Course book Chapter 8: DATA ANALYSIS, INTERPRETATION AND PRESENTATION

Extra literature Chapter 6: SELF-REPORTED METRICS
Quantitative and qualitative data

- Quantitative data – expressed as numbers
- Qualitative data – difficult to measure sensibly as numbers, e.g. count number of words to measure dissatisfaction
- Quantitative analysis – numerical methods to ascertain size, magnitude, amount
- Qualitative analysis – expresses the nature of elements and is represented as themes, patterns, stories
Quantitative and qualitative
Quantitative: be careful with...

- Researcher bias in interpretation
- Think of honest presentation, don’t fool the reader

Not scrutinizing enough (Always study the distribution)

1 2 1 1 6 5 7 7 1 2 6 7

M=3.5?
After the gathering phase..

<table>
<thead>
<tr>
<th>Usual raw data</th>
<th>Example qualitative data</th>
<th>Example quantitative data</th>
<th>Initial processing steps</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Interviews</strong></td>
<td>Audio recordings. Interviewer notes. Video recordings</td>
<td>Responses to open questions. Video pictures. Respondent’s opinions</td>
<td>Age, job role, years of experience. Responses to closed questions</td>
</tr>
<tr>
<td><strong>Questionnaires</strong></td>
<td>Written responses. Online database</td>
<td>Responses to open questions. Responses in ‘further comments’ fields. Respondent’s opinions</td>
<td>Age, job role, years of experience. Responses to closed questions</td>
</tr>
<tr>
<td><strong>Observation</strong></td>
<td>Observer’s notes. Photographs. Audio and video recordings. Data logs. Think-aloud</td>
<td>Records of behavior. Description of a task as it is undertaken. Copies of informal procedures</td>
<td>Demographics of participants. Time spent on a task. The number of people involved in an activity</td>
</tr>
</tbody>
</table>
Simple quantitative analysis

• Averages
  • Mean: add up values and divide by number of data points
  • Median: middle value of data when ranked
  • Mode: figure that appears most often in the data

• Percentages

• Graphical representations give overview of data
Prepare the data…

- Data entry

- Outliers?
Tools to support data analysis

- Spreadsheet – simple to use, basic graphs
- Statistical packages
- Qualitative data analysis tools
  - Categorization and theme-based analysis
  - Quantitative analysis of text-based data
- Nvivo and Atlas.ti support qualitative data analysis
- CAQDAS Networking Project, based at the University of Surrey (http://caqdas.soc.surrey.ac.uk/)
Look!

**Figure 8.7** Interaction profiles of players in the starport

Web analytics

Session Length

```
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Length (log Minutes, binsize = 0.1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0</td>
<td>10%</td>
<td>8%</td>
<td>9%</td>
<td>7%</td>
</tr>
<tr>
<td>0.1</td>
<td>13%</td>
<td>12%</td>
<td>11%</td>
<td>10%</td>
</tr>
<tr>
<td>1.0</td>
<td>16%</td>
<td>14%</td>
<td>12%</td>
<td>11%</td>
</tr>
<tr>
<td>2.0</td>
<td>18%</td>
<td>16%</td>
<td>14%</td>
<td>13%</td>
</tr>
<tr>
<td>3.0</td>
<td>20%</td>
<td>18%</td>
<td>16%</td>
<td>15%</td>
</tr>
</tbody>
</table>
```

“One Hit Wonders!”

Login Frequency Histogram

```
<table>
<thead>
<tr>
<th>Log (t, days binsize = 0.01)</th>
<th>0.0</th>
<th>0.2</th>
<th>0.4</th>
<th>0.6</th>
<th>0.8</th>
<th>1.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Users</td>
<td>8%</td>
<td>16%</td>
<td>24%</td>
<td>32%</td>
<td>40%</td>
<td>48%</td>
</tr>
<tr>
<td>Top 10 Users</td>
<td>10%</td>
<td>20%</td>
<td>30%</td>
<td>40%</td>
<td>50%</td>
<td>60%</td>
</tr>
<tr>
<td>Top 20 Users</td>
<td>12%</td>
<td>24%</td>
<td>36%</td>
<td>48%</td>
<td>60%</td>
<td>72%</td>
</tr>
</tbody>
</table>
```

Several Users on One Account

Regular Users Spikes occur at 1d, 2d,

Multiple Sessions on the Same Day

Simple qualitative analysis

- Recurring patterns or themes
  - Emergent from data, dependent on observation framework if used
Video
Tools!

Noldus

Mangold
Simple qualitative analysis

• Categorizing data
  – Categorization scheme may be emergent or pre-specified

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00:01:15 user goes to help screen

“How do I move to the previous screen?”

NAVIGATION - PROBLEM

“I have diabetes you know and I’m hoping this can help me. So here I go, I’m clicking on this screen about diabetes information”

00:01:23 subject goes to diabetes help screen and clicks on help button

“Now what? It looks like everything has stopped”

LACK OF INDICATION OF SYSTEM STATUS – PROBLEM

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– Het staat een beetje verborgen in een ingeklapte menu. Ik had het eerder terug verwacht op een pagina.

– Ik moest er even naar zoeken doordat ik het hamburgermenu niet direct zag en op zoek was naar een overzicht/userinfo knop.

– Ik vond het nog een beetje onduidelijk wat het verschil was tussen performance en progress.
Simple qualitative analysis

• Looking for critical incidents
  – Helps to focus in on key events

Advantages
• Focuses on important issues e.g. safety critical events may bring major benefits
• Useful for identifying rare events that might not be picked up by other methods

Disadvantages
• routine incidents may not be reported
• poor as a tool for general task analysis
• critical incidents often rely on memory, incidents may be distorted or even forgotten if the incident is collected long after an event.
Qualitative analysis: Theoretical frameworks

• Basing data analysis around theoretical frameworks provides further insight

• Three such frameworks are:
  – Grounded Theory
  – Distributed Cognition
  – Activity Theory
Grounded Theory Design: Definition, Advantages & Disadvantages
Grounded Theory

- Aims to derive theory from systematic analysis of data
- Based on categorization approach (called here ‘coding’)
- Three levels of ‘coding’
  - Open: identify categories
  - Axial: flesh out and link to subcategories
  - Selective: form theoretical scheme
- Researchers are encouraged to draw on own theoretical backgrounds to inform analysis
Distributed Cognition

- The people, environment & artefacts are regarded as one cognitive system

- Used for analyzing collaborative work

- Focuses on information propagation & transformation
Activity Theory

- One cannot pull apart human activity from the sociocultural context within which the activity is conducted
- Explains human behaviour in terms of our practical activity in the world
- Provides a framework that focuses analysis around the concept of an ‘activity’ and helps to identify tensions between the different elements of the system
- Two key models: one outlines what constitutes an ‘activity’; one models the mediating role of artifacts
Activity Theory
Activity Theory: Individual model

Activity → Motive

Action → Goal

Operation → Conditions
Presentation: The right choice....?
Presentation: the right choice….?
Chapter 6: Self reported measures

- UX: Shift from more quantitative to more qualitative
- Accent on performance measures is a human factors legacy
- Delight, joy, trust, fun etc. receive more attention
Self reported measures

- Subjective data, preference data?
- User’s perceptions
- When: during, post-task, post-study
- Social desirability bias (e.g. phone more positive than form)

What?
- attitudes
- Beliefs
- Opinions
Scales…

- $2\text{kg} \times 10 = 20$

but..

<table>
<thead>
<tr>
<th>The cashier was courteous.</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Undecided</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

Code as:  1  2  3  4  5

5 = ....5*1?

Is “1” 20%, or 0%
Likert or Semantic Differential?

Likert scale

+ is easier to answer (seems)
- It has a negative polar and positive polar

Semantic Differential

+ without prejudgment (the word, e.g. I **enjoy** using this system)
- The divisions can be a problem (}
Post task ratings

E.g.

- Ease of use

- After scenario Measure

- Expectation Measure
  - Ask the users how easy/difficult they think each task is going to be, before doing them.
  - Ask them how easy/difficult it actually was immediately after each task.
During task ratings (concurrent)?

- More honest?
Post session ratings

- After the complete range of interactions
  - Lab = free again
  - Overall barometer

- Aggregated individual task ratings
- System Usability Scale (SUS)
  - <50: not acceptable
  - 50-70: marginal
  - >70 Acceptable
Post session ratings: SUS

1. I think that I would like to use this system frequently
   - Strongly disagree
   - 1 2 3 4 5
   - Strongly agree

2. I found the system unnecessarily complex
   - 1 2 3 4 5

3. I thought the system was easy to use
   - 1 2 3 4 5

4. I think that I would need the support of a technical person to be able to use this system
   - 1 2 3 4 5

5. I found the various functions in this system were well integrated
   - 1 2 3 4 5
Post session ratings: SUS

5. I found the various functions in this system were well integrated.

6. I thought there was too much inconsistency in this system.

7. I would imagine that most people would learn to use this system very quickly.

8. I found the system very cumbersome to use.

9. I felt very confident using the system.

10. I needed to learn a lot of things before I could get going with this system.
Postsession ratings

- Computer system Usability Questionnaire (QSUQ)
  - 19 statements, 5-point likert
- Questionnaire for User Interface Satisfaction (QUIS)
  - 27 scales (10 point)
- Usefulness, Satisfaction and Ease of use Questionnaire (USE)
  - 30 (7-point) likert rating scales, in 4 categories
- Product Reaction Cards
  - 118 cards, choose the ones describing your experience, then explain top 5
Postsession ratings: Net Promoter Score

- Net promoter score (NPS)
  - “how likely is it that you would promote, 1-item scale starting at “0”

- Sauro (2010): SUS and NPS correlate $r=0.61$, $p<0.001$
- Sus scores: Promoters: 82, Detractors: 67
Online services (live sites)

- Voice of the Customer (VoC) studies
- Comparable to postsession metrics, but typically done on live websites. Selected sample gets pop-up survey at a predefined moment
- E.g:
  - WAMMI (specifically websites). Visitor experience is measured by asking visitors to the website to compare their expectations against what they actually find on the website. WAMMI compares visitor-satisfaction for the site being evaluated with values from a reference database,
  - American Customer Satisfaction Index
  - Opinion lab
Online services (live sites)

- Opinionlab

- Usabilla

Issues:
- Only few questions possible
- Self-selecting
Let's pitch 😊!!