



Part VI.

Appendices

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1. Interview with Guido Stein

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2. Interview with Jorissa Neugelings

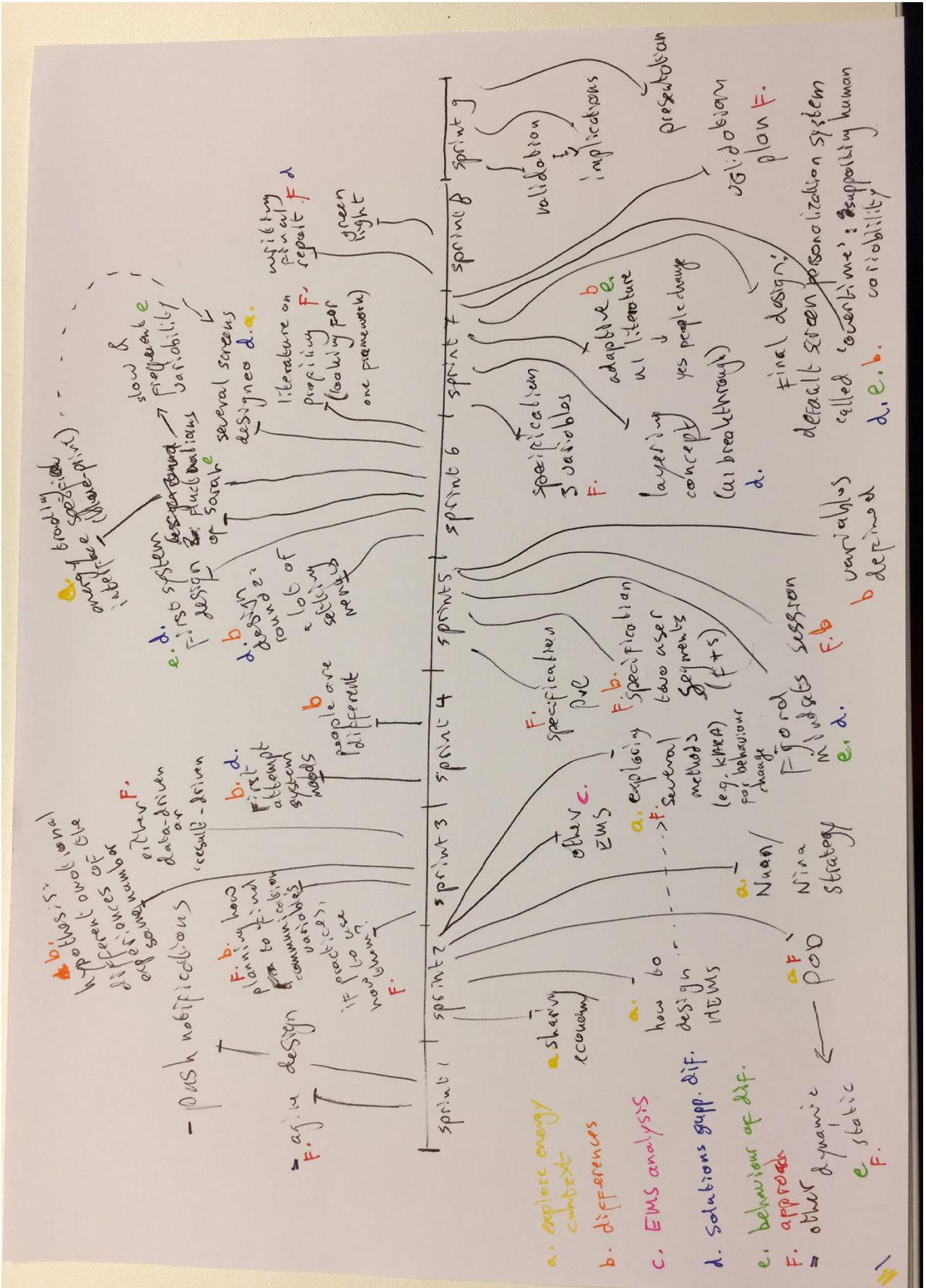
Agenda

Guido is verantwoordelijk voor de strategie van Nuon voor mkb en particuliere klanten. Jorissa is verantwoordelijk voor de digitale innovatie van Nuon voor mkb en particuliere klanten.

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3. The result of a reflection on the design process



4. Nina user test plan

This is the user experience and usability assessment plan for the app Nina, a result of the partnership between Nuon and Mobgen. The plan is developed by Mobgen designers, members of the Noun-team. The plan has been added to this report in order to describe the proceedings of a user test that provided valuable insights to this graduation project.

Goals

- Test general understanding of Household Dashboard and My Usage and find best variables to display in My Usage
 - Do users understand variables and their meaning and relationships?
 - What data gives the most clarity, € or % or combination of both?
 - Are users finding all the information they expect/need where they expect it to be?
 - Are they missing anything?
- Test information architecture for Profile, Settings and Contract Details.
 - Are users finding all the information they expect/need where they expect it to be?
 - Are they missing anything?
- Test navigation and information architecture for Appliances
 - Find the best grouping options for categories
 - Test UX and usability

Who

- Testers from QSR Selectiebureau
- 5 people
- 30-50 years old
- Mixed genders and professions
- All in charge of their energy matters at home
- All English speaking
- In a contract with different energy providers

Roles

- Conversation lead
- Note taker / filmer
- Observers / Note takers in another room

High level test plan

- o Introduction
- o Demographics
- o Energy related intro questions
 -
- o On paper comparison of My Usage variables
- o Card sorting for Appliances grouping
- o Card sorting for order of tiles in Household Dashboard
- o Usability testing – flows to test Profile, Settings, Contract details and Appliances
 - Find your client number
 - Find how much your fridge consumes
 - Find notification settings
 - Follow up questions to understand if users find all the information they need and where they expect it to be
 -
- o Follow up general questions and thoughts

Preparation

- o Prepare brand neutral prototype
- o Get text in Dutch
- o Prepare and print (brand-neutral) screens:
 - My Usage in €
 - My Usage in %
 - My Usage in € and %
 - + Instalment (no amount specified)
- o Prepare and print explanation of the visuals (Robert to provide final text in Dutch)
- o Prepare and print all cards and material for card sorting
- o Prepare empty dashboard and cards for dashboard card ordering
- o Get markers and post-its for observers
- o Invite all observers at the right time
- o Prepare Excel for responses
- o Test script
- o Cameras: reserved and tested

5. Nina user test script

This script is developed by Mobgen designers, members of the Nuon team. It is added to this report to describe the proceedings of a user test that delivered valuable insights to this graduation project. This is an English translation. The session proceedings were completely in Dutch.

Introduction

Hi my name is _____ and I'm going to walk you through this test.

We are building an app for an energy provider and we want to see what it's like for people to use it.

I want to make it clear that we are testing the app, not you. You can't do anything wrong here today and all feedback is welcome.

Don't worry about hurting our feelings either, we want to improve this app so we want to hear your honest feedback.

I would also like to ask you to think out loud as much as possible throughout the test.

You probably noticed the camera. If it's ok for you, we would like to record this conversation so that we can use it in the future to go back to your feedback and use it to improve the app.

[also ask participant to sign NDA]

Demographics

Before we start the actual test, I have a couple of general questions for you.

What's your occupation?

Where do you live?

Who do you live with?

Energy Related Intro Questions

What company is your energy provider?

Do you have a smart meter or a conventional meter?

Who is in charge of the energy contract within your household?

What is important for you when it comes to managing your energy consumption?

How do you experience the contact / communication with your current provider? E.g. website / app / call.

What are the biggest irritations? Or positive things?

How much would you say you care about the energy consumption topic?

Would you define yourself more like a price-conscious or energy-conscious person?

Card Ordering for Household Dashboard Elements

Now imagine you are a customer of an energy provider and this energy provider has an app you installed on your phone.

This is the first screen of the app. As you can see it's just a template and the slots are empty.

[give participant template]

And here you have a set of items that you can have a look at. **[give participant deck of household dashboard items]**

Could you quickly tell us what you think they mean?

Could you now place them on the empty slots in the order you believe would be the best.

Comparison of My Usage Variations

Can you have a look and tell me what you think you are seeing here? **[give the user the three A4 papers with the three variations of three statuses for My Usage and spread them on the table]**

What catches your attention first?

What does this top part mean? **[pointing at the My Usage tiles]**

What is this value? **[pointing either at percentages or Euros]**

What's the 100% here?

What's the relationship between the values?

[See if the participant understands the graphs. If the participant is uncertain, make sure they have access to the explanation screen and they can read it]

Which variables are the clearest for you and why? **[Euros or percentages or combination].**

Usability Test

Here's a prototype version of the app. **[give participant the prototype]** As you can see the first screen here is quite similar to the ones you already saw.

Now, imagine this is your phone and you have an account on this app from your energy provider.

What would you do if you wanted to find your client number?

What would you do if you want to find how much your fridge consumes?

And your washing machine?

What would you do if you want to turn off the notifications for this app?

Where would you check which data we are collecting about you and how we are using them?

Where would you go to modify the payment methods?

Rating and Ordering Profile Info

Here's a list of personal and contract information. **[give participant the list of grouped contract details]**

Which ones would you say are the most important details to see? Can you circle them? **[give participant a pen]**

Which ones are the least important, could you cross them?

Is there anything you would move to a different group?

Follow up questions

Now have a look around your Profile please (if needed, lead also to Contract Details and Settings).

Do you find everything clear?

Would you put some of this information somewhere else?

Is there anything missing?

Did you expect everything to be where it actually is?

Is the amount of information here too much, too little or just right?

Anything you think is not relevant and can be removed?

What are your general thoughts about the app?

Would it help you being more aware and feel more in control of your energy consumption?

6. Nina user test results & discussion

In addition to note taking, I aided in analysing the user test results. I used that thorough study of the test notes to answer the questions related to this study as well.

The goal was to generate a first impression on energy users' needs, interests and wishes regarding managing their household energy. The questions were:

- 1) What different levels of energy expertise can be found?
- 2) What motivators exist to be engaged in household energy management?
- 3) What different attitudes are there towards sustainability in the context of household energy management?

Besides several demographic characteristics, the table on the next page gives an overview of the main interests and motivations per participants. As his way of presenting the results already suggests, the answers to the individual research questions surfaced relatively implicitly and seem interconnected.

Participant	1	2	3	4	5
Age	40	34	50	31	25
Gender	Female	Female	Male	Male	Female
Occupation	Works at TNT daughter of 18	Part-time bookkeeper three boys: 1, 7, 9	Writer 3 children 4/5?		
Household size	2	5			1 upcoming 2 (soon 3)
Interests concerning energy	<p>sustainability - costs - analytics</p> <ul style="list-style-type: none"> - usage of all in-home devices "we have a new house, I'd like to know the consumption of all devices" - Being aware of energy consumption is important, e.g. "how energy is produced, what it costs" 	<p>costs</p> <ul style="list-style-type: none"> - "spending as little as possible on energy" - checking if electricity/gas consumption is not too high - strong disinterest in personal energy saving challenges "I have 3 boys (...) I never finish challenges anyways" 	<p>costs</p> <ul style="list-style-type: none"> - reducing household energy costs "I have been going to the library to save home energy" 	<p>analytics - costs - sustainability</p> <ul style="list-style-type: none"> - price is first - sustainability also if possible - later, when owning a house, "I'd like to have a smart meter and PV on my roof" - likes figures €'s, kWh's, %'s, per week/month/year 	<p>costs - sustainability - analytics</p> <ul style="list-style-type: none"> - keen on unnecessary energy consumption for economic reasons "leaving the light on an hour per day will add up on a yearly basis!" - renewable energy if its effortless - rather €'s than kWh's "I don't have a clue what that means"
Interpretation of expertise level (high - moderate - low)	moderate	low	moderate	high	low

Table 15.1 User test summary per participant

7. Future energy interactions interview plan

This set of interviews was initiated to test the hypotheses that different energy consumers, indifferent contexts of use (of an EMS) prefer to be addressed in different tones of voice. Additionally, it was aimed at exploring peoples expected interests and motivations regarding several future energy interactions. Lastly, by offering participants a questionnaire up front with general demographics related questions, the aim was to explore if such data could be used as predictors for certain tone of voice preferences.

For efficiency purposes it might be wise to fast forward to an important point of reflection regarding this set of interviews. Unintentionally, I pressured too many objectives in a quick, explorative and qualitative set of interviews. During preparations, I let time pressure lead to poor methodological preparations which make the value of the questionnaire results and the evaluation of different tones of voice untrustworthy.

Research goal

To identify possible differences in the preferred tone of voice between different people and in different contexts of use (of an EMS)

To explore the interests and motivations that current energy users expect to have in future energy interactions

Explore possible predictive characteristics of individual energy consumer's demographics data for their tone of voice preferences

Research questions

- 1) To what extent do energy consumer's general EMS tone of voice preferences differ?
- 2) To what extent do energy consumer's EMS tone of voice preferences differ in different contexts of use?
- 3) What interests and motivations do current energy consumers expect to have in future energy interactions?
- 4) To what extent does demographic data of individual energy consumers show possible predictive characteristics for their tone of voice preferences?

Method

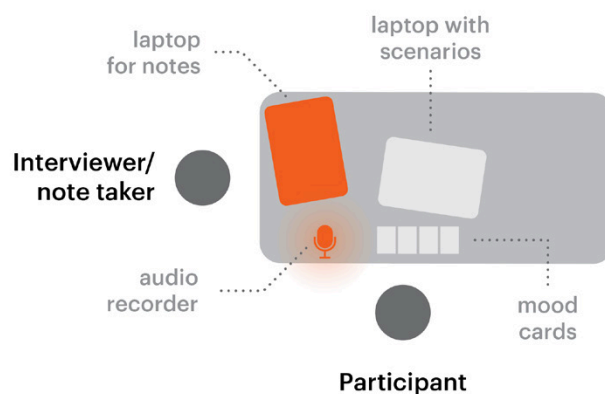
Participants

Participants were scouted with varying age, social and economic status and different (expected) experience with (managing) household energy. The following table provides an overview of the scouted participants.

No.	Gender	Age	Household composition	Occupation	Scouting location
1	M	42	With children	ICT sales representative	TU Delft
2	M	31	With wife and with children	Communications	Nuon
3	F	25	With partner	Marketing	Nuon
4	M	51	With wife and children	ICT development	TU Delft
5	M	48	With wife and children	ICT maintenance	TU Delft
6	F	23	With parents	Receptionist	Mobgen

Setting

The following setting was used for the test. A description and the role of 'mood cards' is explained in the next paragraph.

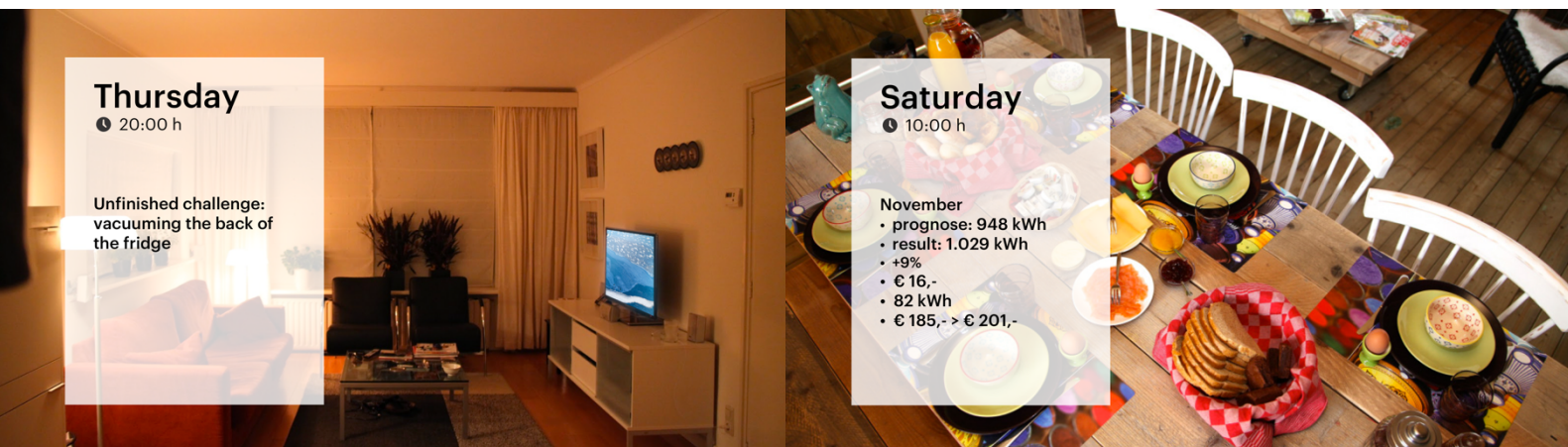


Materials used during the test

During the test participants were provided with different energy scenarios and a set of optional tones of voice.

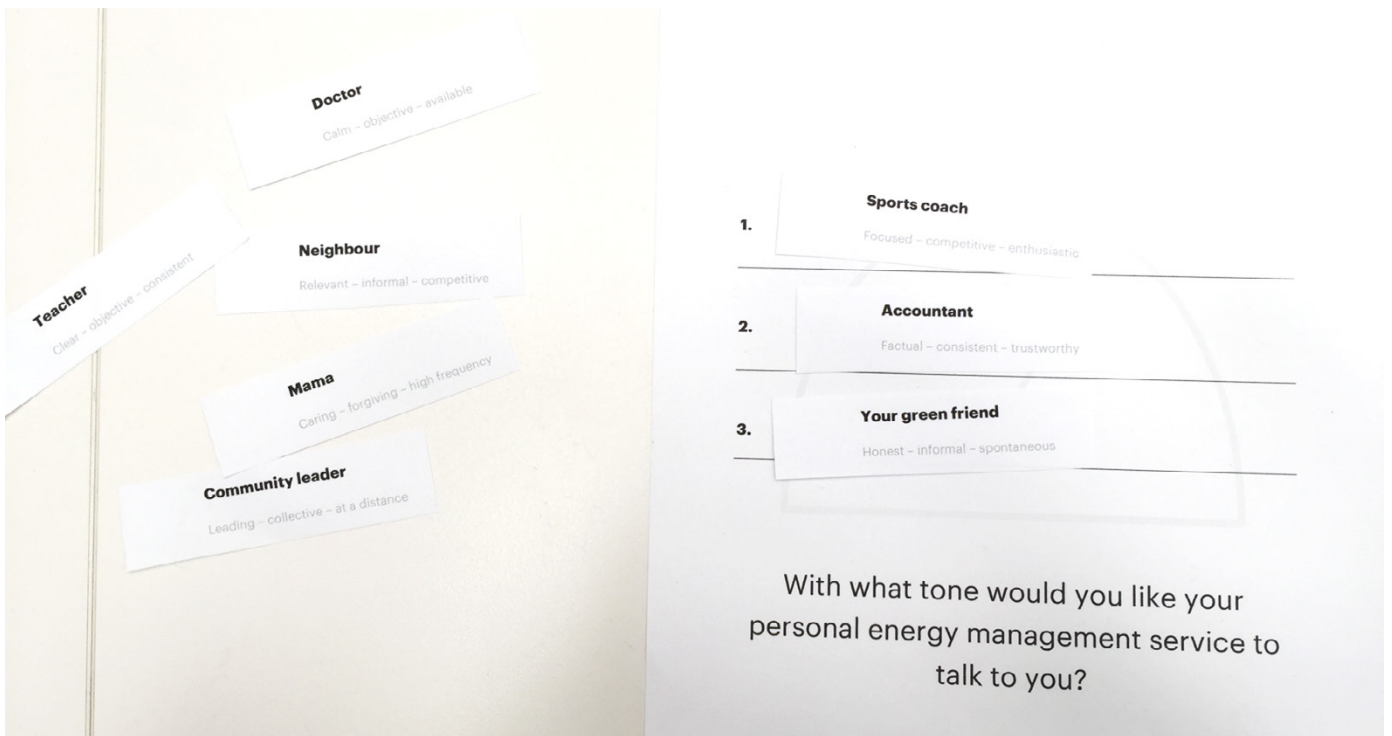
Powerpoint with scenarios

Below you see screenshots of the five scenario slides I used to confront users with. Each was accompanied with audio such as traffic (top two Thursday screens), muffled tv sounds (third Thursday screen) or rain and muffled music (both Saturday screens). The screens aimed to introduce a tangible future scenario in which an energy assistant contacts the user with certain information.



A set of possible tones of voice

Additionally, possible tones of voice were presented in the form of four moods. The cards below were the result of two quick pilots. They represent possible 'moods' that the system could have while communicating certain information to the user. The pink cards describe the different qualities of that mood.



The upper version of the tone-of-voice alternatives was used for the test. The lower one was the first iteration.

Procedure

- 1) Welcoming participant
- 2) Informing about data collection and present consent form
- 3) Short introduction of planning
- 4) Participant invited to fill in Google Form
- 5) General introduction: imagine a future...
- 6) Mobility data from questionnaire influences scenario 1 content
- 7) Participant invited to express mood preference for future energy scenarios one by one
- 8) Debriefing

See the session script in Appendix 7 for more detailed descriptions of each of the steps.

Data collection

- Audio recordings
- Notes

Data analysis

- Notes in excel completed using audio recordings
- Analyse and list differences among preferences per scenario one by one
- Look for differences across questions

8. Future energy interactions interview script

This script is in English. All participants were native Dutch speakers, the session was therefore executed in Dutch as well.

Questionnaire introduction

- o Welcome
- o Experiment part of my graduation
- o Recording
 - Audio
 - Anonymous data
 - OK?
- o Consent form
- o Now please fill in questionnaire, if there are any questions you don't feel like answering please leave them open

General introduction:

- o 10 years from now
- o Average consumer also produces and distributes energy
- o The need for awareness on individual energy consumption is widely spread
- o Covering electrical energy, mobility energy, nutrition energy etc.
- o A system is assisting you to manage your consumption, production and distribution of energy
- o The system has different moods
- o [show moods, let participant study them]
- o Now 5 specific scenarios in this world
- o For each I'm curious what you would expect to be the right system mood for bringing you the information. Mind that 'bringing' does not mean a push notification or pop-up necessarily

Scenario introduction

- o [Scenario description]
- o Trigger question: through which system mood would this information land best with you?
- o Additional questions:
 - Are there qualities that you feel you would like?
 - What do you think gives you this preference?

After scenarios

- o Let's take a look at qualities that you did not specifically name, how did you perceive them? Do you see any use for them?
- o How would you generally reflect on the scenarios? Are there parts that you like or dislike?

9. Future energy interactions interview results & discussion

Before I thoroughly analysed the results of the set of interviews I reflected on the approach of the interviews. It can be concluded that the approach and quality of the prepared materials fell short regarding the complex and ambitious research questions. Or vice versa, that the research goal and questions were too large for the available time frame.

Concretely, the three following elements of the test limit the usability of the results:

- The questionnaire and mood cards were in English while all participants were native Dutch speakers
- By asking participants to 'imagine a system' and 'express a preference for the tone of voice', one could say I let them design a solution, in their mind. There is no guarantee that a participant in practice would actually appreciate his own imagined solution.
- The fully verbal system mood cards demanded a relatively high level of verbal skills to effectively use them

Concluding, due to the abstract exercise and the incomprehensible 'system mood' materials, it is impossible to draw a valuable conclusion about the exact tone of voice preferences per participant per scenario.

The interviews have merely been used as an inspiration. Speaking to the different participants provided a feeling that people prefer fundamentally different in the way they prefer to receive information. The table of results might give an impression of interesting quotes that support that feeling.

Any other conclusions have deliberately not been used for the further parts of the project.

Age	42	31	25	51	48	23
Gender	M	M	F	M	M	F
Occupation	ICT sales representative	Communications	Marketing	ICT development	ICT maintenance	Receptionist
Children	yes	yes	no	yes	yes	no
Household composition	with children	with wife and children	with partner	with wife and children	with wife and children	with parents
Interests concerning energy	costs - analytics	costs - analytics - sustainability	costs	analytics - costs	analytics - costs - sustainability	

The system should inform him about the details of his consumption. Would like to have a system that shows him the benefits of saving energy. The system should not have a judgement about his (energy) behaviour.

"I'd like to know how I'm doing compared to others (...) these people already did it, for example."

"enthusiasm would grab my attention, just like with a charity sales person"

"Clarity and honesty about what it will cost me (...) I'll have to make decisions based on it"

"I don't always have to know exactly what was the cause" of the slightly higher bill

She would like to know how she's doing compared to others

"I'd expect to receive an update on a fixed moment in time"

"What you save or produce on the day itself is not so interesting (...) I rather look at the longer term developments"

"It would be nice to know what [messages] you can expect from the system each day"

The system should only present energy saving tasks "when I ask for it"

She would like to get a "clear update with how much [energy] you saved and how much you spent"

"I'm not such a competitive person, I'd rather compete with myself"

"What you save or produce on the day itself is not so interesting (...) I rather look at the longer term developments"

"It would be nice to know what [messages] you can expect from the system each day"

The system should only present energy saving tasks "when I ask for it"

He would like some competition with his colleagues "because he has a good relationship with them"

He would like the system to help him improve his management "if you install two extra pv cells, you might be self sustaining in november", for example"

He would like updates to be communicated "in a calm manner, no capital letters, no red screens"

"I wouldn't like to be compared with my neighbours because I think I more active in saving energy than them (...) and we don't have that kind of a relationship, we just think too different about it"

"I'd like to know what my colleagues are doing [regarding their energy consumption] and how I could apply that" panels are producing"

"I wouldn't check how much my solar panels are producing"

"I would like to know why the bill is so high"

The system should be clear about the expected impact of an energy saving suggestion

Interpretation of expertise level (high - moderate - low)

moderate

high

low

high

low

Remarks on expected influence of contextual factors

"I'm on the couch [on a weekday evening] and I receive a message (...) I wouldn't like that"

When you're at home [during a workday] you're 'chill even though you're working, so the system should match that"

Receiving message in the evening "that should be funny, a bit humorous"

A usual Saturday morning mood is cheerful, so the system should level with that

On a week day evening the system should be sympathetic, "like someone is standing next to you while you sit at the couch" information"

In the morning he doesn't like "too much information"

"I want to learn from how my colleagues are doing it (...) I could do that in the morning, because it is often quite at work then"

Table 15.2 User test summary per participant

10. Practice-profile-based personalization system design

The model on the next page is visualization of the system design as it was developed in the first phase of the project.

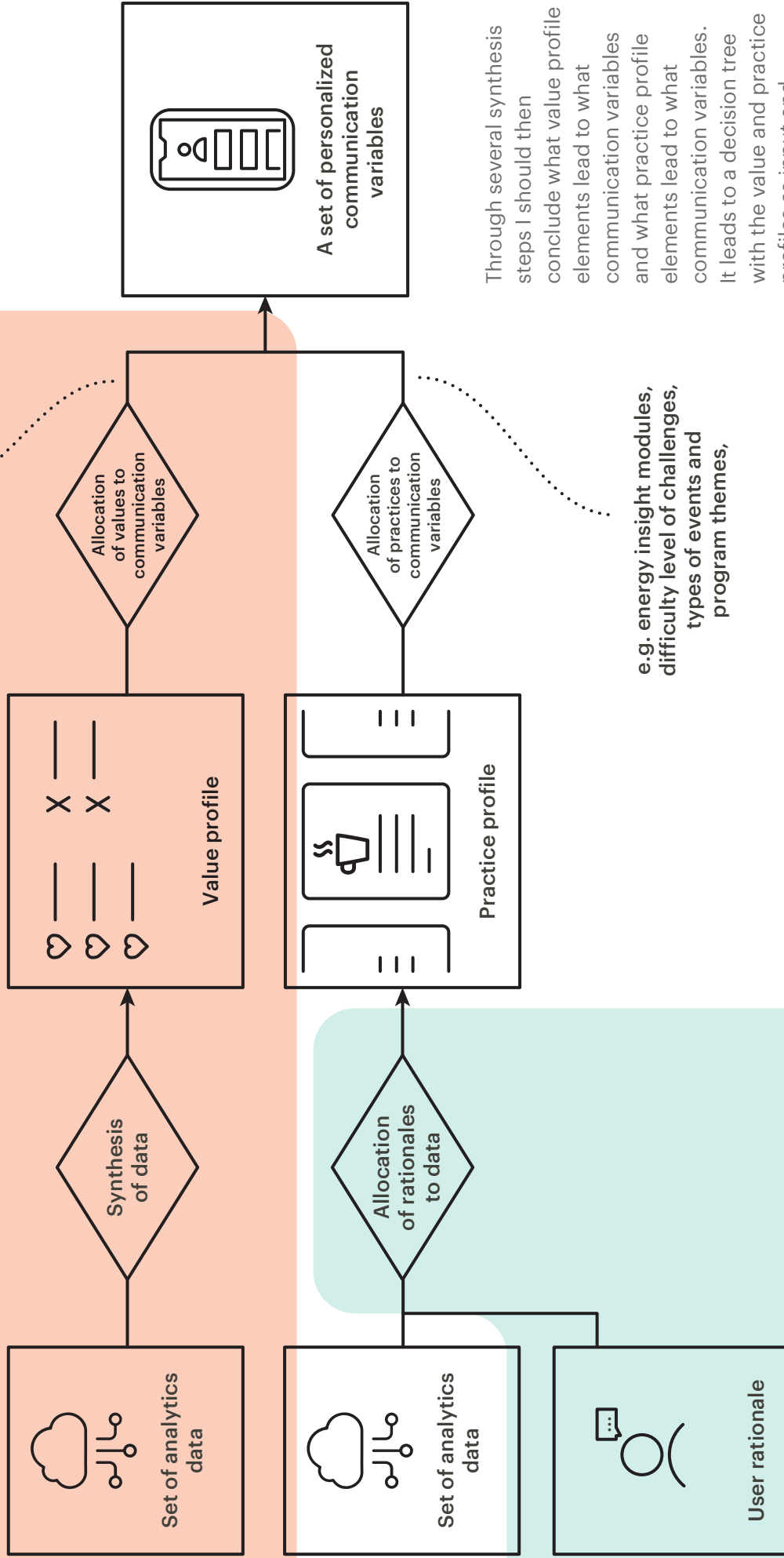
It represents a personalization process, leading to a personalized user interface. Input data is processed into either a value profile (housing a user's character traits for example) and a practice profile (including the main energy practices that the user is engaged in).

The goal for the design process was identify (1) what value profile elements

lead to what communication variables and (2) what practice profile elements lead to what communication variables. This would have led to a decision tree with the value and practice profiles as input and communication variables as output.

Throughout the project it became clear that measuring someone's energy practices is difficult to do. And without that knowledge it's difficult to design a personalization process based on 'practice profiles'.

e.g. language, tone-of-voice, units, choice of communities



Through several synthesis steps I should then conclude what value profile elements lead to what communication variables and what practice profile elements lead to what communication variables. It leads to a decision tree with the value and practice profiles as input and communication variables as output. The role and position of the decision tree in the system is illustrated below.

e.g. energy insight modules, difficulty level of challenges, types of events and program themes,

Parts of the system that I could develop in this project

11. Interview with Lenneke Kuijer

The goals of this interview are:

- 1) *To validate and supplement my current understanding of practice theory*
- 2) *To explore the application of practice theory towards personalized communication, for example by discussing existing applications of it, opportunities Kuijer sees or limitations she expects I'll find*
- 3) *Collect feedback on the practice sensitization plan*

Interview agenda

o Introduction to project

- **Personalization of a PEMS**
- **Static value profiles & dynamic practice profiles**

als je practice theory gebruikt zou je er dus eigenlijk voor moeten kiezen om ook values onder practices te scharen. Ook gebruik van 'u' en 'je' kan je daaronder scharen.

Van een waardenprofiel probeer ik altijd een beetje weg te blijven.

Show scheme

[we laten value profile buiten beschouwing]

"In ieder geval goed dat je de gebruiker meeneemt in het mappen van de practice"

Als ik het goed begrijp is **het doel van practice profiles om informatie aan te bieden die past bij wat je aan het doen bent [of hebt gedaan]**, lijkt me een goed idee. (...) Als je **die info** wilt **aanpassen aan de persoonlijkheid van diegene** snap ik wel, maar hoe je dat doet. Dat zou iemand dan zelf moeten invullen (...) ja ik snap nu wel wat je daarmee wilt bereiken.

o Exploring application of practice theory on personalized communication

- **Ben je bekend met het gebruik van POD in personalisatie van communicatie?**

Nee, niet dat ik zo kan bedenken. Ik heb ook niet veel projecten gedaan met communicatie

- **Welke elementen of links van practices zouden denk je geschikt zijn voor het personaliseren van communicatie?**

Waar volgens mij de moeilijkheid in zit: hoe goed je als computer zijnde kan weten wat er aan de hand is, wat er gebeurt. Je smartphone moet dus in huis altijd bij je zijn en die telefoon moet data kunnen verzamelen die je nodig hebt. En

het tweede probleem ligt bij een soort information overload. Want je stoort de gebruiker dan continue met berichten over hoe het anders zou kunnen.

Ik zou om te beginnen zeggen: richt je op een aantal voorbeelden, bijvoorbeeld de was doen. Hoe meet je dat iemand de was aan het doen is. Dan moet je sensoren op de wasmand en de wasmachine hebben. (...) Het zou mooi zijn als je het kunt doen, want het zou een goede oplossing voor de information overload kunnen bieden. Maar of het haalbaar is weet ik niet.

[laten we wassen eens als voorbeeld nemen. Als je alle sensoren zou kunnen wassen, welke data zou er dan verzameld moeten worden?]

Iemand doet dan een 60° was, en dan moet het systeem direct voorstellen om een 30° was te draaien. Maar dat weet je misschien al lang... Ja je moet dan wel heel veel data verzamelen en sensoren installeren.

Nog een uitdaging. Gebruikers worden natuurlijk wel gezien als carriers van practices. Maar hoe maak je zo'n profiel. Trouwens, je kunt een profiel maken over wat voor een waser iemand is. Alison Browne (University of Manchester) heeft een interessant paper over het [opstellen van practice profiles voor douchen](#).

Als je practice profiles wilt maken, is het heel erg belangrijk om te weten wat je *kunt* meten.

[Dus als ik het goed begrijp zijn practices heel erg complex omdat ze heel erg veel data bevatten. Het leven zit namelijk vol met uitzonderingen. Vandaar het ontwerpen van een systeem dat practice profiles maakt erg onhaalbaar lijkt. Maar het vragen om kwalitatieve duiding van data door de gebruiker, daar zie je meer heil in.]

Mensen zijn veel beter in het duiden van informatie dan computers. Dus dat gedeelte van het systeem is wel belangrijk. Het systeem wat je ontwerpt leert data te interpreteren. Bij bepaalde informatie denkt het systeem dat je de was aan het doen bent. Maar ben je dat daadwerkelijk aan het doen? En hoe kun je als gebruiker zeggen dat je uiteindelijk iets anders aan het doen is? Hoe kun je de medewerking van mensen krijgen in het bereiken van je doel? Hoe krijg je ze zo ver dat ze je vertellen wat ze daadwerkelijk aan het doen zijn?

o Discussing the sensitization plan

- Heb ik de practice op deze manier relevant gedefinieerd?

Je bent altijd heel vrij en flexibel in het definiëren van de practice. Maar wat belangrijk is, is dat de definitie ervan past bij het doel wat je wilt bereiken. 'Wat drinken op een doordeweekse avond' lijkt niet direct heel relevant voor een energieleverancier. Douchen zou even concreet en contained zijn. En het wel relevant voor de energieleverancier, omdat douchen een relatief grote

energieconsumptie met zich mee brengt. En het is al in het onderzoek van Alison Leigh Browne behandeld.

- **Zijn de methodes voldoende dekkend? Zou je er iets aan toe willen voegen? Of juist weghalen?**

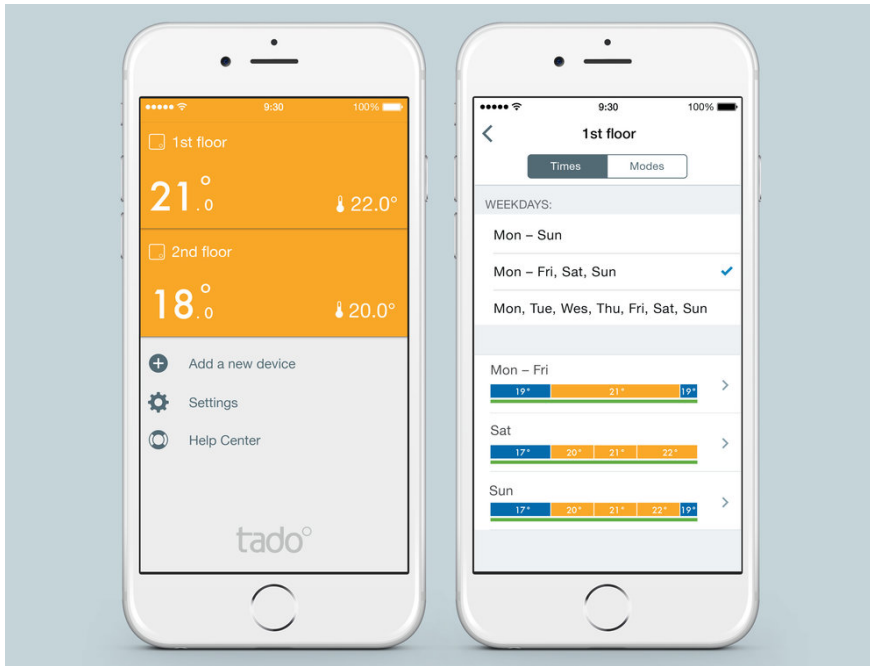
Ja

Gedachten n.a.v. het interview:

- o Lenneke is het vanuit de theorie eigenlijk niet eens met het voorstel om values los van practices te zien. Desondanks begrijpt ze wel dat een concept als practice profiles zou kunnen helpen om gebruikers informatie aan te bieden die past bij wat diegene werkelijk aan het doen is of gedaan heeft. En bevestigt ze dat een concept als een value profile zou kunnen helpen om die informatie af te stemmen op de persoonlijkheid van de gebruiker.
- o Lenneke ziet practices in hun volle complexiteit. Proberen om practices in hun volle complexiteit te meten om er een profiel van op te kunnen stellen lijkt nuttig, maar veel te complex. Nuttig omdat het een zeer rijke vorm van personalisatie op zou leveren. Veel te complex omdat er voor een volledig inzicht in een practice zo ontzettend veel data (en dus sensoren) nodig zou zijn.
- o Een bestaand onderzoek dat practice profiles opstelt is het onderzoek van Alison Brown. Dat zou me kunnen helpen om een inzicht te krijgen in de complexiteit van practices.
- o Het concept om app analytics data te voorzien van kwalitatieve duidingen van gebruikers vindt Lenneke waardevol. Toepassingen die zij zich voorstelt lijken erg concreet, bijvoorbeeld dat de gebruiker bevestigt of het systeem correct of incorrecte conclusies trekt over wat je aan het doen bent, of wat je gedaan hebt. Mijn visie erbij is echter abstracter: dat je betekenis, ervaring, emoties en gevoel kan toevoegen aan app data. De toepassing die Lenneke ziet is concreet. Die van mij niet. Welke kwalitatieve duidingen waar nuttig voor zouden kunnen zijn en hoe ik die duidingen kan verzamelen zal ik dus snel moeten concretiseren om de waarde er van in te kunnen schatten.

12. Benchmarking HEMS functionality and personalization

Tado°

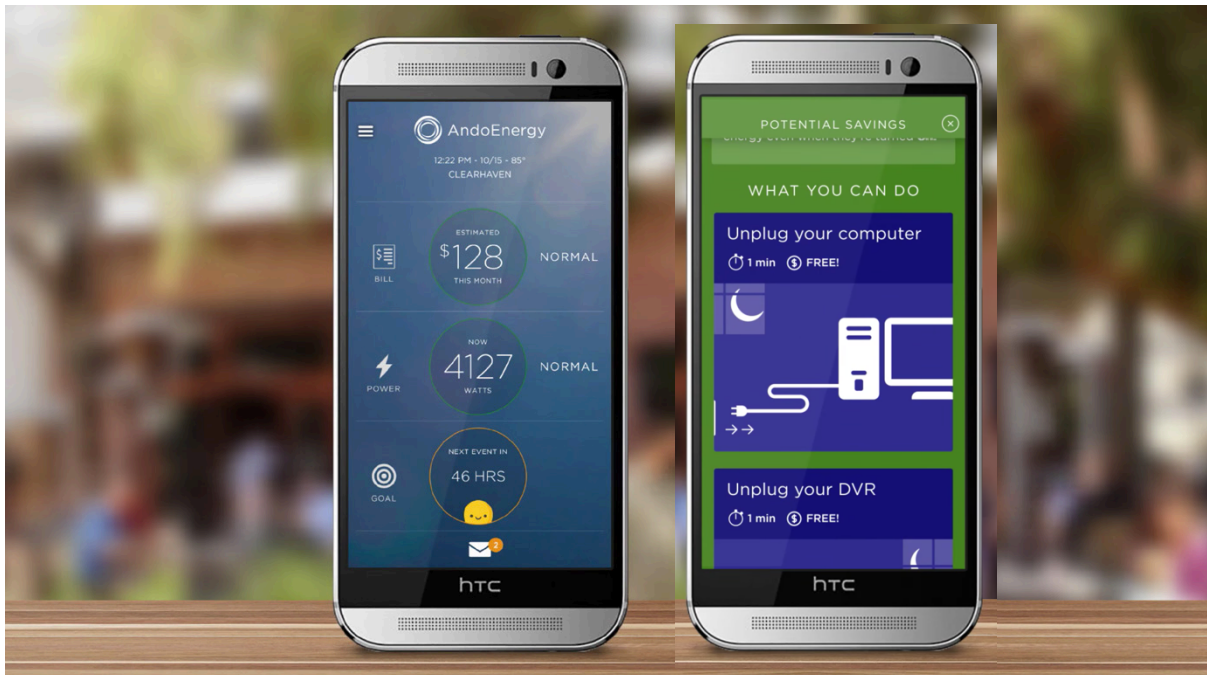


(Image source:

<https://static1.squarespace.com/static/55fadf26e4b0ce5a554dcbef/t/58510612579fb36236a13a73/1481705006226/Tado-Thermostat-App-Scheduling.jpg>)

- **It is:** a smart thermostat and smart radiator valves, that come together with an app
- **Intended for:** households
- **Energy management principle:** It heats your home by learning about the thermal characteristics of it, based on local weather forecasts and based on a user-defined schedule. That way it saves energy. No additional saving tips or behavioural advice.
- **Energy types:** gas/electricity for heating
- **Interaction with user:** app and thermostat. App and periodic reports provide insight in energy usage and savings
- **Personalization features:**
 - Personal heating data
 - Geofencing
 - No display personalization
- **Extra features:**
 - Allows definition of different sections within the house
 - Allows integration with Apple Homekit, Google Home and Alexa

Bidgely

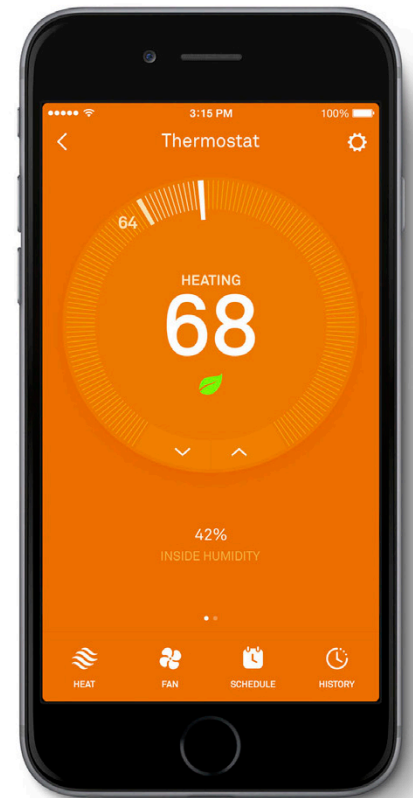


Bidgely's 'HomeBeat' app's dashboard (image source: <https://www.youtube.com/watch?v=uPH1jUDG6NQ>)

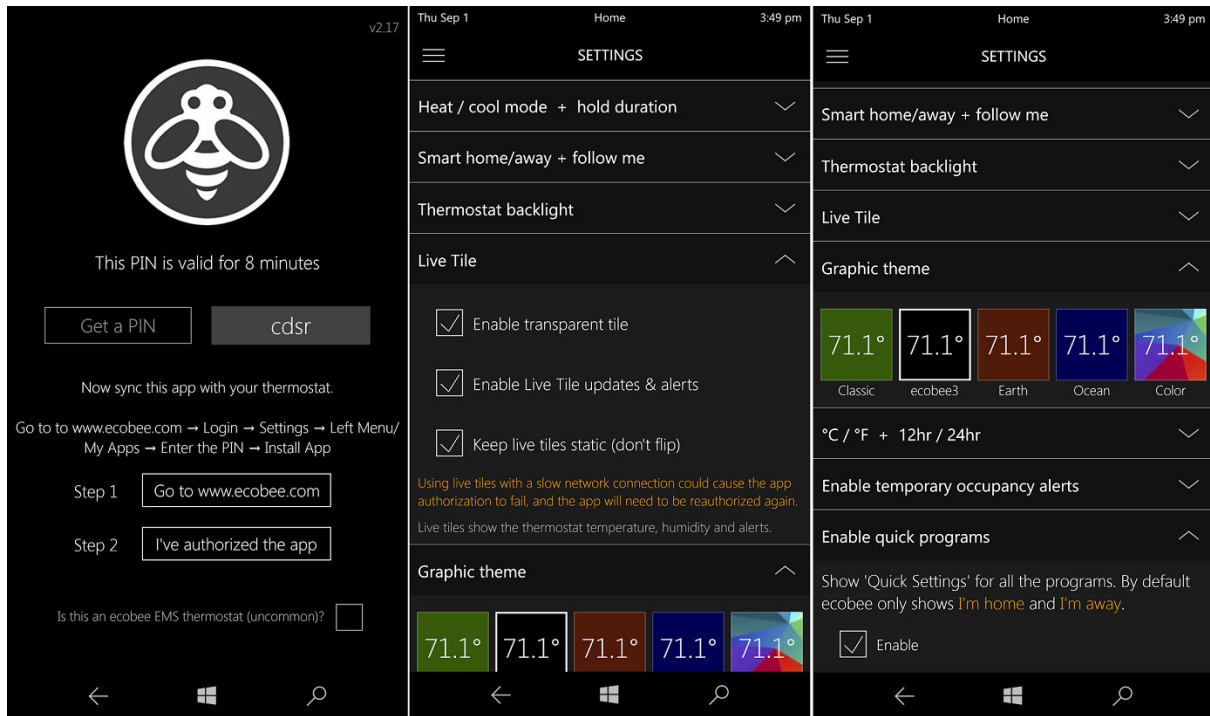
- **It is:** a household energy disaggregation service to create extra customer engagement for utility companies
- **Intended for:** utilities (and support them to engaging households)
- **Energy management principle:** Itemized energy usage insights (from algorithms deriving major appliance energy fingerprints from smart meter readings) and providing matching saving tips (from a recommendation engine)
- **Energy types:** electricity
- **Interaction with user:** through the 'HomeBeat' app (having a billing prognosis, a live usage and a challenges section), sms alerts and email reports
- **Personalization features:**
 - Personal data, such as
 - Personal consumption data
 - Similar households
 - Personal neighbour comparison
 - No display personalization
- **Partners:** Utility companies Eon and Innogy
- **Extra features:**

Nest

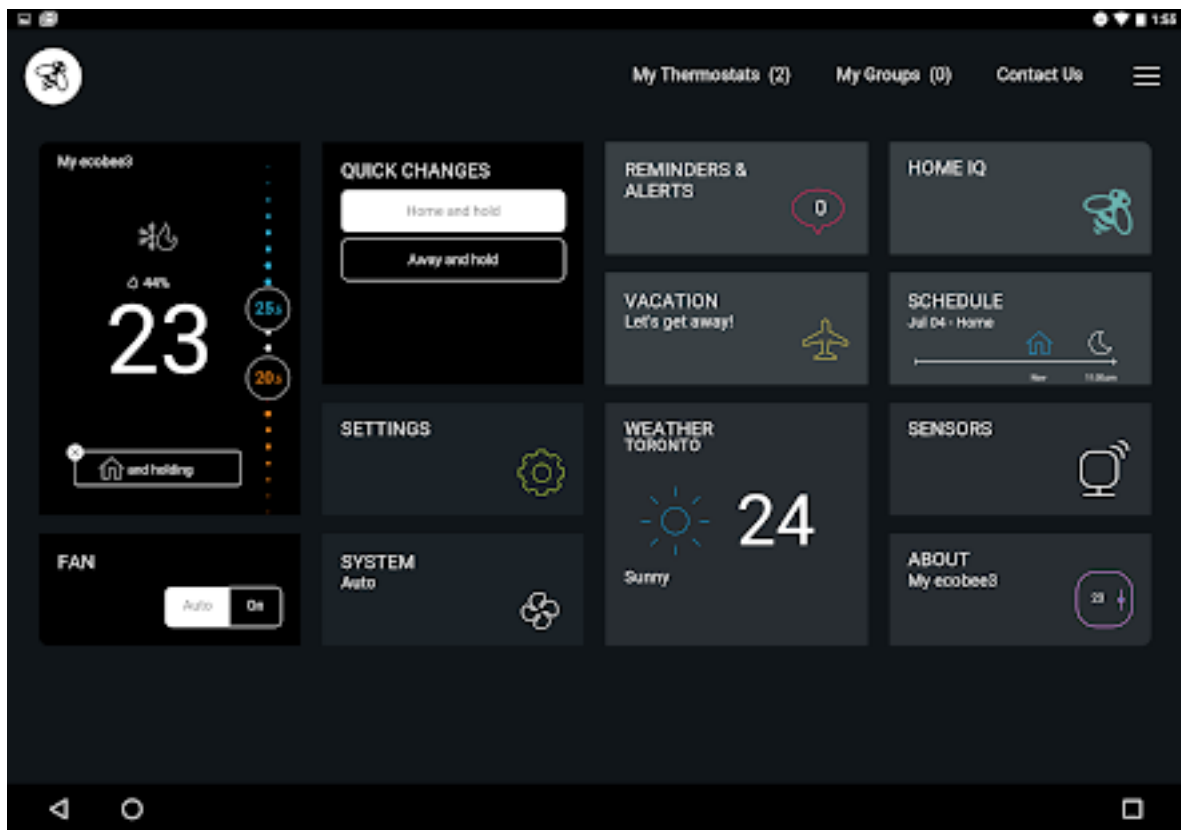
- **It is:** a smart thermostat and app (as part of a family of other home automation appliances)
- **Intended for:** households
- **Energy management principle:** a thermostat and app that self-learn your desired heating schedule and temperatures. It takes local weather history into account for explaining relatively high usage. It awards 'leaves' to eco-friendly heating behaviour and compares these to other months and other nest users. Only gives advice on away temperatures.
- **Energy types:** gas/electricity for heating
- **Interaction with user:** through the thermostat, app (which offers a heat, a schedule and a history section) and monthly email reports
(<https://nest.com/blog/2012/12/07/meet-your-new-energy-report/>)
- **Personalization:**
 - Personal data, such as
 - Personal consumption data
 - Similar households
 - Personal neighbour comparison
 - Personal energy saving score (in the form of 'leaves')
 - Geofencing
 - No display personalization
- **Partners:** owned by Google
- **Comments:**
 - It tries to create a sense of Nest-community by referring to the total amount of energy saved by Nest users



Ecobee



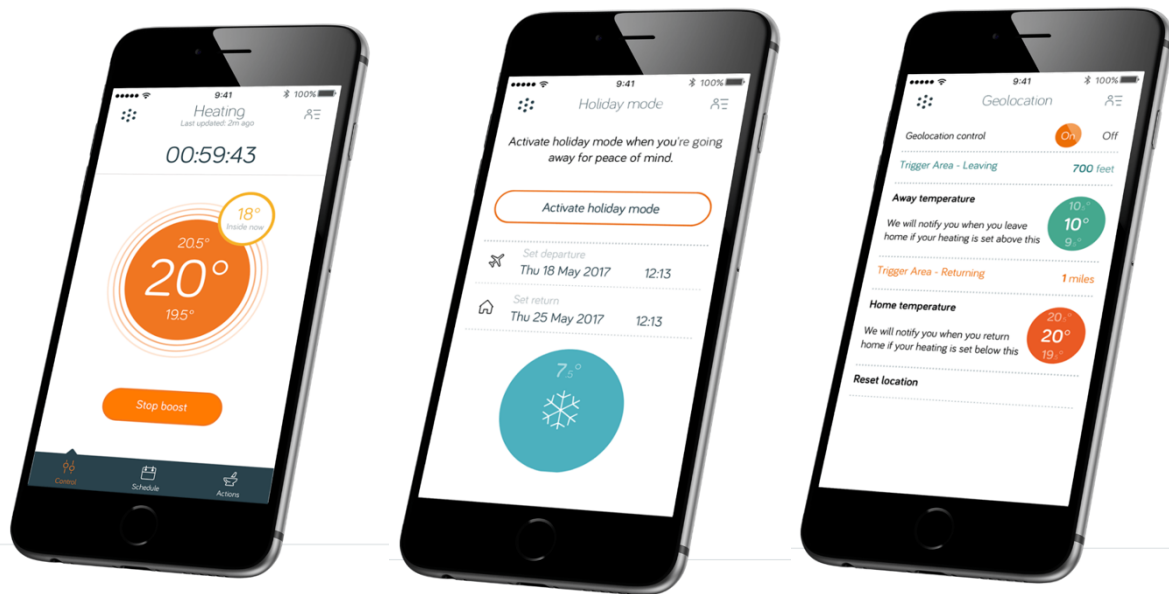
(image source: <https://www.windowscentral.com/ecobee3-review-windows-10>)



(image source: https://lh3.googleusercontent.com/IW1HP55aKk4k4DjeQ-vOni_5LywMwhAk6AD43jDFpzLBCsm8hn9XBtj7XT4aCYuoaPY=w720-h310)

- **It is:** a smart thermostat with room sensor(s) and an app (is to become part of a larger connected home appliance family, e.g. smart light switch)
- **Intended for:** households
- **Energy management principle:** a thermostat and app that self-learn your desired heating schedule and temperature and make sure there's exactly the temperature you want by making use of room sensors. Energy saving is done through technology. No saving tips are provided.
- **Energy types:** gas/electricity for heating
- **Interaction with user:** through the Amazon Alexa controlled thermostat or the app providing weather data [why?], temperature settings and schedule settings.
- **Personalization:**
 - Personal data, such as
 - Personal consumption data
 - Similar households
 - UI graphic theme customization
 - Geofencing
 - No display personalization
- **Partners:** investment done by Amazon
- **Comments:**
 - The thermostat is as well a carrier of all Amazon Alexa services

Hive



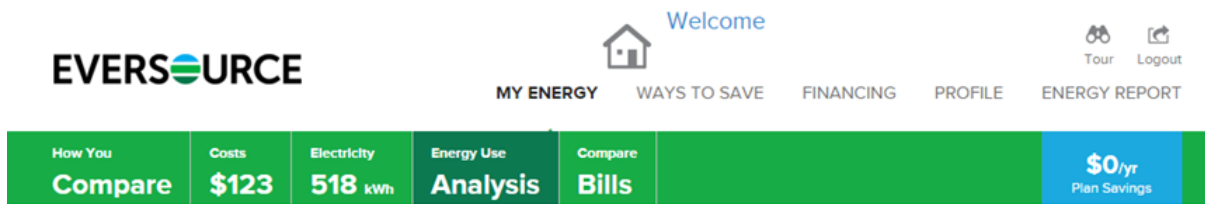
(image source: <https://www.hivehome.com/hive-app>)

- **It is:** a wireless thermostat and app (as part of a larger home automation appliance family) (plus a receiver wired into the user's boiler)
- **Intended for:** households
- **Energy management principle:** a thermostat and app for remote controlling heating.
- **Energy types:** gas/electricity for heating
- **Interaction with user:** through the thermostat or app (featuring a heating and a scheduling section)
- **Personalization:**
 - Personal heating data
 - Heating history
 - Costs
 - Geofencing
 - No display personalization
- **Partners:** owned by British Gas
- **Comments:**
 - Proposition of Hive seems strongly focused on creating a connected home with full ease-of-use, rather than saving energy through a smart HEMS. Wikipedia mentions that AlertMe was using non-intrusive load monitoring to explore customer data and provide energy saving recommendations based on it. But the Hive product doesn't show any of that.

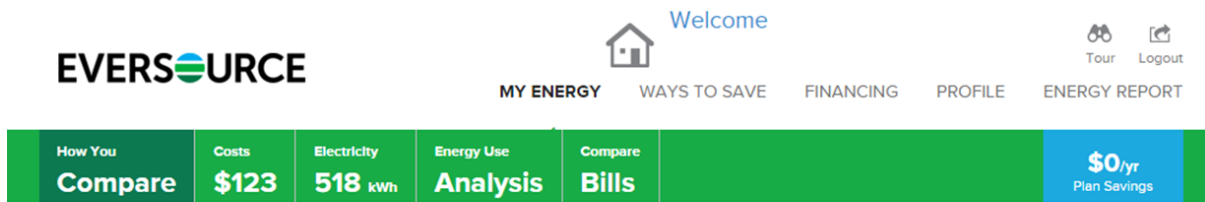
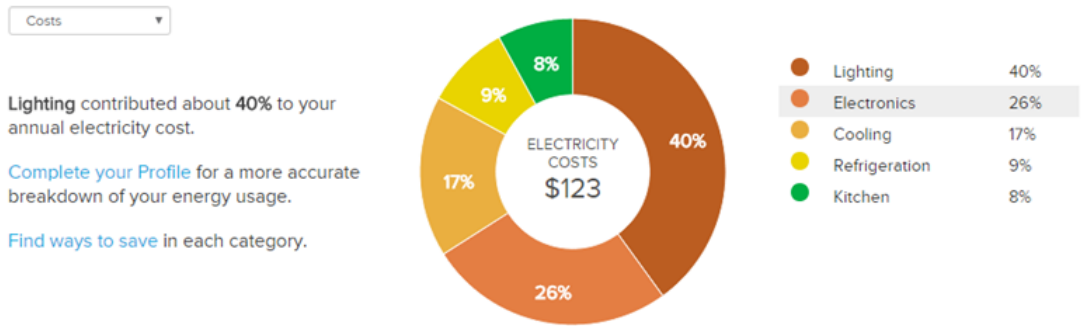
OPower

The following images show the consumer energy dashboard of Eversource, an American utility company that is client of Opower. The dashboard is hosted by Opower but Eversource branded. (<https://www.oracle.com/industries/utilities/products/opower-energy-efficiency-cloud-service/index.html>)

(images source: http://www.greenovateboston.org/eversource_energy_dashboard)



MY ESTIMATED ANNUAL ELECTRICITY COSTS BY CATEGORY



COMPARED TO SIMILAR HOMES

You could save up to \$2 on electricity by becoming more efficient.



ACHIEVE YOUR ENERGY GOALS

You could save on energy by taking one of the following actions:

- [Replace Your Torchiere](#)
- [Upgrade to Efficient Lighting](#)
- [Purchase an Advanced Power Strip](#)

For additional custom recommendations, update your profile.

[Download My Data](#)

Your electricity cost is compared to similar homes in your area. A house is considered efficient if it is more efficient than at least 75% of similar homes in your area.

Estimates are based on similar homes in your area.




TELL US ABOUT YOUR HOME

Your profile is **100%** complete

[View your home profile](#)

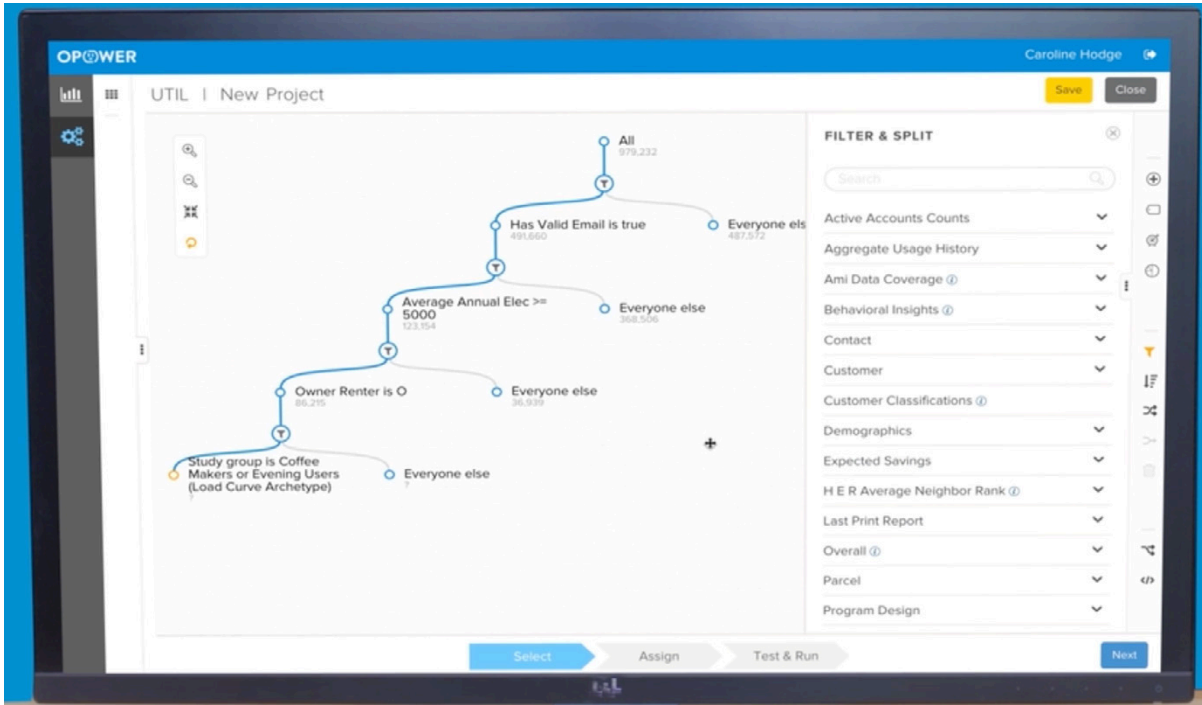
CREATE AN ENERGY PLAN

Select energy saving actions below to add to your energy savings plan.

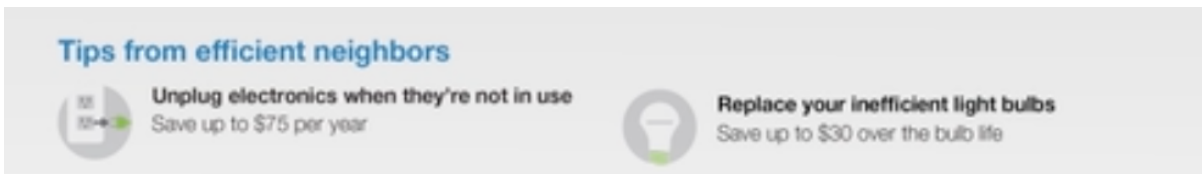
All Categories	Cost	Savings	Payback Period	Status
 Replace Your Torchiere »	\$10 Rebate: \$10.00	\$20/yr	Immediate	<input type="radio"/> Add to plan <input type="radio"/> Already Complete <input type="radio"/> Not Applicable
 Purchase an Advanced Power Strip » View Case Studies	\$5	\$15/yr	4 months	<input type="radio"/> Add to plan <input type="radio"/> Already Complete <input type="radio"/> Not Applicable
 Upgrade to Efficient Lighting » View Case Studies	\$2	\$9/yr	3 months	<input type="radio"/> Add to plan <input type="radio"/> Already Complete <input type="radio"/> Not Applicable

- **It is:** energy saving service for supporting utilities in engaging their customers (for the sake of demand side management (DSM))
- **Intended for:** utility companies (and support them to engaging households and small business)
- **Energy management principle:** offers consumers insight in their energy consumption, forecasts the effect of behaviour changes on the energy bill, uses algorithms to determine the effectiveness of certain, offers clear and effective back-end tools for utility companies to target specific customer segments.
- **Energy types:** electrical energy and gas
- **Interaction with user:** via app and email
- **Personalization:**
 - Personal energy consumption data
 - Usage and history
 - Comparison with (efficient) neighbours
 - Targeted energy saving challenges and demand response management (DRM) based on user segments (containing 100+ variables)
 - No display personalization
- **Partners:** owned by Oracle
- **Comments:**
 - Allows utility companies to adopt their branding onto the platform (such as with Eversource: https://www.youtube.com/watch?time_continue=1&v=qDWs0oOLU6U)
 - Active application of persuasive design to engage customers (<http://uxpamagazine.org/ask-less-get-more/>)
 - It offers 3rd-party partnerships by offering direct links to (Energy Star) appliance sales pages

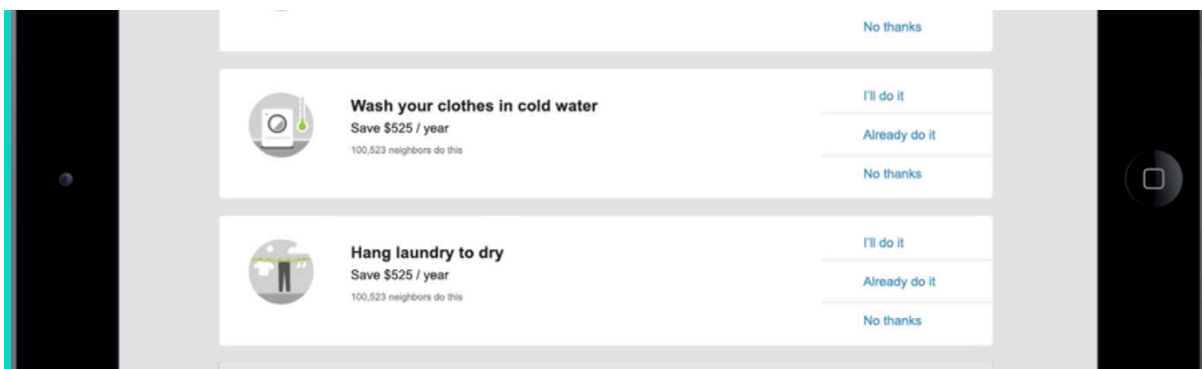
- Text-based explanations for all OPower service features can be downloaded in separate PDF's via this page:
https://docs.oracle.com/cd/E72219_01/documentation.html
- o OPower back-end system allows visual segmentation:



- o In the monthly energy reports OPower offers consumers a comparison with two types of neighbours (average and efficient)
- o OPower's consumer energy reports offer recommended saving actions which they say are 'tips' from neighbours.



- o OPower's challenges are also shown together with the number of neighbours that took up that challenge as well.

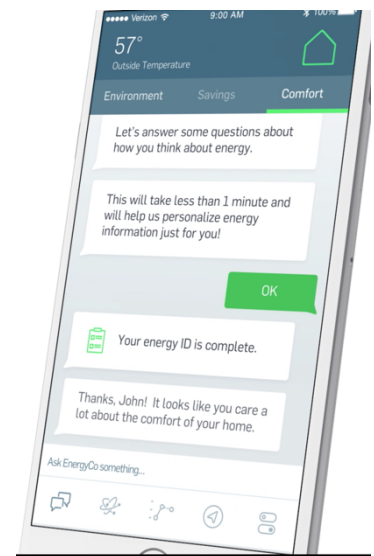
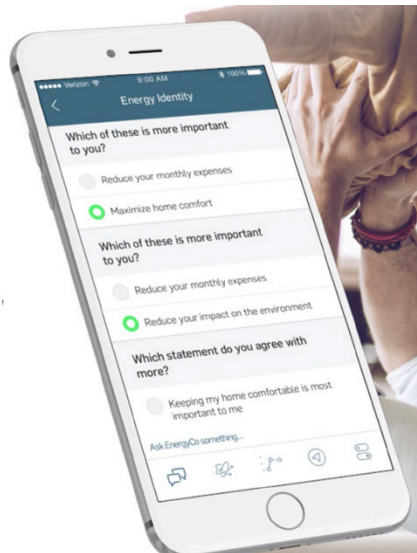


Tendril

- **It is:** an app (Tendril MyHome) as part of a larger set of DSM software
- **Intended for:** utility companies (and support them to engaging households and small business)
- **Energy management principle:** Users manually enter characteristics about their house and enter priorities regarding energy and living. The app offers insight in household energy usage insight and can break it down into different parts [unclear how].
- **Energy types:** electrical energy and gas
- **Interaction with user:** through email, notifications and an app.
- **Personalization type:** practice- & value-based personalization
- **Partners:** ~\$150m investments from Siemens and General Electric
- **Comments:**
 - The app features a chatbot ->
 - The service aims to define a so called 'energy identity' for each customer (i.e. household):

Energy Identity

Understand the people in the home, their unique preferences and what motivates them to act



(image source: <https://www.tendrilinc.com/solutions/solutions-for-utilities-and-retailers/my-home>)

The 'Energy ID' is used to present "optimizes recommendations, tracks their savings and shares information that could determine future settings"

(<https://www.tendrilinc.com/resources/press-release/tendril-orchestrated-energy-redefines-demand-response>)

- Offers demand-peak balancing services to utility companies by actively taking over HVAC behaviour for example (through the 'orchestrated energy' program)
- It states that it enables 'customer communities'
- It offers 3rd-party partnerships by offering direct links to (Energy Star) appliance sales pages

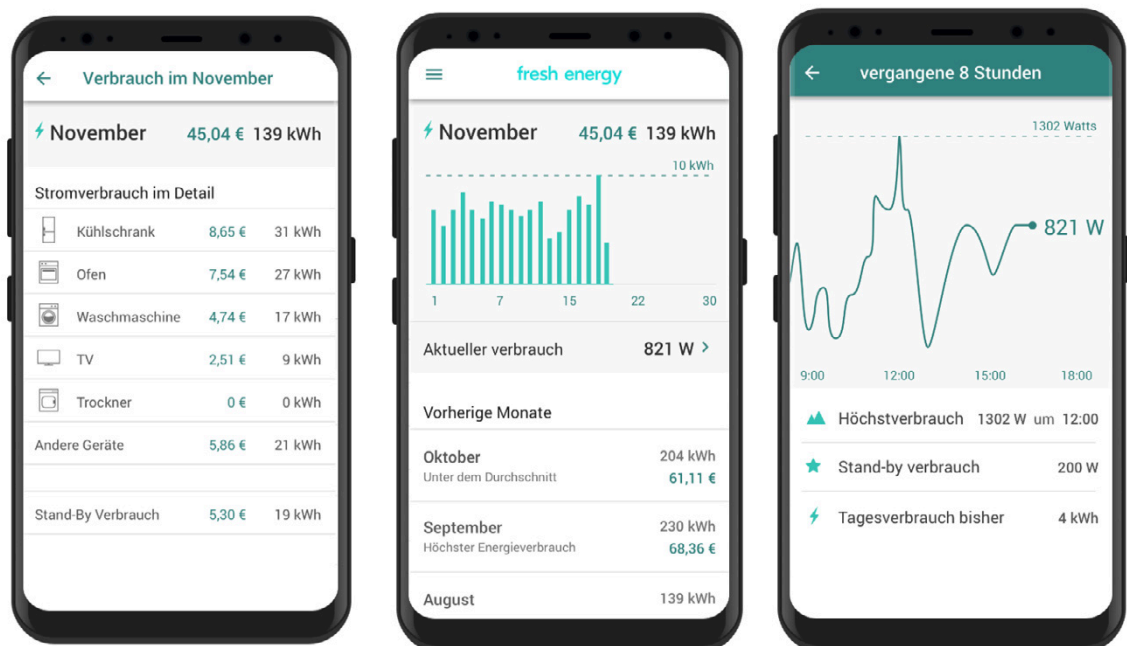
Rockethome

<http://www.rockethome.de/en/solutions>

Principle: supporting utilities in serving customers

USP: approaching energy management from a IoT perspective.

Fresh Energy (+ Discovergy Smart Meter)



(image source: <https://www.getfresh.energy/>)

Principle: becoming a utility itself

Personalization:

USP: allowing exact monthly payments

GreenHome

<https://greenhome.nl/energie-besparen>

Principle: providing integrated eco-renovation consultancy to individual households as well as municipalities.

USP: can have fundamental impact through fundamental solutions.

Greenpocket (for residential customers)



(image source: https://www.youtube.com/watch?time_continue=17&v=7AXb6nFBFQE)

<http://www.greenpocket.de/en/products/residential-customers/>

Principle: supporting utilities in serving customers

Personalization:

- o Personal data
 - Personal usage
 - Comparison with neighbours

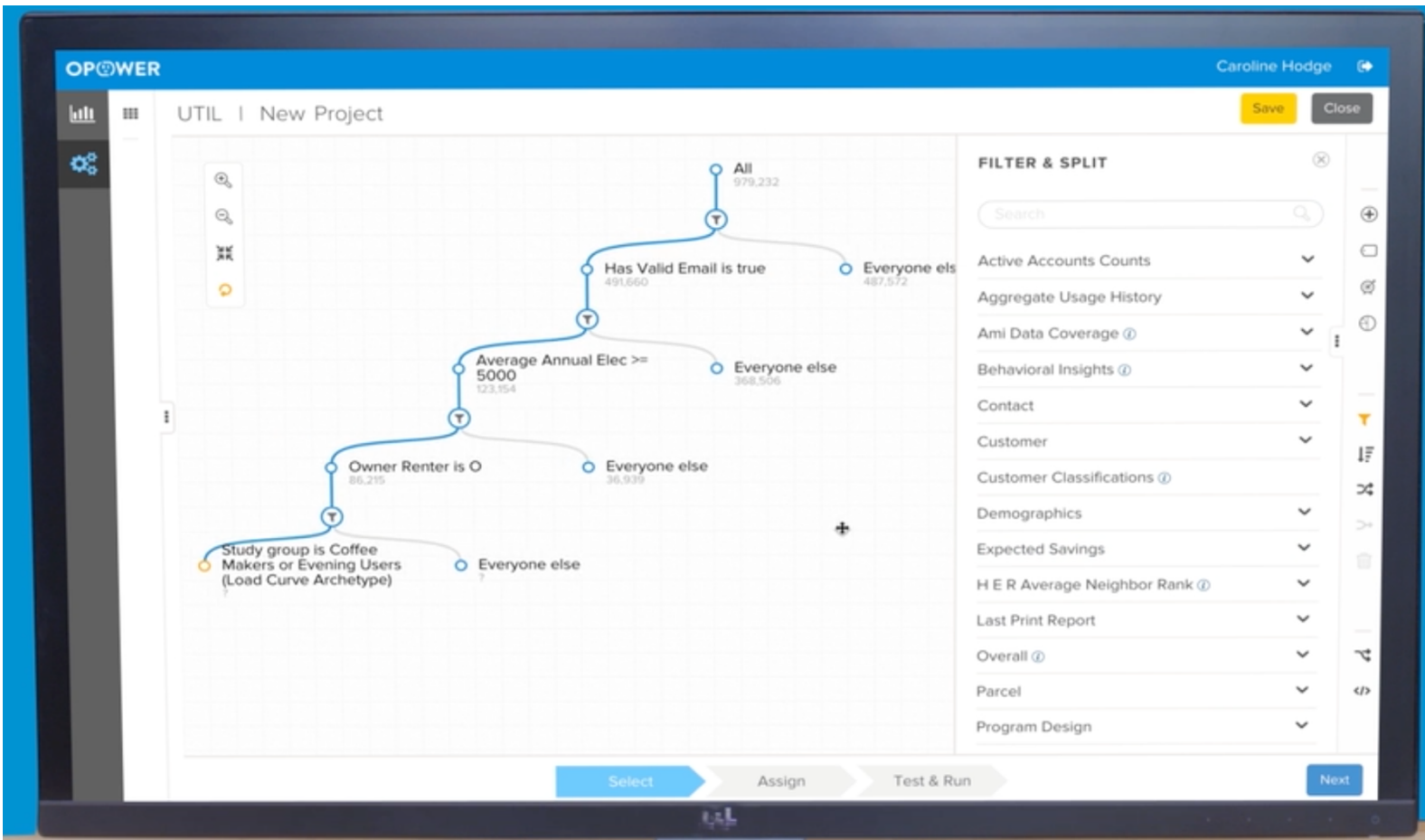
USP: offer 'social metering', a tool for the formation of communities and allowing users to share their energy achievements through social media.

13. Chapter 'Design Goal' from the Analysis Report

To introduce the design goal, this section starts with my considerations on what knowledge already exists and where I see a knowledge gap.

Theoretically the static-dynamic value-practice separation seems interesting and new. But if you look closer, you could say the concept is already widely used in practice. Companies such as Nuon for example build personas for picturing values and utilize live meter data to address people's practices. Also, OPower applies segmentation based on 100 variables, including elements called 'behavioural insights' and 'customer classification' (see figure below). This seems to indicate that the company already applies both value- and practice-based segmentation. Besides, the segmentation tool seems to have a very effective design.

Yet, OPower seems to let utilities use the segmentation tool mostly for the organisation of 'behavioural demand response' (BDR) events, these events focus on realization of peak-load shaving for example. It does not seem to be used for general app content.



A screenshot from an Oracle OPower demonstration video showing the back-end communication management interface for pushing an email to a certain customer segment (retrieved from <https://www.oracle.com/industries/utilities/products/opower-energy-efficiency-cloud-service/index.html>)

Adding knowledge

The segmentation tool of OPower does not seem to be used for personalizing tone of voice, choice of units, and other personalizable in-app communication variables. This raises three subsequent questions:

- 1) What are the different personalized communication variables that matter to users?
- 2) What should the value profile and the practice profile then look like?
- 3) What should the system generally look like that translates the user's value and practice profiles into a choice of a set of variables?

The three questions could be answered by using the following **design goal**:

The goal is to design a system that allows the EMS to approach each user through a personalized set of communication variables that is based on his/her value and practice profile.

And the design goal leads to setting the following **deliverables**:

- o An overview of communication variables that matter to EMS users
- o The design of the value profile and practice profile
- o A general outline of the system that translates the profiles into a user-specific set of communication variables
- o Evaluation results of this system

The design process will start with building value and practice profiles. A method for building V&P profiles in different context might be interesting to Mobgen. Yet, this project will not explicitly discuss that framework. Yet, the approach that will be used and reflection on it might offer implicit insights how to develop V&P profiles in other contexts.

Approach

The suggested approach for realization of the deliverables consists of five parts. At the moment of writing I realize that it might be too substantial to all be done in one graduation assignment. I'm looking forward to go into discussion about it in order to further prioritize.

1. Preliminary V&P profile development

To develop a first idea of what value profiles should look like I should draft some first profiles based on the existing EMS persona's. This is aimed at drawing the necessary components of a value profile.

Also, I should list a selection of EMS practices. To develop an idea of the necessary elements of a practice profile I'll then interview and observe four diverse friends and family members and develop a quick-and-dirty practice profile for them.

Lastly, a list should accompany both profile sketches that lists possible data points that could feed these profiles in the actual app.

2. 2035-EMS scenario development

I need clear and experiential stories to make the future of EMS live among participants in the design process. Together with a focus group (creative, open-minded, available for a full afternoon) develop a set of production, consumption and sharing scenarios for 2035.

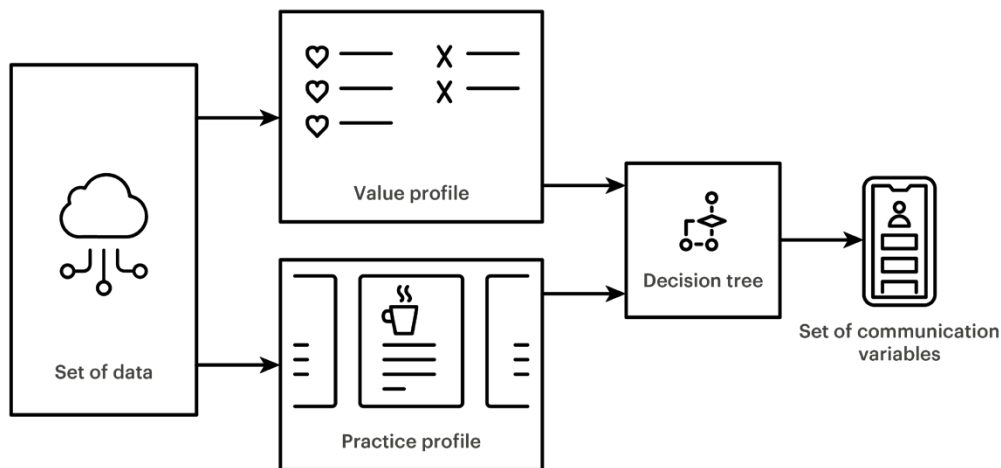
After the focus group session, I turn the scenarios into sketches or photoshops, possibly tailored to the current context of the participants of the next focus group.

3. Communication variables prioritization

Then I need a group of people with more experience to energy practices to evaluate what matters in communication to them. So together with another focus group (part Lombok/Vogelwijk) determine the communication variables that would matter in those scenarios for 2035. It is necessary to also record each of the participants' value-profiles, because this has an influence on the communication variable prioritization.

4. Decision tree development

Through several synthesis steps I should then conclude what value profile elements lead to what communication variables and what practice profile elements lead to what communication variables. It leads to a decision tree with the value and practice profiles as input and communication variables as output. The role and position of the decision tree in the system is illustrated below.



An illustration describing the system that is to be designed

From this step forward more should become clear about the relationship between value and practice profiles, because they will most probably be interrelated. Currently, I am unsure how practice profiles will lead to a preference for communication variables. A clearer vision on this part of the decision tree should emerge throughout the design process. Finally, I should choose an effective medium for creating a communicating the decision tree.

5. Decision tree evaluation

Lastly, the profiles-to-communication decision tree should be evaluated. The design of the personalized communication system could raise the following questions:

- o Does the system correctly assign value and practice profile to users?
- o Does the decision tree match the right communication variable sets to the right V&P profiles?
- o What is the effect of the V&P-profile-based communication variable sets on the personalized service experience?

Because of the limited available time for this project, this evaluation step will be confined to answering the last two questions in a lab-based setting. The action of assigning correct profiles to users will be done manually and for each participant individually during the evaluation procedure.

Because the precise communication variables that will play a role in the system are unknown at this point, the precise methods for this evaluation process should be chosen throughout the upcoming design process.

14. Session Preparations

For this session the objective is to find communication preference differences for EMS users

Six Mobgen colleagues will participate and the session will last for 3 hours.

During the session half of the group will represent Sarah and half of it Frank. The following pages show the session script. Also for the session an application developed by Mobgen will be used, called 'Enso'. Its an application for hosting creative sessions.

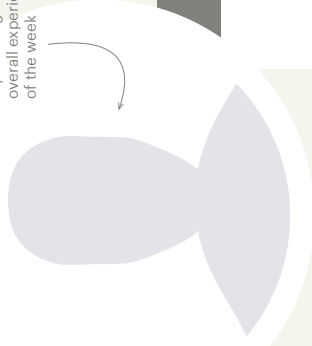
#	Time	Objective	Activity description	Triggers	Details/resources
	5	Welcome			
	10	Introductions	Meeting each other and sharing the last time that you felt really well understood.		
	10	Context introduction	Introduce participants to the track-manage-consume cycle by means of a story/user journey. Introduce participants to: problem scenario with Frank & Sarah. Then briefly introduce the Frank & Sarah archetypes		Customer journey
	15	Week in the life of	<ol style="list-style-type: none"> 1) Participants split into two groups (F & S) 2) Groups go through archetypes 3) Participants fill in the week-out-of-the-life form (see bottom appendix) 	invitations: <ul style="list-style-type: none"> o always go with team members suggestions o pretend like you know this person really well 	A3 printed archetypes (2 of each) Week-out-of-the-life form (A1)
	10	Setting a scope	<ol style="list-style-type: none"> 1) Groups present their week-out-of-the-life forms 2) Together conclude (most important differences) 3) Set goal for rest of session: to facilitate Sarah, Frank and everyone in between 		Flip overs and markers for writing down (1) differences and (2) the problem statement
	10:00 – 10:10	Break			
	5	Energizer	(blind drawing?)		

					markers + post-its post on whiteboard
10	Braindump on interface content	In subgroups F & S participants braindump any elements that should be in the tracking interface of either Frank or Sarah.	<ul style="list-style-type: none"> o Assume that all data would be accessible, what pieces of information should be available? (> consumption but also production!) o What types of information would be understandable for this user? o What visual design elements come up when thinking about this user? o What would strongly engage this user with the dashboard? And what type of language? 		
10	Clustering	Subgroups cluster their results, max 6 clusters clearly indicated			
2	Dashboard designing	Introduce Jesse James Garrett's layering	<ul style="list-style-type: none"> o 		
5	Dashboard requirements	From the braindump select: <ul style="list-style-type: none"> o 4 – 6 pieces of info that should be in the interface o 2 – 4 requirements to make sure that the information is understandable 	<ul style="list-style-type: none"> o Together vote about what elements from the braindump they individually like most 	Flip-over requirement form (add iPad screen constraint)	

		<ul style="list-style-type: none"> o 2 – 4 visual design rules that fit this character o 2 – 4 elements that would keep the user engages with the dashboard (incl. use of language) <p>List them on the flip over</p>	<ul style="list-style-type: none"> o Make it as specific as possible (e.g. 'daily total consumption' instead of 'consumption') 	
10	Dashboard ideation	Four rounds of 2 min. Pass your paper through after each round	<ul style="list-style-type: none"> o intro: use A3 screens landscape or horizontal o Round 1, mainframe design: first try to draw content cards and titles, location of visuals, and navigation aspects (using arrows outside of the ipad) o Round 2, information design o Round 3, visual design o Round 4, engagement: what will motivate this user? When would he/she like to receive updates? And about what? Always the same? Or more spontaneously? 	Markers in different colours 8 x A3 with an iPad wireframe in the middle
10	Dashboard iteration	Discuss the three screen alternatives and assemble a final design. Make a presentation drawing on a flip-over iPad		2 x flip-over iPad screen
11:05 – 11:15	Break			
10	Presentation of screens	<ol style="list-style-type: none"> 1) Both subgroups present their work 2) Audience takes notes of possible differences and similarities 3) Collectively list differences and similarities 	<ul style="list-style-type: none"> o For the selection: What difference do you think is most important to solve? 	Flip-over and markers

			4) Select six challenges to tackle (two for each duo)		
15	Design of the integral interface		<p>Let's merge the two dashboards!</p> <ol style="list-style-type: none"> 1) Split up in duo's 2) First design what both have in common 3) Then design ways to switch between what is different. 		<p>A3's for designing</p> <p>Permanent markers, sharpies and design markers</p>
10	Finalize		<p>Split up:</p> <ol style="list-style-type: none"> 1) Making one final design drawing 2) Checking: can we serve all personas with this system? <p>Persona triggers: Nuon persona's</p>		<p>Nuon persona's printed</p> <p>3 x flip-over iPad screen</p>
5	Present		Present results		

Try drawing the overall experience of the week



A week in the life of _____

	Mo	Tu	We	Th	Fr	Sa	Su
challenges							
likes							
interactions							
peaks							



SCHEDULE



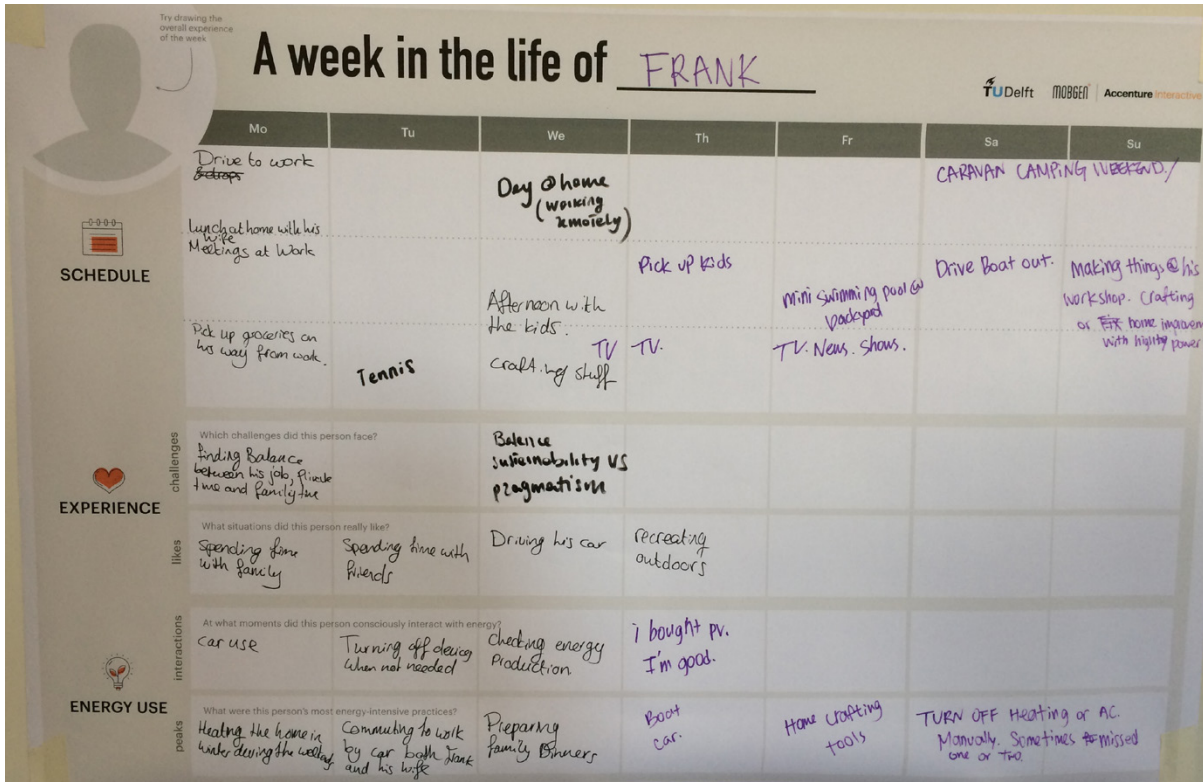
EXPERIENCE



ENERGY USE

15. Session Results

The following images give an impression of the results of the session.



SARAH

Trending Dashboard
Requirements of ...

WHAT INFO?

- Social engagement
- Travel
- Food
- Music
- Events
- Local
- News
- Sports
- Weather
- Health
- Education
- Entertainment
- Business
- Finance
- Technology
- Science
- Environment
- Culture
- History
- Art
- Fashion
- Lifestyle
- Travel
- Food
- Music
- Events
- Local
- News
- Sports
- Weather
- Health
- Education
- Entertainment
- Business
- Finance
- Technology
- Science
- Environment
- Culture
- History
- Art
- Fashion
- Lifestyle

How to Engage Users/Interact?

- Clear layout
- Mobile
- Fun

How to Structure Engagement?

- Connect to Social
- High engagement
- CRM/Analytics

Mobile App Wireframes

Similar

Different

Process

- User of the app
- App features
- App design
- App development
- App testing
- App launch
- App maintenance
- App updates
- App analytics
- App security
- App privacy
- App accessibility
- App localization
- App monetization
- App marketing
- App customer support
- App user feedback
- App user retention
- App user engagement
- App user satisfaction
- App user loyalty
- App user advocacy
- App user referrals
- App user testimonials
- App user reviews
- App user ratings
- App user comments
- App user shares
- App user likes
- App user follows
- App user subscriptions
- App user purchases
- App user donations
- App user contributions
- App user collaborations
- App user partnerships
- App user sponsorships
- App user endorsements
- App user testimonials
- App user reviews
- App user ratings
- App user comments
- App user shares
- App user likes
- App user follows
- App user subscriptions
- App user purchases
- App user donations
- App user contributions
- App user collaborations
- App user partnerships
- App user sponsorships
- App user endorsements

Staples

Mobile App Wireframes

Trending Dashboard
Requirements of ...

WHAT INFO?

- Social engagement
- Travel
- Food
- Music
- Events
- Local
- News
- Sports
- Weather
- Health
- Education
- Entertainment
- Business
- Finance
- Technology
- Science
- Environment
- Culture
- History
- Art
- Fashion
- Lifestyle

How to Engage Users/Interact?

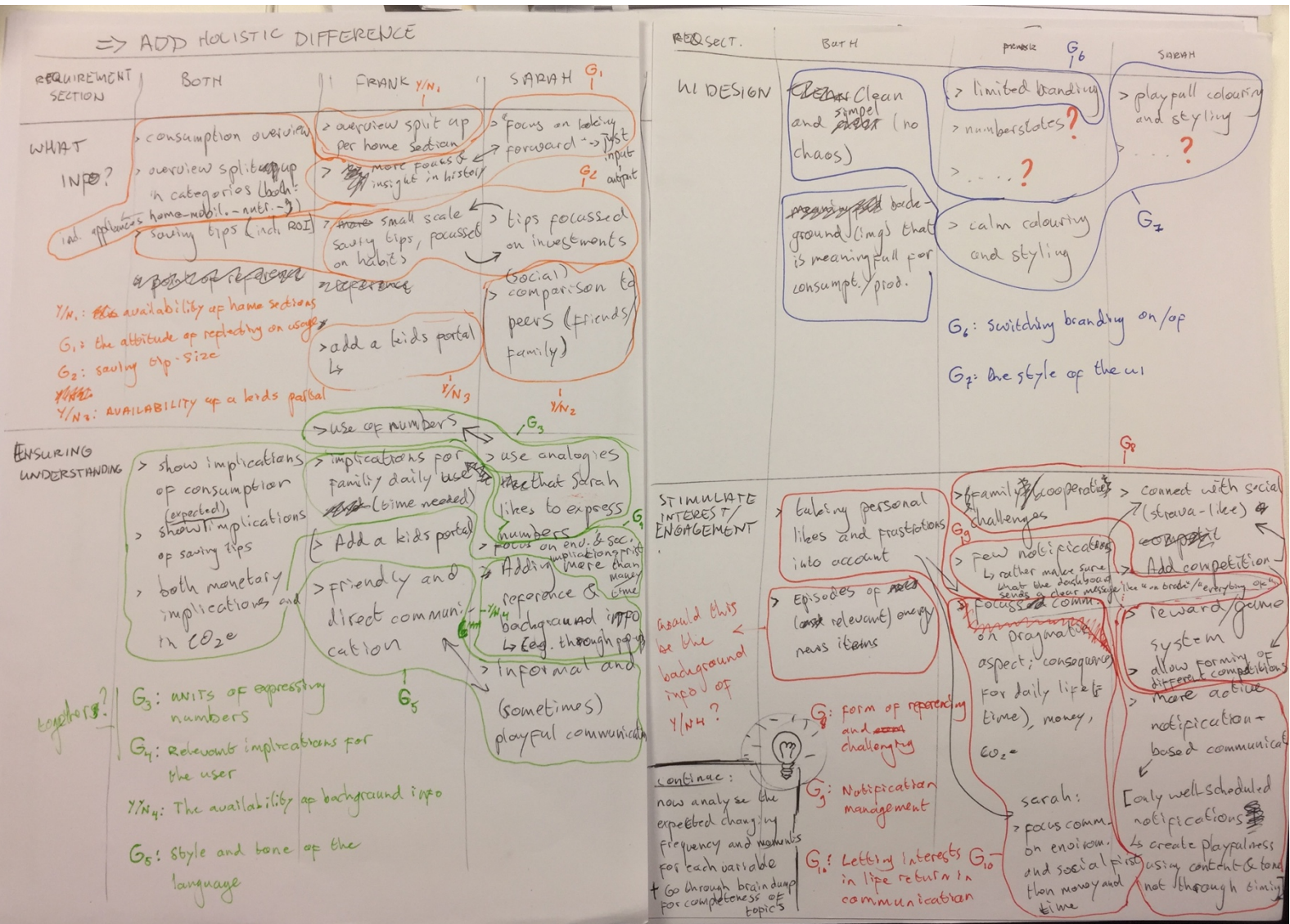
- Clear layout
- Mobile
- Fun

How to Structure Engagement?

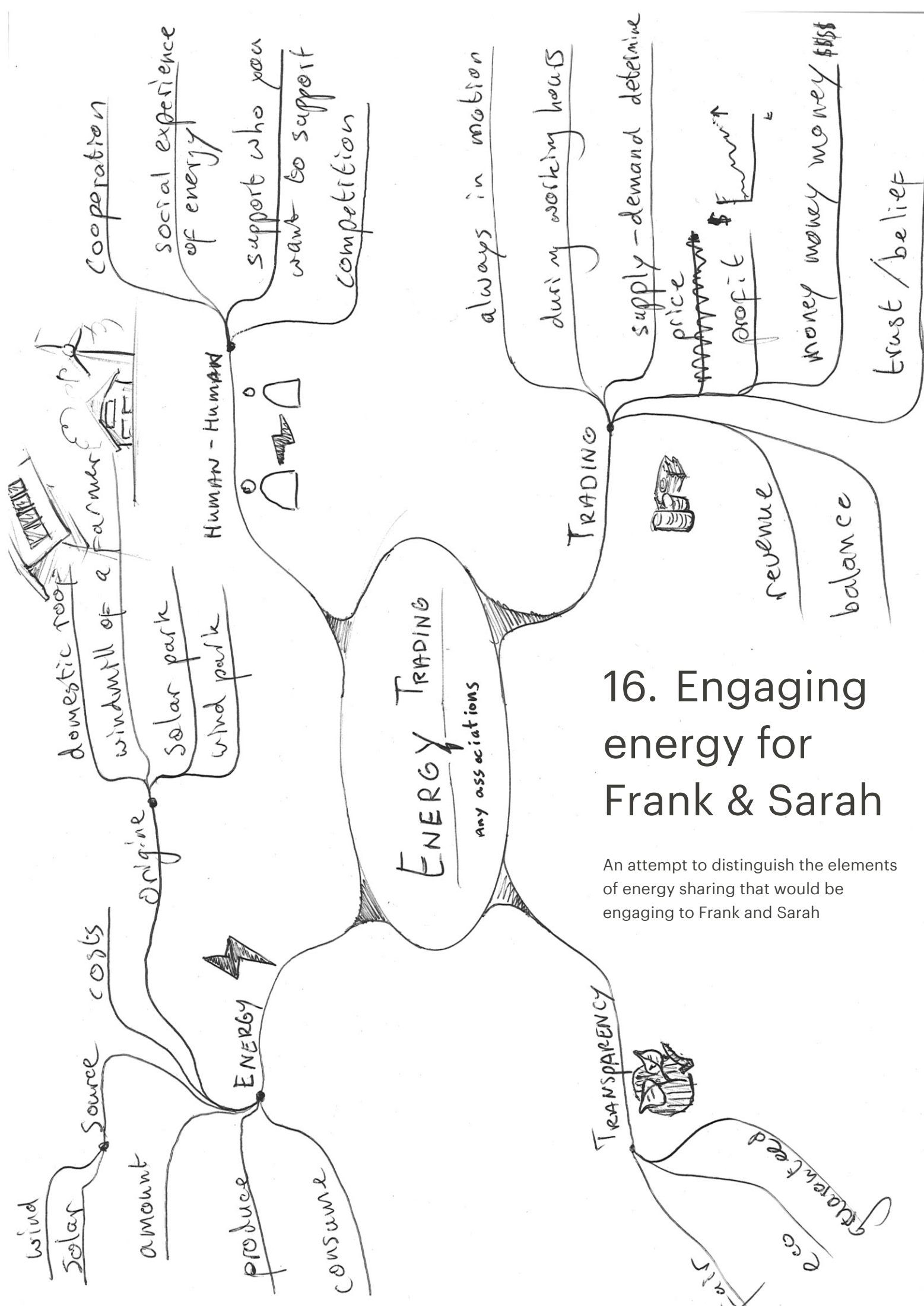
- Connect to Social
- High engagement
- CRM/Analytics

Mobile App Wireframes

The resulting lists of requirements for Frank and Sara were analysed on similarities and differences and then clustered:



This analysis delivered the list of personalization variables as specified in the tables on the next pages. For each variable it displays the display variations as demanded by either Frank or Sarah. Also, in the analysis the connection has been made back to the characteristics of Frank and of Sarah that are expected to cause them to have a specific preference.



16. Engaging energy for Frank & Sarah

An attempt to distinguish the elements of energy sharing that would be engaging to Frank and Sarah

ENERGY TRADING & Social Energy

POSSIBLE USER ACTIONS

PURCHASES/RECEIVING
(INNECOOP)

- orient
- read about
- producers
- story
- energy details
- price
- preferences

MONITORING

- map, search
- source
- select preferred producers
- social local
- purchase
- costs

Social energy

- see prognoses
- one when you need extra energy and how much
- display share dist. results
- check friends' status
- prognoses
- cost
- Frank screens so the will not get any social stuff?!
- start challenges
- control price

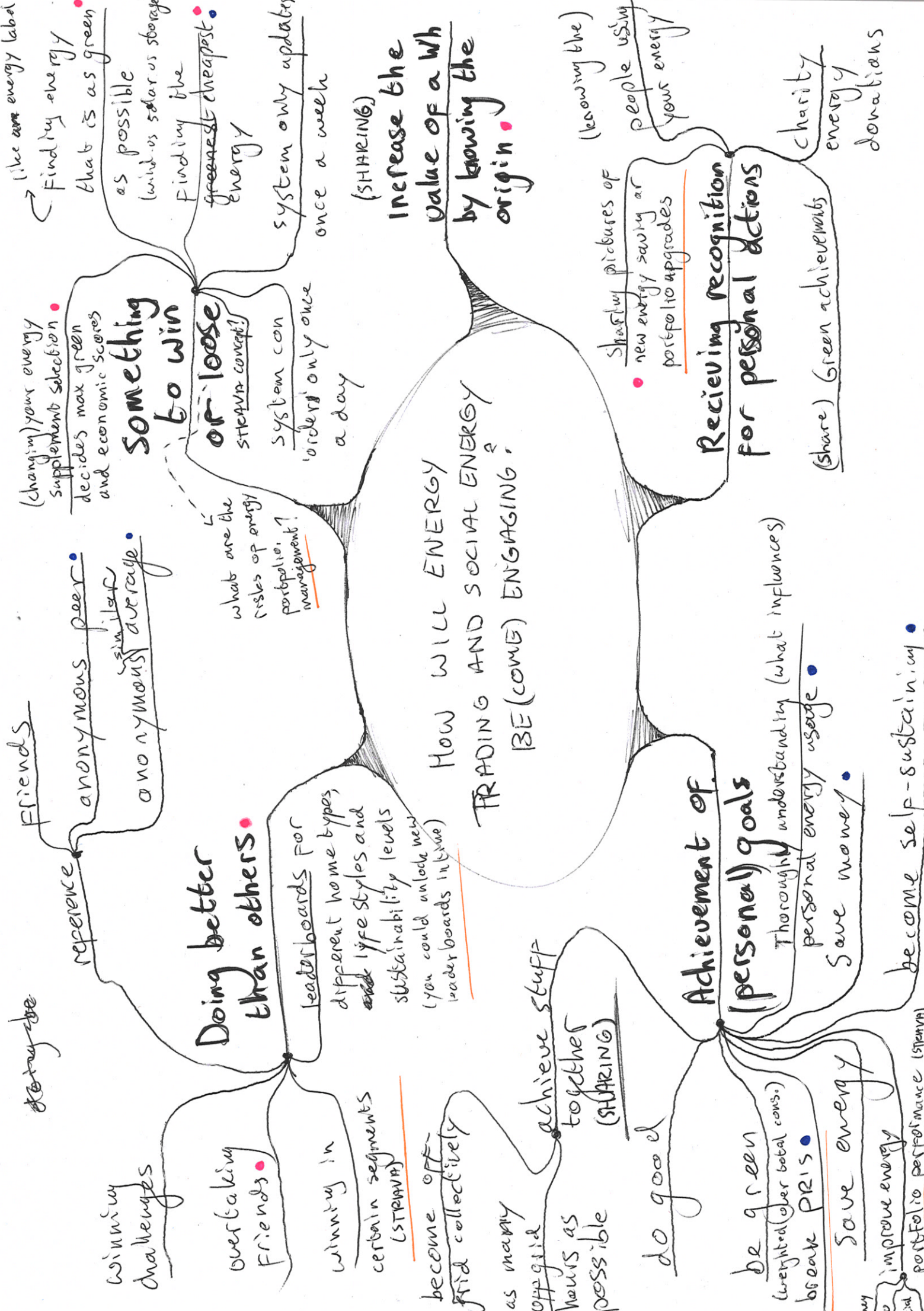
SALES/DISTRIBUTION
(VERKOOPE)

- setting some collective goal/challenge (community)
- score for improvement
- score for challenges
- green status
- determine markets to serve
- commercial
- non-profit
- charity
- (local) firms

Revenue

- sales
- destinations
- day level
- hourly level
- when energy was sold & distributed

FRANK
SARAH



NUMBERS

use of two decimals on a year level see the outlook

you want to VISUALS avoidance of numbers & decimals

- balance in colours for each day + balance colour per month
- graph showing balance (optionally components like product, sales + purch)
- ~~current~~ settlement outlook
- current accumulated balance in numbers

- color label explanation (?)
- colors indicating balance per ~~day~~ ~~month~~ day
- ~~intermediate~~ settlement outlook
- visual status towards settlement

on a monthly level you want to see major influencers and an outlook

- graph showing balance (+ options for showing components)
- icons that depict extremes (ultimately clickable)
- monthly settlement outlook
- current accumulated balance in numbers
- challenge + collab statuses and achievements (if applicable)

- colors indicating ~~balancing~~ the balance per day
- icons that explain extremes
- display charity points (dots) + completed challenges (if applicable)
- monthly settlement outlook + visual status towards settlem.

on a week level you want to see smaller influencers and challenge/collab statuses (if applicable)

Scrolling allowed

- graph showing balance (+ component options)
- indication of extremes with icons
- week outlook ~~status~~ ^{settlement}
- current accumulated balance
- challenges, collabs & social score
- status (and achievements?)

- week outlook + status central and visual (status bar) (see Sarah week screen lim. time)
- Display status of challenges & collabs
- ~~week~~ Color labels indicating balance per day + icons in case of extremes

daily resolution would be too small, even for Sarah and especially for this prototype

17. Sketched PEPMS tracking dashboards

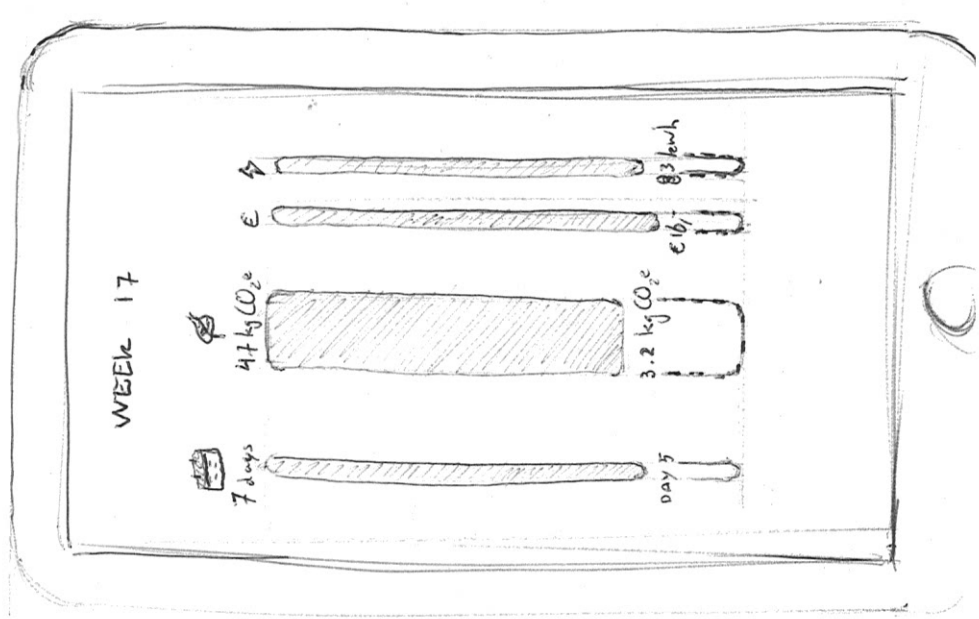
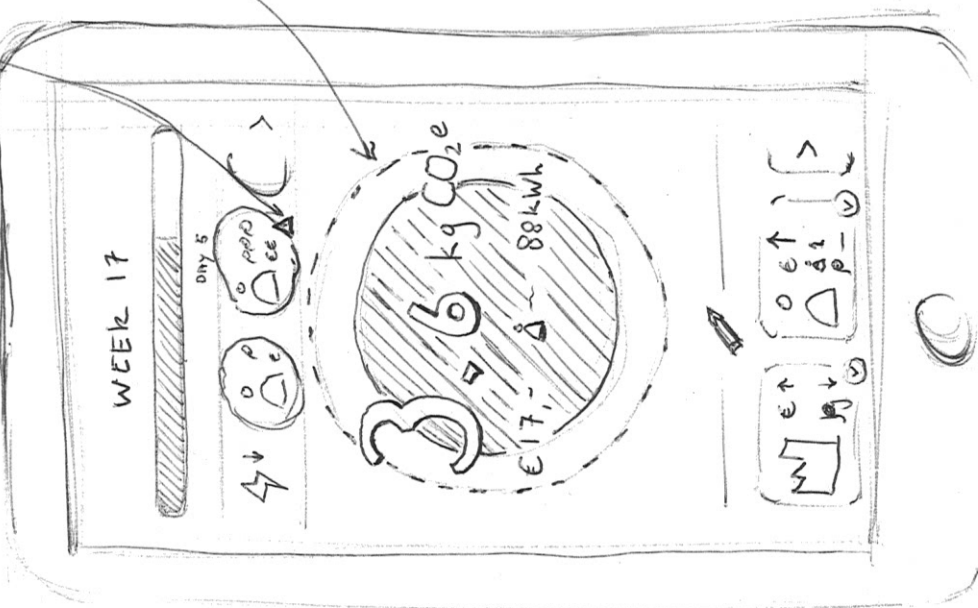
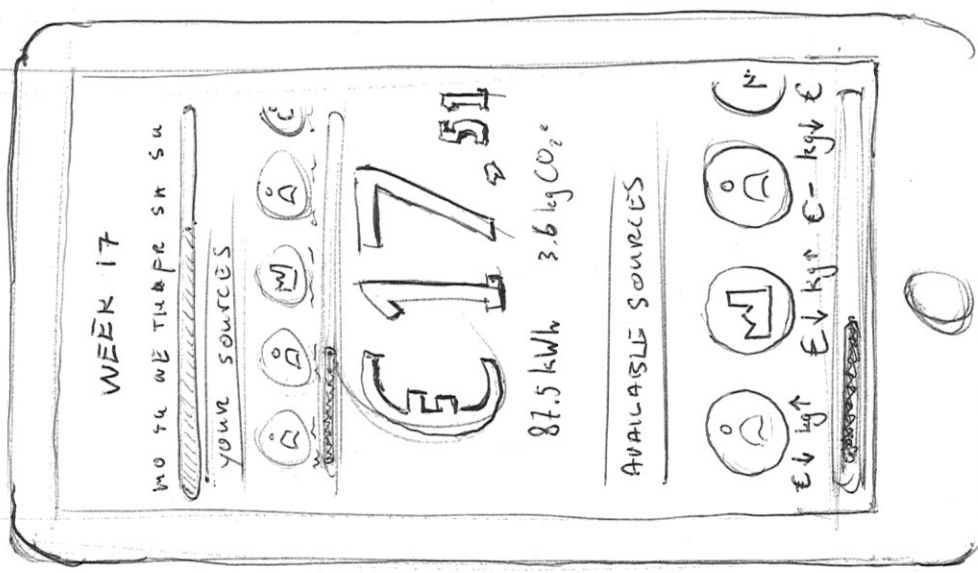
month: 1.029 kWh
 Day: 33 kWh
 - own 16.5 kWh
 - buy-in 16.5 kWh
 prices: €0.2/kWh


PV @ home: 41 g CO₂e/kWh
 PV utility: 48 "
 wind offshore: 12 "
 biomass: 230 "
 wind onshore: 11 "
 nuclear: 12 "

--- goal, circle behind
 CO₂e grows
 indicates price alert
 (with)

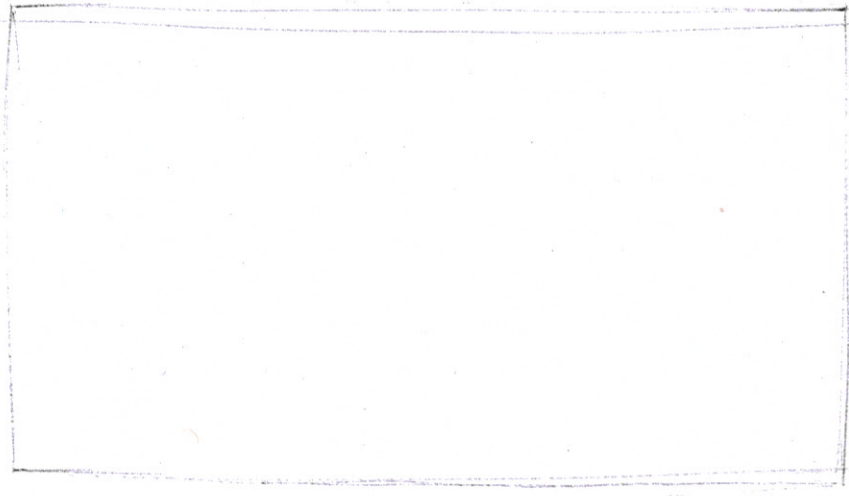
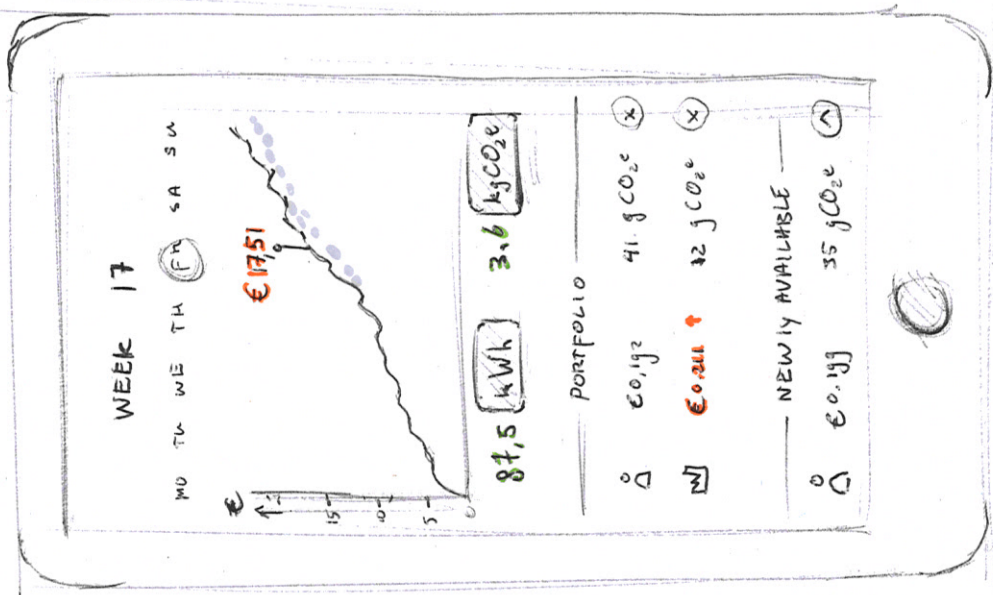
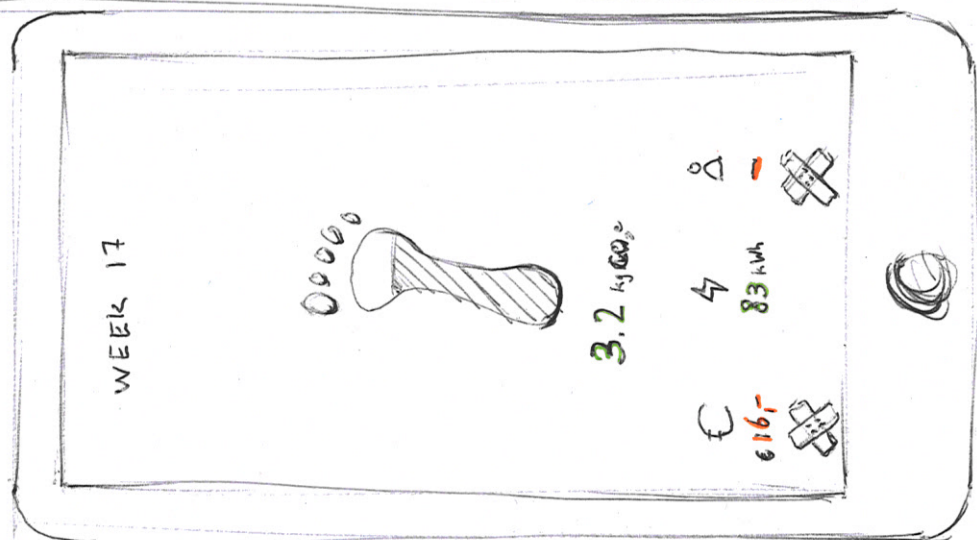
Headers in rows
 less decimals

Headers in rows
 were decimals (in 2010)



Fix button → 

over schedule / average
 on schedule / average
 below schedule / average

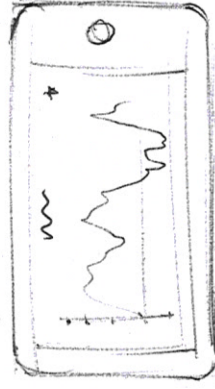


what if...

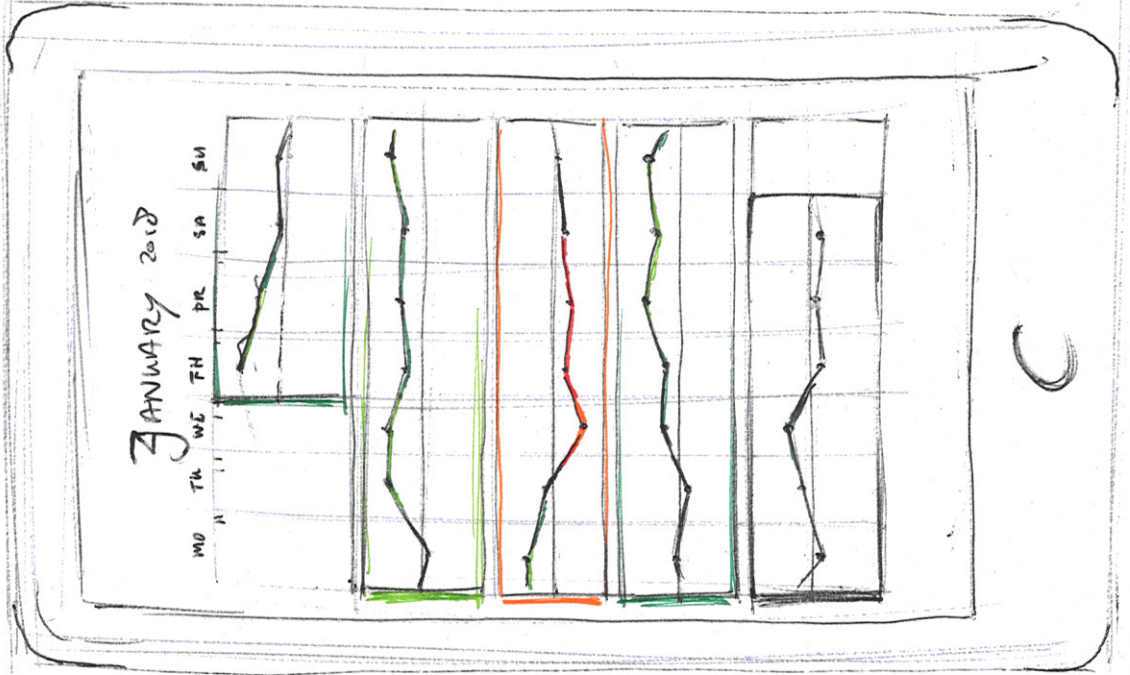
you hold the phone straight up in case you have limited time



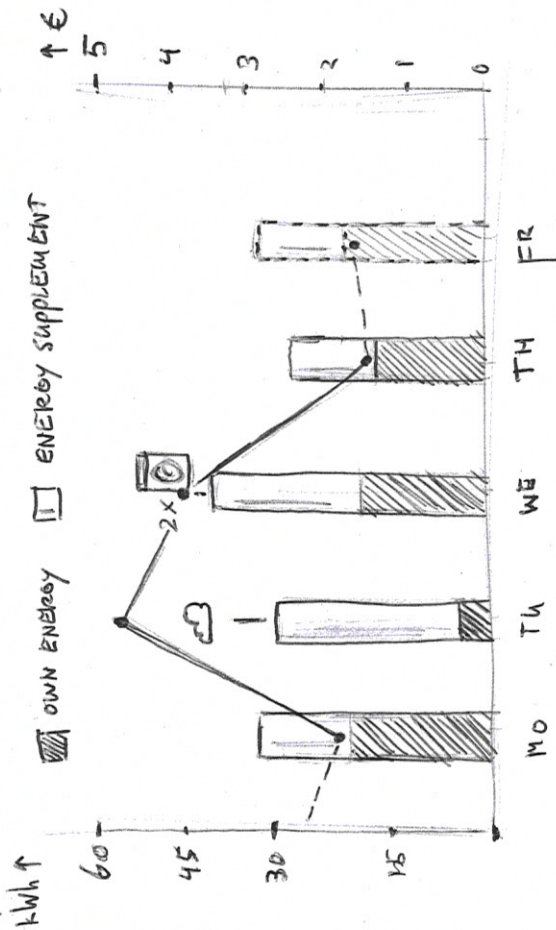
and you tilt the phone if you have more time



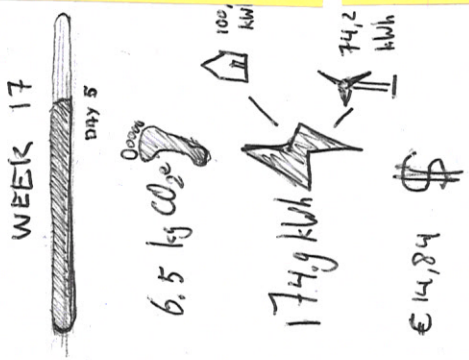
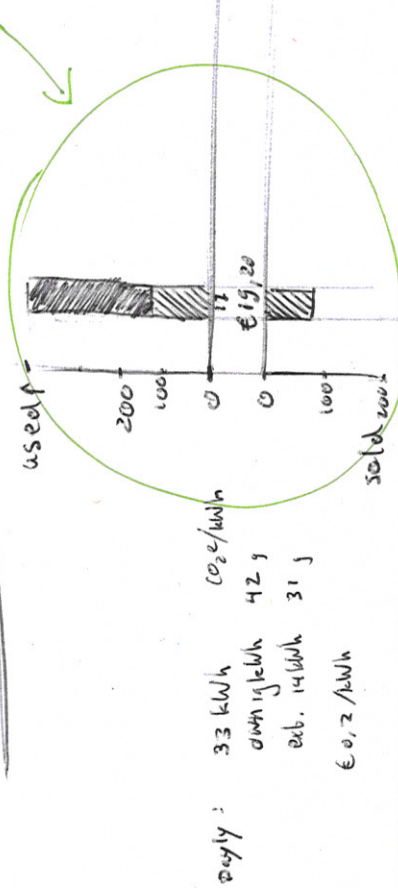
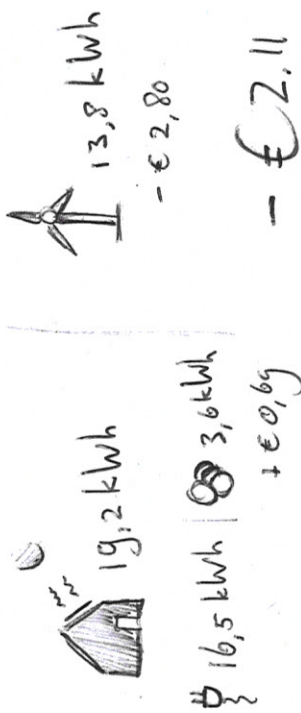
* a graph fits much better in a landscape screen



HOW TO CLEARLY DISPLAY CONSUMED ENERGY COMPOSITION & COSTS



ENERGY BILL BREAKDOWN TODAY

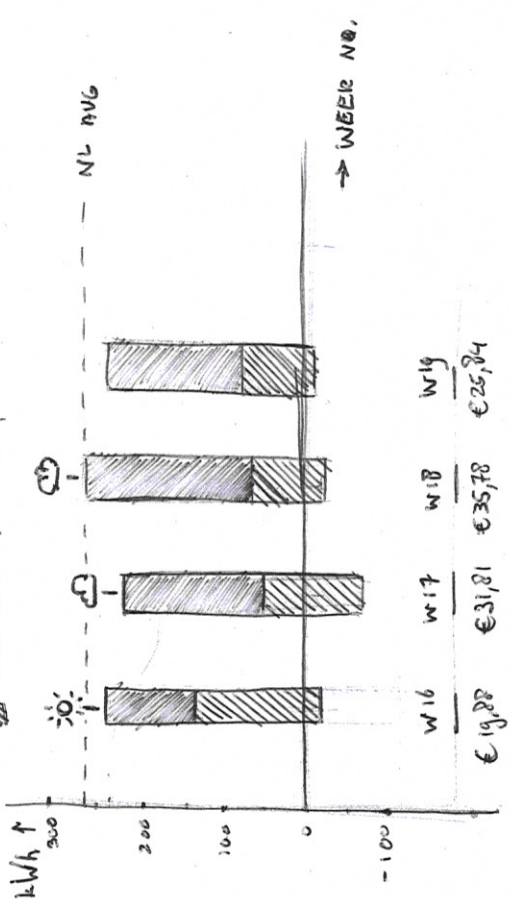


€14,84

174,2 kWh

6,5 kg CO_{2e}

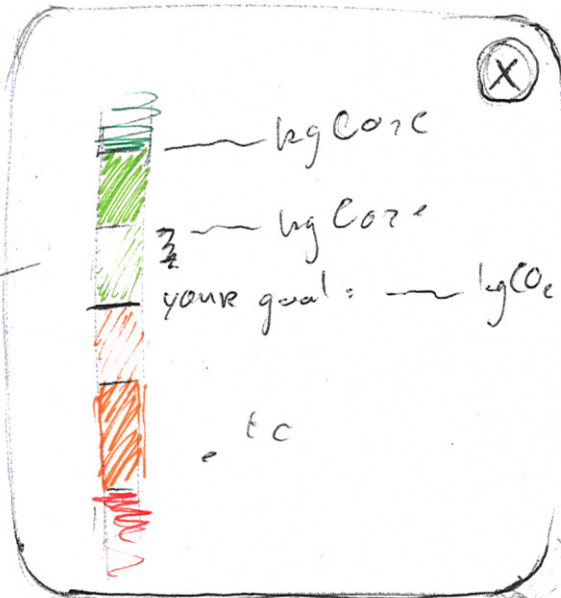
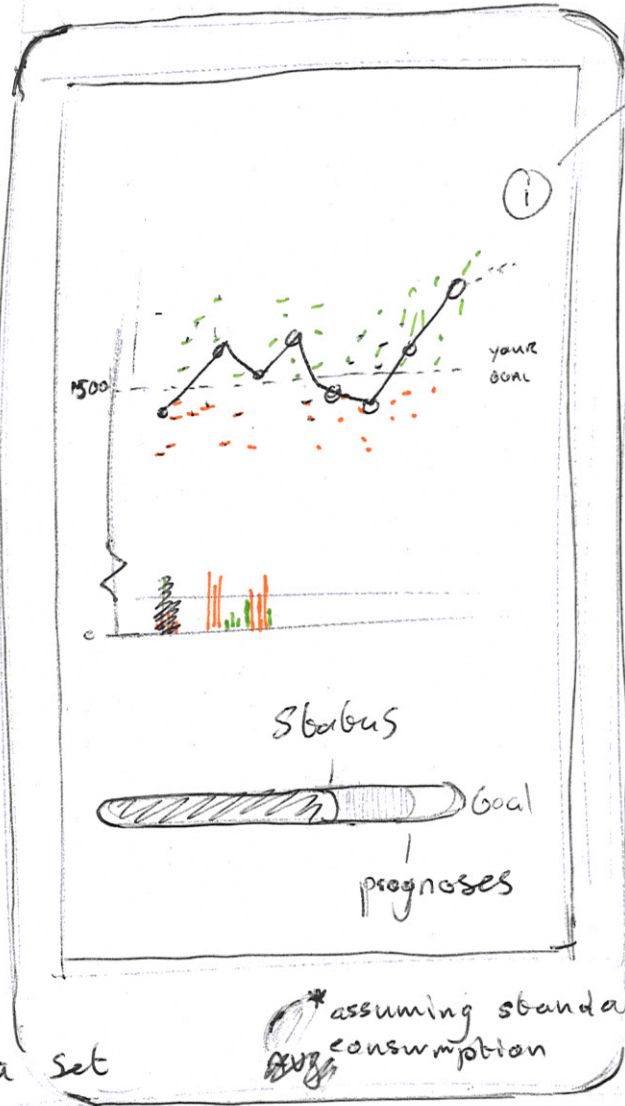
OWN ENERGY PURCHASED ENERGY



FRANK



CO₂e as a unit



Assumptions: ⚡
 avg year: 4100 kWh
 mont: 342 kWh
 day: 11,4 kWh
 week: 79,7 kWh

Fake data set

* assuming standard consumption

a 'bad' day ->
 - no sun 'Dunkelplanke'
 - no wind
 - go to biofuel (230g/kWh)

another 'bad' day
 - lot of sun
 - lot of laundry overdays (1,5 kWh/laundry) (en ant 32)
 : (42 g/kWh)

a 'good' day
 - no sun
 - lots of wind
 (12 g/kWh)

another 'good' day
 - do laundry at night (3x)
 - lots of wind
 (12 g/kWh)

2.619 gCO₂e

634 gCO₂e

136 gCO₂e

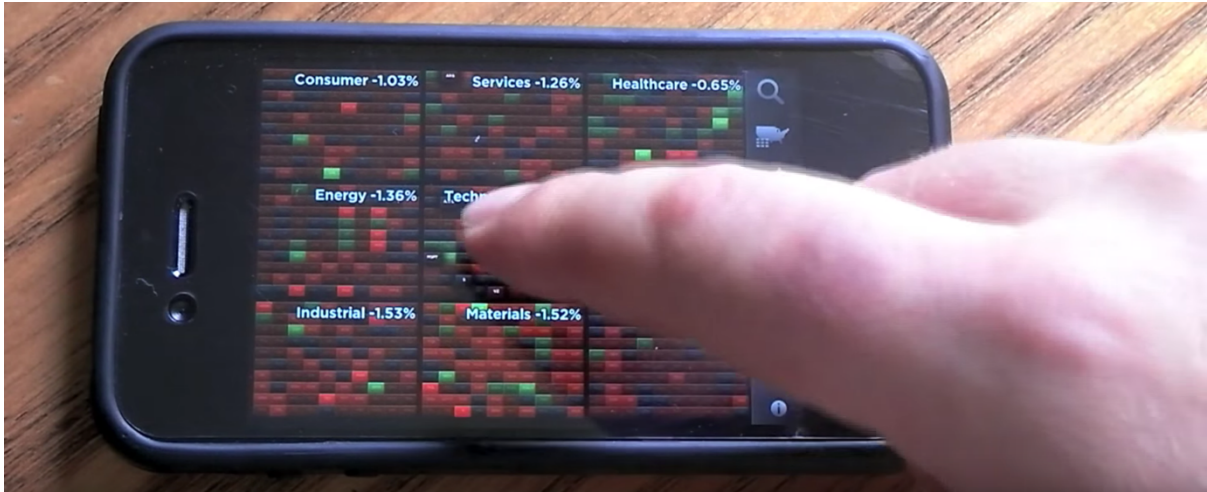
172 gCO₂e

That's quite a range how to capture this in a graph?

EMMISSIONS* CONDITIONS

Layering inspiration

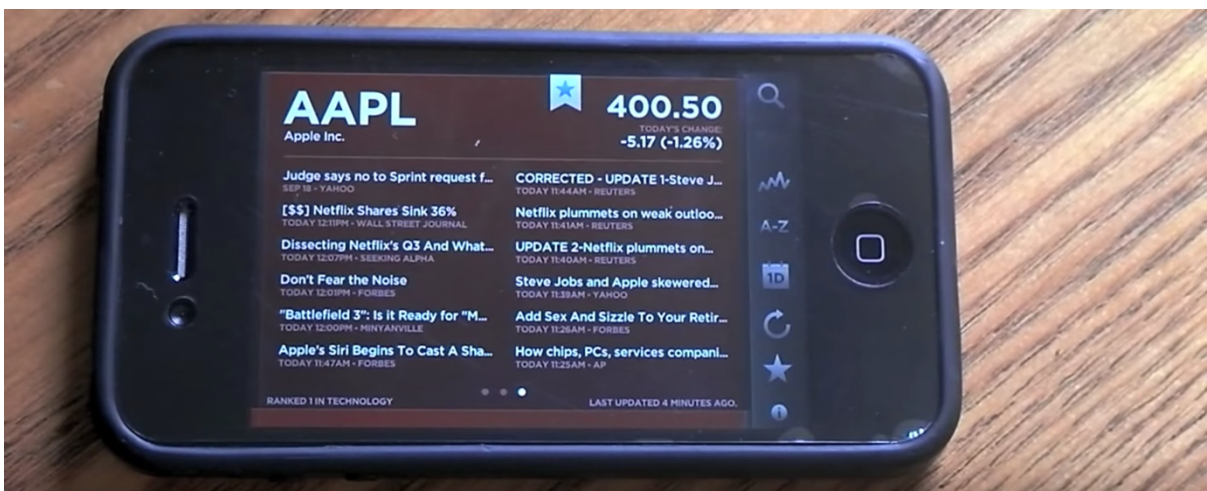
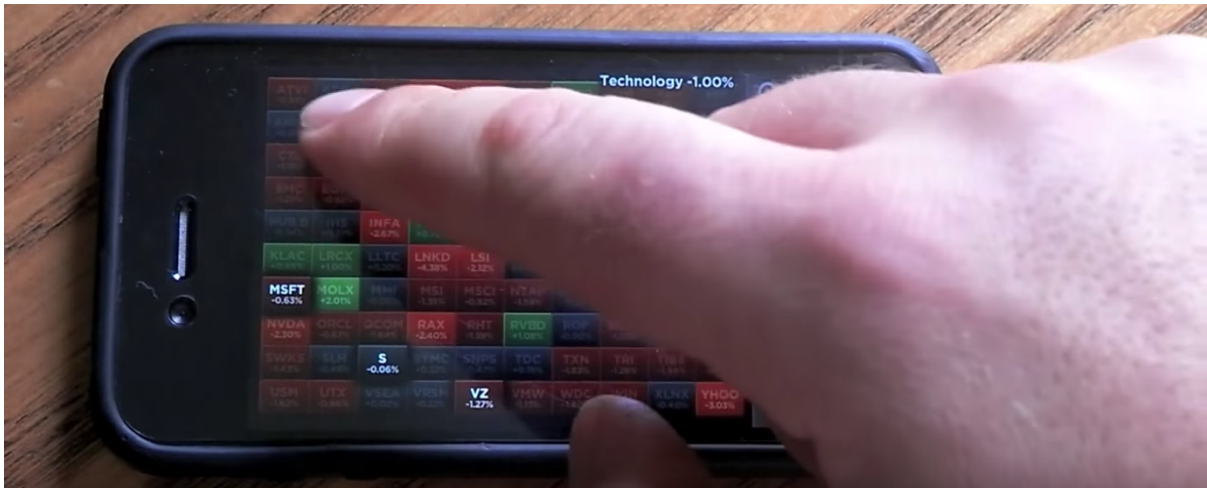
The app 'Stock Touch', users to quickly overview and navigate through different stock markets, provided inspiration for the architecture of the final design. Here's how Stock Touch works. (images are screenshots from: <https://www.youtube.com/watch?v=32v62DBZ2ZE&>)



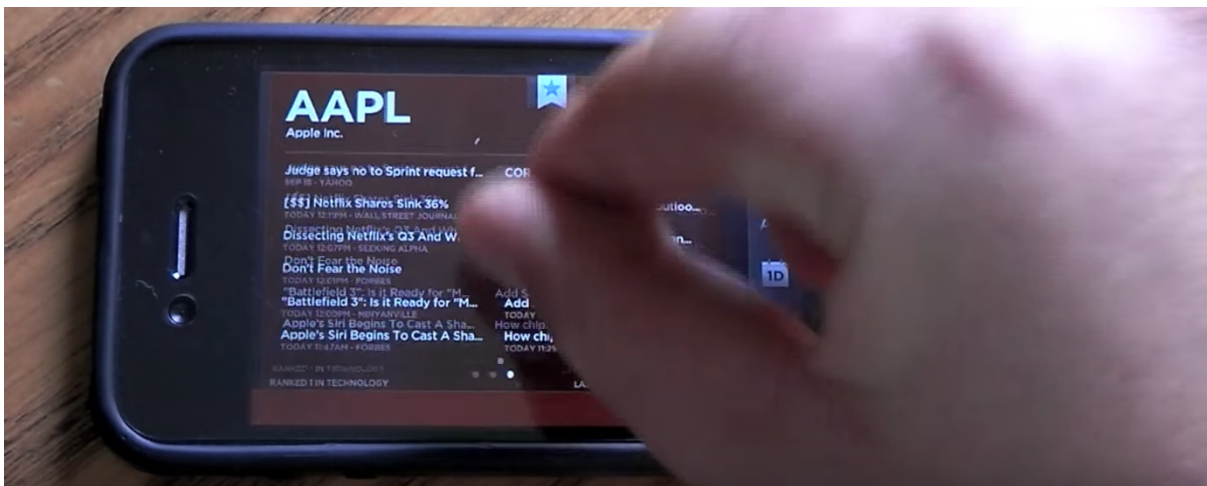
The overall overview shows the different stock markets with their largest companies. The colours represent their value development on the specified time scale (right menu bar)



The screen you see when you select one market (technology in this case). When clicking on one element in this overview, it zooms in on that element, implying to zoom in on the details.

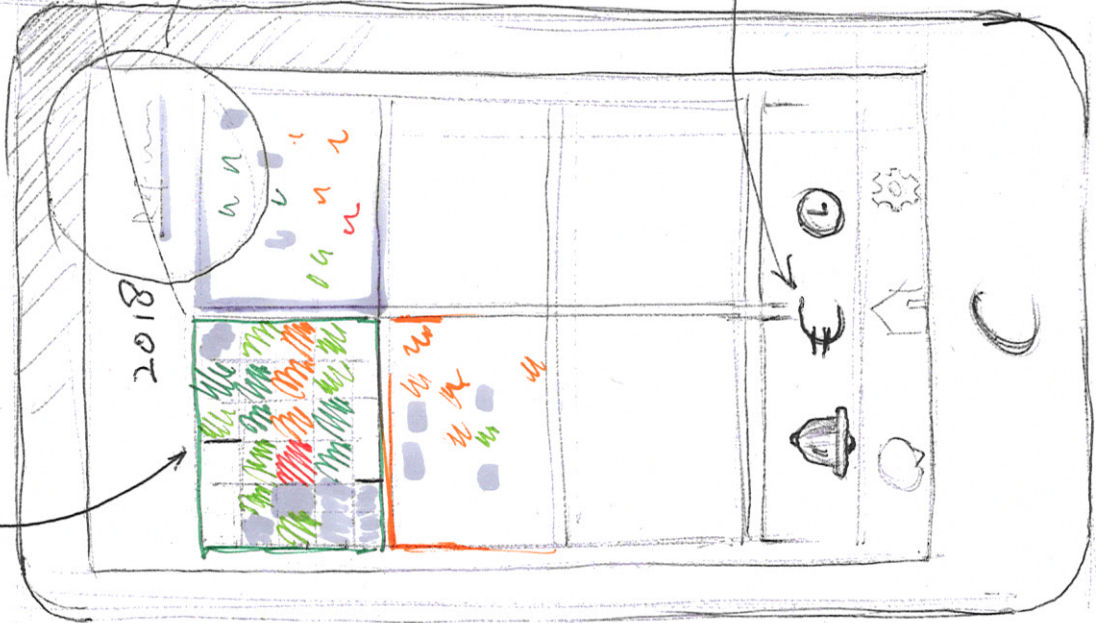


The AAPL screen is an example of the most detailed view.



As shown in this last image, one can 'zoom out' by pinch zooming. This also implies returning to a lower level of detail, a level with more overview. The visual representations of financial balance and the interaction and architecture of this app inspired the architecture of and interaction with the final design.

- possible that period
- neutral result that day / period
- positive result that day
- negative result that day



click

in case of displaying footprint!
REF: 8.500g CO₂/month

personal/collective challenges progress

social/charity score compared to (own goal?)

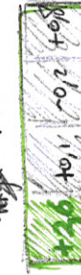
CO₂e compared to target

what target?

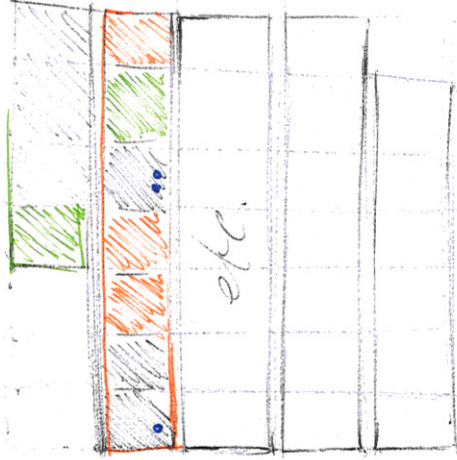
UNIT SELECTION
POP-UP MENU
default/favorite indicators

HIGH DETAIL VS. LOW DETAIL

HIGH DETAIL



JANUARY

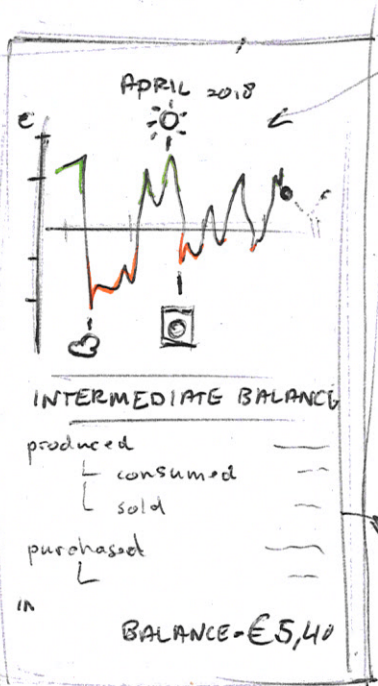


3

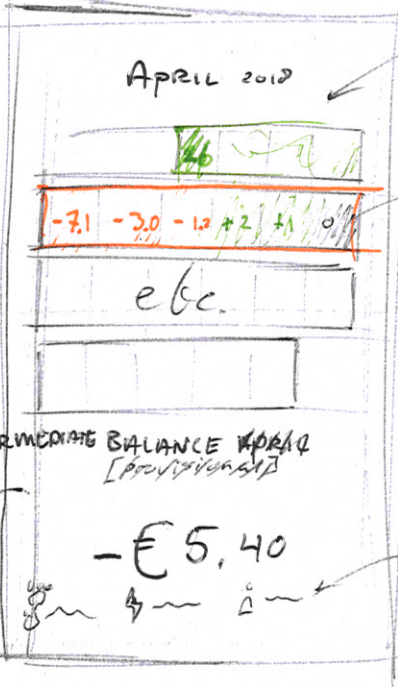
FRANK

(L)

FRANK



add graph title



specify unit

use decimals

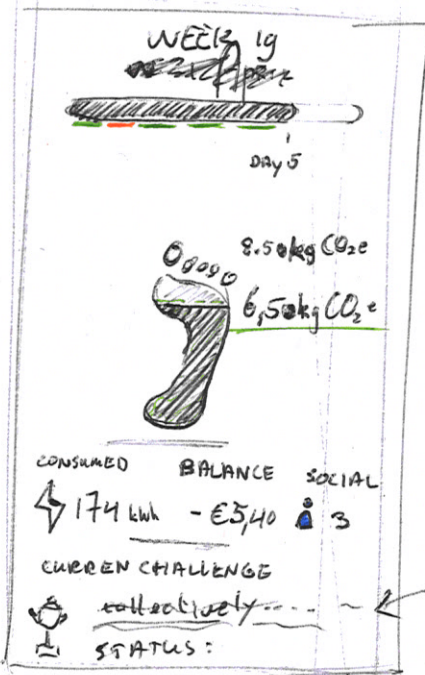
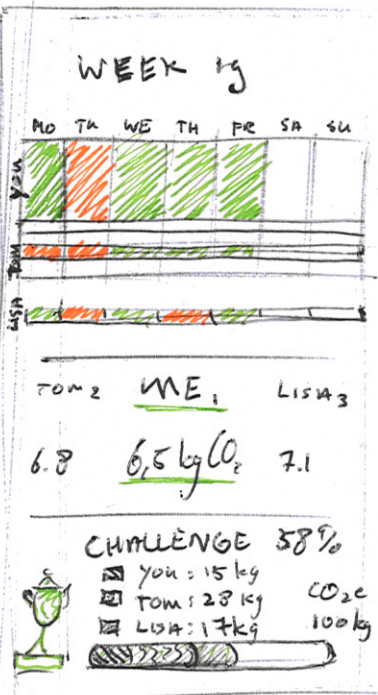
where's the LIVE data?

- current market value of own energy
- development of market price of e.g. solar

(L)

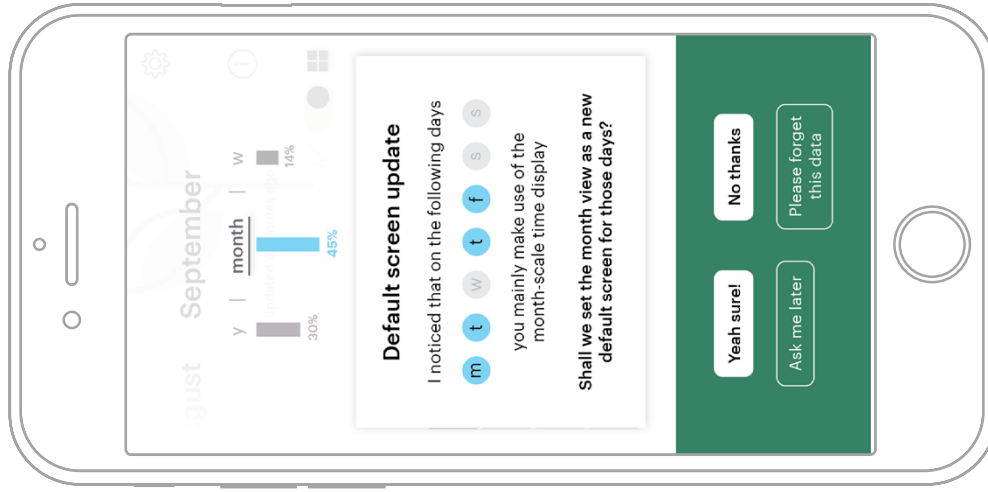
SARAH

(R)

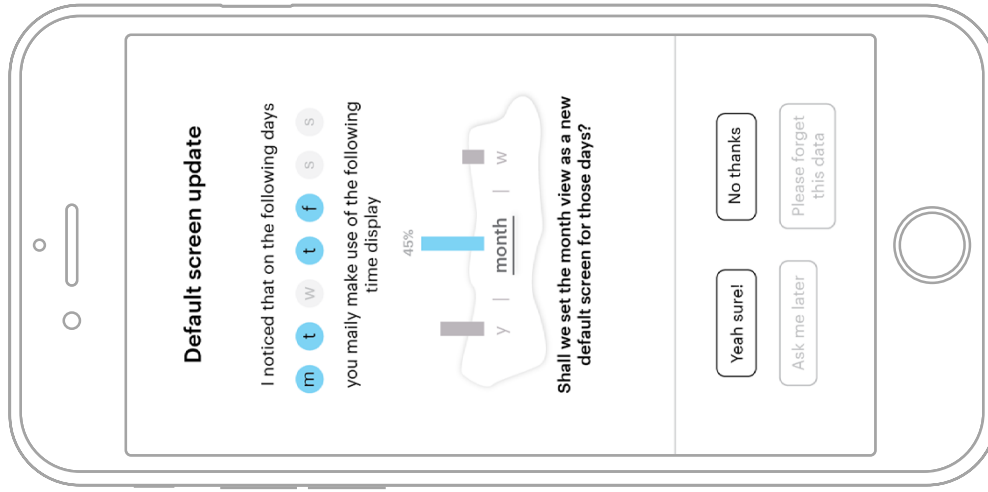


looks a bit too messy for the quick screen now

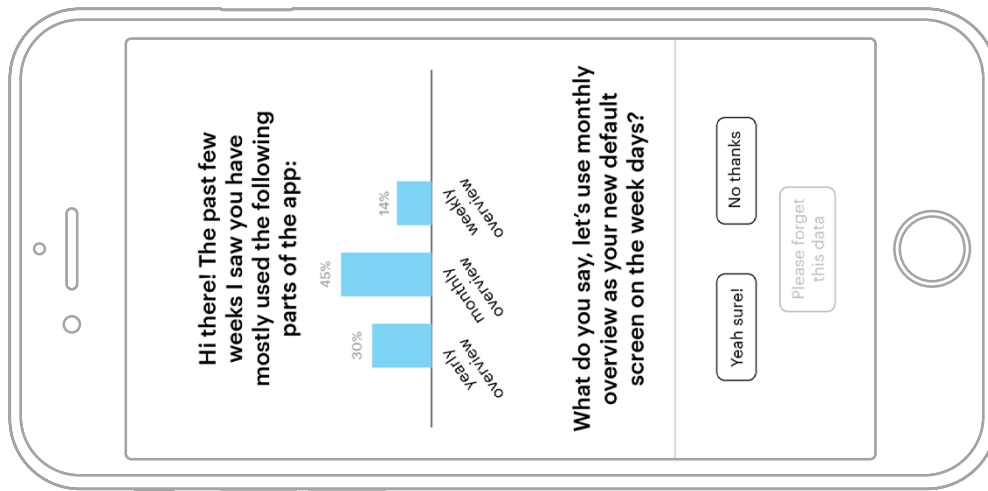
18. Adpt pop-up iterations



In the last iteration the relevant screen is opaque in the background. Also the time-scale buttons are not opaque, thereby emphasizing that the different time scales are compared here. Also the UI has been made generally more attractive



The second iteration uses a cut-out of the real screen to explain what display the proposal is about. Also the applicable days of the week are highlighted. And an answer possibility has been added. Still the connection to the relevant screen is a bit unclear

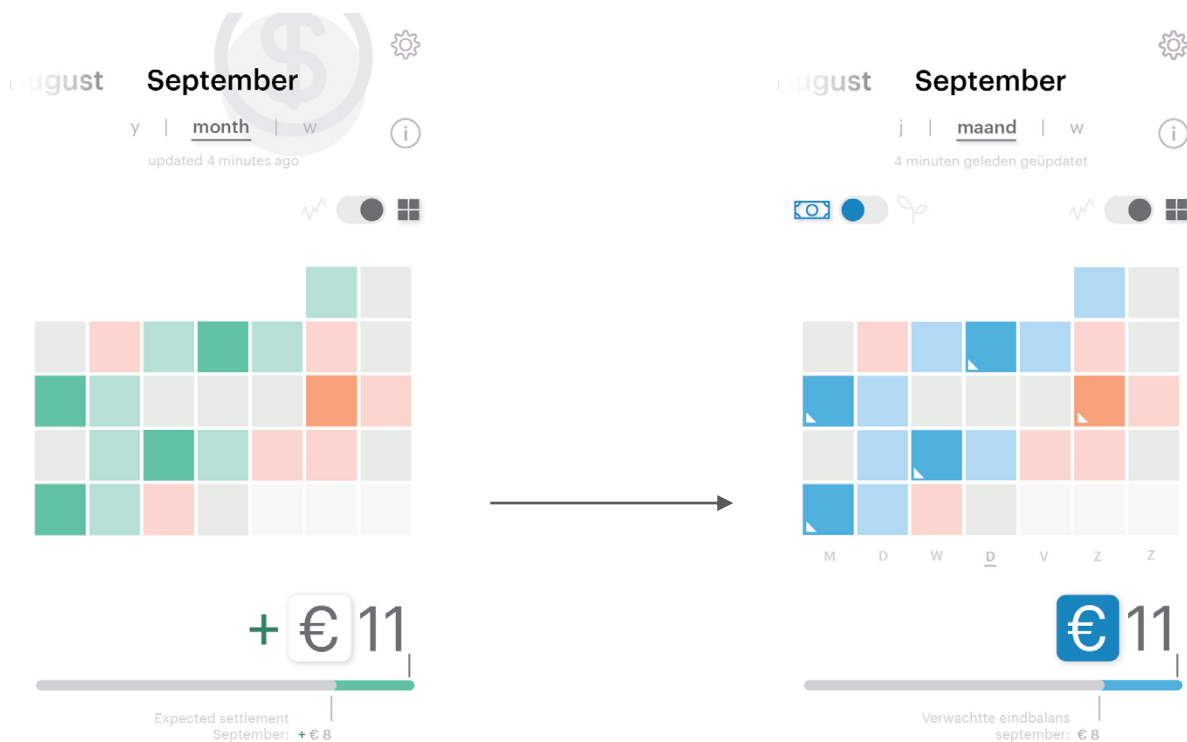


In the first iteration it seemed difficult to understand what display the system was actually referring to. Even though the pop-up might come up at the appropriate display. And the fact that this proposal applied to week days seemed unclear.

19. Design and user test refinements

After the green light report was handed in it was key to prepare the a user test that could validate (a part of) the Adpt concept. The first validation set-up was drafted and piloted before the green light meeting. The insights showed that both the validation set-up as well as the design itself would need one or two iterations of refinement before the validation could deliver valuable insights.

Three iterations of combined dashboard design refinement and validation set-up refinement. For each refinement the pilot insights and subsequent improvements have been described. Iteration 1 represents the pilots that were run prior to the green light meeting and refinements that were done based on the insights.



Iteration 1

Validaiton set-up

The set-up was aimed at confronting the user with two personalization suggestions of Adpt, in order to assess the personalized experience of it.

- o Verbal sensitization
- o Task 1: A friend calls, explain to him your financial balance of this week
- o Task 2: When this year was your best week and when the worst
- o Task 3: What was the number of profitable days this month

During tasks 2 and 3 the participant would receive a pop-up with the personalization suggestion.

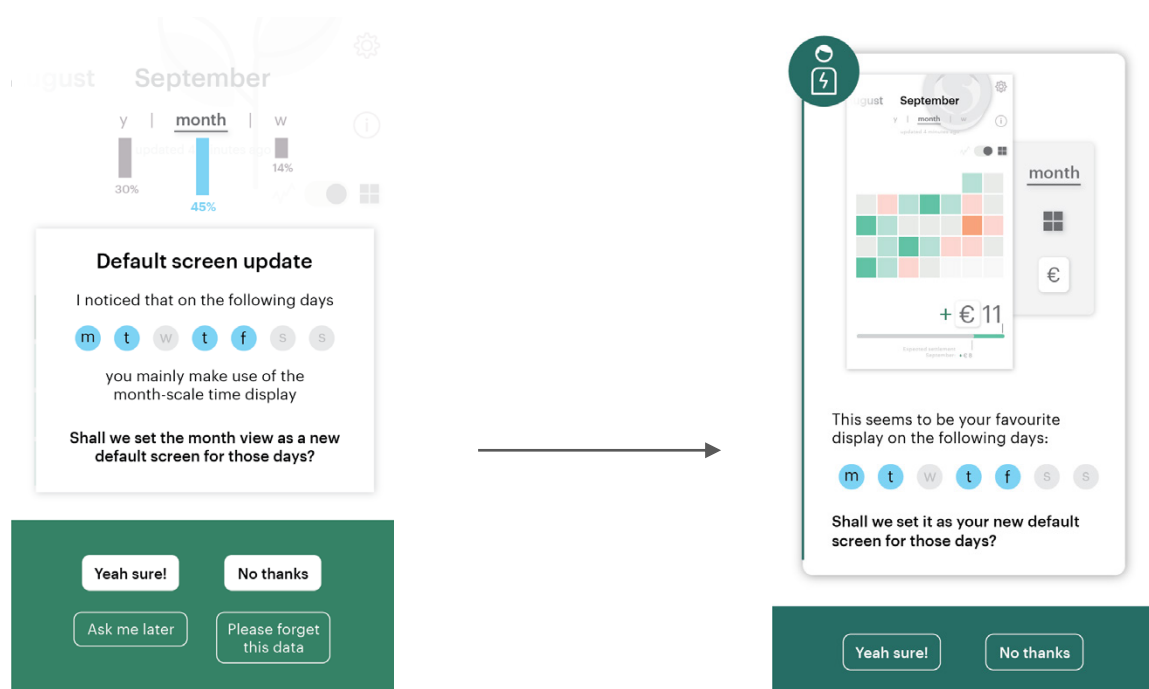
3 pilots

Insights

- o Design: low visual difference between CO2 and €, actionability was lacking, the second Adpt default display suggestion was too complex, role of assistant unclear
- o Validation: tasks are too factual and don't allow users to behave naturally, Adpt strongly interrupts, Adpt (therefore) is not fully understood, ability to test Adpt is limited (prototype complexity, validation time available)

Improvements

- o Design: colour schemes (result from braindump), switch for CO2 - €, new design of Adpt (see below), a few labels with additional information on peak consumption
- o Validation: assistant is introduced at start of task 1, Adpt at the start of a task 2 & 3



Iteration 2

Validation set-up

Same set-up as interaction 1, yet now adpt personalization suggestions were offered at the beginning of each tasks.

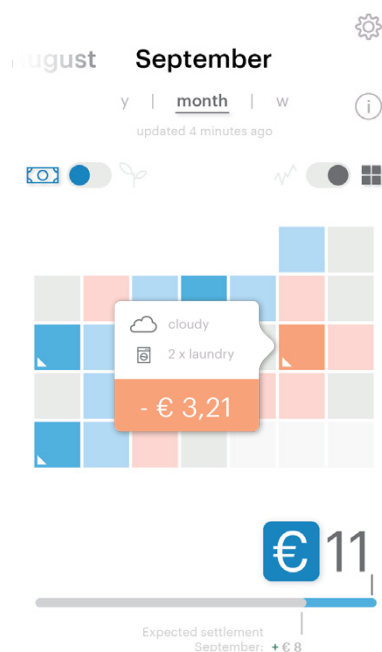
2 pilots

Insights:

- o Design: switch between € and CO2 and their colour schemes improved their differentiation, Adpt II less complex, visual displays lack day labels
- o Validation: story line a bit inconsistent (is this first time use? Or am I using it for a while already?), sensitization could be used to prepare participants better for what they'll find in the app ('balance', 'kgCO2', profit/loss, etc.), tasks are still too 'closed' and factual, Adpt II still very interrupting, research objectives still too broad (assessing 'personalized experience' is not doable with current available time and prototype fidelity)

Improvements

- o Design: day labels added, energy source options added (both to improve actionability, see below)
- o Validation: reduced objective to 'assessing relevance of current communication variables in energy source selection', open-ended tasks incl. 2 times role-playing, more elaborate sensitization explaining profit/loss, footprint and energy source selection, only Adpt II, Adpt II becomes a separate task, add interface exploration (because test is not about evaluating dashboard usability)



The notification states: "Great! You pressed the energy trading button. Here's a list of available sources for you. Please select the one's you like." Below the notification is a list of recommended energy sources:

- Boer Piet** (recommended for you)
Type: wind (onshore)
Price: € € € € €
Footprint: 🌿 🌿 🌿
- Solar Park Schipluiden**
Type: solar (stored)
Price: € €
Footprint: 🌿 🌿
- De Vries Biomass**
Type: Biomass
Price: € €
Footprint: 🌿

An "OK" button is located at the bottom of the notification area.

Iteration 3

Validation set-up

The objective now was to assess the relevance of the current communication variables, tested in a context of selecting an energy source to influence your portfolio balance. The approach was as follows:

- o Sensitization using slides
- o Finish the onboarding and explore the app several minutes
- o Task 1: reflect on the results of September to your partner (interviewer is partner)
- o Task 2: Choose an energy source
- o Task 3: Explain to a friend how you use the app (interviewer is friend)
- o Task 4: Process the suggestion of your assistant
- o Debriefing

1 pilot

Insights:

- o Design: footprint labels in energy source options are unclear, use of English in interface still leads to misconceptions
- o Validation: connection of objectives and approach is a better fit, sensitization using .pdf slides and an explanation by me is inconsistent, switch between role-playing and interviewing is unclear,

Improvements

- o Design: translated the interface, added colouring to footprint labels in energy source options
- o Validation: added hat/glasses to clarify start and stop of role playing, turned sensitization into video,

two dry runs with assistant

20. User test script

#	Tijd (min.)	Activiteit	Beschrijving	Wizard's taken	Benodigdheden
1. Introductie					
1.1	5	Introductie & Consent [doel: de participant voorbereiden op de sessie]	<p>Introduceer:</p> <ul style="list-style-type: none"> o "Afstuderen o Duurt ongeveer 45 minuten o Consent form invullen aub <p>[participant vult consent form in]</p>	<ul style="list-style-type: none"> o Zet camera's aan o Telefoon op vliegtuigmodus en niet storen o Check Proto.io correcte home screen 	<ul style="list-style-type: none"> o Consent form o Facial cam o Smartphone o cam o iPhone
2. Algemene sensitization & oriëntatie					
2.1	10	Introductie tot 2030 [doel: participant begrijpt de interacties van energie delen in 2030]	<ul style="list-style-type: none"> o We gaan voor deze test naar het jaar 2030 <p>[laat sensitization video zien]</p> <ul style="list-style-type: none"> o "Heb je hier nog vragen over?" 	<ul style="list-style-type: none"> o Presenteer laptop met video o Noteer: begrip van participant 	<ul style="list-style-type: none"> o laptop & video

2.2	5	<p>Onboarding en oriëntatie</p> <p>[doel: de participant ontmoet de assistent en krijgt de kans om de interface te ontdekken]</p>	<ul style="list-style-type: none"> ○ We gaan de app testen die je zal inzicht zal geven in je energieportfolio van de afgelopen tijd en die je zal ondersteunen bij het kiezen van een energiebron. ○ “Je hebt zojuist de app geïnstalleerd ○ Bezig met welkomsberichten van de interface ○ De assistent van de app is wat gegevens met je aan het doornemen zodat je de app kunt gaan gebruiken ○ Taak: Maak dat gesprek af en neem daarna het dashboard door voor 3 minuten” ○ Verzoek om hardop te denken ○ Eventueel in laatste minuut participant op wijzen op knoppen die hij/zij nog niet gevonden heeft 	<ul style="list-style-type: none"> ○ Overhandig iPhone met cam aan participant ○ Timer van 2 min. zetten ○ Noteer: handigheid met de app, eerste reacties ○ Neem iPhone weer in ○ Zet app weer op beginscherm 	
3. Taken					
3.1	7	<p>Taak 1: Reflectie September</p> <p>[doel: de participant trekt een voor hem/haar relevante conclusie over de maand September en laat gebruikt daar bepaalde displays bij]</p>	<ul style="list-style-type: none"> ○ “Met je partner ben je thuis ○ Het maandelijkse energiebron keuzemoment komt eraan ○ Je hebt met je partner afgesproken dat jij je deze maand verdiept in de energiebron keuze en het even doorspreekt ○ Taak: Stel een voor jou relevante beschrijving van september op ○ Niets is fout, wat jij in die interface ziet, erbij denkt, etc. is per definitie goed ○ Schrijf daarbij wat steekwoorden voor jezelf op” ○ [bril op] Ik ben nu even je partner ○ Taak: Vertel mij nu kort wat je bevindingen zijn ○ Trigger vraag na een paar minuten: <ul style="list-style-type: none"> - “Wat zou je in oktober anders willen doen?” - Welke conclusie zou je aan mij uitbrengen?” 	<ul style="list-style-type: none"> ○ Overhandig iPhone met cam en pen en papier aan participant ○ Noteer: onderwerp dat de meeste aandacht krijg (interests), scherm(en) waarmee participant best uit de voeten kan in de reflectie (capabilities), [Q1, Q2, Q3, Q4] ○ Link home-screen aan energiebron keuze 	<ul style="list-style-type: none"> ○ Blaadje en pen ○ Hoedje 1/bril

3.2	3	<p>Taak 2: Energiebron keuze [doel: de participant maakt kennis met het afwegen van prijs en carbon footprint]</p>	<ul style="list-style-type: none"> o "Het moment is daar o Je wilt een selectie van energiebronnen voor oktober maken o Taak: Kies op basis van je reflectie op September een energiebron o Denk daarbij hardop na" o Evt. trigger vraag als de keuze te snel gaat: "welk effect zou je daarmee willen bereiken?" 	<ul style="list-style-type: none"> o Overhandig iPhone met cam aan participant o Noteer: de keuze en beweegredenen ervoor o Neem iPhone in o Koppel welcome screen aan home screen 	
3.3	5	<p>Taak 3: Informeer een vriend [doel: de participant laat blijken welke schermen hem het prettigst lijken om te gebruiken]</p>	<ul style="list-style-type: none"> o "Een week later zit je met een vriend(in) in een café o Hij heeft net een set zonnepanelen laten plaatsen o Hij wil zelf ook de app installeren, maar er zijn alternatieven o Dus hij is erg nieuwsgierig hoe jij de dashboard gebruikt o Taak: omschrijf aan je vriend(in) hoe jij de interface de eerste maand hebt gebruikt om een energiebron te selecteren o Niets is fout, wat jij in die interface ziet, erbij denkt, etc. is per definitie goed." o Ik ben even de vriend(in) [zet hoedje 2 op] o Trigger vragen als vriend(in): <ul style="list-style-type: none"> - "Welke scherm gebruik je nou het meest? En waarom? - Je hebt een aantal schermen niet laten zien, klopt het dat je die niet direct zou gebruiken? Waarom niet?" 	<ul style="list-style-type: none"> o Overhandig iPhone met cam aan participant o Noteer: schermen die hij/zij gebruikt in de uitleg, redenen om die schermen te gebruiken, redenen om andere schermen niet te gebruiken o [Q1, Q3, Q4] o Neem iPhone in o Stel verwijzing naar juiste home page suggestion in 	<ul style="list-style-type: none"> o Hoedje 2/bril
3.4	3	<p>Taak 4: Bekijk personalisatie suggestie [doel: de participant maakt kennis met het personalisatie system, zodat hij/zij op de wenselijkheid ervan kan reflecteren]</p>	<ul style="list-style-type: none"> o "Het systeem heeft in de afgelopen weken je gebruik van het dashboard geanalyseerd o Nu wil de assistent jou een suggestie doen o Taak: bekijk de suggestie van de assistent o Denk daarbij weer hardop aub 	<ul style="list-style-type: none"> o Overhandig iPhone met cam aan participant o Noteer: of participanten verwachten dat dit relevant voor hen is 	

4. Debriefing				
4.1	<p>SUS scale [doel: ondersteunt onderzoeksvraag 3]</p>	<p>Vul het in op basis van je ervaringen gedurende de hele test [participant vult SUS scale in]</p>	<ul style="list-style-type: none"> o 	<ul style="list-style-type: none"> o Debriefing set-up o Printed SUS scales
4.2	<p>Context of use interview [doel: antwoord op vragen 5, 6 en 7 vinden]</p>	<ul style="list-style-type: none"> o Stel jij leeft echt in dit scenario in 2030, welke informatie zou jij belangrijk vinden als je je energiebronnen selecteert? <ul style="list-style-type: none"> - Kon je tijdens het reflecteren op September vinden wat je zocht in het dashboard? - Heb je dingen gemist? - Hoe heb je de weergave van die informatie ervaren? Tegels/details, groen/geld o Stel je zou echt in dit scenario leven, in wat voor situatie zou je deze app gebruiken denk je? <ul style="list-style-type: none"> - Probeer je dat eens in te beelden? <ul style="list-style-type: none"> - Hoe vaak? - Wat voor momenten? - Waar ben je dan? - Ga je ervoor zitten? Staan? Lopen? Wat zie je voor je? - In die verschillende momenten, zou je ook verschillende schermen gebruiken? o Op het laatst deed de assistent je een suggestie voor het makkelijker maken van navigatie. Hoe heb je die ervaren? <ul style="list-style-type: none"> - Evt. zou je nog andere personalisatie verwachten hier? En wat dan? 	<ul style="list-style-type: none"> o 	

		<ul style="list-style-type: none"> o Tijdens het selecteren van je energiebronnen kreeg je drie opties. In werkelijkheid zijn er een stuk meer, maar het systeem maakte op basis van jouw keuzen in de app deze voorselectie. <ul style="list-style-type: none"> - Wat vind je daarvan? - In welke mate zou je willen dat het systeem op deze manier werkt? (evt. 'met je mee denkt') - Zou 'ie dat meer mogen doen? Of juist minder? - Tot op welke hoogte moet hij dat met jou overleggen? o Eventueel vragen Jelmer? o Nog een paar vragen over jij en groene energie in 2018 <ul style="list-style-type: none"> - Maak je gebruik van groene energie? - Heb of wil je zonnepanelen? - Hoe actief beheer je je energie op dit moment? o Zou jij nog wat toe willen voegen? Vragen? Opmerkingen? 		
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21. User test results [Dutch]

DEMOGRAPHICS AND PARTICIPANT PROFILES

	p1	p2	p3	p4	p5	p6
Gender	male	female	male	male	female	female
Age		53	41	51	48	28
Education	HBO	MBO	MBO	HBO	WO	WO
Profession	Officier Landmacht	Receptioniste	Network operator	Network consultant	PhD candidate	Consultant
Description of job role	Training consultant	Point of contact for the dentist's patients and filling the agenda's efficiently	Controlling the TU Delft network	Maintenance and innovation on the TU Delft network	Researcher, gathering, analysing and processing data at the cardiology department of the AMC	Member of the tender team for writing a EMVI plan
Expertise on energy, sustainability and carbon footprint	"Why is hydrogen excluded?" Has ben reading into the topic of sustainability quite a bit	"I'm more and more aware of turning things off when I don't need them"	"I put optimizers on my solar panels (...) so here [in his app 'Solar Edge'] I can see how they perform individually"	"I took floor heating because in the future we'll probably be able to hook it up to a heat pump" "Solar panels are part of the plan, but first I have to check if the roof needs to be replaced"	"We [she and her boyfriend] choose one of the greenest energy providers. Eneco? Could that be right?"	"We are client at Vandebron I believe. That's quite a green provider right?" "Jorn [boyfriend] arranges all this stuff, I don't, he does energy and maintenance" "In the supermarket you can't buy anything with CO2"
The primary interests (€ vs gCO2e) the participant seemed to show	"Maybe it costs a bit more [wind energy from farmer Piet] but I intend to do as much as possible for my footprint" "We've been talking about it for a while already. My wife likes solar panels. But we have a red roof, and then with black panels." "But I absolutely consider it!"	"I'd like to support the small entrepreneur, because I think they need it more than the rest" "The farmer might provide 'healthy' energy"	"people like me, who do consider the environment but maybe more the financial aspect (...)" "It [his solar panels] is an investment for now, but also for later" "Look, they ask you to think green, but then you are punished by pushing up the prices when you need energy!"	"To give an idea: I choose my current provider not for their price, but for their sustainability" "The municipality of Delft hosts sessions on the question 'how are we going to get off natural gas?', I like it very much to be involved in that"	"I think both are important. But maybe footprint even a bit more, because we have enough to spend" "Let's choose something with a low carbon footprint. I believe it could even be quite economic"	"I regard energy as something which is unconditional, it's just there. I don't enjoy usage of it." "I'd first check how much money there is left, and then I'd decide how much I would like to do for the environment." "Ahh, then I'd go for [farmer] Piet, he looks so sympathetic with his mustache"
Ease with which the participant interacted with the app	Easy	Hesitant, seemed a combination between limited experience and insecurity. But did recognize several UI elements autonomously	Quite easy, although he forgot his glasses "month, week, year, yeah, same as I have"	Easy	Very easy Laurien: "This would be an info button" P5: "Yeah, but in other apps I never use the info button, unless I don't understand it. And here I understood it already"	Chatbot seems to be a new interface type for her. For the other part of the app, quite easy
Ease with the theory of portfolio balance and carbon footprint	Was well able to grasp the market forces and the idea of carbon footprint	"So here is the average of CO2 energy you could produce", the carbon footprint was not understood	Carbon footprint he understood. Financial balance was misunderstood. "For me a kWh is a kWh", referring to the current rules for delivering solar energy to the grid	"There is not really a point in looking back at the weather of last month for planning my sources for next month"	"Why is there such a strong deviation between day and month balance [year detail €]? Ah of course. If you multiply the daybalance by 30, you might end up quite low on a monthly basis!"	"It is clear that it is easier to earn money in the months with a lot of sun than those with few. And carbon footprint doesn't improve as well"
Info-heavy service (banking, home energy, etc.) user type	"For me this would be a perfect toy, just every day!"	"For me this is an app, that's just private. I'd use it at home. (...) once per month is more than enough"	"I used to look at it every day! But at some point I only look at it a few times a week. It becomes normal I think."	"I like that: you'd not be fixed to one choice, but you can pivot every now and then" "In the evening, when you check all the apps, news, facebook, 'oh how's energy doing'. At leasts that's how I do it" "I just make a choice and then I think [now-it's-enough gesture]. I wouldn't be interested in doing this each month"	"I never sit down for that [banking stuff], (...) I know my periodic expenses and the amount that is left is easy to plan, I can do it in the tram (...) I only sit down for large expenses, like the house or holidays"	When p6 installs and opens an app: "I'll see if I can find what I'm looking for, and if not, I'll de-install the app right away" "I'd like to spend as little time as possible on my smartphone. I don't check my phone on a daily basis to see what's new. I rather put it away as much as possible."
User type	Affluent, tech gadget lover, low structure	Budget-focussed, low cognitive ability, caring	Economic focus, tech gadget lover, mid-high structure	Affluent, affinity with tech, pragmatic, high structure	Affluent, determined, high structure, low effort	Affluent, demanding, pragmatic, low effort

RESEARCH QUESTIONS 1, 2 AND 3

	p1	p2	p3	p4	p5	p6
What displays did the participant use most?	Detail month and week, both € and CO2	Detail month € and CO2	Detail month € and CO2	Visual month € and CO2	Visual month CO2 and €	Visual year and month €
Why did he/she use those?	"You can see the development of the month" Yet also: "I'd have to use it a bit longer to understand what is exactly happening here" [month detail €]	"(...) the monthly result. The graphs clearly shows that, with the increase and decrease per month." "With the year overview you could make a year bill. I'd only use it once a year"	"I like graphs" "A graph, that nicely shows you when the sun starts and when it ends" "This one [month detail €] is a bit messy, I like this one more [month detail CO2e]"	"Here you can quickly see how the days were" "But I must admit I have not been using it a lot yet. The graphs give more a feeling of the precise amounts" "The graph is clearer, it gives you values. That with the blocks, that's not intuitive. You don't immediately know 'ah what am I looking at'. (...) But you get used to it, at some point I got it."	Used the info available in month visual to assess the attractiveness of different energy sources "Really nice that it gives such a clear overview. (...) This is how I work with my agenda's as well. (...) I like to look at the month in this layout" "The graph might be nice once you have the app five years. It would be really nice for comparisons then"	Because previous October data is unavailable: "September looks like May, so October might look like April (...) and then check what sources were used for that" "I think those calendar views were really clear"
What additional info did they expect/wish for?	- the rules of thumb of the information video - "I'd actually like to see a prediction of the sun hours and wind in October"	"I like to see the reserves we have built up"	"the major consuming appliances, and the moment you use them" "How much CO2 I save, I don't care. It means nothing to me. Maybe how many trees I save would be interesting"	"Yes, the weather forecast! (...) statistical historical data, what weather can we expect for October. I think that would be the most important information to have."	"Do you maybe have some averages for me? What is a normal carbon footprint?" "I'd have liked to zoom in on the data behind it [the info tiles]. And the weather predictions, those I estimated myself now" "If a July with a lot of wind and few sun would be coming up, I'd like to see that"	"Data of October last year" "You just don't know exactly what it means. In the supermarket you can't buy anything for CO2"
What additional displays of information did they expect/wish for?	"a graph with a break-even point: when will it not cost me too much but will I be as green as possible?"			"It might be nice to combine it to one screen, footprint and euro's. If you then work with graphs you'd have all your information at one glance"	"It would be nice to be able to compare the July's of past years" "What would be the things we could improve most easily" Based on the information display in the video: "Would be nice if there was something like 'if I drag showering to overdays, what would happen then'"	P6 would like it if you could check "the investment you did for your PV cells and track when you earned them back" "Maybe the app could give a notification saying 'you haven't checked it in three months, I checked and think that there are several new choices you could benefit from'"
What additional wishes did the participant have for the energy source selection page/interaction?	"I'd like to see weather predictions"	"In my case I saw the video, but that information did not return in the interface" "What will it do for me? And what will it do for the small entrepreneur?"	"I like alternative ways. (...) Energy from tidal water movement, that would be nice to select" [based on the assumption that every source of energy costs the same] "Maybe he [farmer Piet] is burning fertilizers, I don't know!"	And advice based on that "Based on the history we suggest to choose this for upcoming month"		"I'd like to know if Piet is real (...) If I choose to invest in sustainability, I want to know that it's real" "What will it do for you or the rest of the world when I choose for a lower footprint? (...) Assume I use energy from coal for a whole year, will it melt 10 kilo's of ice for example"

RESEARCH QUESTIONS 1, 2 AND 3

	<ul style="list-style-type: none"> - The story implied a monthly energy source choosing ritual. Also the month scale was the default display. This might explain part of the popularity of the month display - So the time scale that is preferred might be task-related. In real life, a user might consider how often to select new sources. Thereby the desired time scale could be different as well
Time scales	<ul style="list-style-type: none"> - Participants 1, 2 and 3 seemed to express a preference for graphs based on previous experiences with graphs rather than their judgement that a graph was best for this purpose - The graph is appreciated for showing development throughout the month [p1, p2] - The tile display provides quick and clear insight in how days or months were [p4, p5, p6]
Visual - detail	
	<ul style="list-style-type: none"> - A notification with certain influential weather predictions [p5, p6] - An overview of the major energy appliances and when you use them [p3, p5] - An overview of the energy sources used [p5]
Additional information desired	<ul style="list-style-type: none"> - CO2 savings made tangible through an analogy [p2, p3, p6] or by providing a reference [p1, p5]
Additional displays desired	<ul style="list-style-type: none"> - A combined financial and environmental graph display [p4, p5?] - A projection on what energy source choice would deliver you what costs and environmental gain ('break-even point') [p1]
Additional features desired	<ul style="list-style-type: none"> - the possibility to build up reserves [p2] - notifications on benefits the system think you would be able to gain [p6]
Additional information desired for the energy source overview	<ul style="list-style-type: none"> - participants feel like they want clear and trustworthy information on the energy sources and how they produce their energy [p2, p3, p6] - participants would like to see the gain for their energy source [p2, p3]
Discussion	<ul style="list-style-type: none"> - the preferred displays in this test are limited to (1) a display preference in the first acquaintance with the app, (2) in the context of preparing a energy source choice (3) specifically on a month basis - certain type of users bring about certain types of use, which bring about certain preferred displays - if choosing a choosing an energy source is a main topic, then energy sources should also be a main topic in the interface

RESEARCH QUESTIONS 4

	p1	p2	p3	p4	p5	p6
SUS score		88	88	78	70	95
						When filling in the SUS scale: "It would not be something that would enrich my life. So I wouldn't use it more often"
How satisfied were the participants with the UI design?	"It's not difficult to use, you only need a bit to get comfortable with it"	"It's pleasant to look at. When you look at it, it gives you great clarity"	[comfortable interaction with the app suggests that he might be positive, no clear quotes]	[quick and easy interaction with the app suggests a positive attitude towards the UI]	"Really nice that it gives such a good overview"	[quick and easy interactions and responses like 'very clear' and 'easy to understand' suggest a positive attitude towards the UI]
General	"I needed to search for the buttons a bit before I found them" "The distinction between money and sustainability was clear"	"The grey elements, I'm still curious what they mean" switches look like on-off switches	His own app labels footprint with the word 'uitstoot', the prototype here does not have any such labels	"That's quite a tiny 'j', I wouldn't immediately choose to tap on it"		
Visual display	"The corners on the tiles, I missed them at first" "Some days are grey, they are inaccessible"	Tiles "don't immediately show what how much that would be for this month"	[seems to have insufficient detail for him]	"It's a bit strange why not all the tiles have such a corner" "Maybe I can drag this [amount on status bar in the month vis € display]"	"I also work like this with my own agendas" Laurien: "This would be an info button" P5: "Yeah, but in other apps I never use the info button, unless I don't understand it. And here I understood it already"	"And this [detail month CO2] is how it fluctuates over the month, a different display" "It's an easy overview with those colours, you quickly get it."
Detail display	"Week balance, day balance, yes clear!"	"Gives you a nice overview, clear increases and decreases"	"I like the graph, but I understand that there are more options. Two is a nice number"			"I think those calendar views were really clear"
Other				While choosing a energy source: "One curl [referring to the leaf] and here two, I think that is better"		
General	<ul style="list-style-type: none"> - Grey days are misleading in the visual display as they imply limited availability of data [p1, p2] - switches look like on-off switches [p2] - Adding tekst labels to the screens might stimulate understanding of the meaning of carbon footprint [p3] - some text is really small [p1, p2, p3, p4] - Time scale buttons do not really invite clicking on them, due to size and styling [p2, p4] 					
Visual vs detail	<ul style="list-style-type: none"> - The meaning of the blue/green and orange labels is generally understood [p1 - p6] 					
Choosing energy source	<ul style="list-style-type: none"> - There could be acceptance for two display styles in an app such as this one - The leafs in the energy source options are not completely intuitive yet [p4] 					

RESEARCH QUESTIONS 5 & 6

p1		p2
<p>What types of use do participants imagine for themselves for this app?</p> <p>Choosing new energy sources for the next month</p>	<p>"It'd be nice to set a goal for yourself for a certain period and then see the result after the period has ended"</p> <p>"I'd check during the day on how I'm doing [that day]"</p>	<p>"With the year overview you could make a year bill. I'd only use it once a year"</p> <p>"not necessary more options [for energy sources], but rather a recommendation for what you would benefit from most"</p>
<p>"I'd check during the day on how I'm doing [that day]"</p> <p>"12 o'clock, am I on track? Or can I already see that I'm heading into a financially black day?"</p> <p>"Finances do not really matter, but it's available anyhow"</p>	<p>"I might show the performance of my solar panels at work for example"</p>	<p>"I'd like to have more information about the options [on what they mean for me]"</p>
<p>Why this type of usage?</p> <p>What frequency of use would they expect for this type of use?</p>	<p>Daily</p>	<p>Monthly</p> <p>Monthly</p>
<p>Where would they expect this use to occur?</p>	<p>"I can imagine saying on Sunday evening 'hee let's take a look at the new month'"</p>	<p>At home "This is an app, that is just private"</p> <p>Home</p>
<p>What displays would best fit this type of usage?</p>	<p>At work or in the bar</p> <p>"That depends whom I'm showing it to. For one I'd show this screen [month visual €], to another I'd show the footprint [month detail CO2e]"</p>	<p>month detail €, for the graph</p> <p>Detail</p>

p3	p4	p5	p6
<p>"In the beginning I found it really interesting, I checked it every day!"</p> <p>To check the performance of his solar cells. "It has been a terrific year for PV cells of course! Look at these spikes!"</p> <p>"I'm curious sometimes when it was a beautiful day"</p>	<p>"I might check it every day in the beginning. But after a while several times a month? I think?"</p> <p>"I'd like to talk about it with friends"</p> <p>"A few weeks ago a friend came to me asking what I'd recommend. Chinese cells, or German cells. With or without optimizers. I have German cells (...)"</p>	<p>"Yeah, at the end of the month. This is about the month, right."</p> <p>"I'd just make a choice and then I think [that's done movement with arms]"</p> <p>"At a moment of choice, or when the bill is a setback"</p> <p>"What did we do wrong? Was it the climate or our behaviour? (...) What can I think it might be going we easily improve?"</p> <p>"You reserve a certain amount per month. Even if the wind is disappointing you should still be able to pay that. I wouldn't check it every day"</p> <p>The goal would be to get a picture of fixed costs for upcoming month</p>	<p>"In the introduction movie you could see where the laundry machine was in the day. What if I could drag showering to the afternoon and see what would happen [to my portfolio balance]"</p> <p>Just as with banking: to get an idea of the free part of the budget "and plan how to fill it in"</p> <p>Energy is becoming more and more transparent, so I think it might be going this way</p> <p>"Am I staying within my budget, footprint, euro's?"</p> <p>"Yeah it could be something like 'OK, let me try and shower in the afternoon on Friday to make use of our own solar energy and see what happens'"</p>
<p>Daily</p>	<p>Daily, developing towards weekly</p> <p>"In the evening, when you check all the apps, news, facebook, 'oh how's energy doing'. At least that's how I do it, I sit down and go through the apps"</p>	<p>Monthly</p> <p>"At home yes. No I wouldn't be doing this in a café [chuckles]"</p> <p>"In the evening or in the weekend, when I have time"</p> <p>"At the end of the month I'd look at this [month detail € and CO2] because you can see the development. And the year display [year detail € and CO2], because you might want to check last year."</p>	<p>"if I'd 'have to' choose each month, of course monthly"</p> <p>But p6 would rather use it after a notification from the app such as 'Hey I see your panels are performing less than your neighbours. Maybe consider cleaning them' for the environment"</p> <p>"This type of stuff, I rather don't like to be occupied with that. At home we divided tasks. I do the groceries and the cooking, Jörn does the administrative crap"</p> <p>"I regard energy as something unconditional, it's just there. So I don't specifically enjoy its usage"</p>
<p>Anywhere</p>	<p>Anywhere</p>	<p>Monthly</p> <p>"Kitchen table, cup of coffee, Sunday morning"</p> <p>"Month overviews, for the reflections"</p>	<p>As little as possible</p> <p>"No this is not something you'd to at work. Rather when I have time off, preferably in the evening at home"</p> <p>Home</p>
<p>no clear answer</p>	<p>no clear answer</p>	<p>no clear answer</p>	<p>"I think the year view [visual €] might do the job. And it might be entertaining to look at what happened today [month vis €]"</p> <p>Visual month</p>

RESEARCH QUESTIONS 5 & 6

- **Fun checking: checking the status on a daily basis [p1, p3]**
- Pivoting: improving financially or environmentally by choosing new energy sources periodically [p1 - 5 6?]
- **Running projects: set periodical goals and evaluate your approach after that period [p1, p4]**
- **Assisted financial efficiency: let the system help you to improve the financial efficiency of your energy portfolio [p2, p3]**
- Sharing performance: sharing how your portfolio is doing or how you manage it with friends [p1, p3]
- **Budgetting: estimate fixed costs and remaining budget for upcoming month (both € and CO2) [p5, p6]**
- Least-effort: let the system send notifications if there is something to gain

Different types of use distinguished:

references

- the type of user determines the type of use and thereby the preferred screens

Discussion

RESEARCH QUESTION 7

	p1	p2	p3	p4	p5	p6
What was the first response to the navigation suggestion?	"Yeah, seems fine to me!"	"Yeah if I use it [the app] on those days, then maybe it would be usefull"	"ah, so those are the days... [frowning]. I'm trying to understand the question" "I open the app for a reason" [p3 seems to think that the assistant wants to automatically open the app on the given days]	"Ehh [frowning], yes, that's OK with me"	"It might be that I use that screen a lot, but I'd like to look at my footprint a bit more. (...) So no."	[frowning] "yeah that's no problem"
How desirable would these type of suggestions be for the participant?	"It is being recorded anyway. So let's use it then!"	"Now I understand the grey elements, those are the days you did not use the app" A misconception on the grey colours in the € and CO2 displays	"If it comes up, I'd use it. But for me is has no function"	"I think I benefit from it if they use my behaviour in the app" "This [app] is about information, I want to have that as clear as possible"		"At Nu.nl I only read the 'back cover' (...) I wouldn't mind them asking 'hey shal we turn that into your home page?'" "Yeah I wouldn't mind that, it would even be usefull!"
Other considerations?	"It makes you wonder, why not on Wednesday?"			"Nu.nl also asks 'do you want to see more sports on your home page?'. (...) But with a news app I want to limit the extent to which others try to influence me"	"I would have liked the possibility to choose it myself"	Concerning the reply of the chatbot to p6's 'yes that's OK': "For me that second screen was not necessary"
To what extent does the participant consider the personalize pre-selection of energy sources as desirable?	"Eventually I don't care how the pre-selection is made. Yeah, if farmer Jan lives there [pointing out the window], then I'd want farmer Jan. But otherwise I don't care"	"I'm not looking for more options, just more information about the options"	"If it is explained why, I'm OK with it" "I wouldn't like it if there are commercial reasons. That you struck a deal with the farmer."	P4 indicated to be interested in "something like 'based on the history we suggest to choose this for upcoming month'"	"I would appreciate it if a limited selection is being presented, that suits me."	"He should let me know 'I made a selection based on this, and these are the options. And then I always should be able to look at the rest'"
Under what conditions would the system be allowed to make that pre-selection?	"I'd have to know whether it is in my advantage or not" "Maybe the system could offer some filters? Nah I don't care too much"	"I don't want to just choose, I'd want to know what I'd be up to, what it'd bring me" "And how you support people" [showed no immediate curiosity in knowing how the selection was made]	"three is OK, when it refreshes on a monthly basis" "When a lot of wind is expected, that comes up" [p3 regards the solar cells as an investment for now and the future, mainly financial reasons]	When looking at the selection p4 "would like to be able to click a button [see all for example]... en then I'd probably think 'oh yeah, he was right'" "I'd be interested to see what he bases the selction on, 'you always choose solar energy, therefore we recommend this'"	"I would like to be able to look at the remaining options" "I trust the algorithm. So it doesn't need to discuss how the selection was made"	"I find it important to be able to alter the parameters myself"

Conditions for making a pre-selection

- the system should ask if it's OK to make a pre-selection [p5]
- participants would appreciate to see the remaining options to be able assess the relevance of the selection themselves [p1, p4, p5]
- participants would like to consult and optionally adjust the filters of the system [p1, p4, p6]