

UX Research Projects

Suparna Goswami

suparna.goswami1@gmail.com | +1 984 363 0215 | <https://www.linkedin.com/in/suparna-goswami/>

1. *Design and evaluation of in-car speech interface for Emails*
(Joint project: TU Munich & AUDI)

2. *Designing mobile apps to promote energy savings through personalized feedbacks*
(In collaboration with SAP AG)

1. Joint project: TU Munich & AUDI

- Modern cars use speech interfaces for secondary tasks

- *Messaging*
- *Navigation*
- *Emails*

- Enables the driver to keep hands on the steering

What design choices make a more engaging and effective interface?



Image source: <https://www.audi-mediacycenter.com/>

Design and evaluation of in-car speech interface for Emails

Objective

Designing engaging in-car speech interface for emails that also *minimized drivers' cognitive load*

The Challenge

Designing UI for *multi-goal environments* need careful consideration regarding attention distribution for each task, particularly when one of the tasks - **Driving** - is a highly safety critical task

The Process

Conducted *focus groups* with UX *designers* and *researchers*, draw upon cognitive psychology to understand the process of cognitive load allocation. Designed 2 versions of text-to-speech systems, and *experiment* to test them using a driving simulator, *ANOVA tests* for hypotheses testing

Design Challenges

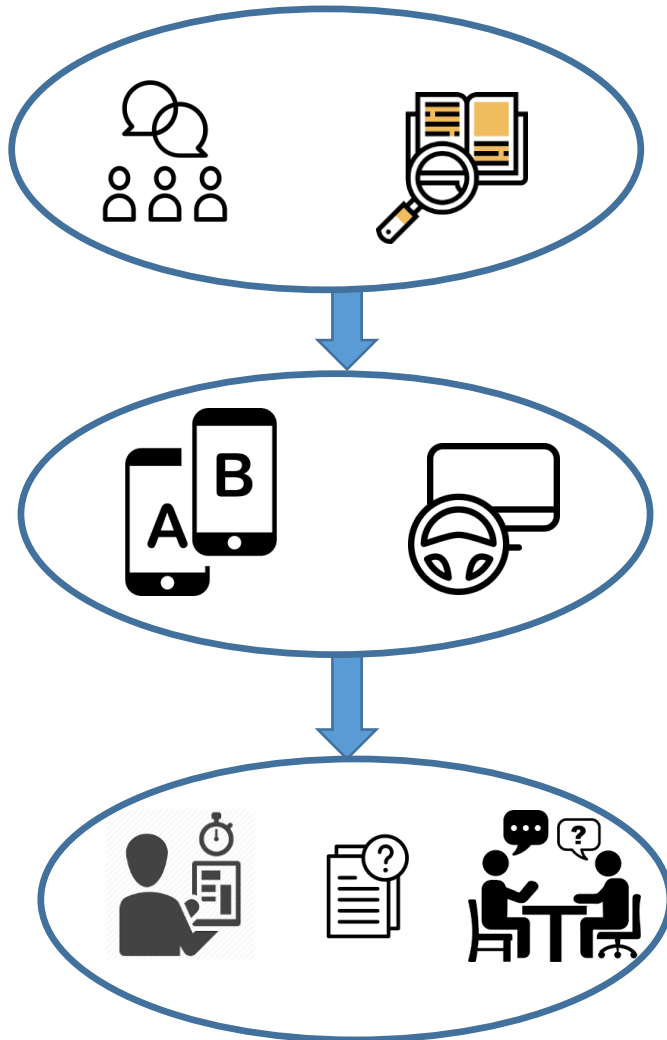
- Multiple goal environment
- Conflicting priorities for tasks
- Driving is a safety-critical task

How can we design a system that allows people to allocate cognitive resources appropriately?



Image Source: <https://www.driversalert.com/are-hands-free-devices-still-a-driving-distraction/>

Research Steps



- *Focus groups/cognitive psychology literature*
 - Reduce cognitive load*
 - Make user's interaction with interface as human-like as possible*
- *2 variants of in-vehicle speech interface*
 - Single TTS (text to speech) voice*
 - Multiple TTS voices to distinguish between different email senders*
- *Evaluative Research - test variants using driving simulator*
 - Experiment*
 - Hypotheses testing*
 - Interviews*

Experiment Design



2 x 2 Factorial Design
112 Participants
Lane Change Task

Primary Task: Driving
Secondary Task: Responding to email

	Email Complexity	
Text-to-Speech Voice Condition	Low	High
Single voice	56	56
Matching voices	56	56

Task Details

Driving	Emails
<ul style="list-style-type: none">Drive on a 3-lane road, at a speed - 90 km/hLane change signals every 150 mtrs (total 18)Took an average of 2 mins to complete a track	<ul style="list-style-type: none">Complete speech-based interface (no visual component)Organized by Email threadsShort speech commands to Read, Dictate and Send replies
Performance measured	Performance measured
<ul style="list-style-type: none">Mean lateral deviationLane change initiation	<ul style="list-style-type: none">Email comprehensionPerceived workload (NASA task load index questionnaire)

Findings & Design Implications

- For the *email task*, users performed better with *matching TTS Voice* condition (perceived cognitive workload was also lower)

However,

- For the *driving task*, performance decreased with the *matching TTS voice* condition

Findings were incorporated in the design of the In-Car Infotainment Services of the car manufacturer

Engagement – Task Performance Paradox

Users inadvertently shifted attention to the more engaging task (emailing) from the primary task of driving

Design Takeaways

- Avoid design principle “make it as simple for the user” when it is not the primary task in a multi-goal environment
- UI for secondary tasks should allow context-aware adaptation (take into account the driving/road conditions)
- Listening to emails is OK, responding causes driver distraction. UI could allow email retrieval, but not responding while driving

2. Design and evaluation of mobile app to promote energy savings through personalized feedbacks

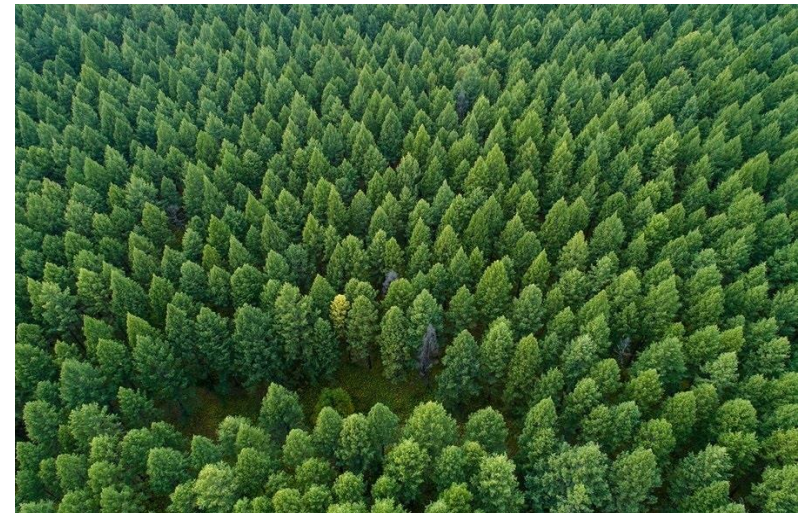
Reduce domestic power consumption through personalized feedbacks

What feedback should be provided to encourage people to reduce power consumption?

Are different people motivated by different feedbacks?



<https://www.earthtouchnews.com/>



<https://www.eppa-eu.org/>

Design and evaluation of in-car speech interface for Emails

Objective

Change domestic energy consumption through *personalized feedback*

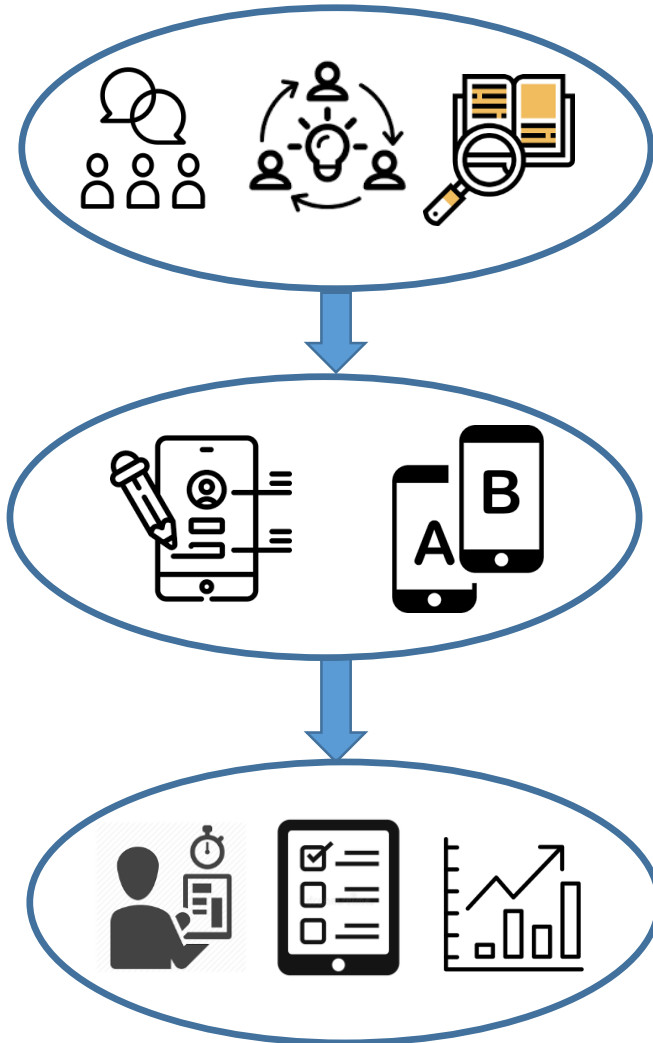
The Challenge

Designing a *feedback system* that is effective for different users – do users have different factors that motivate them when it comes to energy savings?

The Process

Conducted *focus groups* and *ideation sessions* to identify different motivators and design 4 feedback schemes. The 4 alternative designs were tested using *online survey*. *ANOVA tests* were used for hypotheses testing

Research Steps



- *Focus groups & ideation / environmental psychology*

Persuasive systems have mixed acceptance – how to address this?

*Pro-environmental values classified according to **Value-Belief-Norm** theory*

- *Design principle - Match people's values with the feedback provided*

People with different values have different environmental concerns

4 different screens designed

- ***Egoistic, Altruistic, Biospheric, Social** screens*

- *Evaluative Research – users' feedback and acceptance of the alternative variants*

Questionnaire development

Online survey

Hypotheses testing – ANOVA

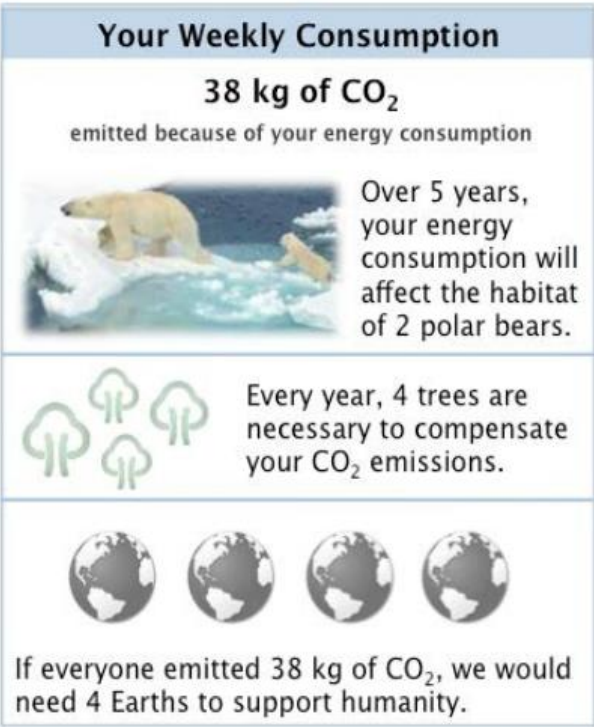
Screen Designs



Egoistic Screen



Altruistic Screen



Biospheric Screen



Social Screen

Survey Design & Findings

Egoistic Concerns

A clean environment provides me with better opportunities for recreation.

Protecting the environment will threaten jobs for people like me.

Laws to protect the environment limit my choices and personal freedom.

Environmental protection is beneficial to my health.

Altruistic Concerns

Pollution generated here harms people all over the earth.

We don't need to worry about the environment because future generations will be better able to deal with these problems than we are now.

The effects of pollution on public health are worse than we realise.

Environmental protection will help people have a better quality of life.

Environmental protection benefits everyone.

Biospheric Concerns

Modern development threatens wildlife.

Over the next several decades, thousands of species of plants and animals will become extinct.

Claims that we are changing the climate are exaggerated.

While some local plants and animals may have been harmed by environmental degradation, over the whole earth there has been little effect.

Social Influence

I would start saving energy if I am sure my friends approve it.

It is important for me that others like my energy saving efforts.

If other people can see me saving energy, I would do as they expect.

I like to know what behaviours make good impressions on others.

Respondents recruited through FB ads, mailing lists → 77 usable responses
People classified into High/Low for each value (*Egoistic*, *Altruistic*, *Biospheric*, *Social Influence*)

Respondents were asked to rate the screens for

- Usefulness
- Satisfaction

Also asked to rank the 4 screens, and individual information element within each screen

Social Influence and *Egoistic* feedbacks were considered most useful
Satisfaction was also highest with these two screens

The information provided in the Egoistic screen was considered the most useful – even for people who self reported themselves low in Egoistic values

Information related to money savings, comparison with neighbors were consistently ranked as most useful

Design Implications for Eco-feedback applications

- Provide more *proximal feedback* → Direct implication to self, short-term, near future implications
- *Visual feedback* is more effective and preferred
- Feedback should contain elements of Egoistic and Social influence related information – as these are construed as most useful
- Depending on user's values/concerns – Biospheric/Altruistic, *localized feedback* regarding these aspects should be provided
- Feedback should be framed in 'positive manner', feedback regarding harmful consequences of user behavior is off-putting and therefore less effective

