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NOT ALL NUMERICAL DATA LEADS TO QUANTITATIVE RESEARCH: INTRODUCTION TO [QUALITATIVE] QUANTIFICATION ANALYSIS

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ABSTRACT: *Very often we face a situation where a student has collected numerical data and (s)he does not know what the research method (s)he uses really is. The purpose of this paper is to explain the difference between quantitative research and [qualitative] quantification. The description of the quantification method is based on our own experiences and a descriptive literature review. We explain in which cases a qualitative quantification analysis should be done. The practical aim of this paper is to help both the student and the supervisor to identify the correct method for analysing numerical data.*
KEYWORDS: research method, qualitative research, quantitative research, quantification, quantitizing

INTRODUCTION

As most university teachers will have noticed, students can become very confused during their research methods studies due to the vast amount of information and numerous methods presented. Very often the same confusion is still present when they begin a thesis (Figure 1). This is understandable. When reading a description of almost any research method, one way or another it would fit your own study. In particular, the practical differences between qualitative methods are difficult to differentiate for novices. One might easily assume that it would be easy to distinguish the applicability of the main methodological categories – qualitative and quantitative research – but this is not the case either. Put simply (and rather generically), analysing numerical data means that it is quantitative research, and when analysing (for example) interview data, focus groups, participation observations (Verboom et al., 2016) or text sources, it is qualitative research. However, only the latter part of the previous sentence is true. When collecting and analysing numerical data, the research approach chosen depends on what is going to be done to the data. A study that involves the calculation of attributes is qualitative in nature, regardless of the numerical data. This is called quantification. Instead, quantitative study involves statistical analysis.

Although the method of quantification is commonly used in theses and researches, it is not much discussed in the current literature. There are only few mentions on the subject and summarising publications are completely missing. Moreover, the existing literature that mentions the subject is relatively old. Therefore, we think that this paper answers to the existing need of theorization of the subject.

The aim of this paper is a) to describe and remind readers of the differences between qualitative and quantitative research at a general level, which here means the level of understanding one needs when it comes to qualitative quantification or quantitative

research; b) to describe cases of qualitative quantification; and c) to explain based on a literature review what quantification (or quantitizing) means. The practical purpose is to help students (especially at bachelor's, but also at master's level) and teachers to choose the appropriate research method, particularly in cases where the collected data are numerical.

We discuss the topic by proceeding as follows. Firstly, we discuss the differences between qualitative and quantitative research. Secondly, we describe when quantification is to be used. Then we introduce the concept of quantification. Finally, we present the results of the paper.

Figure 1. "My head is exploding. Somebody please help!"

METHODOLOGY

Although the quantification method is relatively widely used, there has not been much discussion about it in the current literature. Therefore, it would be inappropriate to use a strictly regulated systematic literature review or meta-analysis. A descriptive literature review (Salminen, 2011) is more suitable. We found and reviewed two Finnish research method books (Eskola & Suoranta, 2015; Tuomi & Sarajärvi, 2018) but only a handful of scientific papers. The latter were discovered by inputing the keywords "quantification," "quantitizing," "quantizing," "kvantifiointi" (the same in Finnish), "research method*," "method*," "qualitative*," "data analysis," "analysis of data," and so on, and all possible combinations of these. If the keyword was presented in a context other than research methods, the result was excluded.

Quantitative and Qualitative Research Methods

At the general level, the main differences between the use of quantitative and qualitative research methodologies can be established by: a) the types of research questions that are asked; b) the types of data that are best suited to provide the desired information; c) the amount of data that is needed to obtain the right information; d) the selection of the units of analysis; and e) the nature of the processing of the collected data.

Quantitative research methods are used to answer "what…?" questions (e.g. Marshall, 1996) with cause and effect (e.g. Sullivan & Sargeant, 2011), and seeking generalizable results (e.g. Marshall, 1996). In contrast, qualitative research methods are used to answer "why…?" and "how…?" questions (e.g. Sullivan & Sargeant, 2011) with the minimum causality, and trying to describe separate phenomena (e.g. Cope, 2014).

The data used in quantitative research are numerical (or countable). The countable data can also be obtained from highly structured surveys (Sullivan & Sargeant, 2011) in which the respondent does not actually answer the numbered alternatives. The qualitative data are usually text (Sullivan & Sargeant, 2011) that can be obtained from various publications, writings, documents or transliterated interviews (and always saved, in both audio and transcript format).

The amount of data collected (from *the sample*) for quantitative and qualitative research can vary considerably. For quantitative research the sample size is typically large, and the resultant data must be sufficient for *statistical handling and reasoning*. In the case of qualitative research, it may vary from one, i.e. a single case study (e.g. Yin, 2009), to several, but the amount of data to be processed must achieve saturation, i.e. more data would add no new information to the study (e.g. Marshall et al., 2013). At this point it is worthwhile consider the nature of the study; even in the case of single case study, a substantial amount of data can be collected, both textual and numerical. The units of analyses will be selected differently: randomly in the case of quantitative methods, and intentionally in the case of qualitative methods (e.g. Eisenhardt, 1989; Runeson & Höst, 2009).

The data collected in quantitative research are *statistically processed* (e.g. Libarkin & Kurdziel, 2002) with the help of statistical analysis computer software such as SPSS, SAS or Matlab. In a qualitative study, data are interpreted by identifying, coding, and categorizing observations (e.g. Patton, 2002). *As mentioned before, numerical data can be analysed in qualitative studies, but not statistically*. This is discussed further in the next section.

Qualitative Quantification Analysis

All that exists, exists in some amount and can be measured.
E. L. Thorndike

As has been mentioned, the current method is widely used, but understudied. Probably most of the authors of theses and researchers who have employed it do not even know they have. Quantification (or quantitizing) is a process of coding and analysing qualitative data quantitatively (Polit & Beck, 2004) and it is potentially a continuation of the process of data categorizing. The same principle applies the other way around,

i.e. numerical data can be analysed qualitatively when it is not implemented statistically by using simple calculations such as addition, subtraction, multiplication or division. (Calculating averages depends on the context of the study. In principle, it is just a form of addition and division).

Quantified qualitative analysis can be seen as a soft option when compared with quantitative methods (Eskola & Suoranta, 2015). The basic principle of quantification is simple: to calculate attributes. This means that the number of times certain things (i.e. *attributes*) appear in the collected data will be calculated; or the number of participants who express the same thing, and so on (Burns & Grove, 1997; Sandelowski, 2001; Tuomi & Sarajärvi, 2003; Polit & Beck, 2004). Examples of quantified data are presented in Table 1. In many cases quantification produces significant additional information compared with mere descriptions of the collected data (Tuomi & Sarajärvi, 2003).

In conclusion, we can say that we can answer "how many?" type research questions using quantitative analysis, and complete other kinds of research questions where we have to examine the frequency of occurrence of some attribute or event (*with no need for statistical handling*). So far in this paper we have explained when qualitative quantification analysis should be used. In the next section we provide a summary of this, and in addition we present a short test to ensure that quantification is the right research or analysis method for your study.

Further reading: an example of implementing quantification in a qualitative study
The present author (Sarja, 2018) used the quantification method to deepen his own understanding of his previous research. He divided the informants he had interviewed before into two groups, HW and SW. (The article explains what these groups mean, but this is not important in the current context; here they simply represent two different groups of people.) The author calculated the "yes" and "no" attributes from the recoded responses, and was thus able to compare their professional behaviour in terms of similarities and differences. After benchmarking these, he was ready to make recommendations to both groups.

Table 1. Examples of quantified data.

Data collection method	Data source	Attribute
Text analyses	Textual sources (books, magazines, journals, reports, all forms of written material)	Letters, words, sentences (Sarja, 2018), portions of pages or words (Elo & Kyngäs, 2007), recurring themes or other attributes
Interviews	Transcription (i.e. of text)	Recurring themes or other attributes, interviewees' background information, perspectives and phenomena considered important to the researcher
Simple[1] surveys, [answers to] open questions [1]If the survey is not "simple" and its sample size is large, it is most probably a quantitative study.	Informants' written answers	Recurring themes or other attributes, perspectives and phenomena considered important to the researcher
Simple surveys, [answers to] structured questionnaires	Likert-type numeric or otherwise weighted response options (eg. check the box, and so on)	The countable numbers of different response options, *without* statistical processing
Observations	Own notes => text material, audio- or AV recordings => own notes or transcription (i.e. text), collected textual material, counted events, and so on	Recurring themes or other attributes, perspectives and phenomena considered important to the researcher

CONCLUSION

Quantification is a process of coding and analysing qualitative data quantitatively, or quantitative data qualitatively. It involves a process of analysis where we count events, or attributes. It may be seen as an easier alternative to quantitative methods. If it is the sole numeric method, it is part of a qualitative study.

This simple test shows whether a study is qualitative, [qualitative] quantification or quantitative. Answer the following two questions:

1) Is the collected data numerical? If the answer is "no," the study is qualitative. If the answer is "yes," it may be either quantitative or quantification.

2) If the collected data is numerical, is it processed using statistical analysis software or simple calculations? If the former, it is quantitative research. If the latter, it is quantification.

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