = Math.log(distance + 1) / Math.log(maxDeviation + 1);
```

is computing a **logarithmic decay factor**, scaled between 0 and 1, based on how far the temperature is from the ideal range.

---

### 🔍 Step-by-step Breakdown:

#### 1. `Math.log(distance + 1)`

- Computes the natural logarithm ( $\ln$ ) of the distance + 1.
- +1 is added so that if distance = 0 (i.e. the temp is exactly on the boundary),  $\log(1) = 0$ , which is what we want.

## 2. Math.log(maxDeviation + 1)

- This is the **maximum possible value** for the numerator, used to **normalize** the result between 0 and 1.
- maxDeviation is set to 5, so this becomes  $\log(6) \approx 1.79$ .

## 3. Division:

javascript

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`Math.log(distance + 1) / Math.log(maxDeviation + 1)`

- This creates a **normalized ratio** between 0 (perfect temp) and 1 (worst tolerable deviation of 5°C).
- So:
  - If distance = 0: decay = 0
  - If distance = 5: decay = 1
  - If distance = 2: decay =  $\log(3)/\log(6) \approx 0.63$

## 4. Why Normalize?

- The result (decay) can now be used to linearly scale or invert the score:

javascript

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`const score = 10 * (1 - decay);`

- So closer to ideal → higher score.
- Farther away → lower score.

---

### 🧠 Summary:

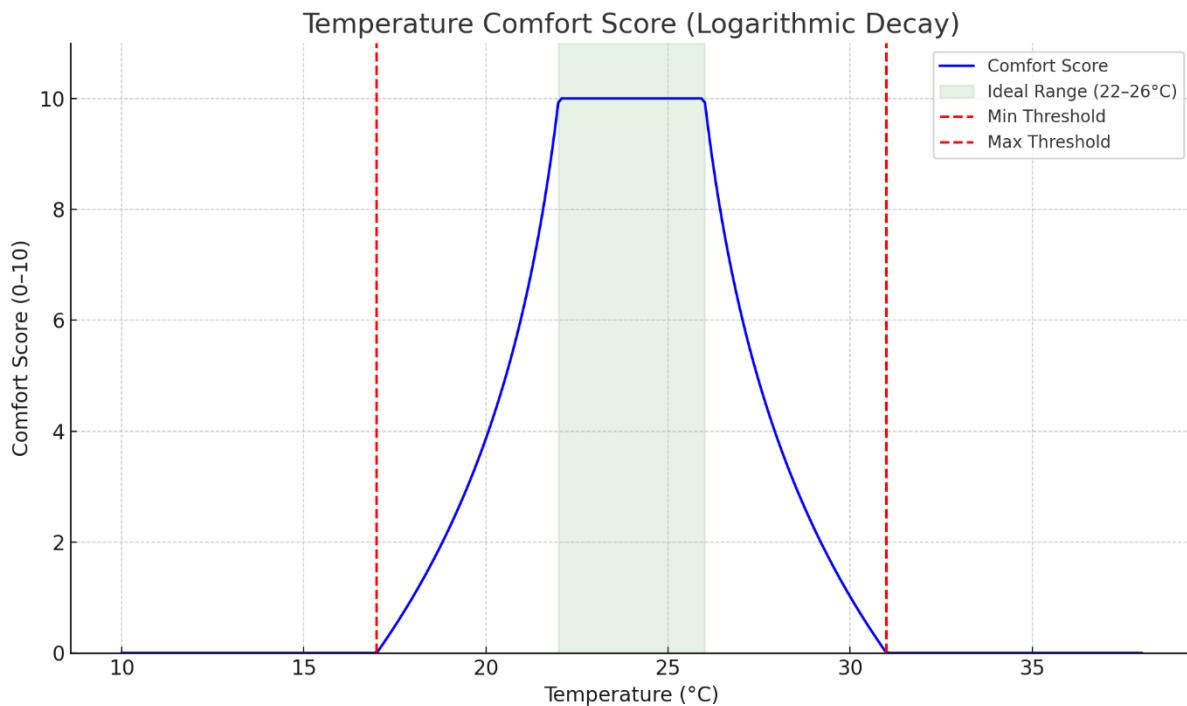
This line maps the distance (0 to 5) **logarithmically** into a decay value between 0 and 1, which is then inverted to reduce the score smoothly as the temperature gets worse — but not linearly. It's a more natural, perception-based decay.

Let me know if you'd like a visual graph of how this behaves!

### You said:

visual graph please

**ChatGPT said:**



Here's the graph showing how the **comfort score** varies with temperature:

- ✓ The **green shaded area (22–26°C)** gives a perfect score of **10**.
- ☒ Outside that range, the score **drops logarithmically** based on how far the temperature is from the ideal zone.
- ✗ Once the temperature is **more than 5°C away**, the score hits **0**.

Let me know if you'd like to adjust the curve shape (e.g., make it steeper, flatter, or try a different function like sigmoid).

**You said:**

why am i normalising between 0 and 1

**ChatGPT said:**

You're normalizing between 0 and 1 in this line:

javascript

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```
const decay = Math.log(distance + 1) / Math.log(maxDeviation + 1);
```

to **scale the result of the logarithmic function** into a predictable range — so you can easily transform it into a score from 10 (perfect) to 0 (bad).

🔍 Why Normalize?

## 1. Logarithmic values aren't naturally bounded

- The `Math.log()` function grows slowly, but it **has no upper limit**.
  - For example:
    - $\log(1) = 0$
    - $\log(2) \approx 0.69$
    - $\log(5) \approx 1.61$
    - $\log(10) \approx 2.30$
    - $\log(100) \approx 4.61$
  - So without normalization, a small distance gives small decay, but a large distance makes decay unbounded — which breaks your score.
- 

## 2. Normalization maps known bounds

You define a **maximum deviation** ( $5^{\circ}\text{C}$ ). That means:

- When distance = 0 → score = 10
- When distance = 5 → score = 0

So you normalize like this:

javascript

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```
normalized = log(distance + 1) / log(maxDeviation + 1)
```

That ensures:

- $\log(1) / \log(6) = 0$
- $\log(6) / \log(6) = 1$

Now your decay value is **always between 0 and 1** — perfect for turning into a score:

javascript

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```
score = 10 * (1 - decay);
```

---

## Final Goal

This structure lets you define a **smooth, predictable drop-off** from 10 to 0 based on distance from the ideal temperature, using a logarithmic curve.

If you didn't normalize, your score function could drop too fast or inconsistently because log values wouldn't fit in a clean range.

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Let me know if you'd like to compare this with other options like linear or sigmoid decay!

**You said:**

what does normalising between 0 and 1 mean

**ChatGPT said:**

Great question!

 **Normalization between 0 and 1 means:**

You take a value that can vary in a wider or unpredictable range, and you **scale it so it always falls between 0 and 1**.

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 **General Formula:**

If a value  $x$  can range from min to max, you normalize it with:

text

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$$\text{normalized} = (x - \text{min}) / (\text{max} - \text{min})$$

After normalization:

- The **minimum value** becomes 0
  - The **maximum value** becomes 1
  - Everything in between is **scaled proportionally** between 0 and 1
- 

 **Why is this useful?**

**1. Creates a predictable range**

If your function outputs values from -5 to 100, you might not know how to map that to something like a 0–10 score or a percentage. But if you normalize it, you always get a value between 0 and 1.

**2. Makes it easy to convert to other ranges**

Once you have a normalized value between 0 and 1, you can easily rescale it:

- Multiply by 100 → percentage
- Multiply by 10 → score out of 10

- Multiply and invert → reverse the effect (as you did with 1 - decay)

### 3. Good for comparisons

If you normalize two different types of measurements (like temperature and humidity), you can compare or combine them, because they now live in the same range.

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#### In Your Case:

In your temperature comfort example:

javascript

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```
const decay = Math.log(distance + 1) / Math.log(maxDeviation + 1);
```

- `Math.log(distance + 1)` can go from 0 to `log(6)` (if `maxDeviation = 5`)
- By dividing it by `log(6)`, you **normalize** it so the result always fits between 0 (perfect) and 1 (worst tolerated deviation)

Then you can do:

javascript

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```
score = 10 * (1 - decay);
```

to get a clean, intuitive **comfort score from 10 to 0**.

## APPENDIX 2 Iterations

### Iteration 1/Mockups

Room 1  
John Smith

**Staff**

Doctor	Sabrina Peters
Charge Nurse	Noah Johns

**Patient Information**

DOB:	20/04/2025
Sex:	Male
Admission Date:	27/04/2025
Parent Contact:	+61 412 345 678

**Current Status**

Light	Sound	CO2 Levels	Humidity	Temperature

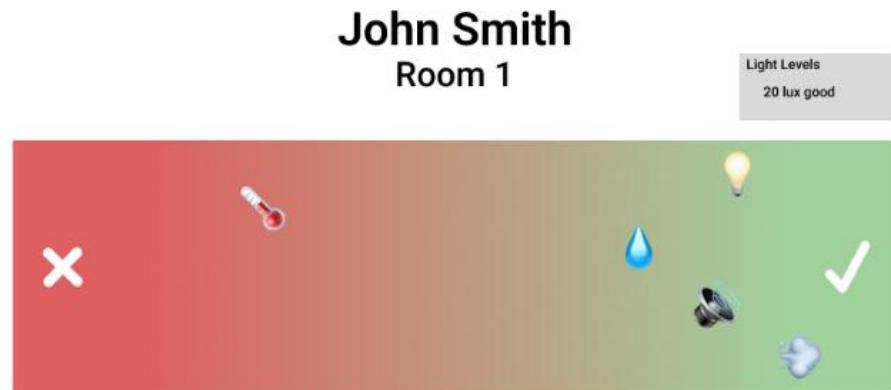
**Measurements:**

**Light**  
Lights are too bright- dim wherever possible

**CO2 Levels**  
**Good**  
**406 ppm**

**Humidity**

**Temperature**  
**24°C**  
Low: 22°C  
High: 26°C



## Iteration 2

### Product page



The product page for the IEQ Dashboard for Healthcare Facilities features a dark blue header with the title "IEQ Dashboard for Healthcare Facilities" in white. Below the title is a sub-headline: "Manage and improve patient wellbeing and health using SAMBA technology." A prominent call-to-action button labeled "See the Dashboard →" is centered below the headline. To the right of the text, there is a stylized illustration of four healthcare professionals (two men and two women) in purple and blue uniforms standing together.

**Boost Patient Recovery and Wellbeing.**

A good Indoor Environmental Quality (IEQ) aids patient recovery, reduces stress levels, and promotes better overall care. Our technology streamlines the IEQ management process for healthcare professionals.

**1** See **real-time IEQ monitoring** of every room in **one place**

**2** Use our dashboard to **quickly identify** what's declining the overall IEQ

**3** Adjust the room to improve IEQ and see **happier patients**

**What is SAMBA?**

A revolutionary Indoor Environmental Quality (IEQ) monitoring system which provides accurate, real-time measurements of IEQ indicators. This device allows us to dynamically measure, monitor, and report, allowing healthcare workers to respond to efficiently to deviations.



**What are we measuring?**

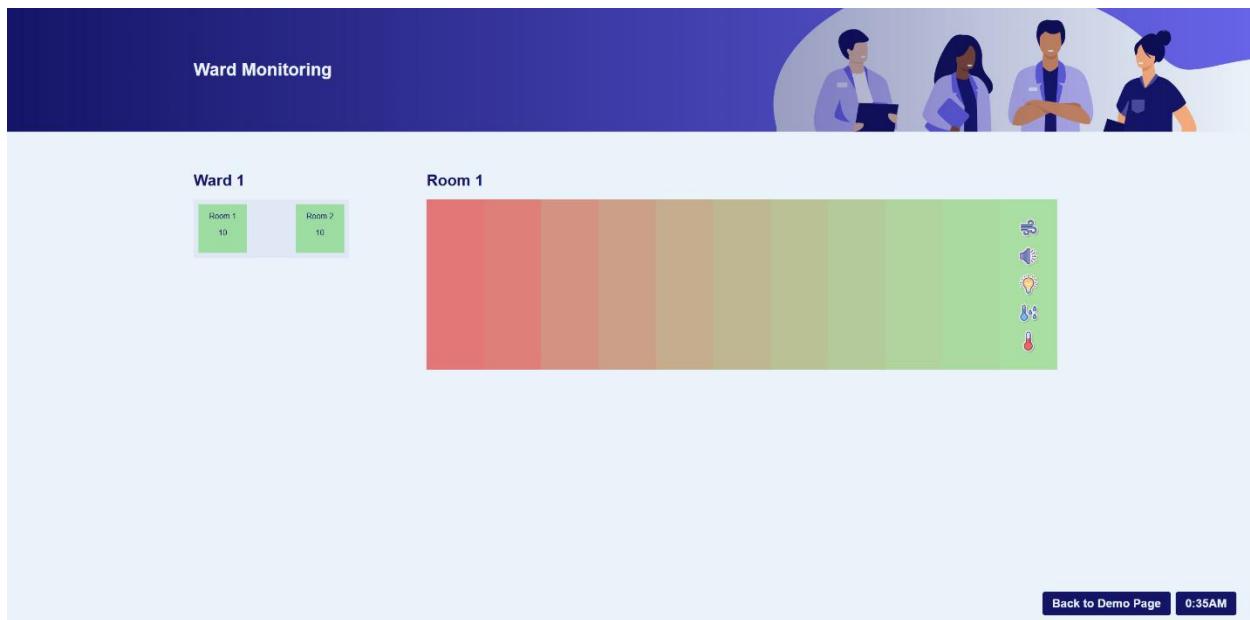
 <b>Temperature</b> Helping staff members to regulate the patient's room temperature- leading to happier patients, and a better work environment for staff.	 <b>Humidity</b> Helping staff members to know the humidity of the patient's room so they can better manage the patients health, safety, and wellbeing.	 <b>Light</b> Which helps staff to know about any light disturbances, particularly at night, so they help to manage the sleeping schedule of their patient.	 <b>Sound</b> Which alerts staff to any sound issues, helping them to reduce the amount of sound to manage the sleep and wellbeing of their patients.	 <b>CO2</b> Helping staff members to maintain adequate ventilation of the patients room, supporting their wellbeing and healing process.
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**Try it out now!**

[Go →](#)

# DECO3100 A2 DOCUMENTATION

## Demo



## Iteration 3

### Product page

The screenshot displays the SAMBA product page with the following sections:

- Header:** "Control patient room environments" and "Manage the Indoor Environmental Quality (IEQ) of your patient's rooms using SAMBA's world-first monitoring technology." A "See the Dashboard →" button is present.
- Image:** An illustration of four healthcare professionals (two men and two women) in scrubs standing together.
- Device Image:** Two SAMBA devices, one large and one small, sitting on a surface.
- Section: SAMBA: The Sentient Ambient Monitoring of Buildings in Australia**

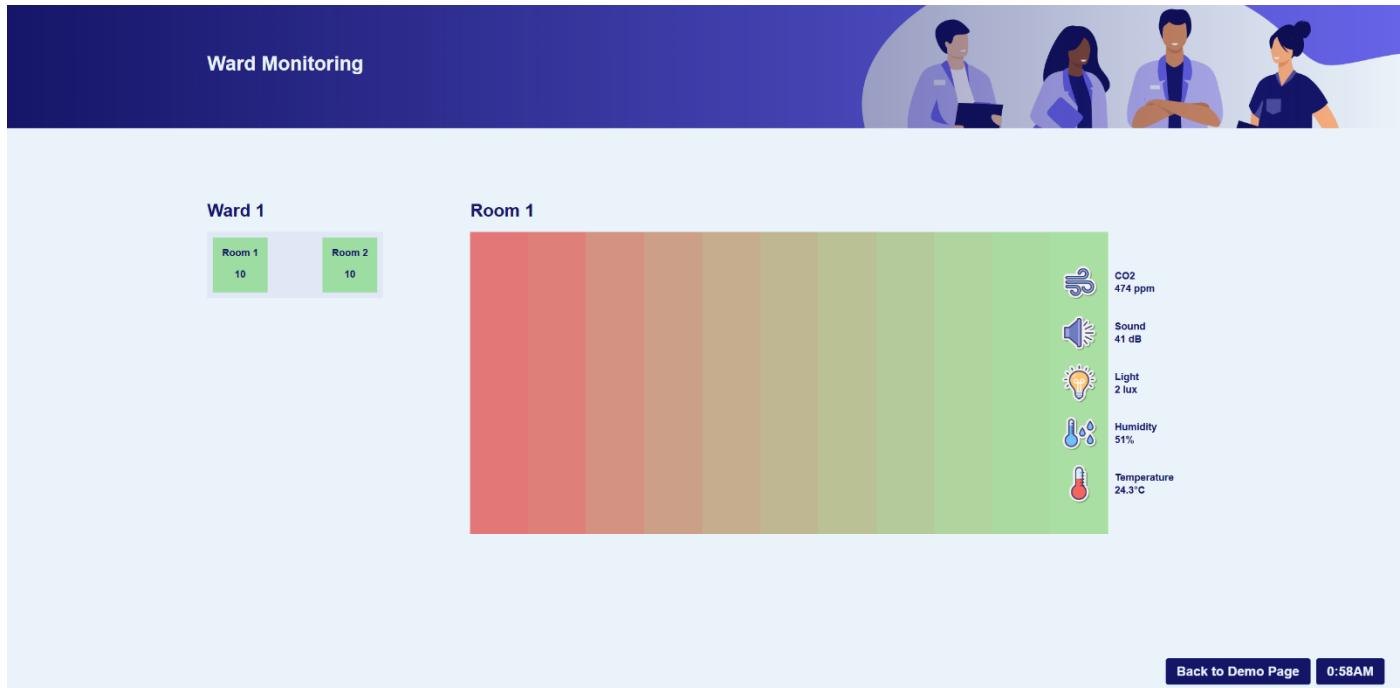
A World-First, Real-Time, and Low-Cost device that measures Indoor Environmental Quality (IEQ). SAMBA can dynamically measure, monitor, and report IEQ parameters: allowing you to respond efficiently to any room environment issues. Perfect for the fast-paced, patient-first environments of healthcare facilities.
- Section: What do we measure?**

Temperature	Humidity	Light	Sound	CO2
Helping staff members to regulate the patient's room temperature, leading to happier patients, and a better work environment for staff	Helping staff members to know the humidity of the patient's room so they can better manage the patient's health, safety and wellbeing	Which helps staff to know about any light disturbances, particularly at night, so they help to manage the sleeping schedules of their patient	Which alerts staff to any sound issues, helping them to reduce the amount of sound to manage the sleep and wellbeing of their patients	Helping staff members to maintain adequate ventilation of the patient's room, supporting their wellbeing and healing process
- Section: The SAMBA in healthcare facilities**

A good IEQ aids patient recovery, reduces stress levels, and promotes better overall care. Our technology streamlines the IEQ management process for healthcare professionals .

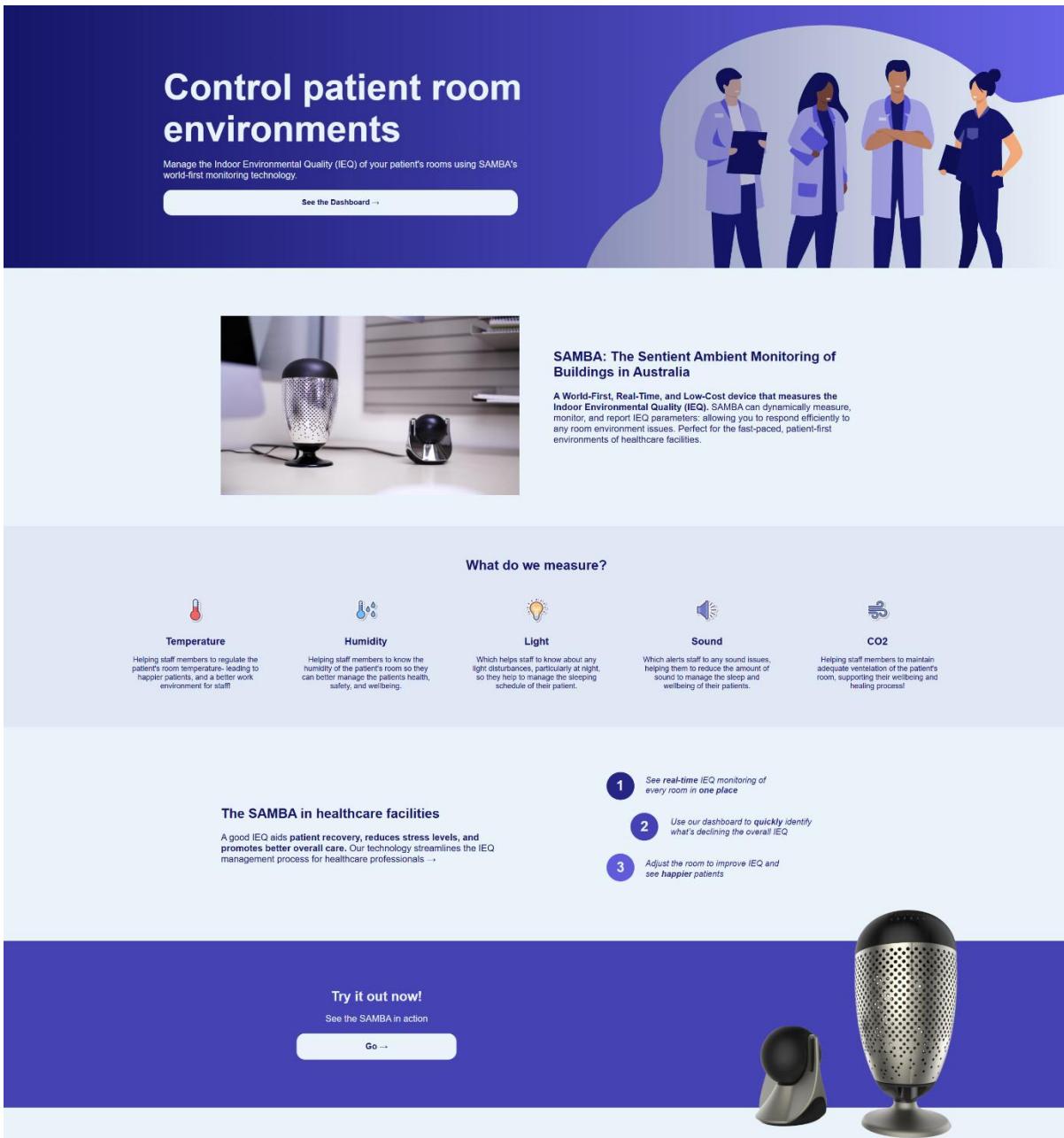
  - 1 See real-time IEQ monitoring of every room in one place
  - 2 Use our dashboard to quickly identify what's declining the overall IEQ
  - 3 Adjust the room to improve IEQ and see happier patients
- Call-to-action:** "Try it out now!" and "See the SAMBA in action" with a "Go →" button. Two SAMBA devices are shown side-by-side.

## Demo



## Final Iteration

### Product page



The screenshot displays the final iteration of the SAMBA product page. The header features the title "Control patient room environments" and a subtext: "Manage the Indoor Environmental Quality (IEQ) of your patient's rooms using SAMBA's world-first monitoring technology." Below this is a call-to-action button labeled "See the Dashboard →". To the right, there is an illustration of four healthcare professionals (two men and two women) in scrubs. The main content area shows two SAMBA devices on a desk. To the right, a section titled "SAMBA: The Sentient Ambient Monitoring of Buildings in Australia" provides a brief description of the device's capabilities. Below this, a section titled "What do we measure?" lists five parameters: Temperature, Humidity, Light, Sound, and CO2, each accompanied by an icon and a brief description. Further down, a section titled "The SAMBA in healthcare facilities" highlights the device's benefits for patient recovery and stress reduction. At the bottom, a call-to-action button says "Try it out now!" followed by "See the SAMBA in action →".

**Control patient room environments**

Manage the Indoor Environmental Quality (IEQ) of your patient's rooms using SAMBA's world-first monitoring technology.

See the Dashboard →



**SAMBA: The Sentient Ambient Monitoring of Buildings in Australia**

A World-First, Real-Time, and Low-Cost device that measures the Indoor Environmental Quality (IEQ). SAMBA can dynamically measure, monitor, and report IEQ parameters: allowing you to respond efficiently to any room environment issues. Perfect for the fast-paced, patient-first environments of healthcare facilities.

**What do we measure?**

 <b>Temperature</b> Helping staff members to regulate the patient's room temperature-leading to happier patients, and a better work environment for staff!	 <b>Humidity</b> Helping staff members to know the humidity of the patient's room so they can better manage the patient's health, safety, and wellbeing.	 <b>Light</b> Which helps staff to know about any light disturbances, particularly at night, so they help to manage the sleeping schedule of their patient.	 <b>Sound</b> Which alerts staff to any sound issues, helping them to reduce the amount of sound to manage the sleep and wellbeing of their patients.	 <b>CO2</b> Helping staff members to maintain adequate ventilation of the patient's room, supporting their wellbeing and healing process!
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**The SAMBA in healthcare facilities**

A good IEQ aids patient recovery, reduces stress levels, and promotes better overall care. Our technology streamlines the IEQ management process for healthcare professionals →

1 See real-time IEQ monitoring of every room in one place

2 Use our dashboard to quickly identify what's declining the overall IEQ

3 Adjust the room to improve IEQ and see happier patients

**Try it out now!**

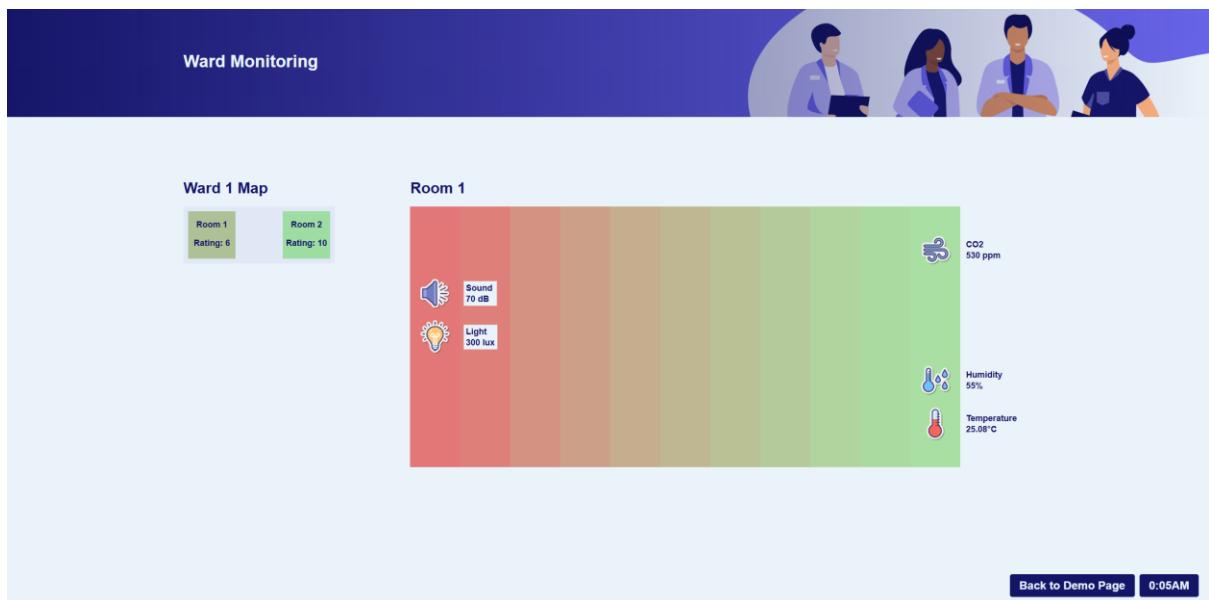
See the SAMBA in action →

Go →



# DECO3100 A2 DOCUMENTATION

## Demo



## APPENDIX 3 User Testing

### 3.1 Testing Methodology

Approach	Tasks																																	
Think aloud	<ol style="list-style-type: none"> <li>1. After scrolling through the product page, tell me what variables this product measures.</li> <li>2. Go to the dashboard and identify the room 2 rating</li> <li>3. Find the current sound DB for room 1</li> </ol>																																	
Interview	<ol style="list-style-type: none"> <li>1. What did you find easy to use?</li> <li>2. Did you have any points where you were confused?</li> <li>3. What do you think can be improved?</li> </ol>																																	
SUS	<p>I used this template during my usability testing. In the appendix below, the scores are stored in a row, starting from question 1 on the far left, to question 10 on the far right.</p> <p><b>System Usability Scale (SUS) Template</b></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; width: 30%;">SUS Questionnaire</th> <th style="text-align: center; width: 10%;">Strongly Disagree</th> <th style="text-align: center;">Strongly Agree</th> </tr> </thead> <tbody> <tr> <td>1. I think that I would like to use this system frequently.</td> <td style="text-align: center;"><input type="button" value="1"/> <input type="button" value="2"/> <input type="button" value="3"/> <input type="button" value="4"/> <input type="button" value="5"/></td> <td></td> </tr> <tr> <td>2. 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### 3.2 User 1

Transcript:

So I'm going to tell you something to do, and then you have to tell me, like your thought processes on how you're getting there.

Yep I understand.

So tell me what variables this product measures, and this is the page.

Like, what do you mean? Oh, temperature, humidity, light, sound and CO<sub>2</sub>,

Ok great. The second task is to go to the dashboard and identify the room two, rating.

9.1

Wow, great. Okay, the last task is find the current sound decibel for room 1.

70 decibels.

Okay, thanks. What did you find easy to use?

The button, because that's all I used. Basically.

Did you know what product I made?

Is it like to see in a hospital room? You like see the levels to see if it's good for the patient.

Yeah. Do you have any points where you're confused?

I think the title, and like the first, like, if I saw this just this, without scrolling, I would be a little bit confused as to what it does, and it doesn't explain what the dashboard is. But I like the layout. It looks professional.

SUS Result

0.5	1	4	1	4	0.5	4.5	1	4.5	0.5
-----	---	---	---	---	-----	-----	---	-----	-----

80 Total score

### 3.3 User 2

Transcript:

So I'm going to show you my page, give you a task, and you have to tell me your thought process into what's going on in your head as you're going through the page. It's like, just say whatever comes to mind. Okay, so your first task is after scrolling through the products page, tell me what variables this product measures?

Umm. The variables it measures. Indoor environmental quality?

What specific variables does it measure? So you can scroll through the whole page.

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Temperature, Humidity, light, sound and carbon dioxide.

Okay, the next task is go to the dashboard and identify the room two rating.

9.1

Great! Task three is to find the current sound decibels for room 1.

70, decibels, that's not very good, it's meant to be less than 45

Yeah, I know haha. What did you find easy to use?

I think the whole interface is good and easy to use, like going to the dashboard.

What was the question? What did I find good or easy?

Easy to use? Slash, good.

I think navigating the website as a whole is pretty good. I like the icons just because they're fun, and I like the colors.

Do you think if you're a healthcare worker and you saw those icons, you'd be like, this is a little bit childish.

I mean, maybe because it's like a healthcare setting, but at the same time, I like me personally. I look at that, and be like, well, this is fun. Do you know what I mean, just because it's like me, you know? Like, if I saw that, I'd be like, huge. But then again, I do want to go to pediatrics, so. Am I really the best judge?

Haha ok, did you have any points where you were confused?

Not really? I mean, maybe you could elaborate on what Samba is, because, like the capitals makes me think it stands for something.

Okay. Do you know what this product is actually doing?

Is it like monitoring, like all this stuff in their rooms?

Do you think it needs to be clearer as to what it's actually doing?

Yeah, probably because you say using Samba technology that comes with the intention that they'd already know what it is like. Is that like a common thing in healthcare, or is it like the Yeah, so maybe being more clear on that. Yeah. Like, probably elaborating on, that might help, okay, just because, like, SAMBA is, like, right there, and then you, like, look down, and nothing's on it, because, like, ieq is up there as well, right? So I was looking for it, and I found that there, yeah, and then I was like, oh, where's Samba, and I couldn't find it.

Okay. Thanks.

SUS Result

4	1	5	1	4.5	1	5	1	5	1
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95 Total score

### 3.4 User 3

#### Transcript

I'll give you a task, and then you have to tell me your thought process into how you're approaching it. just say what you're doing as you're doing it. So the first task is, after scrolling through the product page, tell me what variables this product measures.

I believe that in measuring, indoor environmental quality.

Yeah. What specific variables does it measure?

I'd say... let me read the whole thing. Otherwise, imjust giving you partial information.

If you give partial information, it's still helpful as well. If you don't get the right ones. So there's no right or wrong here.

I would say that it's about the measurements IEQ indicators??

The next task is go to the dashboard and identify the room two rating.

Dashboard, 9.1

That is correct if you wanted to know and find the current sound decibel for room one.

Oh um, currently a 70.

Yeah, sweet. Okay, so what did you find easy to use?

I guess this is very intuitive. Yeah, it's very simple and easy. Whatever you put the mouse on top of it just keeps moving so its pretty easy.

Did you have any points where you were confused?

No, It's pretty chill, I'm not gonna lie. Even though my brain is barely functioning just it's still easy enough for me to understand so it's fine.

Do you know what this product is supposed to be doing?

Improving patient wellbeign and stuff?

And do you like have anything else you want to say, any comments.

Okay, there's not much, unless you want to change this part, but I don't think you're really mean to.

Yes. Okay, thanks.

#### SUS Result

4	1	5	1	4	1	4	1	4	2
---	---	---	---	---	---	---	---	---	---

87.5 Total score

### 3.5 User 4

#### Transcript

Okay, so the first task is to after scrolling through the full product page tell me what variables this product measures.

Ok I am scrolling IEQ dashboard for healthcare facilities. Boosts patient wellbeing okay, aids patients stress and promotes overall care. Identifies what's declining. What the heck is IEQ okay? I just, I have no clue what ieq is, but this one, oh, this? IEQ patient recovery, stress levels and provides better overall care. Ohhhh, indoor environmental quality. This makes more sense. What is SAMBA but revelation in the indoor environmental monitoring system, which provides accurate real time measurements of ieq indicators, dynamic and report allowed healthcare workers to respond to FA efficient to deviations, okay. Oh, so it's pretty much just like a sensor that sits in your room that measures a bunch of stuff. Okay, what are we measuring? Temperature? Okay, humidity, okay. Light, okay, sound, CO two, I like this, like the logos. The logos make me feel nice. Okay, okay, yeah,

okay. The second task is go to the dashboard and identify the room two. rating.

Dashboard, see dashboard. Room two. 9.1 okay. Oh, its 10 now.

Find the current sound, decibel for room one.

Sound, 70 dB.

okay. What did you find easy to use? Did you find any issues when you're looking at it?

No. It just looks a bit weird.

How so?

I prefer, like I get, I get the gradient. The gradient looks good, but it'll be cool to see, like a graph over time? I think it is quite easy to use, like you can tell which sound levels are really bad and what sound levels light levels are really bad, and all that kind of stuff. But it's also you kind of have to hover over things in order to see the values, which sometimes can be okay, but like, sometimes people just want to look at something and then just see what the value is. So that might be better to have, like a graph, okay, but, I mean, the interface is really responsive. It's really quick to use and things like that, yeah, it looks good.

Okay. Did you have any points where you were confused when using it? Do you understand what the product is for?

Yeah, I understand what the products are it's for, like, it's for making sure that patients are okay in their room, like, I'm assuming probably for like, older patients or something like that, to monitor them, make sure that they're okay, make sure that everything in their environment is, like, happy and all that kind of stuff. And like, if they get injured, you know, you can just come and react. So I'm assuming this is probably for like, hospitals and something like that, because you have healthcare

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facilities. So, yeah, I understand that's what. Whenever IEQ is, at the front, front, at the top, it was a bit confusing, because you only mentioned indoor environment quality at the like, one of the points down at the bottom. So I think it'll be if this is not like a I don't know, I don't work in the healthcare field, but if this ieq is not really well known, it might be good to put like, indoor environmental quality brackets ieq at the like in the front heading. But, yeah, I mean if it is well known, then. Okay. But yeah, other, that looks good. I like the product. It looks good. You explain everything really nicely.

Okay. Thanks.

### SUS Result

1	1	4	1	5	1	5	1	5	1
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87.5 Total score

### 3.6 User 5

#### Transcript

Okay, so the first task is after scrolling through the product page, tell me what variables this product measures.

Okay, so I'm on the product page. So I scroll down. Okay, temperature, humidity, light, sound and CO2.

Okay, great.

The second task is go to the dashboard and identify the room. Two, rating, okay, I'm gonna go to the dashboard and then, oh, it's going quite fast. It's currently at 10 slash 9.1 looks like.

Okay, great. And the third task is to find the current sound decibel for room one.

Okay, so room one, it's currently at 42 slash 41 decibels.

Great, perfect. Okay, so what did you find easy to use?

I thought it was pretty easy to understand. I um, I like the use of color and, I mean, yeah, the buttons were easy to use. Like, everything was quite responsive, and it was, like, easy for me to understand what was going on.

Did you have any points where you are confused? I don't really have any points where I was confused. It will probably just probably took me a little bit of time to read through the content, but that's yeah, I'm just a slow reader.

And did you understand the narrative? Y

Yeah, I understood. It's like a monitoring system for patient room so like in hospitals or, like, stuff like that.

Yeah, great, thank you.

## SUS Result

4.5	1	4	1	5	1	4	1	5	1
-----	---	---	---	---	---	---	---	---	---

92.5 Total score

### 3.7 User 6

#### Transcript

So the first task is, after scrolling through the product page, which is this page? Tell me what variables this product measures.

What this product measures? I clicked the dashboard

So what variables does this product measure?

CO3 levels, sound levels, light levels, humidity, temperature. in two rooms, yeah.

So the second task is go to the dashboard and identify the room two rating.

Room two rating. This humidity is going crazy.

Yeah, the interval is too fast, sorry.

Room two, rating, so fast. What's the rating? What rating? CO2 rating?

oh, just like the overall rating for room two.

This is the room two. 6. Its going too fast.

I'll change the interval time. ok. then find the current sound decibel for room 1.

41 point. 41 dB, yeah, 41 dB, okay,

yeah, okay. What did you find easy to use?

I can see the things here. Let's see all the level stuff. And I knew that intuitively, that's room one, room two. I mean, I didn't know that was a rating. You should maybe call it rating. Rating, yeah, you know, instead of Ward one, Ward one rating or something, room rating. But, you know, I, I didn't know what these things are. This color thing is, I don't know what it is. I don't know what these these colours are. I don't know what this means, um, should it be like a CO two level, should there be a bar there like that?

If you look at the colors, what do you think it means? If, for example, if the sound levels if the humidity is in the orange area. What do you think that means?

That means it's kind of like, oh, so it does go to that, all right? For me, that means it's the yellow, the green means good. The red means like, it's too high, yeah. So the temperature is that it means it's good. If it's there, that means it's like, really too high CO2level. So I guess this, this would shift, is it?

Yeah.

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But this means it's like, you know, it's good range, yeah, yeah, okay.

And what do you think can be improved? You can also look at the product demo page as well this one as well as that dashboard.

Also, it's the SAMBA is that thing? Is it? Yeah, all right.

And this is, it's like use case.

Oh, okay, So that product just determines levels, and that's like, that's like, the times, yeah, okay. So, I mean, in this, it does what it says. It records those key levels in the time, and if you want to see it at the current time, this is the visually, the visual aspect of it. But I just wonder, where you can put instead of you can see all the rooms one page be better. I cannot room one Oh, I suppose you can't, because you got all these things, yeah, yeah, but it's okay. But, I mean, it'd be, I mean, there should be another thing, if you can see all the rooms, you know what i mean?

like the idea of this side is that it was supposed to be a map of the ward.

okay, okay, okay, okay, I didn't know what it was. So it's a if it's a map of the ward, and then you just quickly, yeah, yeah, I can understand. Yeah, that's good.

### SUS Result

2	1	4	1	4	1	4.5	1	5	0.5
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82.5 Total score

### 3.8 User 7

#### Transcript

oh, yes, that's very important. Okay, wait, I'm gonna give you, like, a few tasks. Okay, so after scrolling through the product page, tell me what variables this product measures.

light. It's like, air quality, CO two, humidity, temperature.

This product, this specific one, looking at this page.

it's here, temperature, humidity, light, sounds. I didn't do sound, but yeah, that.

go to the dashboard and identify the room two, rating 10,

and find the current sound. Decibel for room one. Sound, 70.

Yeah, okay, what did you find easy to use?

click and see, okay, visualized.

Did you have any points that you were confused?

No, it's pretty, pretty like, easy to understand.

Okay, do you understand what their product is doing? Like, this specific application?

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Yes, it's monitoring a hospital room. Because you're, if you're a nurse, you gotta monitor, like, or not even the nurses. What may not be doing this, but other people, building management may be monitoring this, and you can actually see what's happening in a whole set of rooms. They have so many rooms in the hospital, you gotta manage it. And the good thing about this is you can see whether something is good or something is red, and there may be a reason you need to investigate.

do you think anything can be improved upon?

You need more than, what, two rooms. So you need, like, like, 100 and, you know, like a thing that tells you, so something where you've got 100 rooms, something that's going to tell you you actually need to go and have a look at this room, because there's a problem. There's a consistent problem, an AI thing that sort of tells the user, if I've got 1000 rooms, what do I need to monitor? Because sometimes the thing will, the sound might go off the charts, because this is the loud ass, you know, talking in the room. So it's something that actually tells the user, actually, this is this room is consistently bad for air quality, sound, whatever it is, so you can go and investigate.

Okay, so something that, like, shows you if something's consistently bad.

yeah, something that I actually do need to invest it's something and you can use an AI to help you work out where you actually should focus your time in energy to solve that problem. Because otherwise, it felt like 1000 rooms, how do I,

Ok, thanks.

### SUS Result

4	1	5	1	5	1	4	1	5	1
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95 Total score

### 3.9 User 8

#### Transcript

Your first task is to tell me what variables this product measures?

temperature, humidity, light, sound, CO2.

The second task is to go to the dashboard and identify the room two rating.

It's 10. Oh. It's fluctuating between 10 and 9.1

and your third task is to find the current sound decibel for room 1

41 Decibels.

So what did you find easy to use.

There's not many buttons, and the map would be useful if there was more rooms to easily see a heads up display of all of the variables.

Do you have any points where you're confused.

## DECO3100 A2 DOCUMENTATION

No, it was pretty straightforward.

Do you know what this product is actually doing,

Measuring conditions in health care settings, in wards?

Do you think there's anything that can be improved?

Not really.

Okay, thanks.

### SUS Result

3	1	5	0	4.5	1	4.5	1	5	0
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92.5 Total score