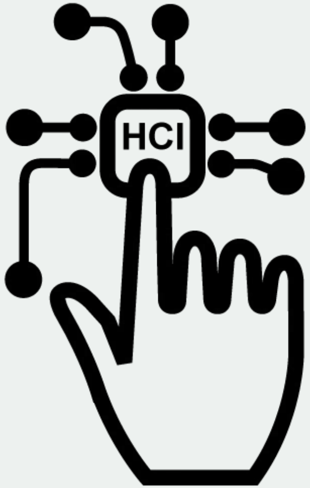
ASSIGNMENT #1

COURSE CODE: COMP 3603

COURSE TITLE: Human Computer Interaction

LECTURER: Mr Nicholas Mendez

GROUP MEMBERS:



Name	ID
Annika Boodoosingh	816035294
Zuhrah Mohammed	816036112
Elena Panchoo	816034966

“BrailleBuddy: A Tangible User Interface to Support Children with Visual Impairment in Learning Braille”

Annika Boodoosingh
816035294
COMP 3603 - Assignment #1

BrailleBuddy

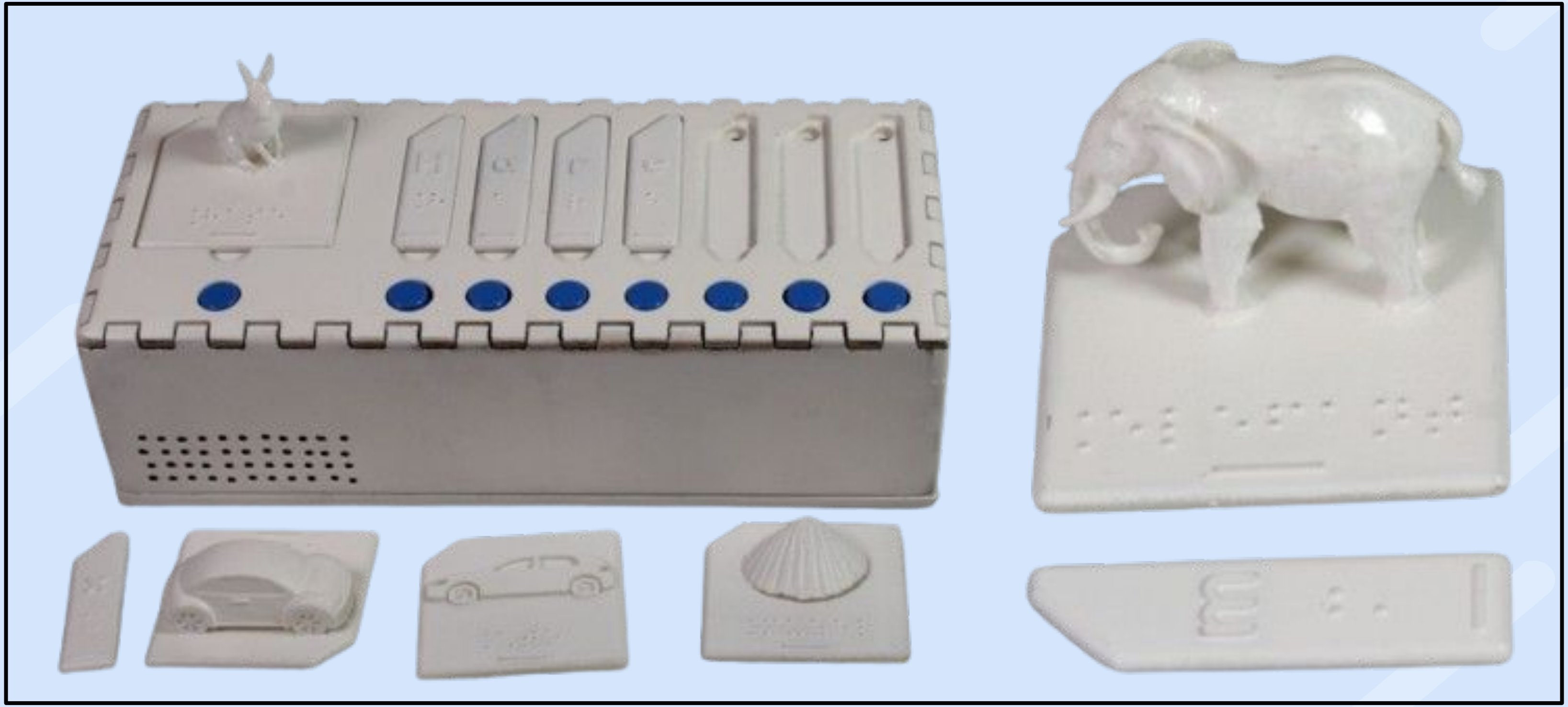


Table of Contents

01

Background

Authors and Affiliations

- **Florian Lang:** Ludwig Maximilian University of Munich, Germany
- **Albrecht Schmidt:** Ludwig Maximilian University of Munich, Germany
- **Verena Pues:** Ludwig Maximilian University of Munich, Germany
- **Tonja-Katrin Machulla:** Institute for Media Research, TU Chemnitz, Germany

Significance in the HCI Field

- **Florian Lang** has advanced HCI with his work on assistive tools like BrailleBuddy for visually impaired children and "creepy" technologies, along with enhancing accessibility for low-vision users through mixed reality.

- **Verena Pues** has significantly impacted HCI with projects like BrailleBuddy, Playmake, Magic Glove, and Cura Chatbot, all aimed at improving accessibility and user interaction.

- **Albrecht Schmidt, a leading** HCI researcher, co-authored BrailleBuddy and has contributed to studies on mixed reality and machine learning for accessibility.

- **Tonja-Katrin Machulla** is known for her work on BrailleBuddy and Playmake, focusing on accessibility and user experience.

Publisher and Publication Date

Publisher:

Association for Computing Machinery
New York, NY, United States

Publication Date:

19 April 2023

02

Abstract

Main Objectives

- Develop BrailleBuddy, a tool to aid in learning Braille, fostering academic success for blind or visually impaired individuals.

Contributions

- Developed BrailleBuddy, a physical interface to assist visually impaired children in learning Braille.
- Supported further adaptation and development by other researchers, practitioners, and educators, the source code, building instructions, and design references were published.

Findings

- BrailleBuddy supports independent use, allowing children to learn Braille at their own pace.
- BrailleBuddy enhances educational materials and promotes playful learning, with high engagement and enjoyment reported by most participants.
- Many children expressed a desire to use BrailleBuddy again, indicating its effectiveness and potential for real-world application.

03

Methodology

Research Methods Used

A study was conducted and the session was divided into three phases:

1. **Introduction:** The participants were introduced to the study's goals and were encouraged to provide critical feedback.

2. **Exploration:** The participants engaged with BrailleBuddy and its components, such as the letter and word cards, to become familiar with the device while receiving minimal guidance.

3. **Evaluation:** The participants engaged in various game modes, such as Word Copy, Word Scramble and Word Riddle, in order to test the device's ease of use and functionality.

Each session lasted 30 minutes, based on expert recommendations and an understanding of children's attention spans. This length allowed participants to explore BrailleBuddy and its features at their own pace.

Provision of Support

During the study, support was provided and classified into three types:

- ➔ **Finding Letters:** Help with locating the correct letter cards.
- ➔ **Solving the Game:** Assistance with game challenges, including clues or tips.
- ➔ **Interacting with BrailleBuddy:** Support with using the device, such as operating it or understanding how to use its features.

This classification aimed to assess how effectively BrailleBuddy supported independent use and identify areas for improvement.

Data Collection Techniques

- **Observational data:** The experimenters took notes on the participants' behaviour. Teacher feedback was also collected after each session to further understand the children's level of engagement.

- **Video and audio recording:** Video and audio recordings focused on participants' interactions with BrailleBuddy, capturing their actions and responses only while they were actively using the device. This data was analyzed to understand how they engaged with BrailleBuddy and their overall behavior.

Data Collection Techniques

- ➔ **Digital interaction logging:** All interactions with the BrailleBuddy, including placing cards, removing cards, and pressing buttons, were recorded, inclusive of timestamps and the digital state of BrailleBuddy.
- ➔ **Teacher interviews:** After each session, the teacher was interviewed to provide further insights on participants' behavior.

04

Results

Game Performance

➔ **Significant Improvement**: A one-tailed t-test was conducted to assess the hypothesis that time would improve in the second half of gameplay. The results showed that participants improved significantly, as the mean time per correct card placement decreased from 113 seconds (SE 23) in the first half to 72 seconds (SE 16) in the second half ($t(10) = 2.82$, $p < 0.01$).

Letter Cards

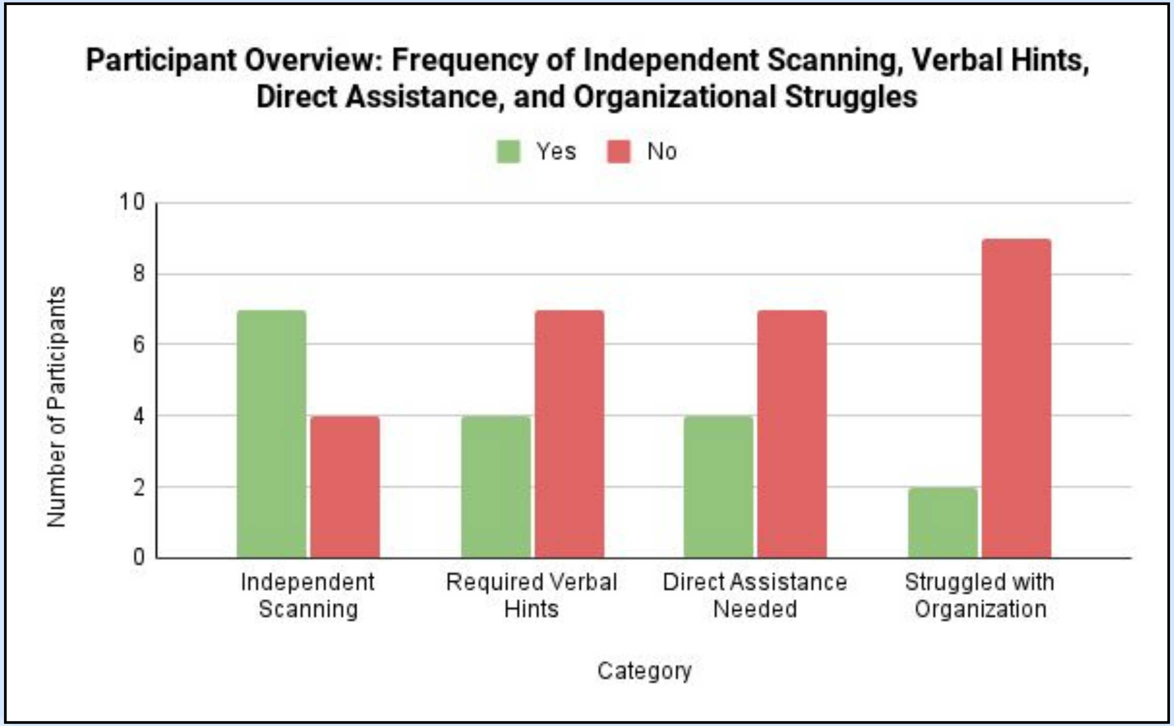
- **Independent Scanning:** Seven participants (P1, P3, P4, P5, P6, P7, P8) were able to independently scan the letter cards to find the correct ones.

- **Verbal Hints**: Four of the participants (P3, P5, P7, P8) required up to three verbal hints during the study when they consistently overlooked certain letters.

- **Direct Assistance**: The other participants (P2, P9, P10, P11) needed more direct assistance, such as having specific letters provided to them.

- **Struggled with Organization**: Specifically, P9 and P10 struggled with maintaining organization, leading to a chaotic and jumbled letter area, which increased the difficulty of the task.

Bar Graph showing Participant Overview: Frequency of Independent Scanning, Verbal Hints, Direct Assistance, and Organizational Struggles



Preference for 3D over 2D objects

- ➔ **Preference for 3D Figurines**: In 14 rounds of Word Copy, participants chose 3D figurines 12 times over 2D relief images, showing a clear preference due to the distinct physical features that made 3D objects easier to recognize.
- ➔ **Detailed Tactile Features**: Participants interacting with detailed 3D objects, like a 3D elephant, found that tactile features improved object identification and interaction.
- ➔ **Mitigation of Confusion**: Some confusion occurred with similar shapes (e.g., mistaking a hare for a rabbit), but BrailleBuddy's audio feedback helped correct these errors effectively.

Preference for 3D over 2D objects

Image showing 3D objects

Image showing 2D relief images

Participant Engagement

- **Interest in Continued Use:** Ten out of eleven participants showed strong interest in using BrailleBuddy again. P7 and P11 wanted the device at home, and P10 asked to play again after their session. Only P2 was unsure, while all others, except P9, said they would use BrailleBuddy in their free time and at home.

05

Discussion

Implications of the findings and their significance in the HCI domain:

- The results of this study offer important insights for HCI research, specifically in the areas of accessibility technology and the design of educational tools.

- The findings highlight the importance of user-centered design that evolves through feedback and iteration. They also emphasize how customized support systems can improve the performance of learning tools like BrailleBuddy.

Improvement in Performance and Engagement

- The children's performance improved with quicker card placements and fewer errors. Positive audio feedback, like winning sounds, kept them motivated, and their letter recognition skills strengthened over time, highlighting the benefits of interactive tools.

- These findings suggest that well-designed assistive technologies with good feedback can significantly enhance learning and skill development.

3D Object Recognition and Tactile Interaction

- The clear preference for 3D figurines over 2D images shows how important multi-sensory interaction is in accessible technology. The physical details of the 3D objects made them easier to identify, highlighting the need for intuitive design.

- BrailleBuddy’s use of tactile feedback combined with auditory cues clarifies ambiguities and corrects errors in tactile recognition, aligning with HCI research that supports the effectiveness of multiple sensory inputs in enhancing assistive technologies and reducing cognitive load.

An Entertaining and Fun Tool

- ➔ The study demonstrates the importance of incorporating entertainment and fun into assistive technologies. Participants' positive engagement with BrailleBuddy, driven by gamified elements and interactive challenges, underscores how enjoyable experiences can enhance user motivation and learning.

- ➔ This aligns with HCI research emphasizing that engaging and fun interactions improve user performance and sustained use of educational tools.

Limitations of Study

Challenges with Usability:

- ➔ **Issues with card interaction:** Some of the children experienced difficulties in rotating and placing the cards correctly. Hence, future designs could include differently shaped cards, handles, or larger, more flexible slots to reduce errors and simplify interactions.

- ➔ **Issues with card organization:** The varied approaches children took to retrieve cards indicate that organizing the storage area into smaller, sorted sections (e.g., by letter type) could enhance efficiency. Additionally, reducing the number of cards and using separate cases for different types of cards could improve organization and ease of use.

Limitations of Study

Audio Feedback:

➔ **Lack of Multilingual and Sound Variety:** BrailleBuddy can be enhanced by supporting multiple languages and incorporating a wider range of sound effects to improve accessibility for users from different regions. Features such as headphone compatibility and volume control would also address various environmental conditions and hearing needs.

06

Conclusion

Main Takeaways

- **An Effective Learning Tool:** BrailleBuddy has proven to be an engaging and effective learning tool for children with visual impairments, significantly reducing the time needed for correct card placement and enhancing skill acquisition.

- **Participant Engagement and Interest:** Many participants expressed a strong interest in using BrailleBuddy at home, suggesting its potential for broader application beyond formal educational settings. Positive audio feedback and tactile elements significantly enhanced user engagement and enjoyment. Additionally, the preference for 3D figurines over 2D relief images highlights the advantages of incorporating clear and distinct tactile features.

Main Takeaways

- **Opportunities for Improvement:** Despite its strengths, BrailleBuddy has areas for improvement, including card placement issues, attention span challenges, multilingual support, and storage organization. Addressing these can further enhance its usability and accessibility.

Relevance and Impact

- **Contribution to HCI Research**: This research offers valuable insights into designing assistive technologies, especially educational tools for visually impaired users. It emphasizes the integration of adaptive feedback, multisensory elements, and engaging interactions to improve learning outcomes.

- **Guidance for Future Development:** The findings suggest enhancements for BrailleBuddy and similar technologies, such as context-aware feedback, multilingual support, and improved storage solutions to boost usability and effectiveness.

These insights are beneficial for researchers and practitioners in HCI, particularly in educational technology and accessibility.

07

References

References

https://verenapues.com/

https://www.researchgate.net/scientific-contributions/Florian-Lang-2180558054

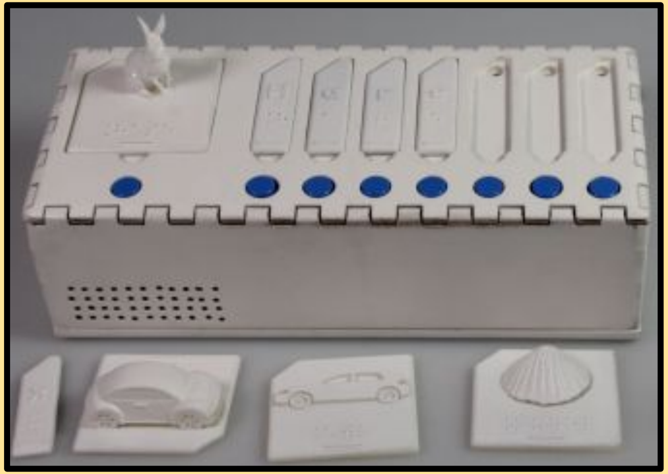
https://www.researchgate.net/profile/Albrecht-Schmidt

https://dl.acm.org/doi/10.1145/3544548.3580844

https://www.sciencedirect.com/topics/earth-and-planetary-sciences/experimental-design#:~:text=Experimental%20design%20is%20the%20process,has%20on%20a%20dependent%20variable.

https://www.geeksforgeeks.org/principles-of-usability/

Thank you for your attention!



Elena Panchoo - 816034966 - COMP 3603 - Assignment 1

Supporting the Contact Tracing Process with WiFi Location Data: Opportunities and Challenges

CONTENTS

BACKGROUND

AUTHORS

Kaely Hall
Mehrab Bin Morshed
Munmun De Choudhury
Dong Whi Yoo
Vedant Das Swain
Alex Endert
Jennifer G Kim
Wenrui Zhang
John Stasko
Gregory D. Abowd

AFFILIATIONS

Georgia Institution of Technology
Northeastern University

PUBLICATION

Published: 28 April 2022
Association for Computing Machinery
New York, NY, United States

SIGNIFICANCE IN FIELD

Notable contributions in HCI by focusing on data visualization, social computing, mental health alongside human-AI interaction. Their works have advanced the usability of systems with focus on the user experience in order to solve real world problems

ABSTRACT

Main Objectives: To determine how technology (WiFi) can help alleviate the need for unreliable sources of data; in reference to contact tracers assisting in the containment of the COVID-19 virus

Contributions: Design implications for technology that aids these contact tracers by using WiFi technology

Findings: Data which showed improved help for the contact tracers, however, there were also negative aspects such as: data inconsistencies, false positives, false negatives and information sharing hesitancy

METHODOLOGY

TWO MODELS

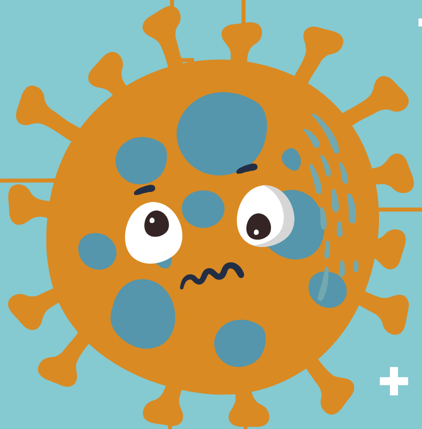
In contact tracing, decentralized device-based and centralized infrastructure-based models are used

DATA SOURCE

University WiFi network chosen as it can provide user locations & has desirable information such as proximity and duration of contact

DATA COLLECTION

Interviews with contact tracers, evaluation sessions for refinement, further interviews with active tracers,



DESIGNS

Initial design, feedback, addressing concerns, new version, more feedback, change of design, finalization of tool

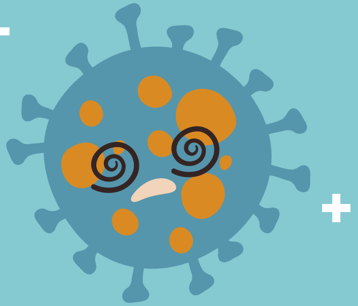
EXPERIMENTATION

Mock tracing calls, investigations, interviews, compensation

PARTICIPANTS

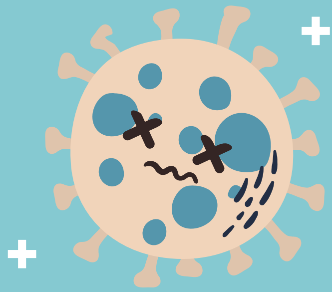
Email surveys, study sessions (note that no design participants were present again), analyzed data, end of participant recruiting

METHODOLOGY



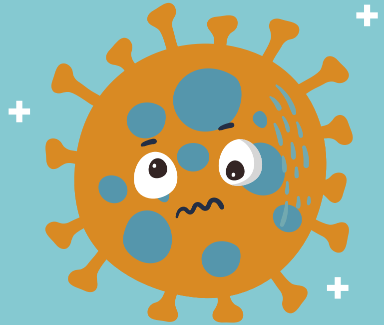
PREPARATION

Case Id numbers created, information given to contact tracers, no identifiable information shared. (Contact tracers were 'trained' with the tool beforehand to ensure best usage) Extra functionalities explored.



PARTICIPATION

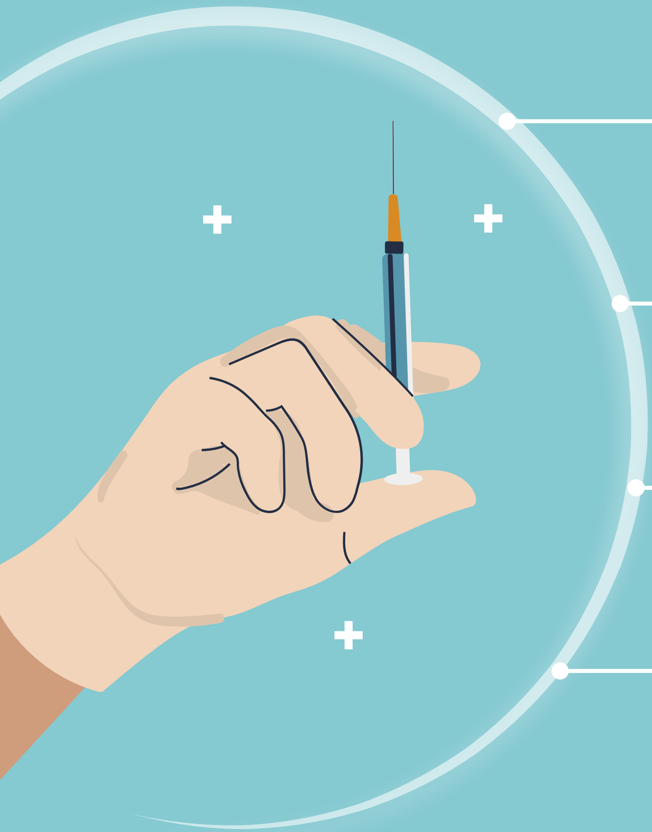
Contact tracers operated more than one call, real locations of users used (WiFi technology), follow up interviews to assess the usefulness of the HCI component



DATA PROCESSING

Thematic analysis (3 themes), open coding to evaluate inferences from participants. Interview transcriptions reviewed, mock calls analyzed for specific data (qualitative data)

RESULTS



1	**DATA**	14 mock phone calls done, 158 identifications (11 per call)
2	**INCONSISTENCIES**	WiFi data ambiguity (false +ves, -ves), user memory problems, information sharing hesitancy
3	**POSITIVES**	Most inconsistencies fixed, (2 not solved), split between the HCI component vs human word, tracers agreed that it was useful
4	**PRIVACY**	Willing to participate due to transparency, want of access to own data

DISCUSSION

FINDINGS AND SIGNIFICANCE:

Socio-technical gaps, i.e false reports, infrastructure based sensing is limited to scope of its network, visualizing data helps add context to imperfect data, and system designs should aid in collaboration between users (tracers and users), relevant data is prioritized and the system should help reconcile inconsistencies

FINDINGS AND SIGNIFICANCE:

The system should also aid in bridging gaps in design to increase utility (i.e. false reports) to help users identify potential inaccuracies and make informed decisions, trust must be established between users and authority; either by allowing users to refine or adjust data or through being transparent about data collection and usage

DISCUSSION

LIMITATIONS:

Small number of participants, bias within community (as those willing to participate were already comfortable with sharing data), limited due to utilization of pre-existing network and infrastructure, unlike the real world

CONCLUSION

The tool designed successfully help contact tracers jog the memory of the participants and raised their confidence. However, the limitations that arose (data inconsistencies, privacy concerns etc…) proved to be challenging in making this HCI tool run perfectly. In order to create something even more functional and easy for users, better design elements can be added to help users prioritize and comprehend the data they are gathering.

This research paper is quite relevant due to the COVID-19 virus not being completely eradicated; and thus contact tracers may still be looking for tools to ease their workflow. This research impacts the way future HCI tools may be developed as the study has shown various insights into problem areas for developers, and ways it can be improved upon in the future.

REFERENCES

https://doi.org/10.1145/3491102.3517703

https://www.kent.edu/ischool/dong-whi-yoo

https://www.who.int/news-room/questions-and-answers/item/coronavirus-disease-covid-19-contact-tracing

THANKS FOR LISTENING

ANY QUESTIONS?

Presented by Zuhrah Mohammed

Exploring Renewable Energy Futures through Household Energy Resilience

COMP 3603
Assignment 1

BACKGROUND

Authors and affiliations:

- Hanna Hasselqvist; Design and Human Factors, Chalmers University of Technology
- Maria Håkansson; Built Environment, Energy and Circular Economy, RISE Research Institutes of Sweden
- Sara Renstrom; Digital Systems, Prototyping Societies, RISE Research Institutes of Sweden
- Helena Stromberg; Design and Human Factors, Chalmers University of Technology

Significance in HCI Field: The authors are recognized for their contributions to Sustainable HCI, focusing on the intersection of technology and environmental sustainability.

Publisher: Association for Computing Machinery New York, NY, United States

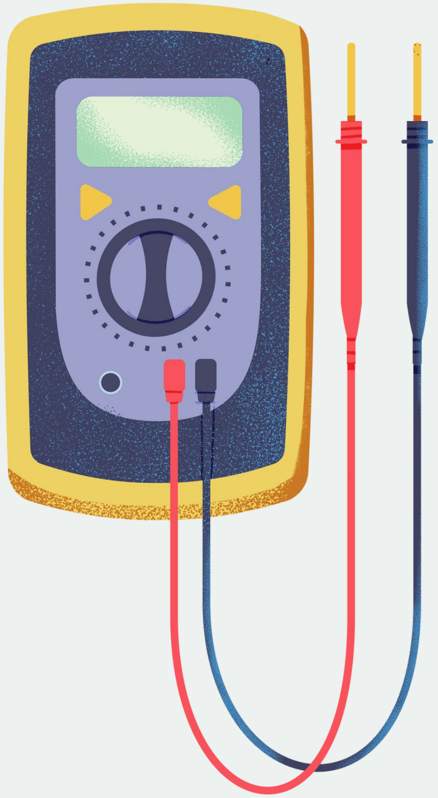
Published on 29 April 2022

Publication: CHI Conference on Human Factors in Computing Systems (CHI '22), April 29–May 05, 2022, New Orleans, LA, USA.

ABSTRACT

Due to the depletion of our climate state, there have been many studies carried out by experts to discover the ways in which the Earth's population may contribute to the improvement of our climate. One of these identified strategies is a transition to renewable energy as an alternative to fossil fuel based production of non-renewable energy.

The paper investigates how households can adapt to intermittent energy supplies as the world transitions to renewable energy sources to meet climate goals. It emphasizes the concept of household energy resilience and identifies strategies that households can employ to manage energy consumption effectively as well as the roles HCI can play to support resilience



METHODOLOGY

- The study employed qualitative research methods, including semi-structured interviews and experience sampling with 21 Swedish households.
- Data collection focused on understanding household practices, challenges, and strategies related to energy resilience in order to identify possibilities for supporting household energy resilience.
- Participants were asked to reflect on their experiences with energy use, particularly during power outages or shortages, and to speculate on future scenarios and expectations involving intermittent energy supply.
- The participants were sought from varying types of households to diversify the results of the study and account for different possibilities and scenarios

01 Firstly, the 21 participants received a workbook describing a possible renewable energy scenario.

02 Secondly they were interviewed about their experiences and expectations in relation to the scenario

03 Finally, they received follow-up questions via text message

RESULTS

Table 2: Overview of the participating households based on the application forms. Perceived preparedness was in relation to a potential 24-hour power outage

Code	*Type of home (location)*	*No of adults in the household (age of any children)*	*Gender **	*Age span **	*PVs, solar water heating or electric car (EV)*	*Comment*	*Perceived preparedness*
P01	Farm (rural)	2 (0, 5, 7, 11, 12)	Man	35-44			Very prepared
P02	House (rural)	2	Woman	65-74			Can adapt
P03	House (urban)	2	Woman	55-64	Solar water heating, EV	Planning for PVs	Somewhat prepared
P04	Apt (urban)	1	Non-binary	45-54			Somewhat prepared
P05	Farm (rural)	3	Man	55-64	Solar water heating		Very prepared
P06	House (rural)	2	Woman	35-44	PVs in future home	Previously lived in and about to move to off-grid house	Very prepared
P07	Attached house (urban)	3 (17)	Woman	45-54	PVs in holiday home		Very prepared
P08	Attached house (urban)	2 (5, 10)	Man	25-34			Somewhat prepared
P09	House (rural)	1	Man	35-44	PVs	Off-grid house	Very prepared
P10	House (semi-urban)	1	Man	65-74	EV		Somewhat prepared
P11	House (urban)	2	Man	65-74	PVs in holiday home	Off-grid holiday home	Can adapt
P12	Apt (urban)	1	Woman	18-24	EV		Somewhat prepared
P13	Apt (urban)	2 (10, 12, 14)	Woman	45-54			Somewhat prepared
P14	Apt (urban)	1 (15, 17)	Woman	45-54			Not at all prepared
P15	Apt (urban)	1 (9, 12)	Woman	35-44			Somewhat prepared
P16	Apt (urban)	2 (2, 7)	Man	35-44	PVs on apt building	Living lab building	Not at all prepared
P17	Apt (urban)	1	Woman	18-24	PVs on apt building & holiday home	Living lab building	Somewhat prepared
P18	Apt (urban)	1	Man	18-24	PVs on apt building	Living lab building	Unsure
P19	Apt (urban)	1	Man	18-24	PVs on apt building	Living lab building	Somewhat prepared
P20	Apt (urban)	1	Woman	18-24	PVs on apt building	Living lab building	Unsure
P21	Apt (urban)	1	Man	25-34	PVs on apt building	Living lab building	Can adapt

Key Observations:

01 **Households in rural areas (farms, houses) tend to be better prepared, especially if they have solar energy systems.**

02 **Urban and apartment households, particularly in living lab buildings with PVs, show varying levels of preparedness, with many being "somewhat prepared" or "unsure."**

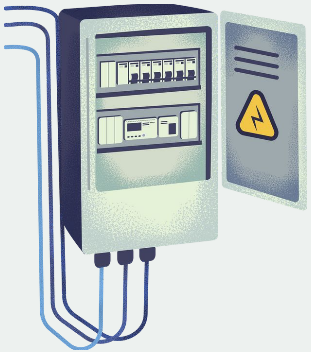
03 **Electric vehicles (EVs) and future plans for PV installations are common in households that are somewhat or very prepared.**

The key findings identified three strategies for enhancing household energy resilience:

- **Response Diversity: Households adopt varied approaches to manage energy use.**
- **Creating Opportunities for Resilience: Households leverage technology and community resources.**
- **Building Community Energy Resilience: Collaboration among households enhances overall resilience.**

DISCUSSION

The findings underscore the critical role of HCI in facilitating household energy resilience. By designing technologies that align with household practices and routines, HCI can help mitigate the challenges posed by intermittent energy supply. The study suggests that future research should focus on developing user-centered designs that consider the social and cultural contexts of energy use.



- Implications: The research has significant implications for policymakers and energy providers. It suggests that fostering community-based energy initiatives can enhance resilience and encourage sustainable practices. Additionally, the findings highlight the need for educational programs that inform households about energy management strategies.

- Limitations: The study's focus on affluent households may limit the generalizability of the findings. Future research should explore the experiences of diverse socioeconomic groups to gain a more comprehensive understanding of household energy resilience.

- Future Directions: The authors call for interdisciplinary collaboration between HCI researchers, energy experts, and community organizers to develop holistic solutions that address the complexities of energy resilience in various contexts.

CONCLUSION

The research done used the perspective of household energy resilience to underscore the potential of HCI to contribute to sustainable energy practices. Given the enhanced digitalization and electrification that has been made common throughout society that inhibits dependency on stable electricity supply, HCI can be made to take into consideration energy constraints and strengthen resilience.

REFERENCES

Hasselqvist, H., Renström, S., Håkansson, M., & Strömberg, H. (2022). Exploring Renewable Energy Futures through Household Energy Resilience. In CHI Conference on Human Factors in Computing Systems (CHI '22), April 29–May 05, 2022, New Orleans, LA, USA. ACM.

https://doi.org/10.1145/3491102.3517597

Presented by Zuhrah Mohammed

Thank you very much!

COMP 3603
Assignment 1