

# SWEN 422 Lecture 4

## Dealing with research data 2

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# Agenda

- Review of previous lecture
- Formative research in HCI
  - Example of understanding a problem
  - Example of understanding behaviour in a setting
- Basic quantitative analysis
- Basic qualitative analysis

# Research data – why?

- “data generated during the research project” (Rudolph et al., 2015)
- We want to answer our question -> analyse
- We want to keep it for future research -> archive for reproducibility
- We want to make it available to others -> re-use as part of open science

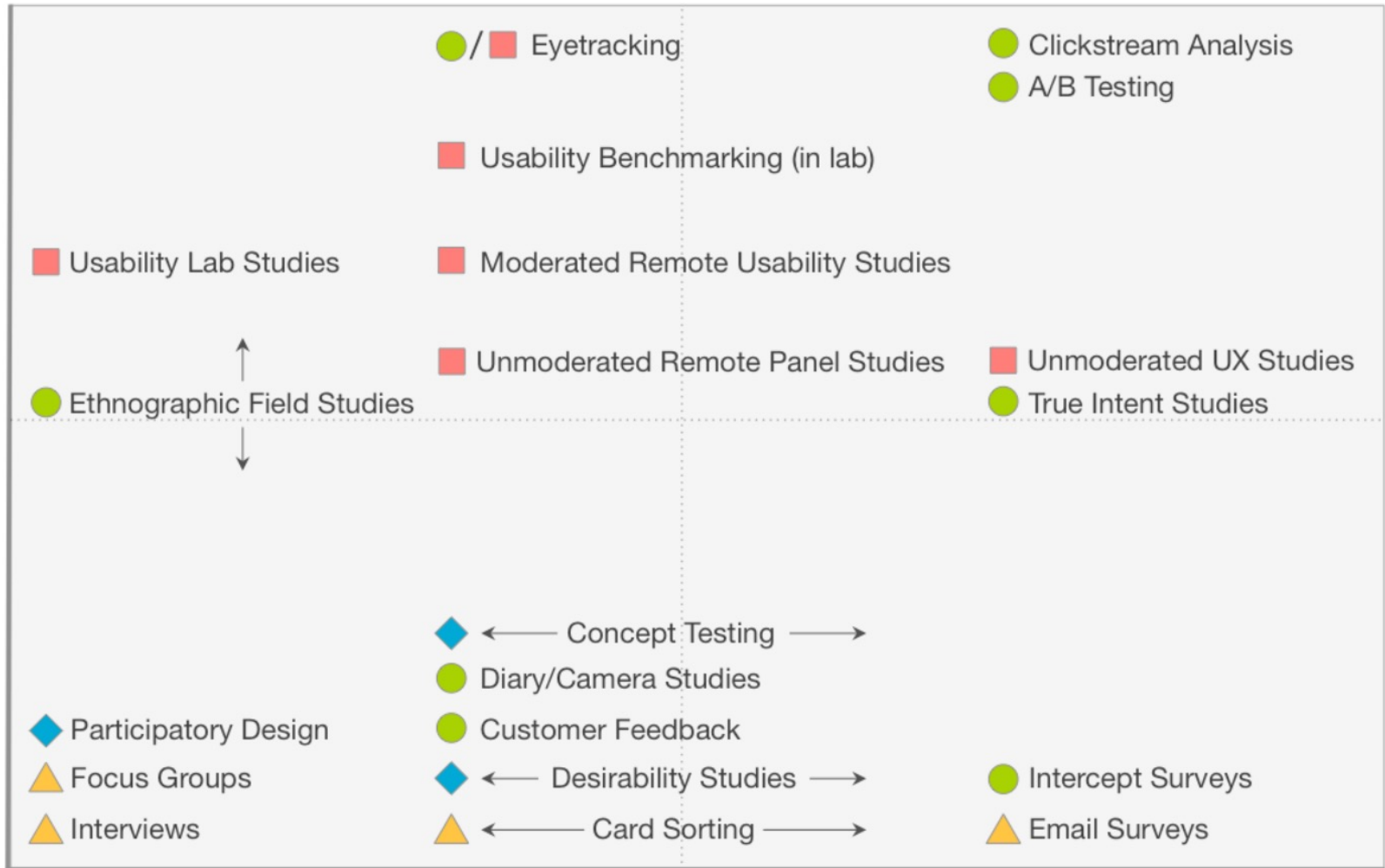
# Considerations

- What is the situation in which the data are collected?
- What do the data consist of?
- What kind(s) of analyses are performed on the data to generate “knowing?”
- What kinds of questions can this method answer (and what not)?

Olson, J. S., & Kellogg, W. A. (Eds.). (2014). *Ways of Knowing in HCI* (Vol. 2). New York: Springer.

# A LANDSCAPE OF USER RESEARCH METHODS

**BEHAVIORAL**



**QUALITATIVE (DIRECT)**

**QUANTITATIVE (INDIRECT)**

## KEY FOR CONTEXT OF PRODUCT USE DURING DATA COLLECTION

● Natural use of product

■ Scripted (often lab-based) use of product

▲ De-contextualized / not using product

◆ Combination / hybrid

# Data analysis method

- Depends on ***goals*** of the study
- Depends on the ***types of data*** collected
- Depends on the ***phase*** of the project/process
  - **Formative research** – early in project/process, evaluates & refines **ideas**
  - **Summative research** – later in the project/process, evaluates & refines **systems**

# Formative Research in HCI

- Establish **relationships** between researchers and participants
  - [Collaborative Research Stories: Whakawhanaungatanga](#)
- Understand a **problem**
  - Why are people abandoning their online shopping carts?
- Understand **behaviour** in a **setting**
  - What are the experiences of emergency medical dispatchers?
- Understand **attitudes** to existing systems or situations
  - How do people view conversational agents (such as Siri)?
- Test an early (lo-fi) **prototype**
- Based on our findings we may want to
  - Formulate requirements for a system
  - Conduct further studies

# Formative Research in HCI: Understand a **problem**

Example Question: **Why are people abandoning their online shopping carts?**

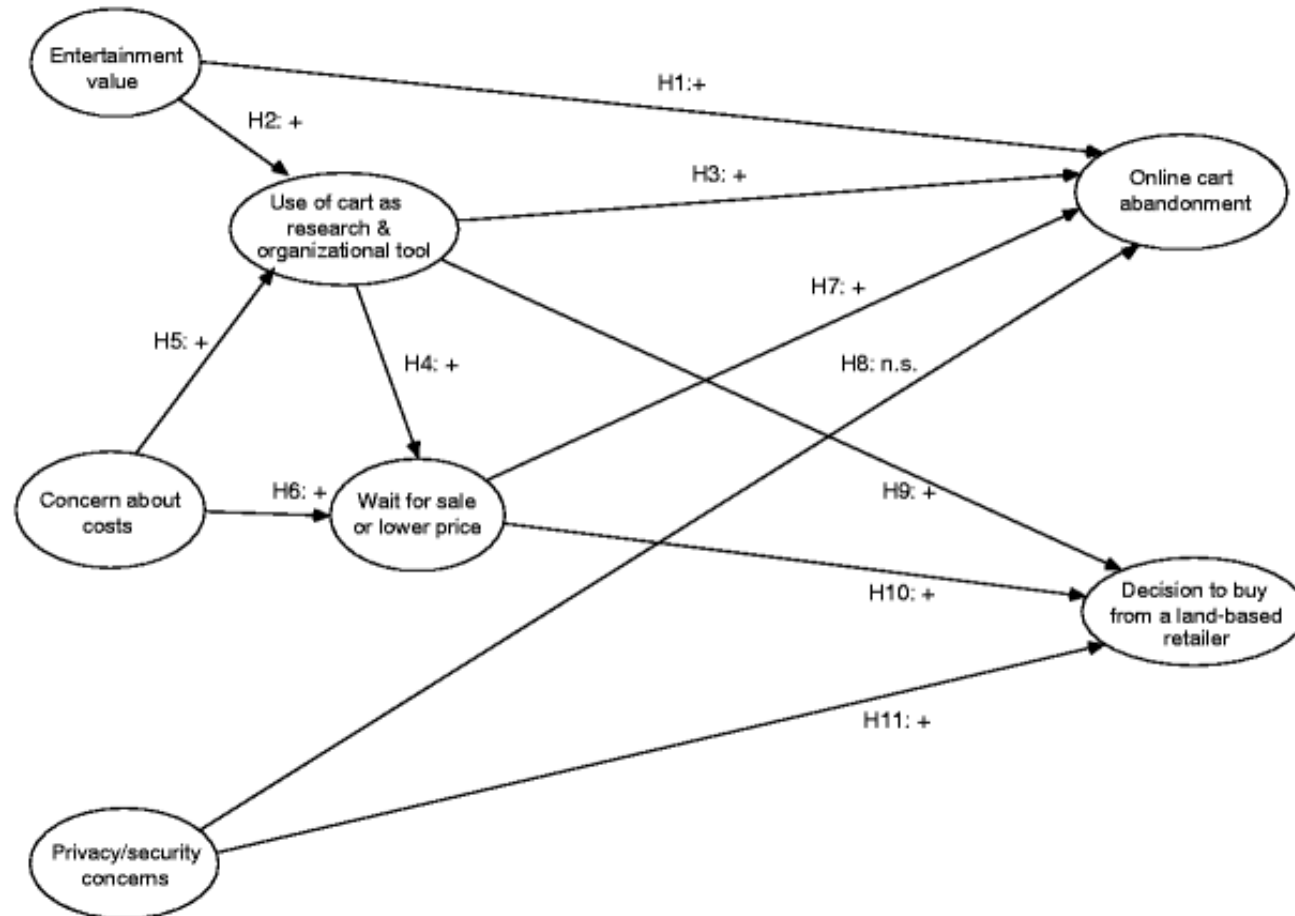
- What does the literature say (aka has anybody looked into this before)?
  - Yes – turns out people use the online shopping cart for things *other* than making purchases: entertainment, narrowing down choices, waiting for lower prices, etc.
  - You can use existing knowledge to develop hypotheses, e.g.,  
*H<sub>1</sub>: The more that consumers use their online cart for entertainment, (boredom or fun), the more likely they are to abandon it.*

Kukar-Kinney, M., & Close, A. G. (2010). The determinants of consumers' online shopping cart abandonment. *Journal of the Academy of Marketing Science*, 38(2), 240-250. SWEN422 Dr Jennifer Ferreira 2024



# Formative Research in HCI: Understand a **problem** (Kukar-Kinney & Close 2010)

**Determinants of Consumer Electronic Shopping Cart Abandonment:  
Conceptual Model**



Note: The direction of the significant effect is shown for each relationship; n.s. = not significant.

# Formative Research in HCI:

## Understand a **problem** (Kukar-Kinney & Close 2010)

- Ran an online survey for quantitative analysis
- Found that all hypotheses except one ( $H_8$ ) were supported by the data:  $H_8$ : “online privacy and security concerns would be associated with greater extent of online cart abandonment.”
- **System requirements:** track cart items as indicators of shoppers’ interests or desires to inform targeted advertising
- **Further studies:** extend the sample to countries other than the US, investigate the role of perceived risk

# Formative Research in HCI: Understand **behaviour** in a **setting**

Example Question: **What are the experiences of emergency medical dispatchers?**

- What does the literature say (aka has anybody looked into this before)?
  - Yes – lots, but nobody has focused on how the team uses artefacts to coordinate its work
  - Turns out there is an analytical framework that can help with this investigation, called **Distributed Cognition**

Dominic Furniss & Ann Blandford (2006) Understanding emergency medical dispatch in terms of distributed cognition: a case study, *Ergonomics*, 49:12-13, 1174-1203, DOI: [10.1080/00140130600612663](https://doi.org/10.1080/00140130600612663)

# Formative Research in HCI: Understand **behaviour** in a **setting**

(Furniss & Blandford, 2006)

- Conducted observations and interviews for qualitative analysis
  - Focused on recording data about the **setting** (e.g. a desk), **people** (e.g. secretary), **objects**, (e.g. a patient's medical records), and **tasks** (e.g. taking a call)



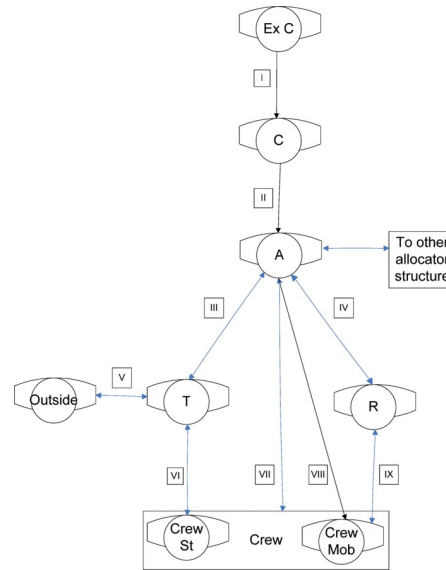
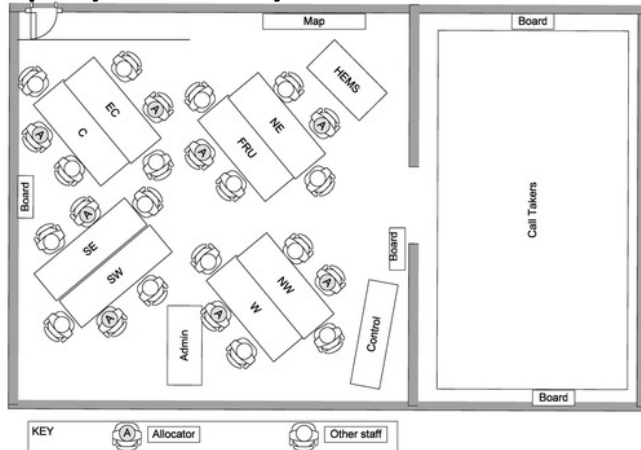
# Formative Research in HCI: Understand **behaviour** in a **setting**

(Furniss & Blandford, 2006)

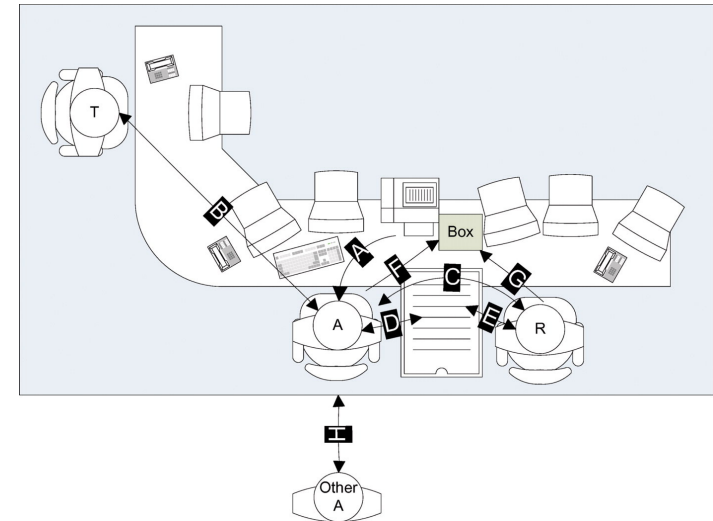
- Developed models of:

information flows

physical layout



artefacts



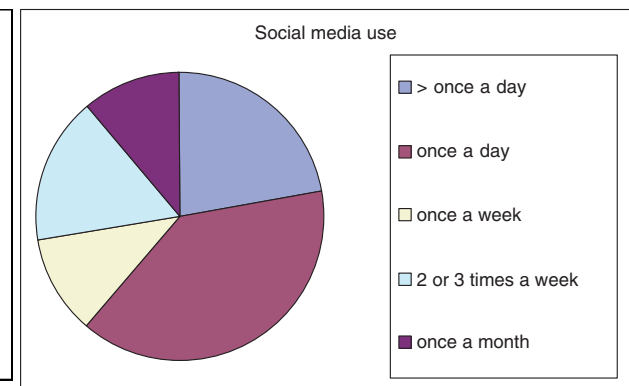
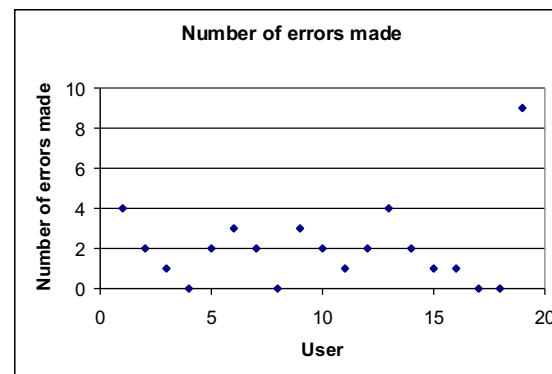
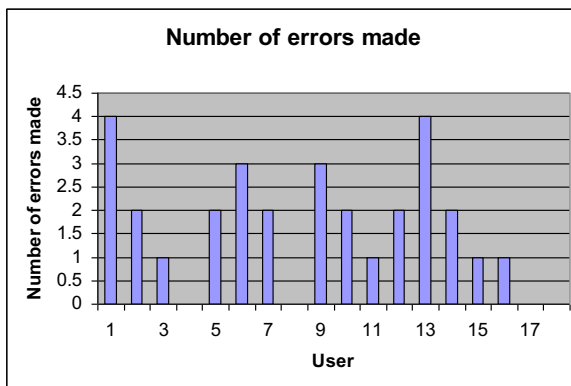
# Formative Research in HCI: Understand **behaviour** in a **setting**

(Furniss & Blandford, 2006)

- **System requirements:** mobile device is needed for EMD to contact crew anywhere
- **Further studies:** testing the method in other team-work situations

# Basic quantitative analysis

- [Quick intro to statistics](#)
- Graphing the data can help to identify trends, outliers
- Software packages: R, SPSS



# Basic quantitative analysis

- How you design the questions can affect the data:
  - “How do you feel about this VR interface?”

Respondent	Realistic	Clunky	Distorted
A	1		
B		1	
C		1	
...			
Total	14	5	7



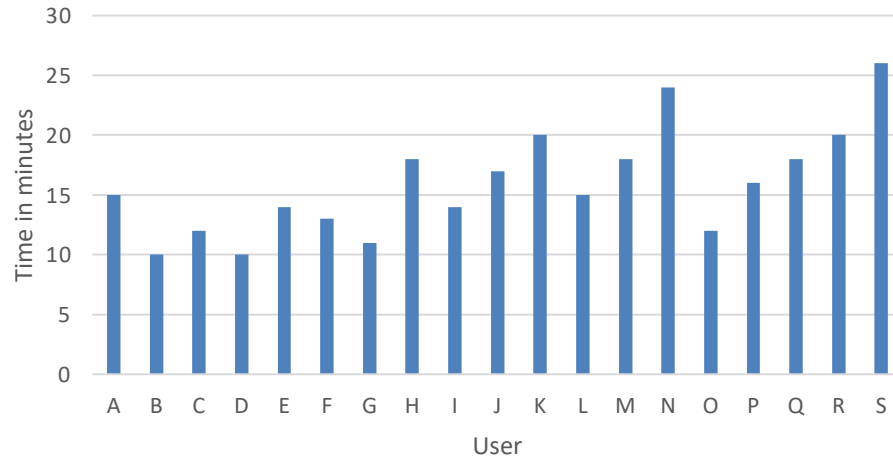
# Basic quantitative analysis

- How you design the questions can affect the data:
  - “Do you agree or disagree with the following statement: This VR interface is realistic:”

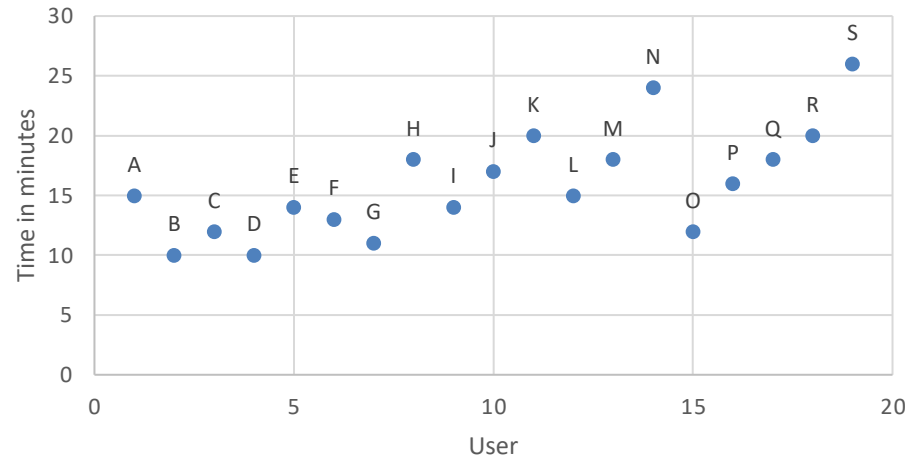
Respondent	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree
A	1	1			
B					
C				1	
...					
Total	5	7	10	1	3

# Activity 1

Time to complete task



Time to complete task



# Basic qualitative analysis

- Looking for critical incidents
  - Focus in on key events
  - Identify themes ([Thematic Analysis](#)) OR
  - Categorise the data ([Grounded Theory](#))
- Inductive analysis
  - Emergent from data
  - Dependent on observation framework if used
- Deductive analysis
  - Categorisation scheme pre-specified
- In practice, combination of inductive and deductive
- Software: NVivo, ATLAS.ti

# Basic qualitative analysis

How you ask questions can affect the response:

- “That was a fun experience, wasn’t it?” (leading) -> “How was that experience for you?”
- “How easy was the software to use?” (leading) -> “Walk us through your experience of using the software”

Interviewer: *“What do you usually do at home in your free time?”*

Participant: *“Sometimes I draw, or maybe do some yoga.”*

Interviewer: *“I love yoga too! That’s really good.”*

The participant then proceeds to discuss yoga more, thus steering the conversation towards it. (interviewer bias)

# Looking for themes

## Interview Excerpt:

- *Interviewer:* Can you describe your experience with remote work during the pandemic?
- *Participant:* Yeah, it's been quite challenging, to be honest. One of the biggest issues I faced was maintaining a work-life balance. When your office is your home, it's hard to switch off. I found myself working late into the night more often than I'd like to admit.
- *Interviewer:* What about communication with your colleagues? How has that been?
- *Participant:* That's another thing. Communication has been a bit of a struggle. Sure, we have all these fancy tools like Zoom and Slack, but it's just not the same as face-to-face interaction. Sometimes I feel like I'm missing out on important conversations or updates because everything is happening online.
- *Interviewer:* Have you faced any technical difficulties while working remotely?
- *Participant:* Oh, definitely. Internet issues have been a nightmare. There have been days when my internet would just drop out in the middle of a meeting, or I'd have trouble accessing important files because of slow connections. It's frustrating, to say the least.

# Looking for themes

## Interview Excerpt:

- *Interviewer:* Can you describe your experience with remote work during the pandemic?
- *Participant:* Yeah, it's been quite **challenging** to be honest. One of the biggest issues I faced was maintaining a work-life balance. When your office is your home, it's **hard to** switch off. I found myself working late into the night more often than I'd like to admit.
- *Interviewer:* What about communication with your colleagues? How has that been?
- *Participant:* That's another thing. Communication has been a bit of a **struggle**. Sure, we have all these fancy tools like Zoom and Slack, but it's just not the same as face-to-face interaction. Sometimes I feel like I'm **missing out** on important conversations or updates because everything is happening online.
- *Interviewer:* Have you faced any technical difficulties while working remotely?
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# Looking for themes

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- *Participant:* That's another thing. **Communication** has been a bit of a struggle. Sure, we have all these fancy tools like Zoom and Slack, but it's just not the same as face-to-face interaction. Sometimes I feel like I'm missing out on important **conversations** or **updates** because everything is happening online.
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# Example themes

- **Theme 1: Work-Life Balance**
- Subtheme: Difficulty disconnecting from work
- Subtheme: Increased tendency to work longer hours
- **Theme 2: Communication Challenges**
- Subtheme: Lack of informal interactions
- Subtheme: Potential for miscommunication or missed information
- **Theme 3: Technical Difficulties**
- Subtheme: Internet connectivity issues
- Subtheme: Difficulty accessing files or software remotely



# TA Conclusion

- **Conclusion:** The thematic analysis of the interview data highlights three main challenges faced by individuals working remotely during the COVID-19 pandemic: maintaining work-life balance, navigating communication challenges, and dealing with technical difficulties. These findings suggest the need for organizations to implement strategies to support remote workers in overcoming these challenges, such as providing resources for managing workload and improving communication channels and technological infrastructure.

I'm thinking that it's just a lot of information to absorb from the screen. I just I don't concentrate very well when I'm looking at the screen. I have a very clear idea of what I've read so far . . . but it's because of the headings I know OK this is another kind of evaluation now and before it was about evaluation which wasn't anyone can test and here it's about experts so it's like it's nice that I'm clicking every now and then coz it just sort of organises the thoughts. But it would still be nice to see it on a piece of paper because it's a lot of text to read.

Am I supposed to, just one question, am supposed to say something about what I'm reading and what I think about it the conditions as well or how I feel reading it from the screen, what is the best thing really?

*Observer – What you think about the information that you are reading on the screen . . . you don't need to give me comments . . . if you think this bit fits together.*

There's so much reference to all those previously said like I'm like I've already forgotten the name of the other evaluation so it said unlike the other evaluation this one like, there really is not much contrast with the other it just says what it is may be . . . so I think I think of . . .

Maybe it would be nice to have other evaluations listed to see other evaluations you know here, to have the names of other evaluations other evaluations just to, because now when I click previous I have to click it several times so it would be nice to have this navigation, extra links.

**Figure 8.9** Excerpt from a transcript of a think-aloud protocol when using an online educational environment. Note the prompt from the observer about half way through

*Source:* Excerpts reproduced with permission from Ursula Armitage (2004) Navigation and learning in electronic texts. PhD thesis, Centre for HCI Design, City University London.

## 1. Interface Problems

- 1.1. Verbalizations show evidence of dissatisfaction about an aspect of the interface.
- 1.2. Verbalizations show evidence of confusion/uncertainty about an aspect of the interface.
- 1.3. Verbalizations show evidence of confusion/surprise at the outcome of an action.
- 1.4. Verbalizations show evidence of physical discomfort.
- 1.5. Verbalizations show evidence of fatigue.
- 1.6. Verbalizations show evidence of difficulty in seeing particular aspects of the interface.
- 1.7. Verbalizations show evidence that they are having problems achieving a goal that they have set themselves, or the overall task goal.
- 1.8. Verbalizations show evidence that the user has made an error.
- 1.9. The participant is unable to recover from error without external help from the experimenter.
- 1.10. The participant makes a suggestion for redesign of the interface of the electronic texts.

## 2. Content Problems

- 2.1. Verbalizations show evidence of dissatisfaction about aspects of the content of the electronic text.
- 2.2. Verbalizations show evidence of confusion/uncertainty about aspects of the content of the electronic text.
- 2.3. Verbalizations show evidence of a misunderstanding of the electronic text content (the user may not have noticed this immediately).
- 2.4. The participant makes a suggestion for re-writing the electronic text content.

### Figure 8.10 Criteria for identifying usability problems from verbal protocol transcriptions

Source: Excerpts reproduced with permission from Ursula Armitage (2004) Navigation and learning in electronic texts. PhD thesis, Centre for HCI Design, City University London.

[I'm thinking that it's just a lot of information to absorb from the screen. **UP 1.1**]  
[ I just I don't concentrate very well when I'm looking at the screen **UP 1.1**]. I have a very clear idea of what I've read so far . . . [but it's because of the headings **UP 1.1**]  
I know OK this is another kind of evaluation now and before it was about evaluation which wasn't anyone can test and here it's about experts so it's like it's nice that I'm clicking every now and then coz it just sort of organises the thoughts. [But it would still be nice to see it on a piece of paper **UP 1.10**] [because it's a lot of text to read **UP 1.1**].

Am I supposed to, just one question, am supposed to say something about what I'm reading and what I think about it the conditions as well or how I feel reading it from the screen, what is the best thing really?

*Observer – What you think about the information that you are reading on the screen . . . you don't need to give me comments . . . if you think this bit fits together.*

[There's so much reference to all those previously said **UP2.1**] [ like I'm like I've already forgotten the name of the other evaluation so it said unlike the other evaluation this one like, there really is not much contrast with the other it just says what it is may be . . . so I think I think of . . . **UP 2.2**]

[May be it would be nice to have other evaluations listed to see other evaluations you know here, to have the names of other evaluations other evaluations **UP 1.10**] just to, [because now when I click previous I have to click it several times **UP 1.1, 1.7**] [so it would be nice to have this navigation, extra links **UP 1.10**].

**Figure 8.11** The excerpt in Figure 8.9 coded using the categorization scheme in Figure 8.10

Source: Excerpts reproduced with permission from Ursula Armitage (2004) Navigation and learning in electronic texts. PhD thesis, Centre for HCI Design, City University London.  
[www.id-book.com](http://www.id-book.com)

# Which analytical framework?

Framework	Data	Focus	Expected outcomes	Level of granularity
Conversation analysis	Recordings of spoken conversations	How conversations are conducted	Insights into how conversations are managed and how they progress	Word-level, or finer, for instance, pauses and inflection
Discourse analysis	Recordings of speech or writing from individuals or several participants	How words are used to convey meaning	Implicit or hidden meanings in texts	Word, phrase, or sentence-level
Content analysis	Any form of “text” including written pieces, video and audio recordings, or photographs	How often something is featured or is spoken about	Frequency of items appearing in a text	A wide range of levels from words, to feelings or attitudes, to artifacts or people
Interaction analysis	Video recordings of a naturally-occurring activity	Verbal and non-verbal interactions between people and artifacts	Insights about how knowledge and action are used within an activity	At the level of artifact, dialogue, and gesture
Grounded theory	Empirical data of any kind	Constructing a theory around the phenomenon of interest	A theory grounded in empirical data	Varying levels, depending on the phenomenon of interest
Systems-based frameworks	Large-scale and heterogeneous data	Large-scale involving people and technology, such as a hospital or airport	Insights about organizational effectiveness and efficiency	Macro-level, organizational level

# Further reading

- [A Brief Introduction to Distributed Cognition](#) by Yvonne Rogers
- Chambers, R. L., & Skinner, C. J. (Eds.). (2003). *Analysis of survey data*. John Wiley & Sons.
- Robertson, J., & Kaptein, M. (Eds.). (2016). *Modern statistical methods for HCI*. Cham: Springer.
- Byrne, D. A worked example of Braun and Clarke's approach to reflexive thematic analysis. *Qual Quant* **56**, 1391–1412 (2024). <https://doi-org.helicon.vuw.ac.nz/10.1007/s11135-021-01182-y>
- Elo, S., & Kyngäs, H. (2008). The qualitative content analysis process. *Journal of advanced nursing*, 62(1), 107-115.
- Chapter 9 in Preece, Jenny, et al. *INTERACTION DESIGN : BEYOND HUMAN-COMPUTER INTERACTION*, Wiley, 2015. *ProQuest Ebook Central*, <http://ebookcentral.proquest.com/lib/vuw/detail.action?docID=4901891>