Optimising operational energy performance through Augmented Intelligence Dashboards *End-User Experience*

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SUSTAINABLE PLACES 2023

This project has received funding from the European Union's Horizon 2020 Programme under Grant Agreement no 101000169

Agenda

- Introduction
- Goals
- Our Process
- Prototype
- Conclusions
- Q&A

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Introduction

The goal of the **EU Strategic Technology Plan** is to improve the energy efficiency and sustainability of buildings.

To develop an interoperable and user friendly system to support the end-users in their daily life energy usage by using Augmented Intelligence solutions to enable buildings and their users to be come self-optimising.

Introduction

*"Auto-DAN will provide **real-time suggestions to buildings' occupants** to improve their operational energy consumption, while expanding the update of **demand response actions in residential and small-to-medium size** commercial buildings across the EU."*

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Goals

- Understand our **end users** and collect feedback
- Create a solution to **encourage users to adopt operational** change to improve building energy performance
- **Test and optimise** the solution to fit the needs of our end-users

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Our process – Human-centric design

*"A problem-solving technique that puts **real people at the centre of the development process**, enabling you to create products and services that resonate and are tailored to your audience's needs"*

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Our process – Human-centric design

- **Why -** What motives the user? What are their **drivers** and values when considering the task at hand?
- **What** - What are the main features and **functionality a user expects** to find in the solution?
- **How** - What does the solution **look like**, and how accessible are the features within the solution?

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1. Strategic Alignment

- Align all stakeholders on the scope of the work package
- Who we're solving for, what are the main challenges we're trying to overcome,
- Why it's important to overcome, and how will we know that we were successful?
- Create a **problem statement, goal definition and proto-personas**

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Problem Statement

Building owners and persons responsible for managing energy efficiency currently do not view the connection ***between energy price and consumption****. Additionally, they find it difficult to understand how their* ***behaviour contributes to energy consumption*** *and cost. Currently, no way exists for users to view which* ***actions they can take to reduce energy costs and consumption****. An inability to view the subsequent best actions also extends to comfort level decisions.*

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Goal Definition

- Develop an innovative Augmented Intelligence dashboard system that **non-technical building users can use to visualise** the trends in their energy consumption
- **Visualise the trends** in users energy consumption
- Provide **feedback and recommendations** on how to improve their energy consumption/cost
- Execute both through automated control and user feedback**, demand-response actions**
- Achieve the energy consumption cost **targets identified**

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2. Research & Analysis

- User Interviews - three-hour online workshops
- Desk Research
- Data and insights gathered during this process serves as input into the review of our initial understanding of the problem and actors

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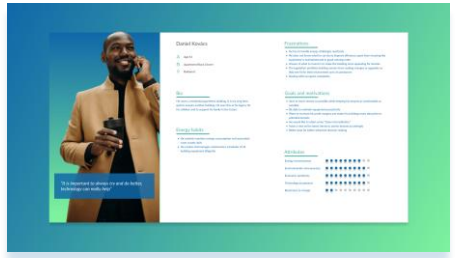
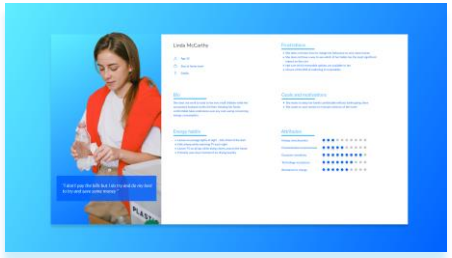
Proto Personas





- **The business owner,** maximizing his investment while cutting costs.
- **The building manager,** sources of the high-energy consumption.
- **The homeowner,** reducing energy bill costs by adjusting behaviours
- **The low-income tenant** is responsible for identifying and addressing their behaviour
- **The student**, have no reason to pay attention to the effect of their behaviour.
- **The professional office worker,** establishing whether their environment is comfortable

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Research & Analysis – Key Takeaways

Decisions are financially Motivated

Although there is an awareness of the environmental impact, the main reason for reducing energy consumption is to save money. Being able to see ROI on effort was cited as necessary.

Lack of detailed, live data undermines efforts

Not being able to track consumption at the appliance level in real-time disengages people from energy savings efforts

Limited knowledge of energy savings practises

None of the participants rated themselves as knowledgeable on the topic, nor could they identify resources they would access to gain knowledge.

Comfort and convenience dictate behaviors

Participants are unlikely to act on recommendations if it negatively impacts their comfort or convenience.

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4. Design

- Key User interviews insights
- Design workshop (all disciplines)
- Digital Prototype
- Test

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Online design sprint

- Sprints are also **integral to agile development**
- Encourages **collaboration** through making.
- Reduces **the cost of failure**
- Encourage original thinking through experimentation
- Makes it possible to **explore ideas** that would typically be rejected by the company out of hand
- Obtain **real data from real users** using a realistic prototype - fast forward into the future

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Online design sprint

- Each design team member produces a prototype
- The prototypes were then presented and discussed with in the second workshop.
- Stakeholders to vote for the best features they felt would address the challenges from workshop one.

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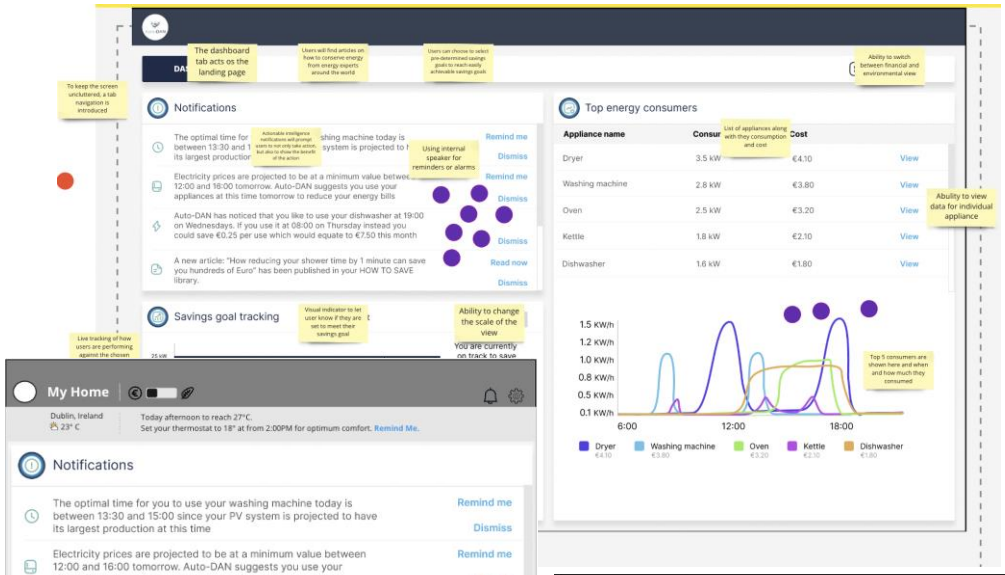
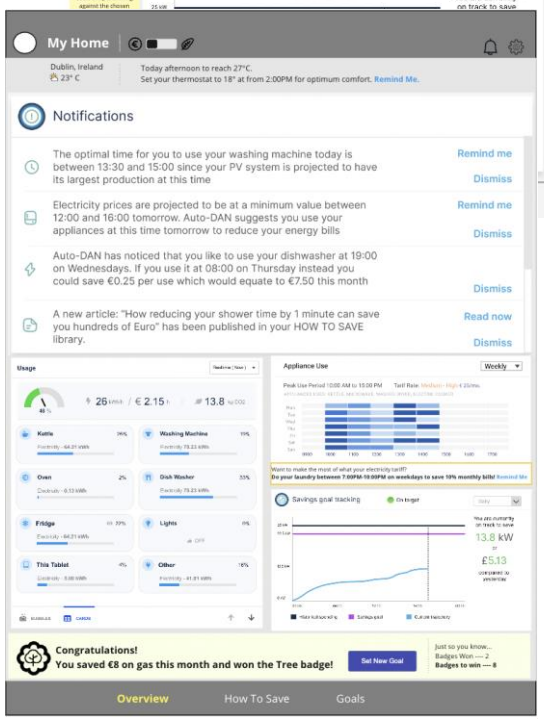
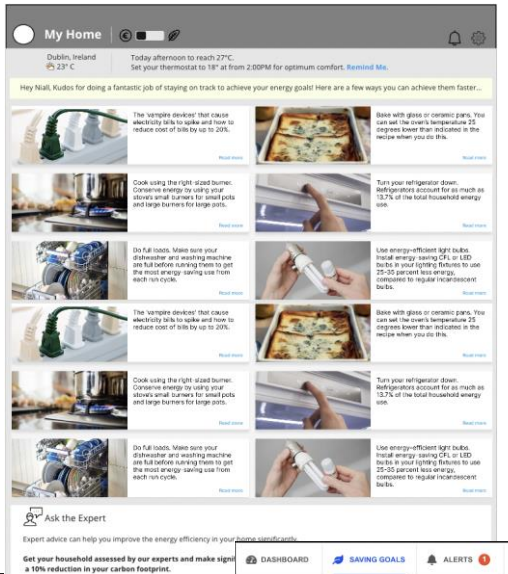
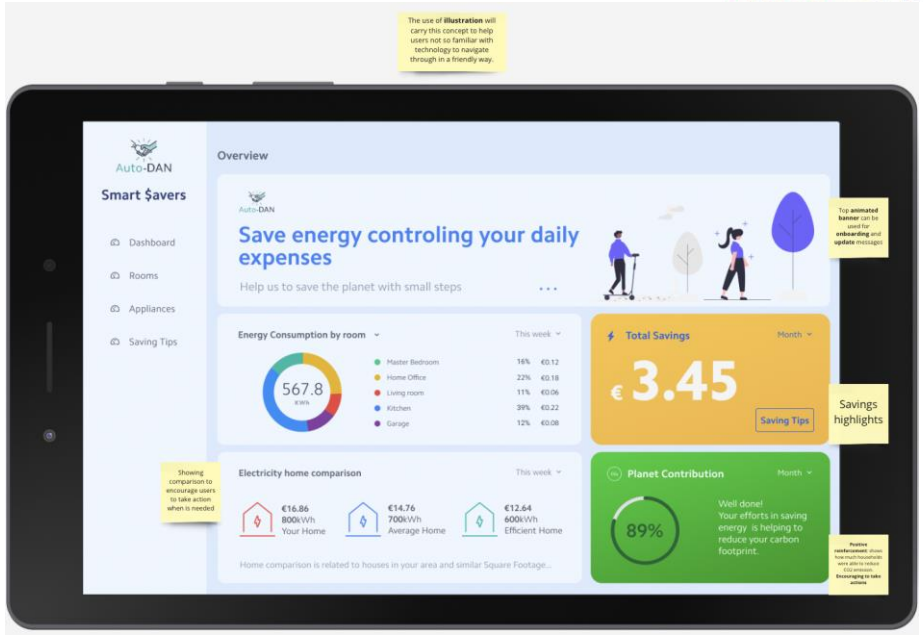
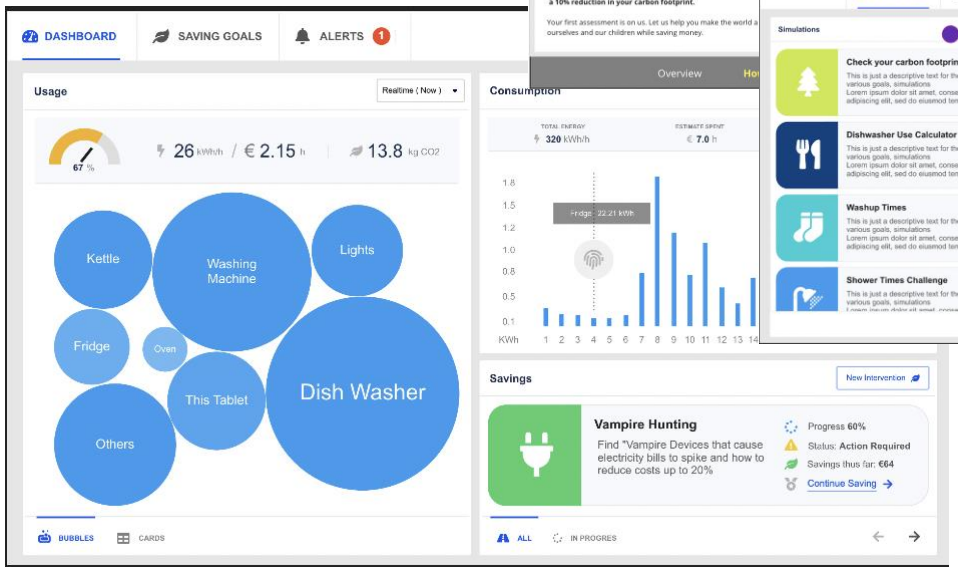
Concepts

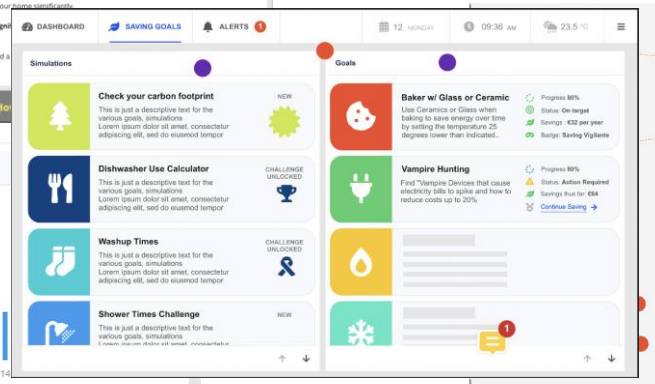

Notifications
Top energy consumers
Savings goal tracking
Appliance name
Dryer
Washing machine
Oven
Kettle
Dishwasher

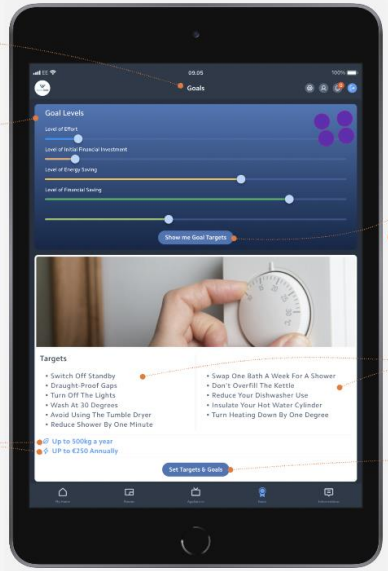

My Home
Notifications
Congratulations!
You saved €8 on gas this month and won the Tree badge!
Overview
How To Save
Goals


My Home
Ask the Expert
Overview

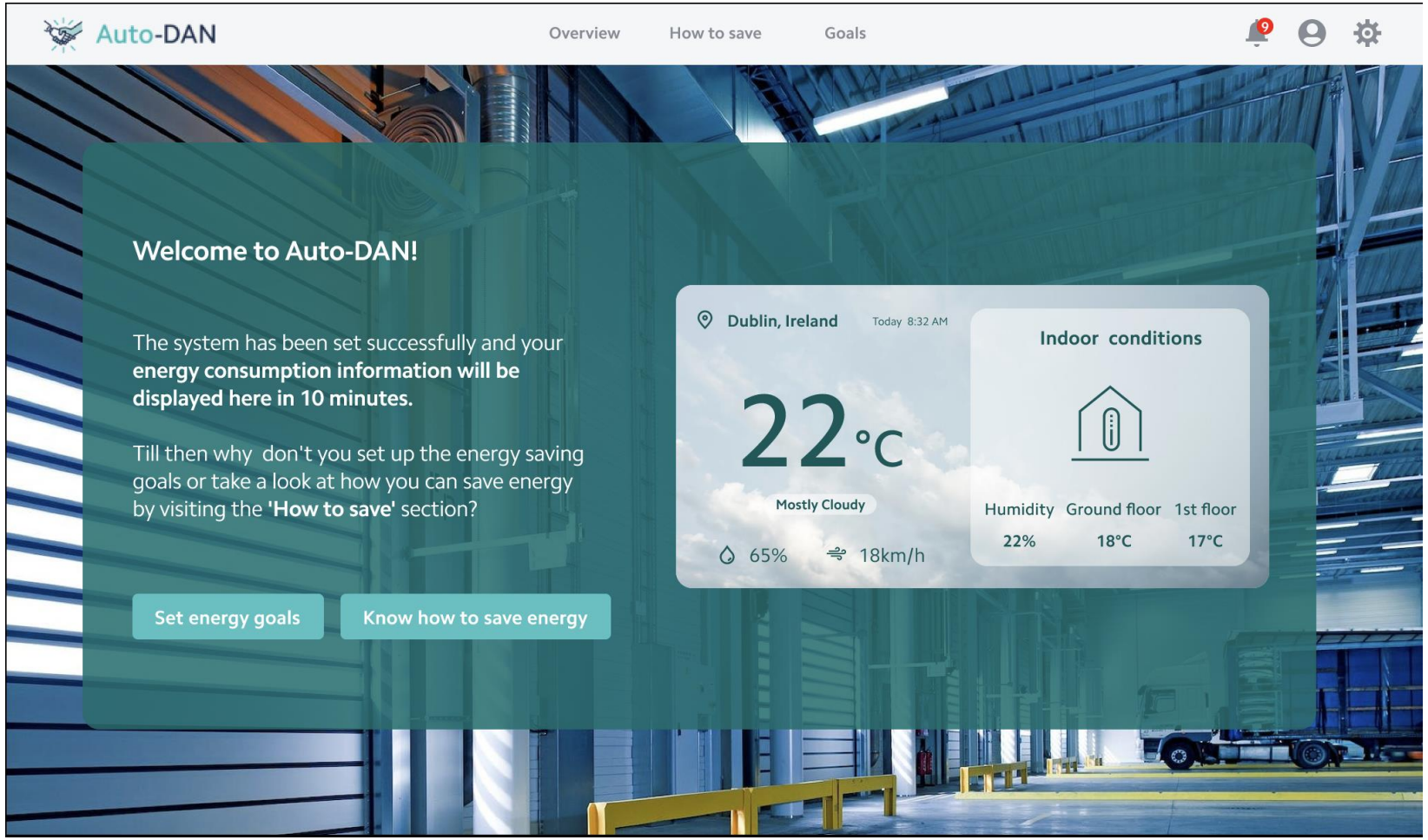

Auto-DAN
Smart $avers
Overview
Save energy controling your daily expenses
Energy Consumption by room
Total Savings
€ 3.45
Electricity home comparison
Planet Contribution
89%


DASHBOARD
SAVING GOALS
ALERTS
Usage
Consumption
Savings
Kettle
Washing Machine
Lights
Fridge
Oven
This Tablet
Dish Washer
Others
Vampire Hunting


DASHBOARD
SAVING GOALS
ALERTS
Check your carbon footprint
Dishwasher Use Calculator
Washup Times
Shower Times Challenge
Baker w/ Glass or Ceramic
Vampire Hunting


Goals
Goal Levels
Targets
Shows potential CO2 and financial savings from targets / goals
Filtered list of targets / goals from goal level filtering

Prototype



[Link to prototype]

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User Access AutoDan after 24 Hours of Installation

Auto-DAN

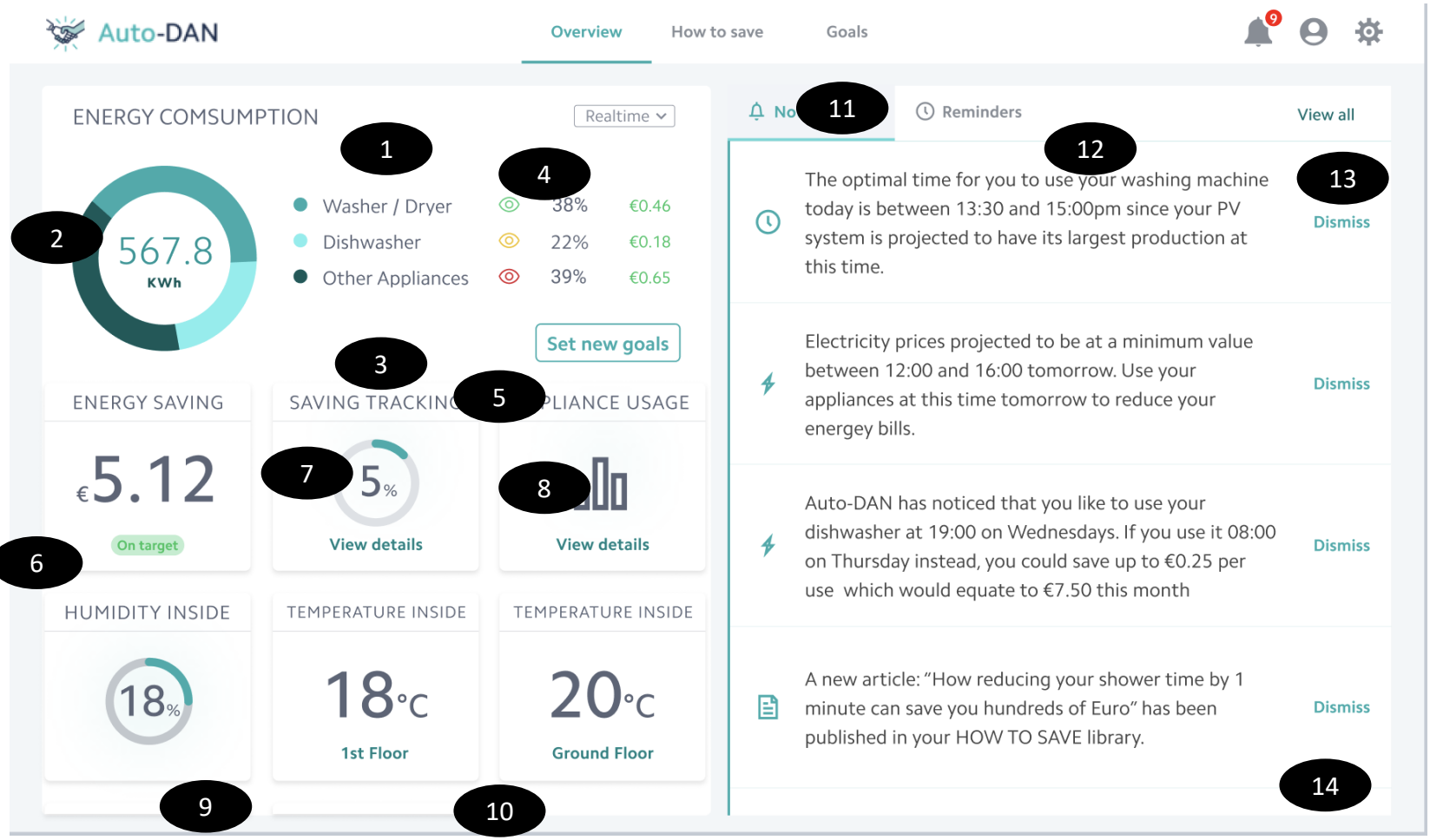
1
Non- functional component.
Displays energy consumption.

2
Non -functional component.
Graph displaying appliance based energy consumption.

3
Combo component.
Appliance list with associated usage information. Click on appliance name opens appliance details in modal.

4
Functional component.

Allows users to see information – Realtime, weekly, monthly and yearly



9
Non functional component.
Real time indoor humidity

10
Non functional component.
Real time indoor temperature

11
Non functional component.
List of notifications for the day

12
Non-functional component.
List of reminders for the day

13
Functional component.
Click opens full list of notifications in modal

5
Functional component - button.
Click opens goal setting modal.

6
Non- functional component.
Energy savings in local currency.

7
Non- functional component.
Energy savings in comparison to the set goals

8
Functional component.
Click opens modal showing appliance usage.

14
Functional component.
Click removes item from list

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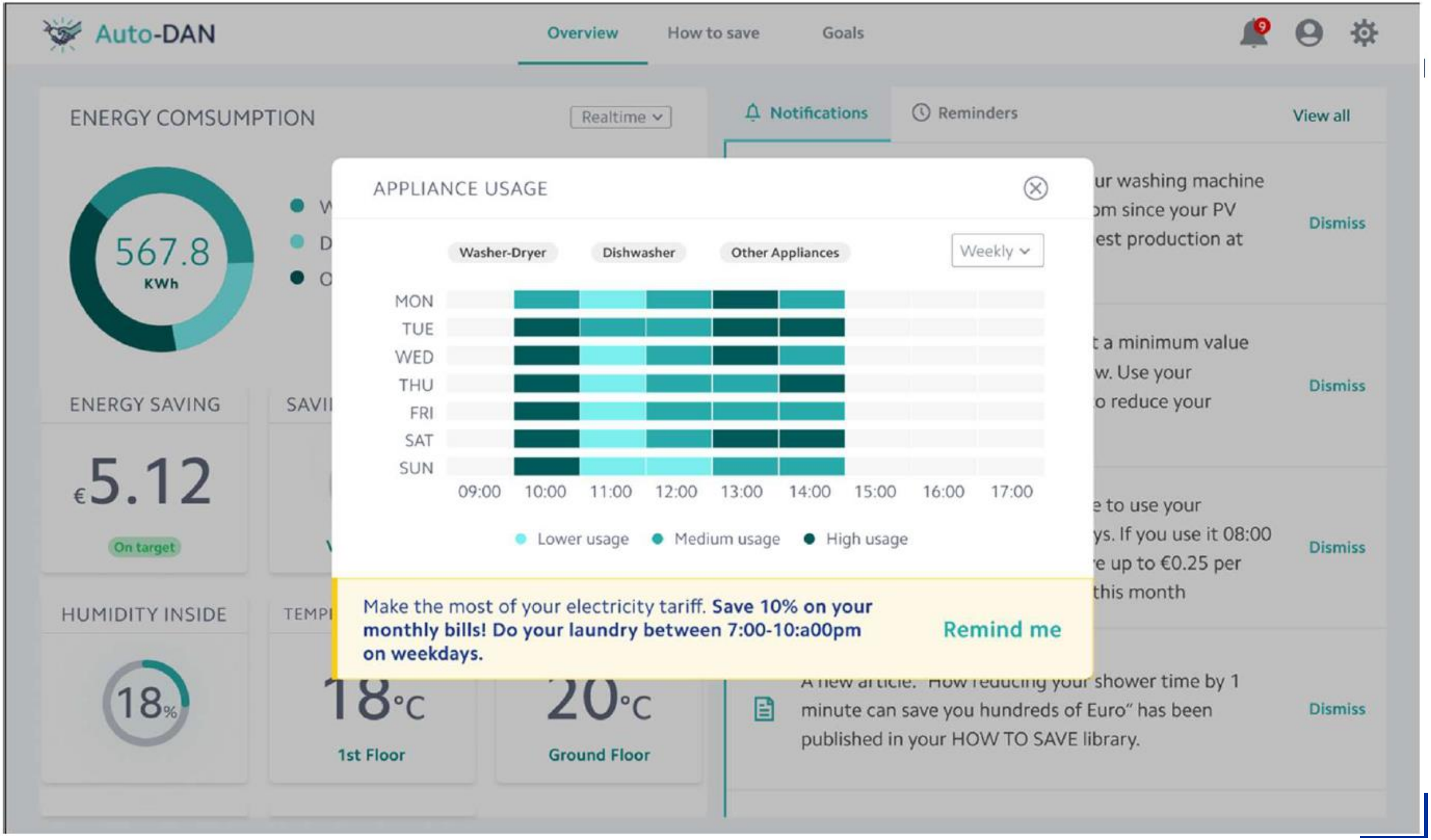
Auto-DAN
Overview
How to save
Goals
ENERGY COMSUMPTION
Realtime
567.8
KWh
Notifications
Reminders
View all
APPLIANCE USAGE
Washer-Dryer
Dishwasher
Other Appliances
Weekly
MON
TUE
WED
THU
FRI
SAT
SUN
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
Lower usage
Medium usage
High usage
Make the most of your electricity tariff. Save 10% on your monthly bills! Do your laundry between 7:00-10:a00pm on weekdays.
Remind me
ur washing machine
m since your PV
est production at
Dismiss
t a minimum value
w. Use your
o reduce your
Dismiss
e to use your
ys. If you use it 08:00
e up to €0.25 per
this month
Dismiss
ENERGY SAVING
€5.12
On target
HUMIDITY INSIDE
18%
18°C
1st Floor
20°C
Ground Floor
minute can save you hundreds of Euro" has been
published in your HOW TO SAVE library.
Dismiss

Auto-DAN

Overview | How to save | Goals

9

YOUR GOALS

Quarterly

Good effort! A few more and you can reduce your carbon footprint and help make the planet healthier place!

Here are few tips that will help you achieve your goals:

- Avoid overfilling the kettle and save up to €15.00 annually.
- Switch off the appliances not in use to save up to €45.00 per year.
- Lorem ipsum dolor sit amet, consectetur adipiscing elit.

Achieve More

Cloudy

Tue, Aug 23

22°C

Dublin, Ireland

Savings

€5.12

Savings Target

€48.50

Update Target

SET NEW GOALS

See more

Saving goals: Seed

5% €11.53

in savings on energy bill.

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Purus, elit nibh et nisl, pellen tesque scelerisque faucibus facilisis at. Place rat morbi sem viverra ...

Set New Goal

Saving goals: Sappling

10% €22.02

in savings on energy bill.

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Purus, elit nibh et nisl, pellen tesque scelerisque faucibus facilisis at. Place rat morbi sem viverra ...

Set New Goal

Saving goals: Tree

15% €43.98

in savings on energy bill.

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Purus, elit nibh et nisl, pellen tesque scelerisque faucibus facilisis at. Place rat morbi sem viverra ...

Set New Goal

Saving goals: Forest

20% €56.78

in savings on energy bill.

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Purus, elit nibh et nisl, pellen tesque scelerisque faucibus facilisis at. Place rat morbi sem viverra ...

Set New Goal

Conclusion

- During the validation stages, the team discovered that the information communicated was valid and relevant.
- Tracking energy consumption's financial aspect will potentially drive behaviour change
- The product will continue to be monitored, and feedback will be gathered to ensure continuous iteration of the platform to align with user expectations

End-users are not only customer,
but also co-designers of the last solution

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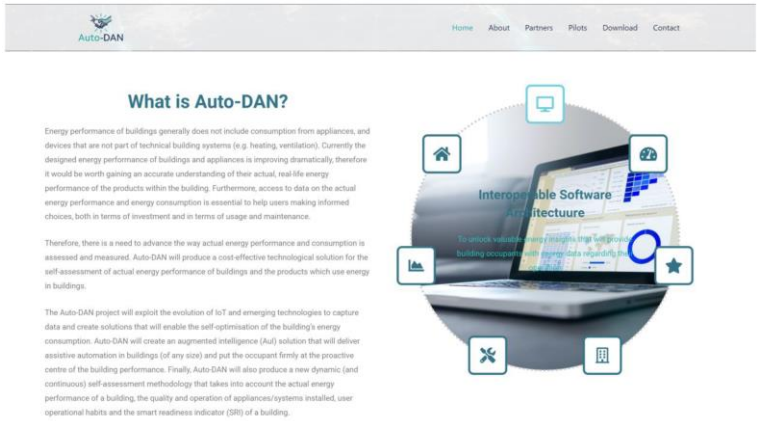
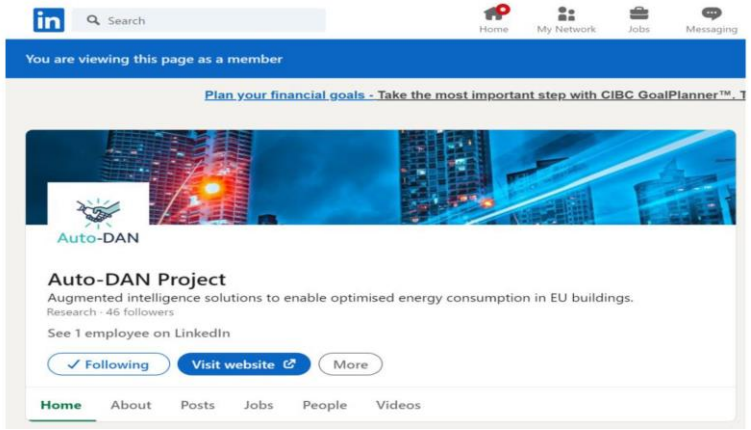
Thank you!



[Auto-DAN Project]



[Auto-DAN LinkedIN]

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