The Human Factor (THF)

Week 5: Error and Safety + Data Analysis

Dr Tara Capel

THE UNIVERSITY of EDINBURGH

Week 5 Outline

- CW1
  - Review marking rubric
- Error and Safety
  - Overview
  - Case Study: LLM and Mental Health Support
- Thematic Analysis
  - Activity

Error and Safety

Error and Safety Overview

- **Context is important:** people interact with technology within specific contexts, which must be considered when designing systems
- **Sources of error:**
  - People, context and technology can each contribute to errors
  - Systems should be designed to prevent and mitigate errors
- **Interdependencies:** errors can arise not just from individual components but also from their interactions
- **Design limitations:**
  - The design limitations of the system must be acknowledged
  - Humans should not have to compensate for poor system design

Frank Ritter / Gordon Baxter / Elizabeth Churchill (2014): Foundations for Designing User-Centred Systems. London, UK: Springer.

Case Study: LLM and Mental Health Support

A LLM is being used as a chat-based virtual therapist, offering advice, emotional support, and even crisis intervention. This system is designed to mimic human-like responses based on large datasets and is deployed via an online platform to those who wish to use it.

- Think-Pair-Share:
  - What are error and safety considerations of the use of LLMs in mental health contexts
  - Consider people, context and technology

Design Limitations and Challenges

- What mechanisms should be in place to detect and mitigate errors in AI-driven mental health support?
- How can the limitations of LLMs be communicated effectively to users to prevent misuse?

Analysing Qualitative Data

Why do we need to analyse data?

- We analyse data to:
  - Make sense of the data we have collected
  - Identify meaningful, interesting and valuable findings
  - Translate findings into design specifications, guidelines, recommendations, suggestions
- Types of Data:
  - Quantitate Data: information that can be quantified or expressed as numbers (e.g. responses to closed questions, error rates, etc)
  - Qualitative Data: difficult to measure as numbers (e.g. descriptions such as field notes, responses to open ended questions, interview transcripts, think aloud talk, etc)

Thematic Analysis

Thematic Analysis of Qualitative User Research Data

https://youtu.be/KUZ6iGvJlGI

Thematic Analysis

- “Thematic analysis is a method for identifying, analysing and reporting patterns (themes) within data. It minimally organises and describes your data set in (rich) detail” (Braun and Clarke 2006).
- A six-step method for identifying, analysing and reporting patterns (themes) within data in response to a research question:
  - Familiarise yourself with the data
  - Generate initial codes
  - Search for themes
  - Review themes
  - Refine and name themes
  - Produce the report
- Thematic analysis is a practical method used across UX industry and research

Braun, V. & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3,* 77-101.
https://www.researchgate.net/publication/235356393_Using_Thematic_Analysis_in_Psychology

https://www.nngroup.com/articles/thematic-analysis/

Phase 1: Familiarise yourself with the data

- Transcribe verbal data
- Immerse yourself in the data: read and re-read transcripts, notes etc
- Read data in an active way: search for meaning, patterns, etc, and take notes about ideas for coding

Braun, V. & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3,* 77-101.
https://www.researchgate.net/publication/235356393_Using_Thematic_Analysis_in_Psychology
https://www.nngroup.com/articles/thematic-analysis/

Phase 2: Generate initial codes

- Codes identify a feature of the data that is important or interesting or meaningful to your research question
  - A code is a word or a short phrase that describes a piece of data - essentially a label
  - Codes can indicate the subject of a comment, the nature of a comment, feelings or emotions, etc
  - Each item can have multiple codes
- Inductive (bottom up) and deductive (top down) coding

Braun, V. & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3,* 77-101.
https://www.researchgate.net/publication/235356393_Using_Thematic_Analysis_in_Psychology
https://www.nngroup.com/articles/thematic-analysis/

Activity 1: Code data by applying existing codes

- See handout
- Apply the list of codes to the text in the transcript extract from a user study about using an online educational environment

Activity 2: Generate codes

- See handout
- Works in groups of 3-4
- Annotate on paper

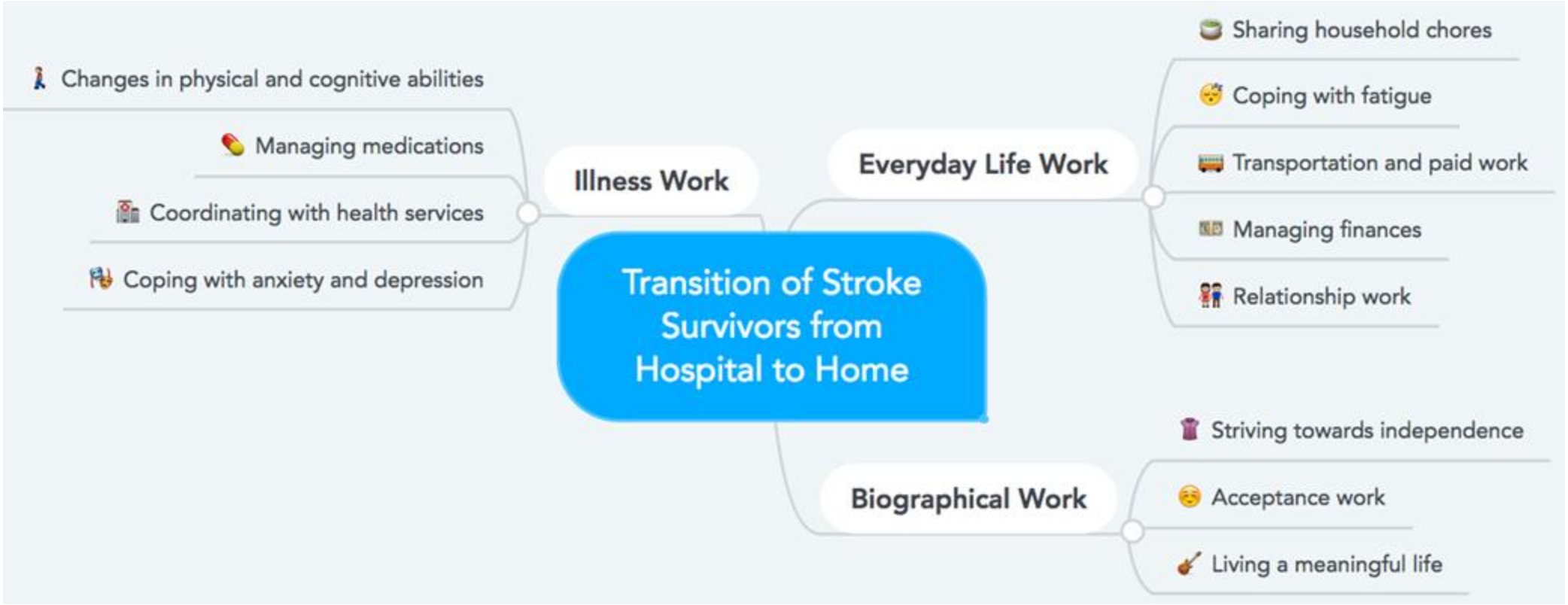
Phase 3: Search for themes

- All data has been initially coded
- Group similar codes together into overarching themes
  - Some initial codes may form main themes, others may become sub-themes, others may be discarded
  - Group codes through an affinity diagram
- Affinity diagram process:
  1. Write one code per post-it note
  2. Place notes on surface and add similar notes in close proximity
  3. Keep revising arrangements
  4. Name each group

Braun, V. & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3,* 77-101.
https://www.researchgate.net/publication/235356393_Using_Thematic_Analysis_in_Psychology

https://www.nngroup.com/articles/thematic-analysis/

Example: codes and themes to describe the experience of stroke survivors in their transition from hospital to homes



Ploderer, B., Stuart, J., Tran, V., Green, T. L., & Muller, J. (2017). The transition of stroke survivors from hospital to home: understanding work and design opportunities. In *Proc. OZCHI* (pp. 1-9). https://doi.org/10.1145/3152771.3152772

Activity 3: Group codes into themes

- Create an affinity diagram to group your codes from Activity 2 into themes

1. 1 code per post-it note
2. Bring post-it notes down to the front
3. Place similar codes together
4. Give each group/theme a label
5. Consider how human factors might illustrate different aspects of the experience

Phase 3-6: Review themes, refine and name themes, and produce the report

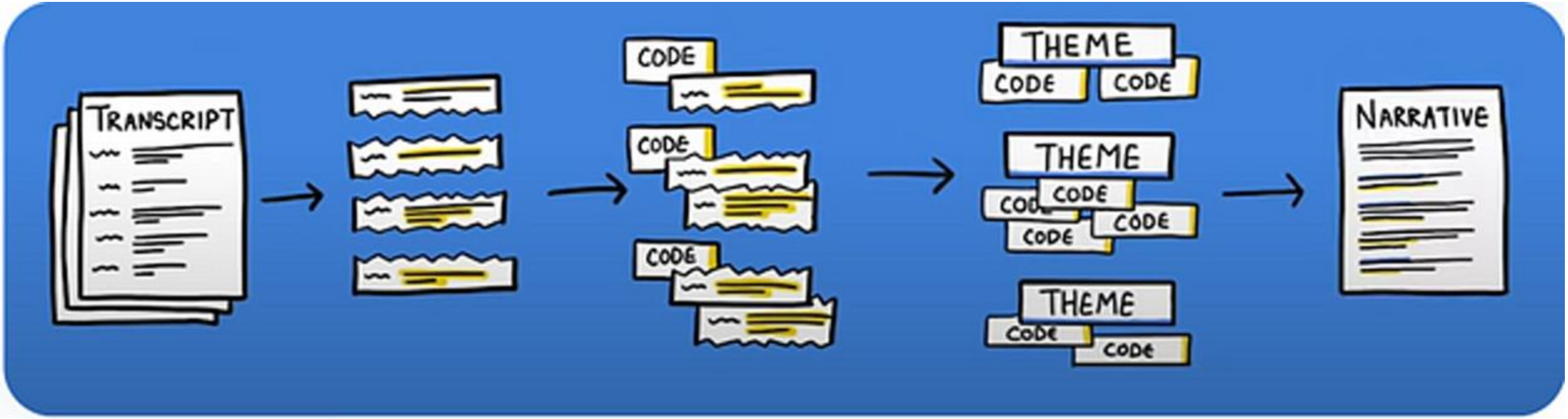


Image source https://medium.com/@aalaa.m.abdou/thematic-analysis-in-depth-ux-research-part-%E2%85%B0-6cbeca890aaa

Tools to support qualitative analysis

- Start coding on paper as you have more flexibility
- You can add codes as comments in Word or through a separate column in Excel
- Online whiteboards such as Miro
- Analysis tools such as Nvivo

Next Steps

CW1 Steps

Week 1:

- **Team formation:** form a group of 3 and register your group on Learn by next Tuesday. This will be the group you will work with in CW2 so ensures you are all working on the same topic.
- **Pick a topic:** pick from the examples provided or propose your own
- **Pick a technology:** each individual student will then pick a technology that fits that topic – these technologies need to be different for each member
- Email Srravya with your topic, technologies and group number. Your topic and technologies will need to be approved before you start.

CW1 Steps

Week 2/3: Individually create usability and UX methods

- **Say methods:** prepare an interview guide to learn about what people have to say.
- **Do methods:** prepare a plan and materials to observe what people do, either through an in-person observation or through a usability test.
- **Make methods:** select an appropriate make method and prepare materials and instructions, integrate method with your interview guide.

CW1 Steps

Week 4:

- **Collect data:** use the instruments created over the past two weeks to study the experiences and needs of your participants (your participants will be the other two members in your group).
- **Transcribe recordings:** transcribe your recordings (you can use online tools). Anonymise transcripts by changing names to pseudonyms. Anonymise any photos or images by covering faces.

CW1 Steps

Week 5:

- **Analyse data and write up findings:** analyse the data thematically to give an overview of key findings. Present data from all methods and participants. Present each theme together with concrete evidence (e.g., interview response, image).
- **Create recommendations for re-designing the technology** based on your findings and human factors.

Any questions?