CONTEXT OF USE AND USER INTERFACE REQUIREMENTS

Semester 1 COS70004-User-Centred Design

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Submitted by:
CO2_T2
Tutorial: Wednesday 6:30-8:30 (EN209)
Tutor: Raihaneh Aghaie

Group members:
Jainish Bipinbhai Satasiya – 104805416
Nisha Jose -104482424
Prachi Manojbhai Paghdal-104776046
Youngwoo Jeon-104358279

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ACKNOWLEDGEMENT OF COUNTRY AND CONTRIBUTION STATEMENTS

We, Jainish Bipinbhai Satasiya ,Nisha Jose, Prachi ManojbhaiPaghdal and Youngwoo Jeon respectfully acknowledge the traditional custodians of the land, the Wurundjeri people, on whose land we completed this assignment. We pay our respects to the elders both past and present, together with those from other areas who have and continue to enrich the cultural heritage of this land. Below table highlights the team member names along with respective contributions.

Name	Contribution
Jainish Bipinbhai Satasiya	Drafted the executive summary. Researched and shared my suggestions with the team for the models, context of use and user requirements sections and formatted the document.
Nisha Jose	Drafted the background, context of use and model section. Suggested ideas for user requirements. Shared OneDrive document and lucid chart links for collaborative work.
Prachi Manojbhai Paghdal	Drafted the user requirements section. Contributed by adding my inputs for the models and context of use sections.
Youngwoo Jeon	Drafted the discussion and conclusion section. Researched and contributed my findings with the team for models, context of use and user requirements sections. Edited and aligned the final document for submission.

EXECUTIVE SUMMARY

In summary, the purpose of this study is to outline the use case and UI specifications for a system that will assist solar-powered homes in optimizing their energy use and lowering their dependency on the grid. Most users are households who have recently installed solar panels with the intention of controlling costs, tracking patterns in energy use, encouraging economical energy use, and safeguarding the environment.

The target user group's objectives, driving forces, and responsibilities are demonstrated through the introduction of a character, John Smith, who represents an advocate for sustainability. Both the flow model and the hierarchical task analysis (HTI) model offer organized depictions of the tasks required to operate the suggested system.

The essential features and functionalities required to satisfy the user's expectations are listed in the user requirements section. Among these include real-time monitoring.

The debate and conclusion emphasize the value of a user-centered design methodology, combining real-time data from several sources and offering customized suggestions based on unique home patterns. It also acknowledges potential drawbacks including data accuracy and long-term user adoption.

The report highlights the necessity of an intuitive user interface that fosters energy literacy, incentivizes energy-saving practices, and assists households in maximizing their solar power use while decreasing their reliance on the grid.

I BACKGROUND

According to analysis of new data from the national inventory of toxic pollution, coal-fired power stations are producing less electricity but remain one of the largest contributors of toxic air pollution in Australia.[1] The 2024 Integrated System Plan which was published in December 2023 by the Australian Energy Market Operator (AEMO), suggests that Australia’s coal power stations will all close in 2038 – five years earlier than previously expected – and variable renewable energy capacity will need to triple by 2030 and increase sevenfold by

2050. The plan laid out has some delays.[2] If large-scale renewable projects are delayed, the impact of rooftop solar becomes gradually more significant to maintain growth towards this target. [3]

Victorian families are groaning under the weight of soaring gas and electricity costs.[4] Close to 3 million people have adopted rooftop solar systems, allowing households to manage energy expenses, such as saving money on energy bills, taking advantage of subsidies/rebates, and attractive feed-in tariffs at the time of installation. [5][6] Rooftop solar systems support households to mitigate their power consumption by utilizing solar energy during daylight hours. Excess energy generated can be fed back into the grid, with households receiving compensation in the form of feed-in tariffs. [7] Solar power is subject to fluctuations influenced by several factors such as time of the day, seasonal variations, or weather conditions.

There are several challenges that house-hold users face such as being unable to utilize peak production due to different usage patterns within the household. Many power retailers offer flexible pricing models, with higher rates during peak periods and lower rates during off-peak times. [8] Implementing energy-shifting strategies, such as running high-energy appliances during peak times or when solar energy production is at its peak, is also a challenge for households. The project aims to support households with solar power systems in making informed decisions enabling them to strategize, optimize their energy resulting in lower energy bills.

2 CONTEXT OF USE

This section briefly describes the user groups such as the primary, secondary, and tertiary groups and further exploring their goals and the environment.

2.1 USER GROUPS

- **Primary user group:** The primary users are households using solar panels on their property. They are actively engaged in managing their energy usage to maximize the benefits of solar energy.

- **Secondary user group:** Other household members such as the individual's partner or children, who are involved in household activities, may have their own preferences on when to use appliances or contribute to decisions concerning energy usage.
- **Tertiary user group:** These encompasses government agencies, application developers, environmental organizations, utility companies, or regulatory bodies. Tertiary user groups also include other residents in the same geographical area who are also customers of the energy supplier who indirectly contribute to the user's experience by providing comparative data on energy usage.

2.2 GOALS OF PRIMARY USERS

- With the rising energy costs users are opting for optimizing energy usage to minimize reliance on the grid and thus reduce electricity bills.
- Users need to understand their energy consumption patterns and align it to the solar power production.
- Energy shifting- Align high energy appliance usage with peak solar production and off-peak rates.
- Protecting the environment by reducing their carbon footprint

2.3 ENVIRONMENT

Physical	Location (Rural/urban): Determines availability of services such as internet connectivity. Climate: Weather conditions impact solar power generation and usage patterns.
Technological	Energy monitoring device, energy supplier’s website.
Artifacts	Appliances, energy tariffs and features of appliances (start/delay feature)
Social	Household dynamics, Community engagement, regulatory policies.

3 MODELS

3.1 PERSONA

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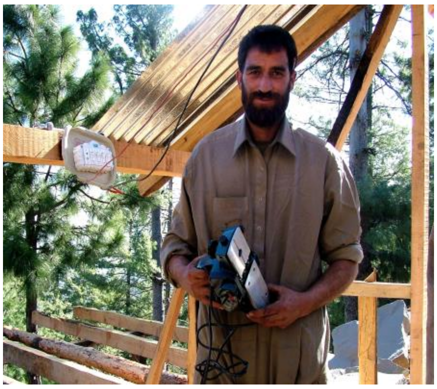

John Smith - the sustainability enthusiast

“I see our investment in solar panels as a step towards a greener future for our family and the planet”
</td>
<td rowspan="2">
John is a 40-year-old carpenter with a commitment to environmental sustainability. Together with his partner and their 11-year-old son, John lives a mindful lifestyle focused on reducing their environmental impact. After years of diligent saving, they have just moved from Sydney to a new home in a coastal town south of Brisbane. John's decision to install solar panels was driven by his dual concerns for reducing expenses and minimizing his environmental impact.

Since installing solar panels, John has tried to adjust his daily routines to make the most of solar energy. He schedules tasks like woodworking, equipment charging, and other energy-intensive activities during daylight hours. However, he finds it difficult to schedule appliances and track his usage to align usage with solar production levels.

He tries to actively monitor their energy consumption using a wireless gadget but sometimes forgets to check the weather forecast for the day or turn off some appliances on time.
</td>
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Tasks
-Understanding their new home's solar production patterns
-Shifting timing of energy usage, appliances to coincide with solar availability
-Deciding when to run certain appliances based on weather/solar forecast vs. off-peak rates
-His wife can work from home, so she helps track usage when John is away at work
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Key Attributes
-Motivated to reduce electricity costs and environmental impact

-Has a busy schedule often freelancing along with his part-time job
-His spouse supports him to manage household tasks such as picking up their son from school
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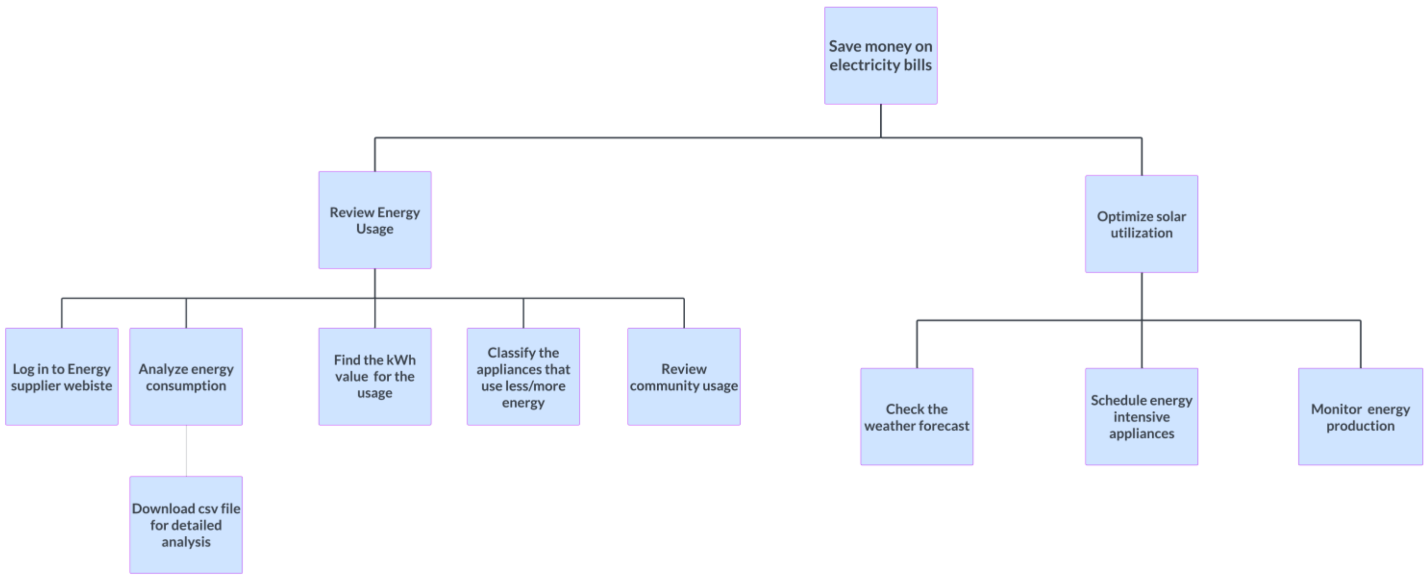
3.2 HTI MODEL


Save money on electricity bills
Review Energy Usage
Optimize solar utilization
Log in to Energy supplier webiste
Analyze energy consumption
Find the kWh value for the usage
Classify the appliances that use less/more energy
Review community usage
Download csv file for detailed analysis
Check the weather forecast
Schedule energy intensive appliances
Monitor energy production

4 USER REQUIREMENTS

1. Real-time Monitoring:

1.1 Monitoring Energy Production

Requirement: The system shall provide a real-time monitoring feature for solar energy production.

Rationale: This feature enables users to track their energy usage patterns promptly, facilitating proactive optimization efforts.

1.2 Notification for significant changes:

Requirements: The system shall provide notifications to users regarding significant changes in solar energy production.

Rationale: With notifications, users get information about sudden weather changes which helps to regulate energy usage of the day.

1.3 Monitoring Energy Consumption

Requirements: The system shall provide a real-time energy consumption monitoring feature.
Rationale: Energy Consumption monitoring helps users to regulate their energy usage in a day.

2. Weather forecasting for grid

2.1 Weather Data Integration

Requirements: The system must integrate real-time weather data for the specific grid location.

Rationale: Weather conditions significantly influence energy generation and consumption, which helps user to predict the usage of devices on a particular day.

2.2 Weather Alert

Requirements: The system shall provide real-time alerts when weather conditions change significantly.

Rationale: This alert aids users in pre-emptively responding to substantial weather changes, enabling effective management of daily energy consumption.

3. Flexible Pricing Information

3.1 Peak / off-Peak Hours Pricing

Requirements: The system shall provide energy pricing and schedules for peak/off-peak hours from the utility provider.

Rationale: This Schedule helps user to regulate the time when they can use their maximum appliances.

4.Cost Savings Insights:

4.1 Energy Shifting

Requirements: The system shall suggest optimal times for scheduling the operation of high energy appliances.

Rationale: This suggestion helps user to align with periods of low energy cost or increased solar production.

4.2 Energy Rating

Requirements: The system shall incorporate an energy rating feature, enabling users to view annual running costs.

Rationale: Energy rating helps user to identify appliances that consume more energy by compare energy efficiency between appliance models.

Note: The user needs to enter the data of any appliances, and then the system shows how much energy those appliances consume.

5 DISCUSSION AND CONCLUSION

5.1 MAIN INSIGHTS

- User centered design
  Applying a user-centered design process is crucial for developing an effective and user-friendly interface that addresses the needs and goals of households with solar power systems. Understanding the context of use, user requirements, and iteratively

involving users in the design process will lead to a system that promotes energy literacy and encourages energy-efficient behavior.

- Integrating real-time data from various sources (smart meters, solar systems, weather forecasts, electricity rates) and providing personalized recommendations based on individual household patterns is essential for optimizing energy usage and reducing grid reliance. This tailored approach increases the relevance and value of the system for users.

5.2 LIMITATIONS

- The system's effectiveness relies on the accuracy and reliability of the data sources (smart meters, solar system monitoring, weather forecasts, rate schedules). Inaccurate or incomplete data can lead to suboptimal recommendations and undermine user trust in the system.
- While the system aims to encourage energy-efficient behavior, user adoption and sustained behavior change can be challenging. Factors such as habit formation, perceived complexity, and competing priorities may impact the long-term effectiveness of the system.

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