Ampify

Phase 1 Report – User and Task Analysis

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1. Project idea description

Ampify is an innovative project designed to help users monitor, manage, and optimize their energy consumption and generation in their residence. In today's world, where energy efficiency and sustainability are becoming increasingly critical, Ampify provides users with the tools they need to better understand their household energy usage and make informed decisions to reduce both costs and environmental impact.

The app allows users to track energy consumption and energy generation all around the place, while leveraging AI and generative tools to make the process easier, smarter, dynamic and more interactive.

Ampify stands out by combining ease of use with powerful, customizable features. The goal is to empower users with actionable data, making energy management both simple and effective.

2. Related apps/services/systems

To better understand the current landscape of energy management tools, we analyzed several existing apps and services that help users monitor their energy consumption and generation. Below are some examples of leading apps and systems that serve as references for the development of *Ampify*.

- **Google Nest Energy Dashboard:** The Google Nest Energy Dashboard is part of the Google Nest smart home ecosystem, allowing users to monitor and control energy consumption through their Nest thermostats and other smart devices. It provides insights into energy usage and personalized suggestions to reduce consumption, making it easier for homeowners to manage their heating and cooling efficiently.
- **Sense Energy Monitor:** Sense is a home energy monitoring system that connects to the electrical panel to provide real-time data on energy usage. It detects and identifies specific devices consuming power within the home. With its detailed reporting, users can better understand their energy usage patterns, identify inefficiencies, and reduce costs.

- **Tesla Powerwall:** Tesla Powerwall is a battery system that stores solar energy and allows users to monitor both their energy generation and consumption. Through the Tesla app, users can track how much energy they are producing, how much they are consuming, and whether they are drawing energy from the grid or their Powerwall, offering a complete overview of their energy footprint.

- **EcoBee Smart Thermostat:** The EcoBee Smart Thermostat helps users optimize their home's energy efficiency by automatically adjusting heating and cooling settings based on occupancy and weather forecasts. It provides energy reports and suggestions, making it easy for users to manage their energy use while maintaining comfort.

- **Efergy Engage Hub:** The Efergy Engage Hub is a real-time energy monitoring system that helps households track their energy consumption. It displays current energy usage and historical data, allowing users to set energy-saving goals. The system provides insight into how much energy is being used and by which appliances, helping users identify opportunities to save.

3. Questionnaire highlights

3.1. Demographics

Our questionnaire was shared through social media messaging, where we managed to obtain 173 anonymous responses. The results are as follows.

First, when it comes to demographics and some general information, the age of the responders was distributed as follows:

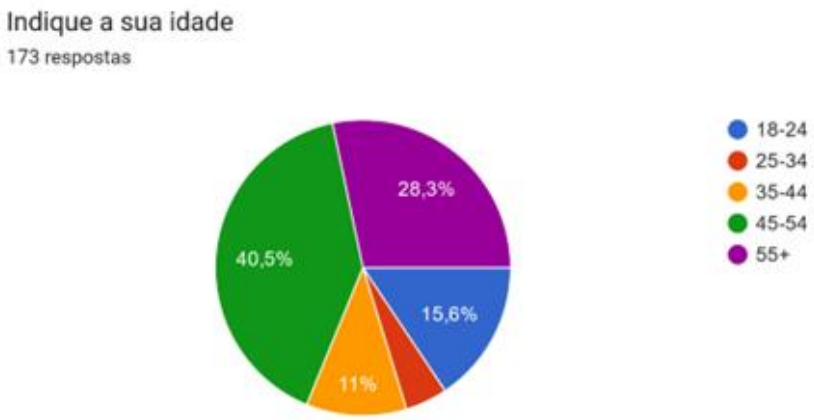

Figure 1: Graph containing age of participants

This graph shows us that this age was more skewed towards older people. Nevertheless, we managed to obtain a fairly distributed range of ages.

The gender distribution among participants was 68% male and 32% female, despite our best efforts to achieve a more balanced representation.

Here are some other representative graphs of our study:

Figure 2: Graph containing number of people in the household

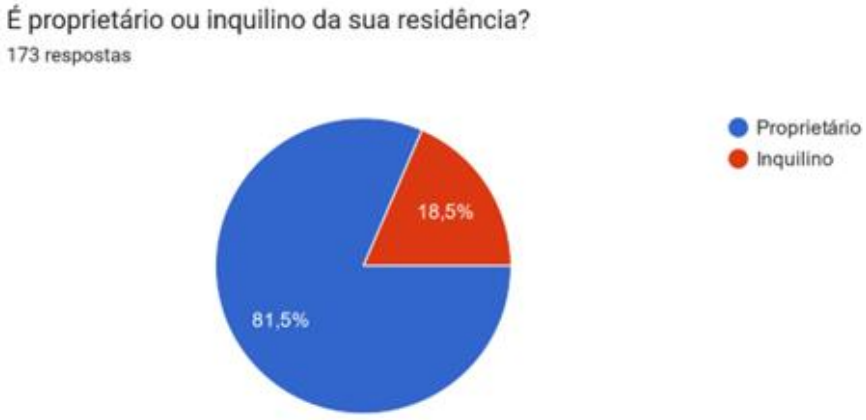

Figure 3: Graph containing percentage of landlords and tenants

3.2. Monitoring

Next off, we prompted users about their current energy monitoring habits. Here are some highlights:

- 50% of participants track their energy usage monthly, while 40% never monitor it. Among those who do, the primary motivations are paying bills, saving money, and comparing current consumption with previous patterns. Only 10% monitor their usage with environmental concerns in mind. Additionally, just 1% of respondents receive incentives for monitoring their energy consumption, highlighting a significant gap in such reward systems.
- In 62% of households, one individual is solely responsible for managing energy consumption, whereas 22% of respondents indicated that this responsibility is shared among multiple members.
- At least 82% of submissions don’t produce any type of energy at home.

- Respondents were asked to rank their efforts to reduce energy consumption on a scale of 1 to 5. The average score was 3.52, indicating a moderate level of effort across the group.

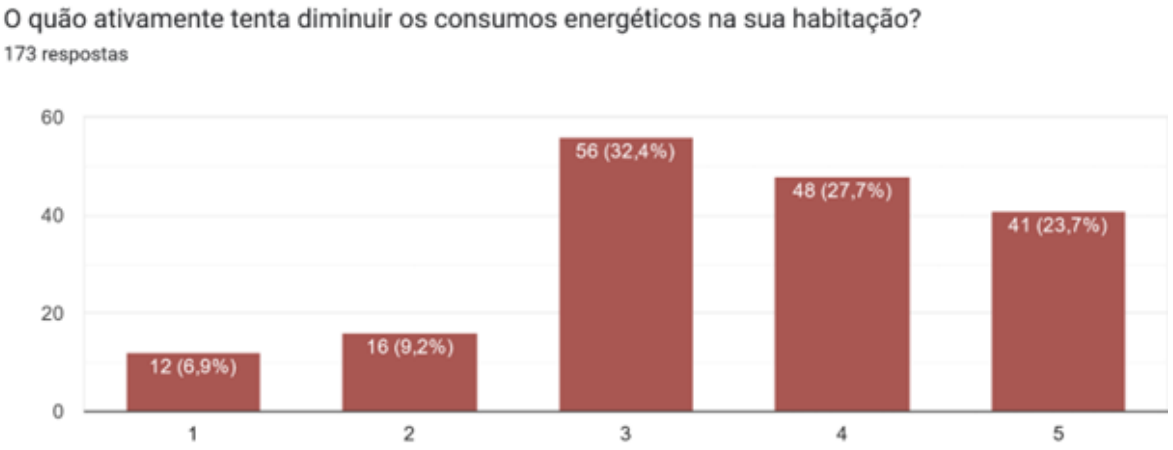

Figure 4: Distribution of efforts to reduce consumptions.

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- 12% don't possess a smart meter, while 13% are not so sure.
- 87% of respondents do not use any form of smart app to monitor their energy usage. Only 2% had used such apps in the past, citing reasons like lack of useful features, preference for other methods, increased complexity, confusing interfaces, poor integration with physical or digital devices, and cost as barriers to continued use.
- Despite this, 70% of people were keen on the idea of monitoring via an app, whereas 23% were not entirely sure.
- 90% of respondents identified their smartphone as the device they use most frequently in daily life. The following section outlines their proficiency levels with mobile applications:

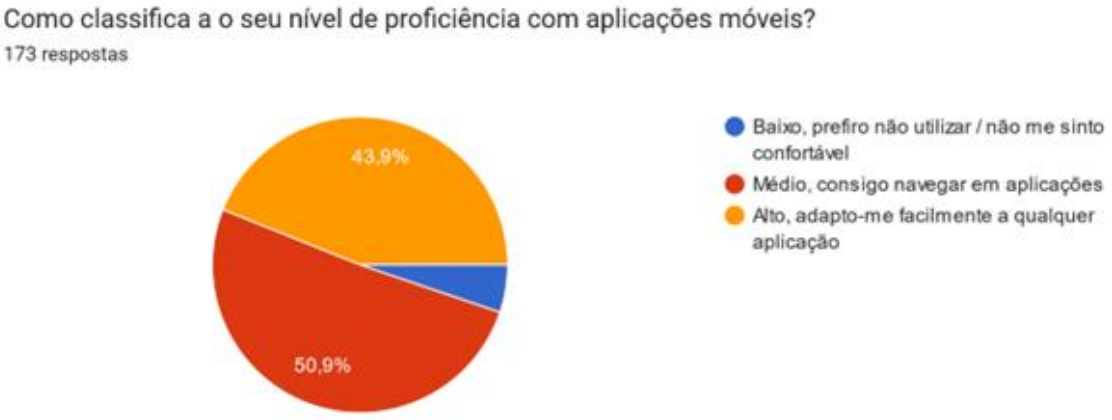

Figure 5: Graph showing levels of proficiency in mobile apps

3.3. Features

In this section, features were proposed to our responders, and an importancy score ranging from 1 to 5 was requested. Here are the features, and mean scores, respectively:

- Verifying the total consumption of energy – 3.44.
- Analize energy production – 2.86.
- Analize energy usage in real time – 3.31.
- Obtain specific data by appliance – 3.29.
- Check my environmental impact – 3.05.
- Visualize energy costs in real time – 3.41.
- Consult consumption past data (ex.: monthly) – 3.45.
- Obtain tips and recommendations about energy saving – 3.40.
- Obtain personalized tips and recommendations about energy saving considering user's profile and data – 3.30.
- Interaction with other users and sharing of information – 2.58.
- Be notified when a set consumption is exceeded – 3.30.
- Be notified about appliances that are consuming energy without being at use – 3.49.
- Be notified about unusual consumptions – 3.49.

Here is the full graph:

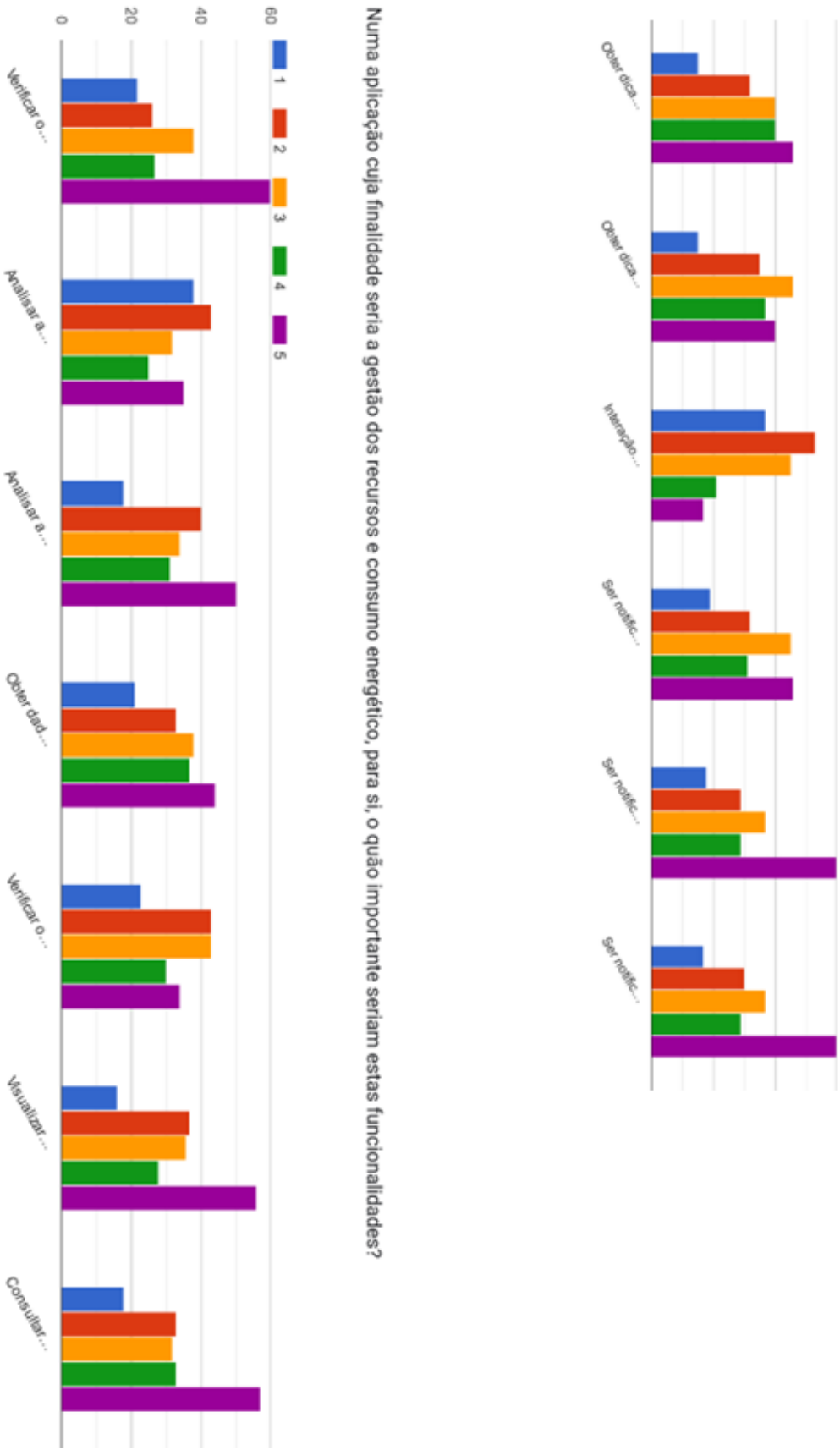

Figure 6: Importance scores given to our features

3.4. Usability preferences

Regarding users' preferences for receiving notifications from the app, the distribution is shown in Figure 7.

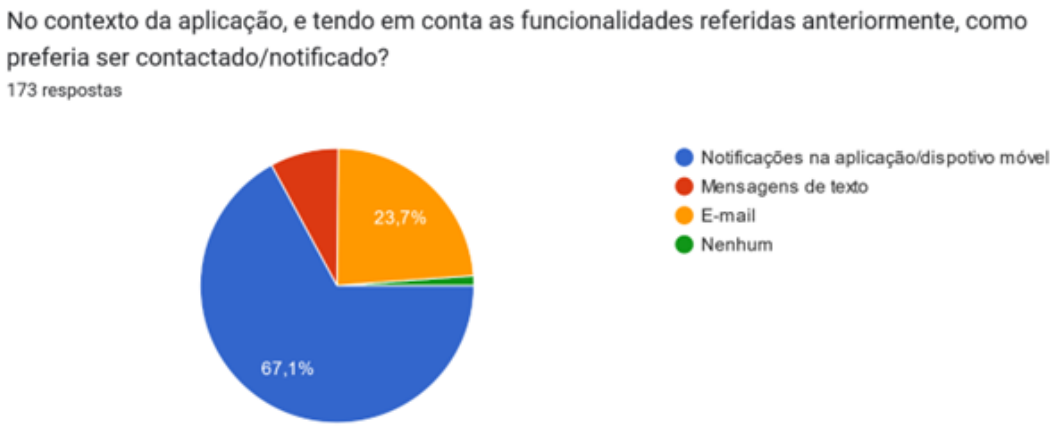

Figure 7: Graph of how users

Based on this, we believe that offering various customization options is essential. For example, users could opt to receive notifications solely through the app, or a combination of SMS, email, and app notifications, with more critical updates being sent via SMS.

We also inquired whether respondents would be willing to pay extra for a service or app similar to Ampify:

Figure 8: Graph of how open users are to the idea of paying for a energy management application

Finally, users had to make a choice between stability or innovation when it comes to the apps they use. The results revealed an interesting split in preferences – around 47% prefer innovation, frequent updates with new features, even if it requires them to relearn and readapt to aspects of the app; 35% chose stability, preferring fewer updates to maintain familiarity with the app.

3.5. Feedback

In the feedback section, respondents had the opportunity to provide open-ended responses to the following questions:

- If you were able to change anything about how you currently monitor your energy consumption, what would it be?
- Is there any feature you wish existed that is not currently available?

There was some overlap in the responses, but several interesting suggestions emerged, including:

- Be able to monitor consumption by day/night.
- An easy way to compare current consumption to the same period in the previous year.
- Receive suggestions about more efficient appliances.
- The capability to remotely switch off appliances or outlets.
- Get information about energy providers and alternatives.
- Easier ways to communicate with energy providers.

4. Pact analysis

The PACT Analysis is used to evaluate the People, Activities, Contexts, and Technologies involved in designing a user-centered application for energy consumption management. Here's the analysis breakdown:

4.1. People

This section focuses on the users of the energy monitoring application, as well as any stakeholders involved.

- **Age**: Adults, a broad range of age groups is targeted, from young adults (18) to senior citizens (55+).
- **Gender**: Should be gender-neutral and inclusive.
- **Tech Comfort**: 87% of users are not using any smart app to monitor energy. This suggests that the target user base may not be highly tech-savvy or might not see value in existing apps. This group might need an intuitive, low-barrier-to-entry experience.
- **Motivation**: Financial concerns (saving money and paying bills) are universal across all age groups. Environmental awareness is more common among younger users who also value energy efficiency.
- **Willingness to Engage**: 70% of users are open to using an app for energy monitoring in the future. This indicates a potential market for a well-designed, feature-rich app.
- **Proficiency with mobile apps:** Ranges from low to high; younger respondents report adapting easily to mobile applications, tend to be more tech-savvy and are willing to adopt smart solutions and integrate them into their daily routines. Older respondents tend to be less comfortable or prefer stability in app usage.

Key stakeholders include:

- **Households**: People responsible for paying energy bills and monitoring production/ consumption.
- **Utility Providers**: Indirectly, they could benefit from users managing energy better or might provide additional incentives.
- **Government or Environmental Agencies**: Could be interested in promoting energy-efficient practices.

4.2. Activities

This section describes the activities that the users want or need to perform using the energy management app:

- **Energy Consumption Tracking**: Users want a simple and effective way to track their energy consumption. The data needs to be easy to access and understand, and reports should be generated.
- **Consumption Comparisons**: Users compare consumption over time (monthly, yearly), indicating the need for historical data visualization.
- **Real-Time Monitoring**: Real-time energy usage is highly valued by the respondents, with interest in seeing both consumption and costs in real time.
- **Appliance-specific Monitoring**: Users want insights into individual appliances or sections to identify inefficient devices and optimize their energy usage.
- **Notifications and Alerts**: Alerts about unusual consumption, exceeded limits, or idle energy use are highly sought after. Customizable notifications via email, SMS, or in-app messages are needed.
- **Energy Saving Tips**: Respondents showed interest in personalized energy-saving recommendations, including tips on efficient appliances or behaviors, both general and specific to the users' needs.

4.3. Context

The app will predominantly be used in a household setting, no matter how many people are living there. Energy monitoring responsibility varies, with some households having a designated person for energy management, while others share the responsibility among residents. Energy monitoring could take place across different digital devices.

4.4. Technology

This section focuses on the technologies the users will interact with, and the technological requirements for the energy management solution.

- The app will work online only, as data synchronization is a critical function.
- User authentication, such as password or two-factor authentication (2FA), will be used to protect access.
- The GUI for this type of application would likely be touch-based on mobile devices, and potentially click-based on desktops. The interface is designed for intuitive use, allowing anyone to understand basic features without extensive training. This would include buttons, sliders (for control adjustments), and graphs/charts.
- Voice commands might be supported, especially when integrated with AI and generative tools.

- Alerts (such as when a certain consumption limit is exceeded) are triggered immediately, requiring a live connection to the internet for the fastest response times.

Technologies users have include:

- **Smart Meters**: Many respondents already possess smart meters or smart appliances that provide real-time data, connecting via, for example, Wi-Fi or Zigbee protocols.

Technologies users need:

- **Energy Monitoring Apps**: Given that 87% of users currently don't use apps to track their energy usage, there's a major opportunity for an intuitive, user-friendly application. Emphasis on easy setup, clear visualizations, and actionable insights can help overcome barriers to adoption.
- **Devices**: The app should be cross-platform to cater to a wide range of devices that users might have. It should also be accessible across smartphones, tablets, and possibly desktop systems for users managing from different contexts.
- **Data Analytics and Machine Learning**: The app will require robust data analytics to offer real-time insights, historical comparisons, and personalized energy-saving tips. ML algorithms can help detect unusual consumption patterns or provide tailored recommendations.
- **IoT Integration**: As users expressed interest in appliance-specific data, integrating IoT technology that monitors specific devices will be valuable. The ability to control appliances remotely could also be explored.

5. Personas

Persona 1: Gonçalo Santos

I'm a 28-year-old engineer from Porto, focused on optimizing my home's energy consumption using smart technology to save money and reduce my environmental impact.

- **Location:** Porto, Portugal
- **Job:** Engineer at a technology company
- **Motivations:** I'm passionate about reducing my home's energy consumption to save money and minimize environmental impact.
- **Goals:** My main goal is to cut energy costs while keeping my home comfortable. I also want to stay updated with the latest energy-efficient technologies.
- **Needs/Objectives:** I need real-time monitoring of my energy usage, personalized recommendations, and seamless integration with my smart home devices.
- **Frustrations:** It's frustrating when devices don't sync well, and energy apps are too complicated. I often struggle to optimize my usage during peak vs. off-peak hours.

Persona 2: Ana Ferreira

I'm a high school teacher from Coimbra, looking for simple ways to manage my energy consumption and lower my bills, without dealing with complex tech.

- **Location:** Coimbra, Portugal
- **Job:** High School Teacher
- **Motivations:** I'm driven by the need to reduce my household expenses. I want to manage my energy consumption better without spending too much time on complicated apps.
- **Goals:** My main goal is to lower my energy bills and make my home more energy efficient. I prefer simple and clear solutions.
- **Needs/Objectives:** I need a user-friendly app that provides clear reports on my energy usage and easy-to-implement tips to save energy.
- **Frustrations:** I'm overwhelmed by too much technical information and complex setups. I find it hard to know where to start with energy-saving methods.

6. Activities scenarios

Persona 1. Gonçalo Santos

The activity scenarios center on customers who want to have more control over how much energy their homes consume. Gonçalo Santos, a 28-year-old engineer who is committed to maximizing energy use at home, is the primary character in this scenario. Gonçalo is an example of a normal user of the app for energy monitoring. Gonçalo´s four-person household's energy expenses had been rising rapidly, so he decided to track and cut back on usage with an energy management software.

Gonçalo's usage of the software demonstrates several crucial steps:

- **Tracking use by device**: The app offers thorough information on the energy usage of every household item.
- **Action in response to alert**s: Gonçalo optimizes his air conditioner's settings after being alerted to abnormally high energy use.
- **Reducing consumption with recommendations**: Gonçalo adjusts additional equipment for energy efficiency and plans high-consumption gadgets to operate during off-peak hours by heeding the app's advice.
- **Real-time alerts**: Assuring prompt action to stop more waste, the software enables Gonçalo to set up real-time notifications that tell him if any gadget uses more energy than anticipated.

Gonçalo was able to identify the biggest energy-consuming gadgets and take proactive measures to minimize their usage using this activity scenario, which led to a considerable decrease in power costs and a lessened environmental effect.

Persona 2. Ana Ferreira

Ana Ferreira lives in Coimbra, Portugal, and works as a high school teacher. Her main goal is to lower family costs while controlling energy use without having to deal with intricate technical interfaces. Ana wants a simple and easy-to-use tool to assist her in making energy-saving decisions because she has a hectic schedule and dislikes complicated systems.

Ana has seen that her energy costs have been constantly high in her daily routine, which has led her to investigate easier ways to control her power usage. She began using the energy monitoring app after installing it in order to monitor her household's energy use in a non-intrusive and controlled manner.

Ana uses the app for a number of crucial purposes, including:

- **Accessing plain Reports**: Without overloading Ana with technical language, the app provides plain and succinct energy reports that show how much energy is utilized by different devices.
- **Putting Simple Advice into Practice**: Ana values the app's simple energy-saving advice. She may reduce energy usage without significantly altering her lifestyle by following tips like shutting off standby gadgets and adjusting the heater's temperature at night.
- **Setting Simple Alerts**: She seldom uses the alarm system and has it set up to simply inform her when certain appliances, like the washing machine, use more than they usually do. This provides her with information without overburdening her with alerts.
- **Gradually Lowering Energy Costs**: Ana has been able to lower her energy usage by following the app's simple instructions. She follows the app's recommendations without feeling overburdened, and she gets pleasure from watching her energy costs drop month after month.

Ana finds that the software empowers her through its simplicity. She doesn't have to comprehend intricate technological intricacies to take tiny, meaningful steps toward energy saving thanks to the app's user-friendly UI. Ana therefore accomplishes her objective of reducing family costs while yet feeling in control of her energy usage.

7. Functionalities and Tasks

The functionalities of the Energy Monitoring Application are designed to assist users in achieving their energy-saving goals through real-time feedback and personalized recommendations. The core features include:

- **Real-time alerts**: Assuring prompt action to stop more waste, the software enables Gonçalo to set up real-time notifications that tell him if any gadget uses more energy than anticipated.
- **Monthly Energy Reports:** The application creates thorough monthly reports that detail each device's energy usage. Users may target gadgets that use excessive amounts of energy and spot patterns using these data.
- **Alerts for High Energy Usage**: When the app notices abnormally high energy usage from particular devices, users receive personalized alerts. With the help of this functionality, users may respond swiftly and modify their settings or habits to avoid overusing.
- **Energy-Saving Tips**: To assist users in lowering their energy use, the app provides personalized guidance. These recommendations, which are based on the user's consumption patterns, are meant to encourage both environmental responsibility and financial savings.
- **Sustainability Mode**: For users who want to lessen their carbon footprint, this environmentally friendly mode offers recommendations for energy saving that are especially pertinent. It encourages eco-friendly practices like resetting appliance settings for best efficiency or using high-consumption gadgets during off-peak hours.

The following are the duties related to these functionalities:

- establishing real-time notifications for several gadgets.
- analyzing monthly reports to find areas of inefficiency.
- observing energy-saving guidelines and modifying equipment use as necessary.
- enabling sustainable mode to cut consumption even more.

8. Annexes

Forms: https://forms.gle/DBeBNfR91eEuH8pZ8

Datasheet:
https://docs.google.com/spreadsheets/d/1mWJpS1NnGyuJw3jXFaNbVOoJpIo6iARRbgYqvqg1evU/edit?usp=sharing

9. Conclusion

Ampify has the potential to significantly alter how users control and lower the amount of energy used in their homes.

The majority of respondents to the study expressed interest in more regular energy consumption monitoring and an appreciation of the potential cost savings, which lends credence to the necessity for such an app. Furthermore, the app's harmony of innovation and stability suits user tastes, guaranteeing that it stays both state-of-the-art and dependable.

With its strong features and user-focused methodology, this project offers a comprehensive solution for users looking to lower their energy bills and minimize their environmental impact.