Book learnings from Research methods in human-computer interaction [1]

This entire file will consist work of the authors [1] and my learnings/ interpretation of it

Chapter 1

1982 first conference

Field grew and was needed when personal computers were becoming in an uprise

Short explanation about the types of contributions, which are very similar to ID

Most popular are empirical (focus of this book) and artifact contributions

Shortly talks about topic shifting

Using big data from apps for correlation, but not causation

Little longitudinal studies in HCI

Micro vs macro hci, task performance vs more complex experience research

Macro can ask for complex methods from for instance psychology

Hci is multi-disciplinary, and other disciplines may have a different view of good research, relevant, or what to focus on

Chapter 2 - Experimental research

Descriptive X happens

Relational research, x then y happens. No proven causality

For causality, use experimental research

Talk about null and alternative hypotheses

Introduction into Fitts law. Time = dist/ area

Interestingly, the book suggests to start off with descriptive testing for explanation during the start of research.

Independent variables change the dependent variable. So studying cause = independent variable, and outcome = dependent

Components: treatments, units and assignment methods

Treatments: different conditions devices

Units: what do you apply the Treatment to, humans often

Assignment methods: how do you devide the different treatments to the units

Explanation about randomization, of assignment and also of other factors such as the scenario =》
Latin Square Design

Bit of statistics, and normal dist.

Type 1: false positive. Rejecting null hyp.

Type 2: false negative. Not rejecting null hyp.

Type 1 error may result in worse than status quo - statistics call this gullibility sometimes

P value is the risk of making type 1 error. Actually increases type 2 error risk of missing something.
Use large sample size to be safe

Chapter 3 - experimental design

See image flowchart

For two or more independent variables, you need factorial design

Basic design:

Variable: typing speed

Conditions: query, dovak alphabet ordered keyboard

Between group: each group sees one condition

Within group: multiple conditions are seen

Between group does not lead to users leaning from one condition and takes less time. Differences in
participants might create noise and a larger sample size is needed.

Factorial design:

Because of complexity, you use a way of structure where you can see both the effects of the
dependent and independent variables. Shown in a grid, such as 3x2 for instance

Split plot has both between group and within group elements combined

Factorial allows to see the interaction effects. So testing different devices, also with multiple groups

Table 3.2 A Factorial Design

	QWERTY	DVORAK	Alphabetic
Composition	1	2	3
Transcription	4	5	6

Image to show an example of factorial design, and the number of conditions with this

Short explanation of random errors vs systematic errors, which was already known

Chapter 4 – Statistical analysis

Starts off with preparing data for analysis

- Coding answers
- Checking if data has errors and appears reasonable

Then run descriptive statistics for a basic understanding, so check spread (normal dist.) for example

Then talks about comparing means, and uses chart to show what type of ANOVA test to use

T-tests

- Independent, when using random sampling
- Paired, when there is a link such as one participant doing multiple conditions you can use the paired test. Here the data should be parallel in the data frame

Variance

- One way: Calculating for between group one independent variable mean square and also having a significance value between the groups
- Factorial: Calculating for between group two or more independent variables
- Repeated measures: For within group design
- Split plot: For mixed containing both within group and between group design

T-test and F-test assumptions

- If not met, then you should not do the test
    - Errors should be independent from each other
    - Errors should be identically distributed
    - Errors should be normally distributed
- Consider being met by normal distribution of data often

Relationships:

Correction

- Pearson's test value, 1=perfect lineair
- Pearson's R squared variance of once value explained by the other

Regression

- For more complex with more variables, models often
- Done using SPSS

Non-parametric makes fewer assumptions about data

- CHI-squared, also calculates probability
- Good for frequency counts for example

Then explains method other less-used non-parametric tests

Chapter 5 – Surveys

Introduction into up and downsides which was not new

Stratification: Dividing populations into groups, and then take a sample from each group.

Nonprobalistic sampling: be very clear of the techniques you use. This is very relevant for industrial design

Oversampling: Way larger size of respondents than perceived or expected might influence results. Some discussion on this within the community. Explains different amounts different researchers find good.

Proportion is important relative to your total group size

Self-selected, when you let all people choose on a website to fill in or not

Explanation about open-ended and closed questions which is not new

Structure and decision tree explanation

Explanation about pilot testing, response rate and short part referring to the data analysis chapter

Chapter 6 – Diaries

Diaries are for longer time, self-reporting

With structure sometimes such as questions

Explains long but interesting list of strengths and weaknesses

Types:

- Feedback diary: when even or at end of day for instance
- Elicitation diary: Basic information recording to ask more about later
- Feedback and elicitation to combine context and follow-up

Considering how users must record (paper, audio, digital text) and when are very important

Analysis should be done like other method of qualitative data

Chapter 7 – Case studies

Running a study with a large group is great, but can be hard

Case studies often have one or multiple participants and thus have different challenges

Often:

- In-depth, deeper examination of results
- Better examination in context, more time and value in understanding
- Multiple data sources (reflections, speculations, experiences)
- Larger focus on qualitative data, interviews etc.

Can help for:

- Exploring, e.g. potential users to really understand them
- Understanding, e.g. what designs work
- Describing, e.g. special life of a person or a process
- Demonstrating, e.g. how a tool is used

Intrinsic are special, particular situations

Instrumental hope to open up and be more generalizable

Embedded focus on multiple units of analysis

Holistic focusses on only one unit

For these studies, you still make a research question, hypothesis and come up with an analysis plan

Bit of info on selecting cases and data collection that is really basic

Consider doing an 'informal case study' (more open, less procedures) for exploration, or when you want to do a check before running the full study.

Chapter 8 – Interviews and focus groups

Basic introduction and explanation

Most of this chapter is already known to me

Contextual interviews and focus groups seem really interesting. Asking a nurse when she is in the hospital, and seeing their environment and the participant being able to demonstrate and imagine better

Good tip for debriefing at the end of a focus group to see for final points and a quick summary

Known parts about analysis and interrater reliability

Chapter 9 – Ethnography

Combination of observation, interviews and participation

Offers very deep insight

The goal is to get one of the deepest levels of understanding, such as complex practices

Ethnography is a name for both the process and the written outcome

All about understanding how a product is used, how these people operate. So observing how people use a phone for instance

Firstly, you choose a group and a role. You strive to be actively participating to learn as much as possible

Not stating you are a researcher allows for different and easy observations, but is it often ethical and needed?

It is very important to be open for building the relationships and making contact

From here, observe, analyze, interview, repeat and very important: theorize

Consider how you bias, using your interpretation and maybe even confirmation bias

Important settings are:

- Home, very rich and personal
- Office, more productivity oriented
- Education, understanding context of younger people
- Mobile and ubiquitous systems, very diverse
- Virtual, searching and being in the digital landscape, extra relevant now

Chapter 10 – Usability testing

Basic introduction about what it is, which we all know here at ID

Interesting learnings on automated testing

- Software for testing interface designs digitally
- Read through code quickly and pick up basic problems

Piece about formative vs summative (so open for improvement vs validation)

Google van is a really cool example of researching people using a mobile lab

Most of this chapter was already known

Chapter 11 – Analyzing qualitative data

Content analysis:

- What is the media: Publications, websites, broadcastings etc
- What is the audience content: Notes from interviews, video recondings

Before starting, make sure you really understand and define what you will analyse'

Grounded theory means that you use the data from the study to create a theory

This is different than starting with a hypothesis and then thinking about the study and data needed to test that

Four stages:

- Open coding
- Development of concept
- Concepts grouping into categories
- Formation of a theory

First read and understand the text, then develop the code

Capture this code and explain its procedure and definition

Then refine and iterate

You can test agreement between multiple coders, to get a sense of coding and observation reliability

This same method can be done with fragments of multi-media content of course

Chapter 12 – Automated data collection methods

All about using sensors and computers for collection, truly objective and large data sets

Great existing tools:

- Web logs: browser data, email data. For web design already very useful
- Stored application data: hard drive data, how do people organize their inbox, desktop etc
- Activity logging software: proxies and interaction recording tools
    o Proxy: man in the middle that captures what happens
    o Interaction recorder is a man looking from a distance to observe what happens
- For web applications, there also are web proxies available
- Keystroke and activity loggers also provide great data about what people do
- Interaction recording tools, screen capture, thinking out loud

Custom software:

- Adding software for recording is called instrumenting
- Be very careful with what you should (not!) collect as a researcher
- You can also create specific research software for your purpose

Hybrid methods:

Combining the above basically

Often you get large amounts of data, so consider how you will handle this data

There are still changes, since it is hard for computers to understand usability and user experience.

It is important that people monitor and are there for understanding and checking results

Chapter 13 – Measuring the human

How to you extract data from the human body?

Eye tracking

- Gives a lot of data about focus and attention
- Great for products, websites and behavior

Muscular and skeletal position sensing

- Think easy: wii connect
- Using cameras and markers

Physiological tools

- Breathing rhythm
- Heart rate
- Blood flow
- Great table in the book for which data which sensors and where

Data collection, analysis and interpretation

Very similar to other quantitative data

Understand what the changes in values mean

Chapter 14 – Online and ubiquitous HCI research

With movable and wearable computers, just measuring at a desk might not be enough

Online research

- Observational: view what they. Use screen sharing or thinking out loud
- Online data collection: A/B testing of websites and features, questionnaires

Online activities

- Viewing online communities such as reddit
- Search for trends in social media and interaction data

Challenges:

- Not all topics are suited
- Recruiting is different
- Study design is different
- Double think about privacy and online consent

Human computation: Some tasks are easier for humans to do

reCAPTCHA for instance still works well

Conducting these studies:

- Use the right software (paragraph about with different softwares)
- Use a set design with tasks

Sensors and Ubiquitous computing

Arduino etc. for realization

Gives examples or research history, and speculation + alternative input devices

Ubiquitous computer design has many data sources:

- Understand context
- Have design sessions
- Use sensor data
- Use diaries
- Use physiological data
- Triangulate data to see correlations

Chapter 15 – Working with human subjects

Consider with whom you need to test.

How many do you need for your test?

How will you recruit them?

Caring for them:

- Consider their risks
- Protect privacy
- ERB
- Informed consent

Most if it is not new for me

Consider if you really need deceptive research. Allow participants to withdraw after being fully informed afterwards

Consider the burden of longitudinal studies

Take extra care with children and ask parents

Consider special concerns for vulnerable people

Chapter 16 – Working with research participants with disabilities

Technology is used everywhere, also by people with a disability

It is my opinion that it is also good to test with these user groups, if possible, so that you can consider their needs

Consider what the inclusion criteria are and follow these

Abilities such as blindness can have different levels, consider and learn about these different levels and use these as a criteria. So aim for all levels of disabilities or only a specific one

Consider how to recruit them using 'pools' of data (or social media groups I would say)

When people are death or have speech impairments, you might consider sign language help

Can proxy user help? (without the disability)

- Giving people a blindfold
- Covering their ears

Methodology considerations

- Smaller sample size?
- Distributed research/ remote data collection
- Case studies
- Consistent scenario or best-case scenario?
  - o Some have an adapted computer
  - o Custom setup to allow for better functioning

Logistics:

- Do a pilot study (perhaps with a proxy user?)
- Schedule clearly
- Consider how to adapt to better help these people (dim lights, remove sounds etc.)

- Adapt forms etc. so that they can be read and understood one way or another
- Bring extra technology, death people may not have speakers. Some people may not have pens. Be prepared
- Give a useful payment. Not a gift card that a person cannot visit.

End of book.

Book reference:

[1] Lazar, J., Feng, J. H., & Hochheiser, H. (2017). Research methods in human-computer interaction. Morgan Kaufmann.