CHAPTER 5: Q METHODOLOGY

5.1 INTRODUCTION

This chapter discusses the theoretical foundation of Q methodology and its five parts. It also highlights its benefits and limitations. Q factor analysis is explained as a procedure for statistical data analysis.

Q methodology is a research methodology that permits the systematic study of subjectivity and the communicability of subjective perceptions in a discourse on a specific topic. It adopts the participant's point of view and understanding as being central to its investigative procedures (Goldman 1999:589).

Q methodology was invented by the British physicist/psychologist William Stephenson in 1935, and introduced by him in a letter to the editor of the British scientific journal, *Nature* on 24 August 1935. Stephenson was the last assistant to Charles Spearman, a statistical theorist who first developed factor analysis (Brown 1980a:9). Stephenson was interested in a way to reveal the subjectivity involved in any situation, for instance, in aesthetic judgment, poetic interpretation and perceptions of organisational role. (Brown 1996). What makes Q methodology unique is that all perceptions, concepts, reports of events, music, literature, etc, can be transformed into operant factors which Q methodology develops. In other words, definitions of viewpoints are those of the participant's own subjective standpoint rather than intuitive or arbitrary (McKeown & Thomas 1988:40).

The following three questions underlie a Q study (Stricklin & Almeida 1999):

- What is the range of communicated ideas in a particular discourse?
- What are the prevalent variations in it?
- How do these variations logically relate to each other?

5.2 Q METHODOLOGY DEFINITIONS

Table 5.1 below provides a list of Q methodology definitions.

Table 5.1: Q methodology definitions

Terminology in Q methodology	**Q methodology definition**
Concourse	This involves ordinary conversation, commentary and discourse about everyday life not restricted to words, but including collections of paintings, pieces of art, photographs and even musical selections.
Q sorting	This is the process of sorting selected statements about the concourse in the participant's preferred order of preference.
Q sort cards	Statements that need to be arranged by participants are printed individually on Q sort cards that resemble playing cards. Similar to well-written survey items, there should only be one individual statement per Q sort card written in language familiar to the participants.
Q sort deck	This is the total set of Q sort cards which can vary between 30 and 100, but is typically between 50 and 70.
Q sort diagram	An enlarged diagram (or board) on which the statements are arranged in the participant's preferred order of preference. Figure 5.1 is an example of a Q sort diagram.
Rating scale	The rating scale according to which statements are arranged may range from +3 to -3, or +4 or -4, or +5 to -5, depending on

	the number of statements in the study.
Distribution marker	The distribution marker is the +3, +4, etc of the rating scale.
Q sample	This entails the process of selecting or excluding statements following a scientific procedure since the whole concourse cannot be administered because it may consist of hundreds of statements.
Person-sample	This is a group of participants selected from the people involved in the discourse to sort selected statements about the concourse in the participant's preferred order of preference.
Score sheet	A small version of the Q sort diagram on which the number of the placement of each Q sort card of each participant is recorded for factor analysis.

5.3 THE FIVE PHASES OF A Q STUDY

A Q study generally follows a sequence of five phases. The researcher first collects a discourse from people involved in it and then selects a sample of statements representative of the range of communicated ideas in the discourse. Participants are selected from the people involved in the discourse and asked to sort statements in their preferred order of importance on a large board, known as the Q sorting process. The Q sorting process usually occurs in the presence of the researcher. The participants' sortings of statements are then compared by means of Q factor analysis. Finally, the results are analysed to establish trends in the discourse (Stricklin & Almeida 1999).

These five phases are explained as follows:

5.3.1 Collecting the concourse

In Q methodology the discourse about a specific topic is referred to as a “concourse”[81]. A concourse is ordinary conversation, commentary and discourse about everyday life and includes all communication about a specific topic (Brown 1991). A concourse is not restricted to words, but might include collections of paintings, pieces of art, photographs and even musical selections (Denzine 1998; McKeown, Hinks, Stowell-Smith, Mercer & Forster 1999:255). A concourse may be obtained from both primary and/or secondary sources. Primary sources include interviews, group discussions and talk shows. Secondary sources include photographs, newspaper clippings, literature and editorials (Denzine 1998; McKeown et al 1999:255).

The primary and/or secondary sources from which the concourse can be obtained, can be further elucidated by means of Q sample types. Q sample types can be divided into two major types, namely naturalistic and ready-made Q samples.

Naturalistic Q samples are compiled by obtaining written or oral statements on the topic by the participants who will be involved in the Q sort. This type of sample is beneficial in that the participant is able to Q sort the Q sort cards much faster and also understands the statements better. Ready-made Q samples are compiled from sources other than communication of the participants, for instance, literature or radio shows. In other words, several subtypes exist, namely quasi-naturalistic Q samples, Q samples drawn from conventional rating scales, standardised Q sorts and a “hybrid” category (McKeown & Thomas 1988: 26-27).

Quasi-naturalistic Q samples are similar to those obtained from interviews, but are developed from sources external to the study, for instance, taking statements from an interview with an expert on a topic without the expert being included in the study.

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[81] from the Latin *concursus* meaning a running together.

In some Q studies, statements are borrowed from attitude and attribute scales which are incorporated into Q samples to establish whether personal meanings held by participants correspond with the meanings the items are designed to measure.
The use of conventional scales does not impede the discovery of meanings different from those “built” into the scale.

Statements from naturalistic and ready-made Q samples can be combined to form hybrid-type Q samples. For instance, in a Q study statements can comprise both interviews with participants as well as statements from newspaper articles.

McKeown and Thomas (1988:26-27) refer to several standardised Q samples that are also available, for instance Block’s (1961) adjective Q-set for nonprofessional sorters (personality assessment) and the Butler-Haigh (1954) Q sample for psychotherapeutic counselling.

5.3.2 Selecting a sample representative of the range of communicated ideas in the discourse

It is impossible to administer an entire concourse, which might consist of several hundreds of statements containing opinions and not facts (Brown 1980a:55). Once statements about a concourse have been selected, they should be presented in “miniature”. The researcher thus faces the challenge of compiling statements which are more or less representative of the concourse (Brown 1980a:187).

Stephenson (1953:63) reiterates the above arguments. He argues that since a concourse is composed of statements, art objects, descriptions of behaviour or personality traits it is “impossible to define population universes for them”. To illustrate his point he refers to a study in which a sample of 60 coloured photographs of vases were used. No single one was alike. These pictures of vases would never be a representative sample, but what was achieved was certain “homogeneity” with respect to the vases - that is, anyone would tend to regard them as of one class. A definite “heterogeneity” was also achieved because all the vases were different (Stephenson 1953:65).

Different Q sample structures are used to present the statements in “miniature” and present a way to the researcher to be clear about his or her own theoretical point of view and to facilitate the selection of Q samples (Brown 1980a:189).

Two Q sample structures are used to select or exclude statements from the concourse, namely unstructured and structured Q samples.

5.3.2.1 Unstructured Q samples

Unstructured Q samples include statements presumed to be relevant to the topic at hand and are chosen without excessive effort made to ensure coverage of all possible subissues. Unstructured samples are selected at random from a “parent-universe”. The unstructured sample therefore provides a reasonably accurate survey of positions taken or likely to be taken on a given issue. However, some topical aspects might be either under- or over-sampled - hence a bias of some sort could be unintentionally incorporated into the final Q sample (McKeown & Thomas 1988: 28).

Not all Q samples need to be structured; in fact some of the best Q studies have used an unstructured sample (Stephenson 1953:74).

5.3.2.2 Structured Q samples

Once statements have been gathered from primary and/or secondary sources in the widest sense, the researcher has to organise, analyse and present them properly. The researcher is compelled to group the statements into theoretical categories.
Structured Q samples are composed more systematically because the researcher groups statements according to categories. The researcher also covers different aspects of the same statements to make them more or less representative of the concourse (Brown 1980a:189).

The structure is achieved by applying Fisher’s (1960) methods of experimental design to samples. In Q methodology, representativeness is sought through the application of the principles of variance design (Fisher 1960) in which the statements are conceptualised theoretically in order to include different aspects of each statement.

Structuring Q samples provides a focus and places boundaries on the topic in which the researcher is interested. The factorial structure is not necessarily a hypothesis for testing although it can be used as such. In most cases it merely provides a possible explanation of the resulting factors (Brown 1980a:38).

Where research is extended to include the testing of more than one independent variable, it is referred to as a factorial design and the independent variables are called factors. Individual factors may have more than one level or variation. Where two independent variables are researched, this is referred to as a two-factor design, or with three independent variables, to a three-factor design, etc. A factorial design can be described in the following way (Du Plooy 1997:182):

A 2 X 14 X 6 factorial design comprises three factors (the numbers 2, 14 and 6 each comprises a single factor). The first factor has two levels, the second 14, and the third factor six. Factorial designs are most commonly used in experimental designs.

In an experimental design model, certain factors are defined with a number of levels respectively without any replication. However, in Q methodology, the levels are replicated. Fisher (1960) refers to this as a balanced block design. Levels refer to elaboration of the factors. In a balanced block design statements are drawn from the factors in equal numbers and provide a number of groupings (combinations) for each level. A set of statements cover each of the groupings to make it more or less representative of the concourse. Not only are the factors “explained”, but all possible groupings of their levels are also elucidated (Stephenson 1953: 41). Statements are assigned to each grouping based on the author’s definition of each factor (McKeown & Thomas 1988: 29).

An experimental design procedure such as that of Fisher provides a reasonable way for selecting a Q sample theoretically. It also releases the researcher from sampling a large number of statements, and alternatives to large numbers become available. A structured Q sample can be a kind of “thought maze” for the participant, in the sense that he or she has an attitude about each Q sort and rejects or ignores some statements while being positive about others. It also affords the researcher the opportunity to "state his or her theoretical position explicitly". In addition, it provides a formula for composing or replicating a sample of statements that is comprehensive (Brown 1980a:38).

A structured Q sample enables the researcher to focus a Q sample around conclusions drawn earlier by him or her or somebody else. The method of reasoning can be either deductive, inductive or both (Brown 1996). In Q methodology, a deductive factorial design comprises categories and levels that are specified at the outset according to theory that has been clarified at the beginning. A structured Q sample most commonly constitutes a deductive factorial design (Stephenson 1953:73).

Inductive factorial designs are unknown at the outset and formulated as statements are collected. The dimensions that guided the selection of statements were suggested "by the statements themselves" and were not obvious prior to statement collection (McKeown & Thomas 1988:28, 30).

Table 5.2 below illustrates a structured Q sample in Q methodology.

Table 5:2: An explanatory table of a structured Q sample in Q methodology

Factors	**Levels**	**No of levels**
X, "Attitudes"	(a) Introversion (b) Extroversion	2
Y, "Mechanism"	(c) Conscious	2

	(d) Unconscious	
Z, “Functions”	(e) Thinking (f) Feeling (g) Sensation (h) Intuition	4

(Number of groupings (combinations) of the levels = 2 X 2 X 4 = 16).

Source: Stephenson (1953:69)

Three main factors are specified in the above example: (X) attitudes (Y), mechanisms and (Z) functions. A balanced block is constructed to provide conciseness, clarity and representativeness and overcome bias and preference (Brown, 1996). This leads to 16 (2 X 2 X 4) groupings of the levels. In order to expand the coverage of the factors, a set of five statements cover each of the 16 groupings, making a final structured Q sample of 5 X 16 = 80 statements in all (Stephenson 1953:69). The size of a structured Q sample is determined by the number of multiples of the basic design. The principle of heterogeneity is used. This means that given the relative homogeneity of all statements in a specific cell, the selection of those which are most different (heterogeneity) from one another in the same cell, is suitable to produce the kind of comprehensiveness that is desirable in the sample as a whole (Brown 1980a:189).

Brown (1996) explains that all Q samples should have at least minimal structuring (implicitly if not explicitly) in terms of positive and negative statements. From a practical point of view, this will avoid statements piling up on either the positive or negative side of the Q sort diagram if a participant holds an extremely positive or negative view of the topic.

Table 5.3 below illustrates the differences between a structured and an unstructured Q sample.

Table 5.3: The differences between a structured and unstructured Q sample

Structured Q sample	**Unstructured Q sample**
Statements are selected purposefully according to categories.	Statements are selected at random from a "parent-universe" presumed to be relevant to the topic at hand.
The structure is achieved by applying Fisher's (1960) methods of experimental design to samples.	Statements are selected without an excessive effort to ensure coverage of all possible subissues.
It provides conciseness, clarity and representativeness of the concourse and overcomes bias and preference.	A bias of some sort could be incorporated unintentionally into the final Q sample.
Subjective points of view are communicable and always advanced from a position of self-reference.	Subjective points of view can be compromised with an external frame of reference provided by the researcher.

Sources: McKeown & Thomas (1988:7; 37) & Brown (1996)

5.3.2.3 Number of statements for a Q study

Opinions on the number of statements for a Q study still vary among theorists. Kerlinger (1986) in Denzine (1998), for instance, suggests that the Q sort deck should comprise at least 60 Q sort cards for the statements to have statistical stability and reliability. McKeown et al (1999:254) state that the Q sort deck can vary between 30 and 100 Q sort cards, but is typically between 50 and 70 (McKeown et al 1999:254). Schlinger (1969:54) argues that the number of statements should not overwhelm the respondents. She considers 55 to 75 statements as ideal.

A large number of successful studies have been completed with statements numbering between 49 and 70 statements (for instance, studies by Popovich, Masse & Pitts 2003; Lipgar 2003). In this study the researcher considers a Q sort deck from 49 to 70 as ideal in order not to make the Q sorting process too time-consuming.

5.3.2.4 Preparation of the statements for the Q sorting process

Once the Q sample has been finalised, the statements need to be prepared for the Q sorting process. Donner (2001:27) suggests that no list of statements is perfect or has to be perfect. Of real interest are “the tacit, underlying criteria and perceptions people use to consider an issue”. However, statements need to be sufficiently broad and clear to generate these criteria and perceptions and provide the researcher with insights into them.

Similar to well-written survey items, there should be only one individual statement per Q sort card written in language familiar to the participants. Each statement is printed on a separate card to form a valid and reliable Q sort deck (Denzine 1998). Statements should be pretested on a few participants to ensure clarity and general comparability. The following are also suggested (Donner 2001:27):

- All statements need to be written in the same style.
- Extreme statements should be avoided.
- Statements need to be “plausible competitors” with one another.
- Double negatives should be avoided.

5.3.3 Selecting participants from people involved in the discourse and asking them to arrange the sample of ideas in their preferred order of importance

The third phase involves selecting participants from the people involved in the discourse and asking them to arrange the sample of ideas in their preferred order of importance.

In Q methodology, participants are selected from people involved in the discourse. This group of participants is referred to as the person-sample. The person-sample, unlike the structured Q sample, does not need to be representative of the population. Participants in Q methodology are sampled theoretically as they are in qualitative research using nonprobability sampling. When sampled theoretically, participants are purposively selected with the expectation “that they will hold different points of view on the topic being studied (Dennis 1986:10). Large numbers, which are so fundamental in social research, are rendered relatively unimportant in Q methodology because the emphasis is on the nature of the segments of subjectivity that exist and the extent to which they are similar and dissimilar (Brown 1991).

Enough participants are required to establish the existence of a factor for the purposes of comparing one factor with another. The results of a Q study are not generalised to the population, but to a specific factor type - that is a generalisation of a particular perspective (Brown 1980a:192). Generalisations are valid for other persons of the same perspective, for instance, for those persons whose views would lead them to load highly on a factor (Brown 1980a:67). Since factors are "qualitative categories of thought", additional participants would have virtually no impact on the factor scores" (Brown 1991).

According to Brown (2004), the strategy for selecting participants should be to obtain as much diversity as possible on variables such as gender and age. However, the proportion of the population that belongs in one factor rather than another is not important in Q methodology. The focus is upon the views that the factors represent "rather than the group memberships" of the persons comprising the factors. Even though as much diversity as possible should be included in the person sample, it is not necessary for the sample to be statistically representative of a specific category, such as gender or race. The likelihood that all factors at issue will have an opportunity to show themselves should rather be enhanced (Brown 1999).

Q methodology requires factors to be well defined, for instance, on which four or five participants are substantially loaded. Usually no more than seven factors and often fewer emerge from the data in most Q studies – hence the need for a relatively small number of participants (Brown 2003a; Dennis 1986:11). However, Brown (2003a) states that because the researcher does not know in advance how many factors there are going to be, he or she tends to "oversample". The more factors that eventually turn up, the larger the number of participants that will be required to provide good factor definition. However, he emphasises that even though the exact number of participants required cannot be specified in advance, this does not mean that the figure is arbitrary. In addition, Brown (2003a) states that whether or not a small number of participants is adequate also depends on the “factorial diversity” of the wider population (which is not known in advance) as well as on the diversity of the person- sample. Brown (2003a), however, emphasises that a very large person-sample is “counter-productive” because “large numbers of Q sorts can smother operant factors that cannot get out from under the pile”.

Q methodology uses nonprobability sampling techniques to select participants, but because it typically employs a small number of participants, it also uses either an intensive or an extensive person-sample, which is based on the condition of instruction to participants.

The use of an intensive or extensive person-sample depends upon the nature and purpose of the study (McKeown & Thomas 1988:37).

5.3.3.1 Intensive person-sample

An intensive person-sample requires participants to sort the Q sort cards under many conditions of instruction. A condition of instruction is a guide to a participant for sorting the Q sort cards from his or her own point of view. In an intensive person-sample, a small number of participants, one to about 30 persons, can sort the Q sort cards under many conditions of instruction. If only one person participates in the study, it is referred to as a single case study. In a single case study, one participant sorts statements about a specific topic under different conditions of instruction at different times (Brown 1991). For instance, a student could be asked for his or her views on an aspect of tuition under different conditions of instruction at different times to determine whether his or her subjective perception has changed or remained static over time.

5.3.3.2 Extensive person-sample

In an extensive person-sample many participants sort the Q sort cards under an identical condition of instruction. Enough participants are required to establish the existence of a Q factor for the purposes of comparing one factor with another. Brown (1980b) suggests that 40 to 60 participants are usually adequate, but that, in some instances, even fewer may be adequate.

Table 5.4 below illustrates the differences between an intensive and an extensive person-sample.

Table 5.4: The differences between an intensive and extensive person-sample

Intensive person-sample	**Extensive person-sample**
Participant(s) are given many conditions of instructions.	Participants are given only one condition of instruction.
A small number of participants or even only one person can be examined in depth.	Typically uses 40 to 60 participants but fewer in some instances.

Source: McKeown & Thomas (1988:37)

5.3.3.3 Selection of the response format

Once the person-sample has been selected, the researcher must select a response format. A response format refers to the names chosen for the ranking dimensions. The ranking dimensions refer to the participant's viewpoint according to which statements are sorted, for instance, how agreeable or acceptable statements are. If the researcher selects "agreement" as the subjective area of interest, participants would be asked to rank statements using a continuum of "most disagree" and "most agree" (Denzine 1998). This is important because participants' negative feelings can be as strong as their positive ones. Participants are asked to sort the Q sort cards according to those statements with which they most agree, to those with which they most disagree. The rating scale may range from +3 to -3, or +4 or -4, or +5 to -5, depending on the number of statements in the study (Dennis 1986:11).

5.3.3.4 The Q sorting process

Q sorting is the "technical means whereby data are obtained for factoring" (Brown 1980a:17) and is the qualitative data collection technique in Q methodology (Denzine

1998). Q sorting requires the participant to sort statements about a topic along a specific dimension such as “how relevant”, “how interesting”, or “how pleasing” the statements are, generally in the presence of the researcher (Schlinger 1969:53).

Prior to sorting the cards, participants are given their condition of instruction for the placement of the cards (Dennis 1986:12). A condition of instruction is a guide to a participant for sorting the Q sort cards from his or her own point of view (McKeown & Thomas 1988:30). The researcher needs to decide whether to use a “forced-choice” or “free-sort” condition of instruction.

a Forced-choice condition of instruction

When given a forced-choice condition of instruction, the participant needs to place the Q sort cards on a preset enlarged Q sort diagram with a space for each card. He or she is forced to place each card on the Q sort diagram in terms of, for instance, agreement and disagreement. The participant could be asked to sort the statements according to those with which he or she most agrees to those with which he or she most disagrees.

In the case of the forced-choice condition of instruction, the participant is instructed to commence with the sorting process by initially dividing the statements into a specific number of piles, for instance three. When three piles are used, those statements experienced as agreeable are placed in one pile to the right, those as disagreeable in a second pile to the left and the remainder in a third pile in the middle. The researcher can also instruct the participant to place a specific number of statements into each of the three piles.

The rating scale is spread across the top of a flat area such as a desk, and may range from +3 to -3, or +4 or -4, or +5 to -5, depending on the number of statements. The distribution is symmetrical about the middle, but usually flatter than a normal statistical distribution.

The participant now follows the procedure outlined below (McKeown & Thomas 1988:31-33):

He or she spreads the statements under the distribution markers, while maintaining the general left-centre-right relationships. This facilitates the reading of the statements contextually and the making of comparisons.

Studying the statements to the right, and in accordance with the distribution, the participant selects the number of statements called for, for instance, any four statements with which he or she most agrees, and places them vertically, under the +5 marker. The order of the statements under the markers is not important because all four statements beneath the +5 marker will receive the same score when the data are recorded. Turning now to the left side, the participant studies the statements and selects four from among those on the left with which he or she most disagrees. These are placed under the -5 marker. Again, the specific order does not matter.

Returning to the right side, the participant now picks four statements with which he or she agrees but not as much as the four already selected (located under +5) and places them under the +4 marker. On second thought, the participant might decide that a statement selected for +4 is more important than one under +5. He or she is perfectly free to replace it with another at this or any other time.

Attention reverts to the left side and the process is repeated, with the participant working toward the middle 0 position, until all of the Q sort statements have been positioned from left to right. Statements placed under the middle marker (0) are often the ones left over after all of the positive and negative positions have been filled.

The reason for having participants work back and forth is to help them reflect again on the significance of each statement in relation to the others. Once completed, the Q sorts should be reviewed, and the participant can make adjustments among statements, which upon rearrangement, more accurately portray his or her personal point of view.

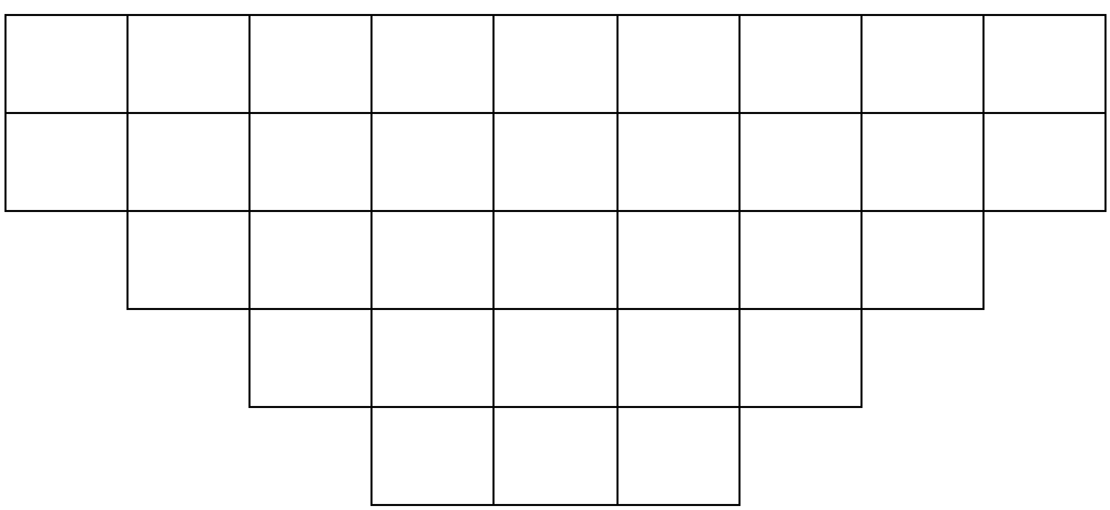
Finally, statement scores for the completed Q sorts are recorded by writing the statement number on a score sheet that reproduces the Q sort distribution.

Figure 5.1 below is an example of how Q sort cards are spread on a Q sort diagram using a forced-choice condition of instruction.

Figure 5.1: An example of how Q sort cards are spread on a Q sort diagram using a forced-choice condition of instruction

Most **Most**
disagree
agree

-4 -3 -2 -1 0 +1 +2 +3 +4



When using a forced-choice condition of instruction, researchers “force” participants in the following ways (Denzine 1998):

- Participants may only use a certain number of piles (heaps of Q sort cards) for the Q sorting task. In the above example in figure 5.1, nine piles are used, for instance, from -4 to +4.
- In placing a specific number of statements in each pile, for instance, in the above example in figure 5.1, participants can only place two cards under the +4 pile and three under the +3 pile, etc.
- Participants may also be asked to first put the statements into piles. For instance, participants could be asked to first sort 60 statements into three piles with each pile containing a specific number of statements. Once this process has been completed, participants will be instructed to rank-order the statements within each of the three piles before placing them on the Q sort diagram. This provides some structure in the task because some participants may experience the task of simultaneously ranking 60 statements as overwhelming.

b *Free-sort condition of instruction*

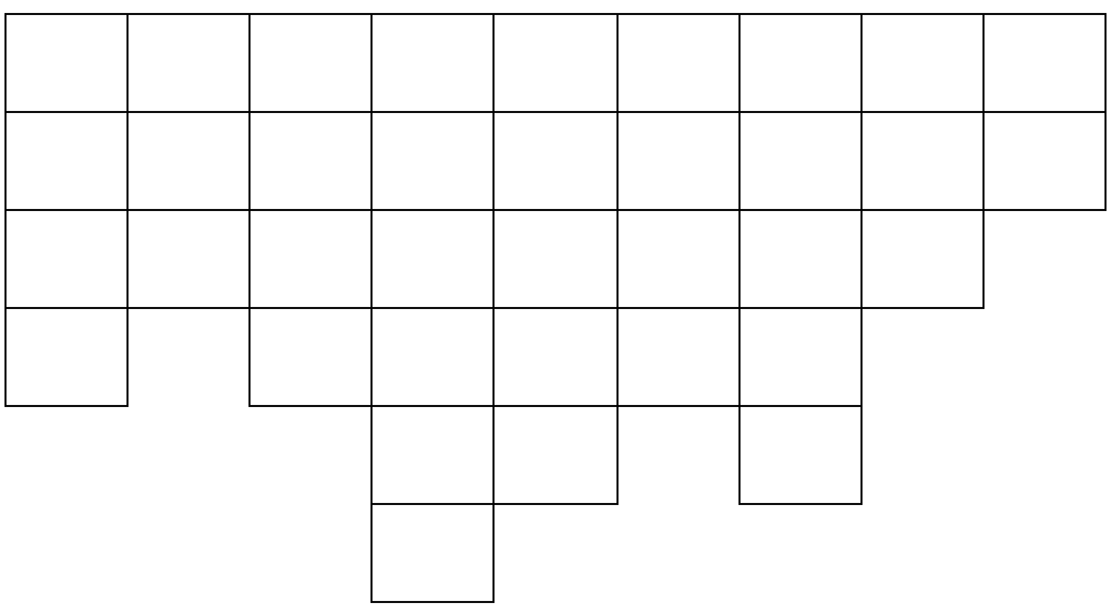
Participants are in no way restricted when given a free-sort condition of instruction. They are free to place the Q sort cards in as many piles needed for the specific research problem. They may also place as many or as few Q sort cards under the distribution markers as they desire. Researchers do not determine in advance the number of piles to be used for the Q card sorting. The participant could be asked to sort the statements, according to those with which he or she most agrees to those with which he or she most disagrees, in any place under the distribution markers.

In the free-sort condition of instruction, participants are asked to read through the statements first to familiarise themselves with them. They are then allowed to determine the number of piles to be used for the Q sorting. Once they have decided on the number of piles to be used, they may place any number of Q sort cards under the distribution markers until all Q sort cards have been sorted. The rating scale may range from +3 to -3, or +4 or -4, or +5 to -5, depending on what the participant decides. He or she is allowed to shift Q sort cards from one pile to another until he or she is satisfied with his or her Q sorting. Finally, statement scores for the completed Q sorts are recorded by writing the statement number on a score sheet that reproduces the Q sort distribution.

Figure 5.2 below is an example of how Q sort cards are spread on a Q sort diagram using a free-sort condition of instruction.

Figure 5.2: An example of how Q sort cards are spread on a Q sort diagram using a free-sort condition of instruction

Most **Most**
disagree
agree
-4 -3 -2 -1 0 +1 +2 +3 +4



When using a free-sort condition of instruction, participants are free in the following ways (Hess & Hink 1959: 84):

- They may use any number of piles for the Q sorting task.
- They may place as many or as few Q sort cards in each pile as they desire. In the above example in figure 5.2, the specific number of Q sort cards differs in each pile according to the participant's decision.
- Participants may sort the Q sort cards in any way they like.

Table 5.5 below reflects the differences between a forced-choice and a free-sort condition of instruction.

Table 5.5: The differences between a forced-choice and free-sort condition of instruction

Forced-choice condition of instruction	**Free-sort condition of instruction**
The researcher determines in advance the number of piles to be used for the Q card sorting.	Participants are allowed to determine how many piles or categories are needed for the specific research problem.
Statement sortings are more stable and discriminating.	Statement sortings are less stable and discriminating.
Participants become frustrated because they are forced to place the Q sort cards on specific places under the distribution markers.	Participants' frustration is lowered because they are free to place the Q sort cards at any place under the distribution markers.
A participant is compelled to pay close attention to the statements or items since he or she has to make decisions on their placement.	A participant does not pay as close attention to the statements since he or she can place them anywhere under the distribution markers.

This method helps researchers to decrease responses by participants.	This method may increase the number of responses by participants.

Sources: Block (1955 :487); Denzine (1998); Hess & Hink (1959:83); McKeown (1997)

5.3.4 Formal comparison of the arrangements by participants by means of factor analysis

The fourth phase in a Q study is to formally compare the arrangements of the statements by participants by means of factor analysis. In this section, factor analysis is briefly discussed as well as the way in which it is applied in Q methodology.

5.3.4.1 Factor analysis

Kline (1994:1) explains that factor analysis is a statistical technique widely used in psychology and the social sciences to simplify complicated data in an orderly way. The central aim of factor analysis is the "orderly simplification" of a number of interrelated issues to make sense out of the apparent chaos of the environment (Child 1970:2). In other words, it is used to uncover the latent structure of a set of variables. It reduces attribute space from a larger number of variables to a smaller number of factors. When a group of variables has for some reason, a great deal in common, a factor exists. According to Kline (1994:5), "a factor is a dimension or construct which is a condensed statement of the relationships between a set of variables". Kline (1994:5) also refers to Royce (1963) who states that a factor is a "construct operationally defined by its factor loadings". Factor loadings are the correlations of a variable with a factor or what is computed in the factor analysis (Kline 1994:5). The technique of correlation is used to discover these related variables (Child 1970:2).

In the application of factor analysis a distinction needs to be drawn between exploratory and confirmatory factory analysis.

a Exploratory factor analysis

Exploratory factor analysis is the most common form of factor analysis. Its aim is to uncover the underlying structure of a relatively large set of variables. The researcher assumes that any indicator variable may be associated with any factor. There is no prior theory to discern the factor structure of the data (Kline 1994:9).

b Confirmatory factor analysis

According to Kline (1994:10), the aim of confirmatory factor analysis, which was developed by Joreskog (1973), is to determine if the number of factors and the loadings of measured variables on them conform to what is expected on the basis of the pre-established theory. It is used to test hypotheses. The researcher assumes that each factor is associated with a specified subset of indicator variables. Indicator variables are selected on the basis of prior theory. Factor analysis is used to establish if they load as predicted on the expected number of factors (Kline 1994:10).

5.3.4.2 Q factor analysis

In Q factor analysis, the correlations between persons as opposed to variables are factored. It determines which sets of people cluster together. Q factors load on individuals rather than on tests. Q factor analysis is sometimes referred to as “inverse factor analysis” because the normal data matrix is turned on its side (Kline 1994:78). Q factor analysis rather reflects “functional relatedness” and is more “gestaltist” and “holistic (Brown 1980a:208).

Factor analysis applies to Q methodology in the following way:

a Extraction of factors

Factors are extracted to obtain only the common factors or factors that are of any interest. Factors which have *eigenvalues* of more than 1,00 are extracted. Those with less than this amount are regarded as insignificant and generally of too little interest to warrant further investigation (Brown 1980a:40). Eigenvalues are the sum of squared factor loadings for each factor. The percentage of total variance accounted for by each factor is equal to the eigenvalue divided by the number of variates in the matrix. In Q methodology, the variates are the number of persons whose responses have been factored (Brown 1980a:40). Kline (1994:30) explains that the larger the eigenvalue, the more variance[82] is explained by the factor. Although software for Q methodology typically extracts seven to eight factors to ensure enough variance in the factor, as a rule only three to four factors have any value.

Q methodology uses centroid factor analysis to extract factors, which is a way of defining "centers of gravity embedded in a correlation matrix". A centroid refers to a kind of grand average of the relationships between all the sorts, because they are represented by their correlation coefficients (Brown 1980a:40). Kline (1994:3) explains that a correlation is "a numerical measure of the degree of agreement between two sets of scores". It runs from +1 to -1. Full agreement is indicated by +1, 0 indicates no relationship; while –1 indicates complete disagreement and is known as the correlation coefficient. A correlation coefficient thus refers to the strength of a relationship between two variables in a population and its values range from -1 for perfect negative correlation up to +1 for perfect positive correlation between variables (Berenson & Levine 1996:732). Factor loadings are values expressing each sort's relationship with the centroid. Each loading represents a sort's contribution to the length of the centroid and can thus be expressed as the correlation of the sort with the centroid (Stricklin & Almeida 1999). The factoring process commences once a matrix of Q sort correlations is provided (McKeown

[82] Variance is a common statistical term and provides an index of the dispersion of scores.

& Thomas 1988:49).

A correlation matrix is simply a way through which the data must pass (numerical treatment) on the way to revealing their factor structure. It indicates in tabular form, the extent to which each Q sort is correlated or uncorrelated in terms of significant or insignificant loadings (Brown 1991).

Table 5.6 below is an example of a correlation matrix.

Table 5.6: An example of a correlation matrix

Sort	1	2	3	4	5	6
1	0	56	57	56	57	63
2	56	0	73	76	71	81
3	57	73	0	73	72	75
4	56	76	73	0	70	69
5	57	71	72	70	0	79
6	63	81	75	69	79	0

Owing to the development of more sophisticated computer programs, the centroid method (or simple summation method) of factor extraction, for instance, has been replaced by the principal factor method (Comrey 1973: 51). The principal factor method is a form of factor analysis which seeks the least number of factors which can account for the common variance (correlation) of a set of variables (Comrey 1973:76).

Because of sound theoretical reasons, Q methodology still extracts factors using the centroid (or simple summation) method. It allows for manual rotation in accordance with the researcher's research problem. Stephenson (1953) wants the researcher to be able to pursue his or her own rotational solution (for instance, judgmental rotation) to take the theory into account (Brown 1980a:261). The researcher may, for instance, also have reasons for selecting a particular Q sample and the person-sample, which the researcher's own rotational solution can then highlight.

b Factor loadings

After factor extraction, a column of numbers is generated, one for each Q sort. Each column represents the loadings of the Q sorts on that factor. These loadings represent the extent to which each Q sort is associated with each factor (Brown 1991). Factor loadings are thus correlations between the Q sorts and the factor (Comrey 1973:7).

A factor loading in factor analysis is worth considering for interpretation when it represents about 10 percent or more of the variance (Child 1970:45).

Participants who do not load significantly on any factor have points of view that are "idiosyncratic" and cannot be included under any theme depicted in the Q factor analysis results (Schmolck 1998).

Table 5.7 below is an example of factor loadings.

Table 5.7: An example of factor loadings

Sort	1	2	3	4	5	6

Factor	1	66	90	85	78	82	90
Factor	2	-10	8	16	4	-18	-22
Factor	3	-9	10	-3	13	1	9
Factor	4	-9	-2	15	12	14	12
Factor	5	4	14	3	19	0	-8
Factor	6	3	2	-5	-11	-10	16

In the above example, all six Q sorts load very high on factor 1 and lower on the other five factors which make factor 1 the prominent factor. Sort 1 of factors 2, 3 and 4 indicates a negative loading which, in Q methodology, does not have a clear meaning. All sorts with negative loadings are considered to be in a cluster of their own.

c Rotating factors

"The process of manipulating the reference axes" is known as rotation (Child 1970:52). The factors can be rotated in a number of ways. The researcher rotates factors in terms of "preconceived ideas, vague notions and prior knowledge about the topic" (Brown 1991). In Q methodology, the significance level determines whether there is a factor which is taken into account by the rotation method. A significance level is usually set equal to or greater than the value of two standard deviations away from the mean. It is a statistic directly related to the number of items in the Q sample. As the number of statements increases, the theoretical significance level decreases. The smaller the number of statements, the higher the theoretical significance level will be (Stricklin & Almeida 1999).

Once the factors needed to account for the correlations in the correlation matrix are extracted, the values are arranged in a table referred to as "the matrix of unrotated loadings". Unrotated factors tend to be highly complicated factor constructs that relate to or overlap with many of the variables instead of only a few. This factor matrix is then rotated into another form that "is mathematically equivalent" to the original unrotated matrix. However, it represents factor constructs that are often much more useful for scientific purposes than the unrotated factor constructs (Comrey 1973:7).

Q methodology typically uses varimax rotation, followed by judgmental rotation, depending on the goals of a particular study.

i Varimax rotation

According to Kline (1994:62), the varimax factor rotation, devised by Kaiser (1958; 1959), is strictly mathematical and provides an orthogonal solution. This means that factors are rotated in such a way that they are always at right angles to each other, that is, the factors are uncorrelated.

Through an "iterative"[83] process, variance is distributed across the factor structure in such a way that each sort has the highest degree of association with only one factor, all sorts and all factors being taken into consideration (Stricklin & Almeida 1999).The purpose is to maximise "the purity of saturation" of as many Q sorts as possible on one or the other of the number of factors extracted initially" (McKeown & Thomas 1988:52).

ii *Judgmental rotation*

Q methodology may use judgmental rotation (also known as graphical rotation or hand rotation), depending on the goals of the particular study. A researcher may have specific theoretical goals in mind when using a Q study and may therefore have reasons for selecting a particular Q sample to provide the Q sorts. For instance, the researcher

[83] Number of cycles. Starting from an informed guess about the possible value of communality, a more reliable value is calculated by repeated approximations until the final value alters very little with repeated calculations (Child 1970:37).

may decide to maximise a specific individual's Q sort to reveal relationships previously unrecognised. Another purpose of judgmental rotation can be to account for as many of the sorts as possible in as few factors as possible (Stricklin & Almeida 1999).

Criticism against judgmental rotation has to do with its subjective nature because the researcher allegedly rotates and "forces" the data to conform to his or her theory. However, Brown (1980a:229,165) states that this criticism is unfounded, because "only those structures can emerge which the data will tolerate". Judgmental rotation "permits the observation of reality, represented by the Q sorts performed, from the theoretical vantage point of the observer".

The graphic controls allow the researcher to put the theoretical considerations "into motion". Interrelationships of the Q sorts are not changed in any way through rotation.

5.3.5 Analysing the results of the factor analysis

The fifth and last phase of a Q study involves analysing the results of the factor analysis. This is accomplished through the assessment of factor scores and the interpretation of the factor array as well as the distinguishing and consensus statements. This section explains factor scores and interpreting the factor array and distinguishing and consensus statements.

5.3.5.1 Factor scores

A factor score is the score for a statement as a "kind of average" of the scores given that statement by all of the Q sorts associated with the factor (Brown 1991).
In Q methodology, interpretations are primarily based on the factor scores, in

comparison with most research applications in which factor interpretation is based on factor loadings.

Once the researcher is satisfied with his or her rotations, the software program for analysis, PQMethod[84], is allowed to compute factor scores for a final factor solution. This means that particular Q sorts are associated with factors.

Before allowing the software program to compute factor scores for a final factor solution, the researcher marks each Q sort to be associated with factors with an X (known as flagging – see chapter 6, 6.4.2.4), on the basis of his or her consideration of the following:

a Pure loadings

A factor rotation often generates mixed Q sort loadings (known as mixed cases) which are regarded as “factorially impure”. This means that a Q sort has significantly loaded on two or more factors, which represents a “blend” of the two respective factor views (Brown 1997a). The researcher needs to present a final solution of as many purest loadings as possible on a factor to estimate the factor scores. Pure loadings are pure expressions of the factor and provide a focused view of the point of view of a specific factor (Brown 2003e).

b Factor reliability

Defining a factor by the number of participants who loaded on it, represents one way to compute factor scores. The composite reliability of a factor depends on how many participants define it. A factor should have at least five participants defining it. This will generate factor reliability of 0,95 (Brown 2000b).

The following formula is built into the PQMethod program:

Rxx = 0,80p / [1 + (p-1), 080]

Where 0,80 is the assumed average reliability of the Q sorts comprising the factor, p is the number of those Q sorts, and Rxx is the test-retest reliability coefficient. When p = 5 Q sorts defining a factor, the factor reliability is therefore
Rxx = 0,80(5) / [1 + (5-1),80] = 0,9524.

Brown (2000a) further explains that the reliability of a factor is significant because it enters into the calculation of the standard error of the factor scores:

SEfs = Sx[Sort(1 – Rxx)] where Sx is the standard deviation of the Q sort distribution (Sx = 1,00 when dealing with normalised factor scores). For n = 5 Q sorts, therefore, SEfs = ,2182.

According to Brown (2000a), a good result will increase factor reliability. Q methodology is designed to provide the basis for examining differences in subjective perspectives - hence only enough individuals are needed for each factor type to provide the researcher with a clear “reading” of the point of view which that factor represents. A factor reliability of 0,95 is sufficiently high to obtain a clear reading of the factor. Adding increasingly responses only “marginally” clarifies the picture.

Brown (2003e) explains that factor reliability provides the researcher with “a kind of index” of how much confidence can be placed in the factor.

c Size of the factor loading

Since each Q study and context are unique, the researcher’s judgement and discretion cannot be denied (Brown 2000b). Schmolck (1998) suggests that the researcher should be creative in his or her detection and elaboration of unanticipated perspectives.

A researcher should also deliberate the size of the factor loadings of the few

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[84] The steps followed using the PQMethod software program are discussed in chapter 6.

cases/participants on a factor. Loadings can be extremely high because the number of statements is small or because the Q sample contains simple and unambiguous statements to which participants respond in highly similar ways, in which case the factors may reflect "commonplace" or obvious rather than meaningful and interesting responses.

Brown (2002) suggests that, depending on the number of Q sorts defining a factor (for instance, only three or four), the researcher may also select Q sorts that load significantly higher on one factor than on the other, for instance, 0,80 on one factor and 0,38 on another, even though this will be a mixed loading. The factor with the high loading will not be "contaminated" too much with the participant's low loading on another factor.

d Consideration of Q sorts with low factor reliability

When a theoretically important participant loads very high on one factor and very low on other factors, it is also recommended that this factor should be examined, interpreted and compared with other factors, even though no other participant loaded on that factor. Brown (2001) explains that if a pure factor loading contains only one participant, it might first be judged unworthy of retention. It should, however, be retained if the participant is deemed important for theoretical reasons.

5.3.5.2 Interpreting the factor array

Once factor scores have been computed, each factor is presented in the form of a factor array, that is, a diagram representing overall points of view. Brown (2003c) explains that Q methodology attempts to explain "entire response patterns" found in factor arrays that represent "overall points of view". In other words, the factor blends elements into an overall "gestalt" that cannot be further reduced. A factor reveals "in general outline" the thinking of participants with a particular perception. Q methodology is interested in statements involving integration into overall viewpoints (which are represented by factors) and not as isolated and independent events (Brown 2003c).

Table 5.8 below is an example of a factor array.

Table 5.8: An example of a factor array

Factor A

-5	-4	-3	-2	-1	0	1	2	3	4	5
20	11	10	2	3	4	23	1	9	13	21
27	16	15	5	6	8	25	7	17	30	26
31	18	47	14	12	19	41	28	22	32	34
	29	48	38	36	35	49	33	24	37	
		54	40	44	43	50	39	42		
			53	45	51	52	46			

In the above example, the factor array indicates where each statement was placed on the Q sort diagram with regard to the subjective perceptions of the separate group, known as factor A. However, it does not indicate the placing of the statements as members of the specific group because it is possible that the participants do no necessarily feel the same as the factor indicates.

The researcher studies the factor array for each factor that emerged from the statistical analysis to ascertain which statements are considered more agreeable than others. Based on the analysis of the factor array, an appropriate name is given for each factor identified. In the above example, the factor is characterised by statements that loaded on +5, -5, +4 and –4 (Brown 1980a:23-24).

There is no set strategy for interpreting a factor array, because it depends on what the researcher attempts to achieve (Brown 1980a:247).

5.3.5.3 Distinguishing statements

The results of the Q factor analysis will also provide a list of distinguishing statements. Brown (2003d) emphasises that factors should not be highly correlated because the higher factors are correlated, the fewer distinctions there will be between the factor known as distinguishing statements.

A distinguishing statement depends on the number of Q sorts defining a factor and the standard deviation of the Q sort distribution. It receives a significantly different score from each of the other factors and is treated differently by participants (Brown 2003d). According to Brown (1998), the number of distinguishing statements for each factor will be different and depend on how many statements receive significantly different normalised scores from those scores received in other factors. In Q methodology, the researcher should not only consider statistical criteria, but also use her or his own judgment in the interpretation.

5.3.5.4 Consensus statements

The results of the Q factor analysis will also provide a list of consensus statements. Brown (1997b) explains a consensus statement as one in which there is no significant difference between any factors. It therefore fails to distinguish one factor from others because all factors may give the same statement the same score. However, according to Brown (1997b), "just because a statement is singled out as distinguished or consensual by statistical criteria, does not mean that we are obliged to accept this as having special theoretical or substantive importance".

5.4 BENEFITS AND LIMITATIONS OF Q METHODOLOGY

As a research methodology, Q methodology has both benefits and limitations. These are discussed below.

5.4.1 Benefits of Q methodology

Q methodology is a unique research method that investigates associations, feelings, opinions and ideas that an individual may have about a topic. Statements are collected from the participant's opinion and organised by the participant himself or herself. This provides greater insight into what an individual feels about a topic (Schlinger 1969:53). Because of the active involvement of participants, data are highly reliable in that problems with missing data, social desirability, “undecided” responses, or response sets are “virtually nonexistent”. Since the Q sorting process is done in the presence of the researcher, he or she becomes more familiar with the participants’ feelings about the topic (Dennis 1986:5).

Another benefit is its cost-effectiveness. In Q methodology, fewer participants are required than in most other research methods, which make it less expensive (Dennis 1986:5).

5.4.2 Limitations of Q methodology

As a research methodology, Q methodology also has various limitations. One of the main limitations is that the Q sorting process is extremely time-consuming (McKeown & Thomas 1988:34). Both the method and instructions also need to be explained extensively to participants because they are generally unfamiliar with it. Participants with limited education also need to be shown how to proceed. Validity can therefore be affected if the participant’s lack of comprehension leads to misrepresentation (Dennis 1986:6). The time-consuming process of Q sorting can be alleviated by the use of focus groups which allow various participants to arrange statements on several Q sort diagrams at the same time. However, much of the qualitative data obtained will be disregarded when a focus group is conducted which will make the results of the Q sorting less effective (Denzine 1998).

Q methodology has also been much criticised because it uses a small sample. Results cannot be generalised to the rest of the population and are limited to different perceptions only (Schlinger 1969:54).

5.5 SUMMARY

This chapter provided a detailed explanation of the research methodology for this research. The five parts of the theoretical foundation were outlined, and the data analysis process, known as Q factor analysis, explained. The next chapter, chapter 6, deals with operationalisation.