USER EXPERIENCE IN SMART KITCHEN ENVIRONMENT

Pagenkopf, Engeln, Palm, Zeiner, Burmester, & Scheible
SMART KITCHEN

- Scientific research project funded by the German Federal Ministry of Education & Research

- **Project partner:** E.G.O. Elektrogerätebau Oberderdingen GmbH, Institute for Visualization and Interactive Systems (VIS) at the University of Stuttgart

- **Aim:** Enhancing the user experience of cooking by examining how digital media can be accessed intuitively using multimodal interaction
SMART KITCHEN

» **Project duration:** 02/2016 - 01/2019

» **Project leader:** Prof. Dr. Jürgen Scheible

» **Project staff:**

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<tr>
<th>Interaction Design &amp; Implementation</th>
<th>User Experience</th>
<th>Data privacy</th>
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<tr>
<td>Prof. Dr. J. Scheible</td>
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WHAT IS USER EXPERIENCE?

› “A person's perceptions and responses that result from the use or anticipated use of a product, system or service."

(ISO 9241-210)

› “I devote myself to this field of study since half a century. For me the subject of usability is done for. If I buy a new car or a new camera - I don’t ask myself: Does it drive? Does it make pictures? Today I ask myself:
   › Is it fun to use?
   › Can I establish a positive emotional attachment?”

(Don Norman - brand eins, 07/2013, S. 73; own translation)
HUMAN-CENTRED DESIGN PROCESS

Plan the human-centred design process

Designed solution meets user requirements

Evaluate the designs against requirements

Understand and specify context of use

Iterate, where appropriate

Specify the user requirements

Produce design solutions to meet user requirements

DIN EN ISO 9241-210: 2010
SPECIFY CONTEXT OF USE & USER REQUIREMENTS

› Procedure:
   › Contextual inquiry
     › Aim: Explorative analysis of context of use and current experiences while cooking
     › Process: Combination of observation and interview methods while cooking in private surroundings
     › Result: 10 Opportunity Areas

› Analysis of experiences
   › Aim: Inquiry and analyses of requirements for positive cooking experiences
   › Process: Experience interviews (online) regarding positive experiences while cooking and in the kitchen
   › Result: 17 experience categories
RESULTS – OPPORTUNITY AREAS

- Securing success & good results
- Support well-being & relaxation
- Sensory impressions
- Efficiency
- Meeting the demands of others
- Allow guidance
- Room for experimenting
- Hygiene, cleanliness and health
- Create social activities
- Protect the environment
RESULTS – EXPERIENCE CATEGORIES

Resonance & Support
› Receiving personal feedback
› Learning new things
› Teaching others
› Helping others
› Receiving help
› Doing something for others

Competence
› Rising to a challenge
› Experiencing creativity

Organization
› Finishing a task
› Keeping track of things

Communication
› Creating something together
› Experiencing community
› Connecting with others
› Acting according to one’s beliefs

Atmosphere
› Remembering & Tradition
› Savoring
› Experiencing something new
CONCLUSION

› Results from both approaches complement each other
  › Opportunity Areas: Focus on the task itself; addresses both positive and negative aspects/problems of a situation
  › Experience categories: Focus is slightly more on social aspects and communication; addresses solely positive aspects of a situation

Combination of both approaches ensures a broad cover of relevant aspects for the user experience
HUMAN-CENTRED DESIGN PROCESS

- Plan the human-centred design process
- Designed solution meets user requirements
- Understand and specify context of use
- Evaluate the designs against requirements
- Iterate, where appropriate
- Produce design solutions to meet user requirements
- Specify the user requirements

DIN EN ISO 9241-210: 2010
IDEATION

› Generation of ideas based on the Opportunity Areas and experience categories

› 3 ideation phases:
   › Different methods (e.g. Lego Serious Play, brainstorming, brainwriting)
   › Different teams

› Development of story based low fidelity prototypes
WHAT ARE LOW FIDELITY PROTOTYPES?

› Fast and easy produced prototypes of functionality, interaction and design of a product
  › E.g. story based scenarios, sketches, paper models, ...

› Advantages of low fidelity prototypes: (Busche, 2014)
  › Detect and fix major problems early
  › Build cheaply and easily
  › Draw feedback that focuses on high-level concepts, rather than execution
  › Iterate more willingly
  › Carry and show them easily
**HUMAN-CENTRED DESIGN PROCESS**

1. Plan the human-centred design process
2. Understand and specify context of use
3. Specify the user requirements
4. Design solution meets user requirements
5. Evaluate the designs against requirements
6. Iterate, where appropriate
7. Produce design solutions to meet user requirements

DIN EN ISO 9241-210: 2010
EVALUATION

› Focus groups: qualitative discussion of whole kitchen concepts
  › Evaluation of the overall User Experience
  › Optimization of single functions
  › Generation of new ideas

› Online study: quantitative evaluation of single functions (AttrakDiff, Hassenzahl et al., 2003)

Optimization of data quality through the combination of qualitative and quantitative evaluation methods

Good data basis for prioritizing functions for the implementation in the next steps
RESULTS OF EVALUATION

› Qualitative insights (examples)
  › Many people want to have music in the kitchen
  › It must be possible to turn every function off in order to retain control

› Quantitative insights (examples)
  ”The SmartKitchen is connected to your fridge and storeroom and thus knows, which ingredients you have at home. The kitchen suggests meals based on this information.”

  ”You invite guests for dinner. Afterwards they have the opportunity to rate the food on a cooking platform.”
NEXT STEPS

- Mid fidelity prototypes
  - Evaluation of mid fidelity prototypes (simulation study)
- High fidelity prototypes
  - Evaluation of high fidelity prototypes (lab experiment)
- Installation of final prototype in private households
  - Evaluation of final prototype (field experiment)
REFERENCES


THANK YOU FOR YOUR ATTENTION
## USER RESEARCH - SAMPLE

<table>
<thead>
<tr>
<th>Affinity</th>
<th>Age</th>
<th>Stove</th>
<th>Name</th>
<th>Age</th>
<th>Stove</th>
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<tbody>
<tr>
<td>C+ (high affinity for cooking)</td>
<td>1 P</td>
<td>&lt; 30</td>
<td>Dominik (26)</td>
<td>(gas stove)</td>
<td>Renate (68)</td>
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<tr>
<td></td>
<td>2+ P</td>
<td>30-60</td>
<td>Lena (21)</td>
<td>Mathias (50)</td>
<td>Natalie (31)</td>
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<tr>
<td>C- (low affinity for cooking)</td>
<td>1 P</td>
<td>&lt; 30</td>
<td>Elisabeth (24)</td>
<td>(gas stove)</td>
<td>TP2* (34)</td>
</tr>
<tr>
<td></td>
<td>2+ P</td>
<td>30-60</td>
<td>TP5* (24)</td>
<td>Martin (49)</td>
<td>(gas stove)</td>
</tr>
</tbody>
</table>

* The names are not mentioned according to users’ privacy requirements.
EXPERIENCE INTERVIEWS - SAMPLE

› 81 participants
  › Age: M = 28.84 years (SD = 9.28)
  › Sex: 61 women
  › Household size: M = 2.33 (SD = 1.47)

› Distribution channels
  › Facebook
  › Homepage
  › Students of the HdM
  › Friends and acquaintances
OPPORTUNITY AREAS

Definition

- Area of insufficiently met or unmet user needs
- Are often driven by the improvement of one or more UX facets.
- Points to a possible solution space
- May be a springboard for ideas.

How to define opportunity areas?

1. Analyse your key findings according to moments of experience
2. Formulate “How might we ...” questions which points out a possible solution space for these moments of experience
3. Structure those questions into a few groups of similar contents
4. Find a headline for those groups which expresses an opportunity area to be addressed
IN NEGATIVE TERMS: DEAD END AREAS

Definition
• Area where insufficiently met or unmet user needs become more obviously
• Are often driven by worsening of one or more UX facets
• Points to a possible weak point of the user
• Has to be avoided because it endangers the success of solutions

How to define dead end areas?
1. Analyse your key findings according to
   - critics on the current process
   - needs and expectations for improvement
2. Formulate “How might we avoid that …” questions which point out possible dead ends for future design.
3. Structure those questions into a few groups of similar contents
4. Find a headline for those groups which expresses a dead end not to be addressed
EVALUATION - SAMPLE

› Focus groups:
  › 8 focus groups with 3 participants each
  › Students of the HdM

› Online study: Evaluation of single functions (AttrakDiff, Hassenzahl et al., 2003)
  › 246 valid data sets
ONLINE STUDY - SAMPLE

Sex:
- Male: 40%
- Female: 60%

Age:
- 0-19: 10%
- 20-29: 50%
- 30-39: 10%
- 40-49: 10%
- 50-59: 10%
- 60-69: 5%
- 70-79: 5%

Average age: 31.45 years (17-73)
ONLINE STUDY - SAMPLE

School education

- Hauptschulabschluss
- Realschulabschluss
- (Fach-)Hochschulreife

Professional qualification

- Apprenticeship
- Bachelor's degree
- Master's degree
- Diploma
- Doctor's degree
- None

Februar 2017

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ONLINE STUDY - SAMPLE

**Residence**

- Village: < 5,000 citizen
- Small town: 5,000-20,000 citizen
- Town: 20,000-100,000 citizen
- City: > 100,000 citizen

**Household size**

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 12
- 18

**Household income**

- < 1,000€
- 1,000-2,000€
- 2,000-3,000€
- 3,000-4,000€
- > 4,000€
- ns