**Exercise VII: Processing and Displaying Data**

When you have collected the relevant data for your study you need to process it, and that means preparing and then analyzing the data. Finally you want to show what you have found in your study by presenting the results to answer the research question of the study. This exercise breaks this process down into operational steps for qualitative and quantitative studies.

Template of Exercise VII:

This exercise breaks this process down into operational steps for qualitative and quantitative studies and then presents a guide to communicating and displaying different types of data. You can use the following points can be used as a checklist.

QUANTITATIVE STUDIES

STEP I Preparing data for analysis in quantitative studies

1. Check your raw data for any inconsistencies, missing data and errors. You can make any changes (edit the data) if you are certain that you will not distort the data. It is best to examine the answers to one question/variable at a time or check the responses given to all the questions by one respondent at a time. If you electronically save your dataset always keep a copy of the raw data and a copy of your edited version which you will work with.

**Data cleaned**

1. In quantitative studies you also want to code your data by providing numbers for answer options in closed questions, e.g. the variable gender could be coded as males (1), females (2) and other (3). Numbers given to the categories have to be mutually exclusive for each variable. Remember each number stands for a value or an information label. For open questions you can create categories and assign a different number to each category, for example you could put the actual age into age bands (20-24 is coded 1; 25-29 is coded 2; 30-34 is coded 3 and so on). For open text questions you may need to read through the responses provided by respondents to decide on the categories that will summarize the responses best.
2. It is suggested that you keep a code book detailing all variables and its codes as a reference. If you have a questionnaire you can number the questions and also write the number codes next to the tick boxes for each question. It could be that you have variables that have no categories or codes because you record a number for it, (e.g. age in number of years).

**Code book created**

1. Variables can be measured in different scales. Which of your variables are

Nominal scale (in discrete categories, e.g. male/female)

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Ordinal scale (categories that are in an order, e.g. income measured as above average/average/below average)

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Ratio or interval scale (e.g. age in years, or income in dollars)

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1. When you are satisfied with your variable measures and code book you can code the data accordingly. For each participant record the codes for each question/variable. E.g. if Participant number 1 is female and 29 years old, you would record gender: 2, age band: 2 (if using the codes introduced above).

The data can be coded manually or directly in to a computer program such as Excel, SPSS or SAS. Typically each line of data will represent a participant or observation and the column will represent the question/variable.

**Data coded**

STEP II Developing a frame of analysis

1. Before you analyze your data, you need to decide on your analysis methods. Start by planning which variables will be analyzed. List all variables you are planning to analyze and their answer options you have coded in the previous step: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Produce a frequency distribution of all variables listed above in nominal and ordinal scales. This provides for each variable how many responses were given for each subcategory and is best reported in counts (frequency) and percentages. (e.g. how many of your respondents were male and how many female? Is it a 50/50% split?)

**Frequency distributions produced**

1. You may also want to describe data using means/median for interval scale variables (e.g. the average age of respondents). Describing two categorical variables can be done in a cross-tabulation (also see next step). Make a note of variables this applies two:

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1. Typically you want to analyze two variables to understand the relationship between them and may have expressed this in your hypothesis. Make a list of the variable pairing you want to analyze and indicate the independent variable (the variable that has an effect on the other variable, e.g. gender) and the dependent variable (the actual data, e.g. job satisfaction measured as 1-satisfied, 2-not satisfied) for each pair.

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1. It is recommended that you use a statistical program such as SPSS or SAS to analyze your data, but you need to decide on statistical procedures first. Select an appropriate statistical analysis (e.g. chi square, regression analysis, analysis of variance) that is suitable for your variables. Justify your choices and provide details before you carry the analysis.

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QUALITATIVE STUDIES

STEP I Preparing data for analysis in qualitative studies

How you process and analyze data in a qualitative study depends upon how you plan to communicate the findings. For writing a narrative form you need to familiarize yourself with the data and decide on the sequence of the narration. However if you decide to identify main themes that emerge from the data (which can also be quantified) you would typically transcribe audio recordings of interview, focus groups or observational field notes. In any case know your data as this may require reading the transcript several times.

How will you analyze your qualitative data?

 **A: Develop a narrative to describe a particular situation/event/ instance**

 **B: Identify the main themes that emerge from the data**

 **C: In addition to identifying themes, also quantify the frequency of their occurrences**

STEP II Identifying main themes

When deciding on identifying the main themes you need to organize and sort your data in a systematic way. Start by coding the transcript(s) in order to find new insights (the themes of the data). Read through the transcript and assign a descriptive label, a keyword or number to relevant sections of the text. To do this it is suggested you use different colored highlighter pens and write in the margins of the transcript. Note that some text may be allocated to more than one description. Look for actions, relationships, emotion, ideas and meanings when coding. You may have to read through the transcripts several times, adding or collapsing codes each time. A question to ask during coding is: What is happening?

**Assigned codes/descriptive labels to the text**

STEP III Assign codes to main themes

Next you need to assign codes to main themes. By reading through the codes you can attach meaning to the data and the codes can be analytical as well. What patterns, themes and trends can you see from the codes (you may want to count them too)? Now decide on themes by grouping codes. What information (code) contributed to the understanding of the themes? Each theme can have multiple layers or be seen from different perspectives. What are the main themes that emerged from the data and how did you derive at them? Write them down or alternatively draw a mind map.

Theme 1

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Theme 2

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Theme 3

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Theme 4

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STEP IV Classify your responses under the main themes

Having identified new ideas you need to support each theme with appropriate excerpts from the transcripts. Select relevant sections from the data to explain a certain aspect of the theme. Here you may draw on answers from different participants. Organizing the data can be carried out using computer programs such as NVivo, ATLAS.ti or MAXQDA and this is advisable if you have large amounts of data e.g. you interviewed many participants. Doing this manually you will search through all responses for relevant data quotes. Make sure you keep track on what you select and you perhaps list relevant passages in a document for each theme.

**Selected responses/quotes form the data for each theme**

STEP V Integrate themes and responses into the text of your report

Finally you have to report your findings (themes) in your report. Here you have some freedom to use narratives to explain what was found, verbatim quotes to support a particular point to say it in the words of the respondent. You can also count how frequently a theme has occurred and provide a sample of responses. It is suggested that your writing expresses the findings clearly and integrates them into the literature. Also keep the audience/reader in mind so that they can follow how you arrived at the new meanings and therefore answered the research question. To perfect this it may require several drafts.

Practice writing up themes/findings:

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COMMUNICATING AND DISPLAYING ANALYSED DATA

1. **Text**: Text is by far the most common method of communication in both quantitative and qualitative research studies, so it is essential that you know how to communicate effectively. There are conventions on how to present statistical data depending on the procedure you have chosen. If you decide to present your results using text describe the results in a clear manner by stating percentages or means. This is most effective if there are just two values to compare (e.g. 52% were female and 48% male).
2. **Tables** are the most common method to present analysed data in quantitative studies. The structure of the table includes a title (a clear description of what the table shows), the stub (the subcategories of the variable listed at the head of each row), the column headings (number of respondents/ percentages of respondents or subheadings of the second variable), the body (cells that display the analyzed data) and optional footnotes (e.g. the source or general notes). Check list for your table:

 **Includes all elements of a table outlined above**

 **Only numbers are presented in cells, headings explain the units**

 **Accurate data (a number typo could change the result drastically)**

 **Reader friendly and neatly formatted**

 **Includes a unique table number**

1. **Graphs** can be used to visually show the analyzed quantitative and qualitative data. A graph often displays frequencies of one variable. There are a range of graphs to choose from depending on the data that should be displayed. The measurement scale is important for interpreting graphs but also on how it looks like in proportion to the two axes. Choose an appropriate scale and clearly label the two axes, typically the horizontal x-axis displays the subcategories of a variable and the vertical y-axis the number or percentage of respondents. The point where the axes intersect is the zero point for the y-axis. Check list for your graph:

 **Chosen an appropriate graph for the data (e.g. histogram, bar chart, etc.)**

 **Axes are labelled clearly**

 **Appropriate scale for axes chosen**

 **Color and shading can be distinguished (consider optical effect and printing)**

 **Values are displayed for clarity (also consider vertical lines)**

 **The graph title summarized what the graph shows**

 **Unique graph number included to refer to in the text**