ONE

Introducing Q methodology: the inverted factor technique

Introduction: the structure, style and aims of the book

Welcome to *Doing Q Methodological Research: Theory, Method and Interpretation*. Q methodology is a research technique, and associated set of theoretical and methodological

concepts, originated and developed by William Stephenson, which focuses on the subjective or first-person viewpoints of its participants. The basic method combines the gathering of data in the form of Q sorts and their subsequent intercorrelation and factor analysis. A well-delivered Q study reveals the key viewpoints extant among a group of participants and allows those viewpoints to be understood holistically and to a high level of qualitative detail.

The book has been written to provide a simple yet thorough introduction to Q methodology, which might be of assistance to students, academics and researchers interested in using the method for the first time and/or who wish to further develop their methodological skills and understanding. It aims to help you deliver high-quality Q methodological research.

In order to best facilitate these aims, the book's content has been divided – or, at least, loosely separated – into three sections covering theory, method and interpretation respectively. It's a really clever book title in that respect! Chapters 1 and 2 present the theoretical work, Chapters 3, 4, 5 and 6 cover the conduct and delivery of the method (and analyses) and Chapter 7 demonstrates how the findings of a Q methodological study can be interpreted to maximum effect. Chapter 8 then delivers some potentially helpful thoughts and arguments about the writing and presentation of Q methodological papers. The method section and chapters are supported by Appendix 2, which provides advice about the running of Q methodological factor analyses using the freely downloadable and dedicated software package PQ Method, version 2.11 for Windows, which is available at www.lrz.de/~schmolck/qmethod/downpqx.htm (Schmolck, 2002; see also Chapter 5). This appendix will also help you to navigate safe passage through the extensive output file generated by PQ Method.

Every attempt has been made to make the book accessible to each and every reader. We are aware, however, that Q methodology is now used in a very wide variety of disciplines, often in a variety of subtly different ways. This has made pitching our book quite difficult, it being all but impossible to assume a generic set of background skills and/or knowledge. For that reason, we've assumed only that you're intelligent and eager to learn about the method, and that clear, simple and straightforward explanations are probably the order of the day.

The latter does not mean, however, that every argument has been reduced to bullet points. On the contrary, a narrative style has been retained throughout. This is very deliberate. So many textbooks highlight particular issues, but fail to adequately demonstrate connections between those issues or fail to show how a successful transition can be made from one idea, or one bit of method, to the next. That's something we wanted to avoid. Seeing the whole in Q methodology – and understanding the various transitions in the method and analyses – is very important. Retaining the narrative style also gave us the best chance of producing a book that might at once claim to be informative and a cracking good read. We've given both our best shot.

As a compromise to this free-flowing style, however, you'll find that the narrative is punctuated at regular intervals by a series of major headings (as the Introduction: The Structure, Style and Aims of the Book above) and minor subheadings (as Section 1: Theory below). These headings and subheadings evidently serve to divide the

chapters into manageable portions and are also reflected in the list of contents that appear at the beginning of each chapter. Therefore, navigating quickly to the appropriate material and section of the narrative should be a straightforward matter. Each chapter also ends with a simple summary of its key content and important things to remember.

Section 1: theory

The book begins with two chapters that focus on technical and theoretical issues. Chapter 1 demonstrates that Q methodology can be understood, in its most basic form, as a simple derivation or inversion of the statistical technique known as *factor analysis*. A basic explanation of factor analysis is provided and the reader is introduced to the motivations, career and legacy of William Stephenson, the man who originated and developed Q methodology. A number of useful references, websites and general information about the Q methodological community are also included at the end of this chapter.

Chapter 2 adds some flesh to these bones via coverage of the main theoretical issues and concepts which William Stephenson subsequently developed alongside – and as a means of explaining – his basic *Q technique* or by-person factor analytic procedure. This chapter includes discussion of concepts like subjectivity, self-reference, concourse and abduction. It also explores the mathematical and conceptual links between Q methodology and quantum theory in physics, as well as the use of Q methodology as a social constructionist method.

The theory section has been designed to help the reader grasp the historical and theoretical context of Q methodology; to understand, in other words, what Q is, where it comes from, and why, and what it does or might mean. The provision of such context is the main motivation for including these chapters at the very beginning of the book. Please be clear, however, that engagement with these chapters should be considered as *optional*. In the long run, they will probably become an important means of developing and extending your methodological knowledge, but their content is certainly not imperative to the doing of effective Q methodological research. Some of the technical and theoretical information provided is also quite complex. If all you want to do, therefore, is to get your study done as quickly and effectively as possible, skip straight to Chapter 3 and hence to the method section of the book. We'll forgive you! Just try and return to Chapters 1 and 2 at a later date, perhaps after you've conducted one or two studies, because the material they contain will undoubtedly give you a more rounded understanding of the method you're using.

Section 2: method

Chapters 3, 4, 5 and 6 cover the basic method. Used in combination with Appendix 2, these chapters should give you the means to set up, run and analyse a piece of Q methodological research. Chapter 3 deals with basic design issues, including

potential research questions, conditions of instruction and Q (or item) set development. Discussion of both single- and multiple-participant designs is also included. Chapter 4 offers advice on the conduct of your fieldwork. The nature and number of participants is discussed, as is the concept of a sorting distribution, the generation of effective study materials and matters of procedure (including the conduct of *online* studies).

Chapters 5 and 6 then finish this section via extended coverage of the analytical process. For the sake of continuity and clarity a single set of example data is used throughout these chapters and also in Chapter 7. This data is drawn from a participant group of hearing-impaired children, aged 12–16, and the study focuses on the perceived role played by the adult helpers in their educational setting. The research was carried out by Rachel Massey who was (successfully!) completing a doctorate in Educational Psychology at the University of Sheffield and the project was supervised by Martin Hughes. We want to thank them both for their generosity in allowing us to use their data as a means of helping others.

Chapter 5 presents a conceptual and statistical explanation of the process of factor extraction, including a discussion of relevant software packages, the importance of having an analytical strategy, factor loadings (variance and eigenvalues), useful equations, alternative extraction methods, bipolar factors and advice about the number of factors to extract. Chapter 6 provides a similar explanation of factor rotation. The process and its aims are clearly illustrated, different methods of rotation are compared and the preparation of factor arrays (for interpretation) is also demonstrated.

Section 3: interpretation

Chapter 7 continues by offering a preliminary rationale and simple method to facilitate effective factor interpretation. The process is explained in a step-by-step fashion culminating in a full interpretation of the first factor drawn from our example study data, which was extracted in Chapter 5 and subjected to rotation in Chapter 6. The remaining four factors from our example study (see Appendix 3, page 219) can thereafter be interpreted by the reader as a means of practising and developing the necessary interpretative skills. Chapter 8 then brings the book to a conclusion by providing advice on the preparation and delivery of sound Q methodological papers. Q methodology is a different and exciting method, but this attracts a good deal of potential misunderstanding among journal editors and reviewers alike. Chapter 8 offers several simple ways to maximize the potential of your publications.

That's it really, other than to say that the ultimate aim of the book is to be helpful. As we proceed you'll see that the practice of Q methodology continually requires decisions to be made. Given time and knowledge, therefore, there is a strong possibility that you will come to disagree with some of the arguments we make and the positions we adopt. But that's life isn't it? Nothing here is set in stone and we'd actually be delighted if you feel you know better. If Q methodologists share one thing in common it is almost certainly an interest in other people's viewpoints, perspectives

or attitudes and a belief that those viewpoints are somehow important in the context of our subject matter and to our lives in general. It would be illogical, therefore, to expect a single view of Q methodology to exist and positively hypocritical to assume that our viewpoint is superior. Make your own decisions and go your own way as soon as you feel able. In the meantime, we have written this book to act as your guide. Read it from cover to cover and it will provide you with an honest, highly practical and step-by-step introduction to *Doing Q Methodological Research* effectively and with impact. We hope you enjoy the trip …

The birth of Q methodology

Q methodology made its first appearance in 1935, in the guise of a letter to the journal *Nature* authored by one William Stephenson. The basic statistical principles outlined in this letter were immediately developed by Stephenson in a series of very exciting and thought-provoking academic papers that appeared over the next three or four years (Burt and Stephenson, 1939; Stephenson, 1936a, 1936b). Employed as an assistant by two of the most famous names in the history of British psychology – first by Charles Spearman and subsequently by Cyril Burt – at University College London in the 1930s, Stephenson was considered by Spearman 'to be his most gifted and creative student, for it was only in the hands of his independent-minded protégé', he felt, 'that anything fundamentally new was added to the methodological foundations of factor analysis, the statistical method which Spearman [himself] had invented' (Brown, 1980: xiii).

Q methodology emerges as the culmination of these fundamentally new ideas and can be understood, in its most basic form, as a simple yet innovative adaptation of Spearman's traditional method of factor analysis. This first chapter will explain these ideas and demonstrate the nature of the adaptation on which Q methodology is based. In order to understand what Stephenson *added* to Spearman's method, however, it is first necessary to establish a preliminary conceptual grasp of factor analysis itself. As we've already hinted, this important piece of groundwork can easily be overlooked. Yet there is little doubt that having a basic grasp of factor analysis will ultimately make you a better Q methodologist. This chapter will certainly help, as will the later method chapters, particularly Chapters 4, 5 and 6, but reference to an introductory factor analytic text may also be useful (Field, 2009: ch. 17; Kline, 1994).

A brief guide to factor analysis and its data

Table 1.1 represents a standard table of data, or data matrix, that has been gathered for analysis using Spearman's factor analytic method.

Table 1.1 Data matrix for factor analysis

	Variables				
Persons	*1*	*2*	*3*	*4*	*m*
a	ax1	ax2	ax3	ax4	axm
b	bx1	bx2	bx3	bx4	bxm
c	cx1	cx2	cx3	cx4	cxm
d	dx1	dx2	dx3	dx4	dxm
n	nx1	nx2	nx3	nx4	nxm

This matrix contains data gathered from a sample of *n* persons (Persons a, b, c ... *n*) each of whom has been subjected to measurement using a range of *m* tests and hence in relation to a range of *m* variables (Tests 1, 2, 3 ... *m*). These could potentially be measures of anything at all, but to make matters less abstract let's assume that Test 1 is a memory test; Test 2 a measure of verbal ability; Test 3 a measure of mathematical ability; Test 4 a measure of introversion/extroversion, and so on. As is typical of measurement processes, each person is subsequently awarded a score relative to each of the tests they have completed. In Table 1.1, the score received by *Person a* relative to Test 1 is represented by ax1, for Test 2 by ax2, and so on, across the first row of the matrix. The score received by *Person b* relative to Test 1 is represented by bx1, for *Person c* by cx1, and so on, down the first column of the matrix.

Spearman's factor analysis focuses attention on the columns of this matrix. This means it is going to be focused on the conduct of analyses relative to the measured variables. We already know, for example, that column 1 of the matrix reflects scores relevant to the memory capacity of a sample of *n* individuals, while column 2 does the same for verbal ability. These variables are undoubtedly of interest in their own right, but factor analysis is less concerned with any single test or variable than with revealing patterns of association between all the variables in a given data matrix.

Correlation statistics

A first simple measure of association between the variables can be established using a correlation statistic. Correlation statistics are ordinarily employed to measure 'the degree of agreement between two sets of scores [which have been gathered] from the same individuals' (Kline, 1994: 18). They are scored on a scale ranging from +1.00 to –1.00. A large positive correlation, say +0.70, indicates that persons who scored highly in relation to *Variable 1* have tended to do similarly in relation to *Variable 2*, while a large negative correlation, say –0.70, suggests that high scores relative to *Variable 1* are typically associated with low scores on *Variable 2* (and vice versa). A correlation of zero indicates that there is no association between the two variables.

Factor analysis begins with the calculation of such correlations relative to all the variables in the data matrix. Each variable is correlated with all the others, pair by pair. The total number of correlations required can be calculated using the equation (*m*) (*m*–1)/2 (Stephenson, 1936a), where *m* signifies the number of measured variables (or

columns) in the matrix. For example, a data matrix containing measurements for 20 variables would require a total of 190 distinct correlations to be calculated (since m = 20 and m–1 = 19 in this case).

The standardization of scores (or *Z* scores)

In order for these many correlations to be meaningful, however, the scores captured in each column of the data matrix must first be *standardized*. This standardization is a built-in feature of correlation statistics like the Pearson's product-moment correlation (r), so there's actually nothing to do in practice. The statistic takes care of the problem. It is nonetheless important to understand standardization from a conceptual perspective, because it has a pivotal role to play in the development of Q methodology.

Standardization of scores is necessary because a question like 'Is 176 cm bigger than 200 lb?' doesn't really make sense. Neither does the proclamation 'I am taller than I am heavy'. Direct comparison is precluded in both cases because the variables height and weight don't share the same unit of measurement. This is also true of all the variables in our example data matrix. You can't directly compare introversion and verbal ability scores *unless* the same (i.e. standardized) measuring unit has been applied in both cases – which is usually impractical – or unless some kind of standardized system of scoring can be imposed *after the event*.

Fortunately, the latter is ordinarily achievable. The rationale is also straightforward. It doesn't make sense to ask if I am taller than I am heavy in a direct or absolute sense, but you could legitimately be interested in the proportion of the general population that are taller or heavier than me. This second question makes sense because the comparison it wants to make is *relative* rather than absolute. It also offers the key to the standardization of scores. An absolute score can be successfully converted into a standardized score by calculating its relative position within an overall distribution of gathered scores. It would clearly be impractical to gather scores from the entire population, so instead we simply estimate the parameters of the population through the measurement of a representative subset or *sample* of its members.

In practice, the final standardized score – which is also known as a standard or z score – is calculated as a mathematical expression of the distance between a particular absolute score and the mean average score of the measured sample. This distance is expressed proportionately in terms of a number of standard deviations (see Kline, 1994, for more details on the standard deviation). The main point for our purposes, however, is that the calculation of these z scores for my own height and weight would enable us to estimate, with some reliability, what proportion of the population are taller than me and what proportion are heavier. It turns out that 50% are taller, while only 27% are heavier. The magic of this approach is that it suddenly makes our original question both sensible and answerable – despite the different measuring units employed in the various columns of the data matrix. 'Am I taller than I am heavy?' The answer is now obvious: 'No, I'm not. Relative to the population, I am clearly heavier than I am tall.'

By-variable factor analysis and R methodology

Standardization allows distinct variables, captured using different units of measurement, to be directly compared. In so doing, it allows the respective columns of a factor analysis data matrix to be correlated in a meaningful fashion. The process of correlation then yields a variable-by-variable *correlation matrix* that allows the associations between all of a series of *m* variables to be observed. Alluding to the *r* contained in Karl Pearson's famous correlation statistic, which is known as *Pearson's r*, Stephenson devised a generic name for all methods of this general type, which employ tests or traits as variables and operate using a sample of persons: he called them *R methodology*. The main aim of an R methodological factor analysis, of the type we have so far been describing, is to account for the many manifest associations captured in the correlation matrix through the identification of a greatly reduced number of underlying, explanatory or latent variables. These latent variables, so identified, are known as *factors*. Understood in this way, it is apparent that factor analysis is primarily a technique of *data reduction*.

In practice, factor analysis delivers on this reductive promise by isolating groups of variables – traits, abilities and so on – exhibiting measured scores that have varied proportionately (or covaried) across a population of persons. We might, for example, observe that people who scored highly on a test of verbal ability have also tended to score highly on tests of mathematical ability and problem solving. A low score on one of these tests, conversely, seems often to coincide with low scores on the other two. It is apparent that the scores on the tests *covary*. For the factor analyst – and the process of factor analysis – this covariation suggests that the three variables might, in fact, be better understood as *alternative manifestations of a single underlying or latent factor*. An observed association between verbal, mathematical and problem-solving ability could, for example, be made understandable on the basis of a single latent factor called *intelligence*. Application of factor analysis across a whole data set typically leads to the emergence of a small number of such factors, which, taken together, can be used to facilitate a greatly simplified (or reduced) explanation of the many manifest associations captured in the original correlation matrix. It's an elegant and potentially very effective methodological system.

Individuals and individual differences

By the mid-1930s, R methodological, or by-variable, factor analysis had become intimately associated with the so-called *individual differences* tradition in psychology. It remains so to this day. As the name suggests, this tradition concerns itself with the comparison of different individuals in relation to specific psychological traits or characteristics. Nonetheless, Stephenson saw this as something of a misnomer, since he had observed, quite correctly, that the factors revealed by an R methodological factor analysis did not, and could not, reflect the differing personal characteristics or perspectives of specific individuals. This failure turns out to be strongly connected with the standardization of scores.

As we have already discussed, absolute measurements of different variables – traits, abilities or characteristics – cannot usually be compared directly because of the different measuring units involved. This problem can be surmounted, however, by converting each absolute score into a standardized score that reflects its position within, and relative to, the overall distribution of sampled scores for the relevant variable. Solving one problem, however, creates another. The process of standardization serves also to *disassociate* the scores from the specific individuals who made them. All the absolute scores for each variable directly reflect the personal characteristics of certain individuals and they only make sense by reference to those individuals. The standardized scores, in contrast, reflect the position of a specific score relative to a statistical aggregate of scores and they only make sense *by reference to that aggregate*.

Stephenson describes the situation as follows. Although, he says, the R methodological system:

> Appears to begin with absolute variates [measurements or variables], it does so only in a sense 'relative to a population of persons'. [It follows that the] … system can certainly tell us if, and how the various attributes vary proportionately in a population of persons. But it can tell us little or nothing about … any individual person. It supplies information of a general kind. (1936b: 201)

Stephenson's concerns are easily illustrated. Imagine for a moment that one of the variables in our data matrix was *height*. *Person a* turns out to be 174 cm tall, *Person b* is 180 cm, *Person c* is 171 cm, and so on. We have seen, however, that the standardization process transforms these absolute scores into merely relative scores that reflect how the attribute of height varies proportionally across the *whole population of persons*. The heights of specific individuals are no longer of any real concern. The fact that *Person c* is a full 9 cm shorter than *Person b* – an observation which is clearly indicative of a key difference between these individuals – is really of no interest to R methodological factor analysis. The factors revealed by this method are demonstrative, not of individual differences between persons, but of associations and differences *between variables* mapped at the population level. Stephenson was right. This is information that ought to be of more 'interest to General rather than to Individual psychology' (Stephenson, 1936b: 205).

It is true that the R methodological system can go on to specify how certain individuals differ relative to its chosen variables, although it requires subsequent measurements and processes to achieve this. One might, for example, ask two individuals to complete a previously validated and reliable measure, which taps one of the emergent factors (or latent variables). A test of intelligence would work in the context of our earlier example. For Stephenson, however, even this secondary pursuit of individual differences still managed to disappoint. First, he observed, because it only considered 'measuring any individual for those differences which enter into a factor' (Stephenson, 1936b: 205). This is problematic, because while these differences would almost certainly be relevant to the population as a whole, they might potentially be of little or no consequence to the one or two individuals being studied. Second

because, despite its best efforts, the R methodological system couldn't define those individuals in any sort of *holistic* fashion.

The latter was of particular importance to Stephenson because he felt, not unreasonably, that defining and understanding each individual completely, and hence as a whole, was a necessary prerequisite of any full and genuine comparison of individual differences. The simple problem for R methodology, however, was that its focus on specific *bits* of people – variables, traits, abilities and so on – necessarily invoked a kind of methodological dissection, and once this dissection had taken place no effective means had been found 'to put the person together again' (Stephenson, 1936b: 202).

By-person factor analysis and Q methodology

We have dwelt on the issues raised above for two reasons. The first was to give you some basic insight into the workings of factor analysis. The second was to emphasize that the limitations of R methodological factor analysis and the related failures of the individual differences tradition in psychology were Stephenson's initial and primary motivation for developing Q methodology. He was in pursuit of a genuinely holistic methodological system for the discipline of psychology and had already spotted that a simple adaptation of Spearman's factor analysis might potentially allow him to achieve that end:

> Factor analysis ... is concerned with a population of n individuals each of whom has been measured in m tests or other instruments or estimates. The $(m)(m–1)/2$ correlations for these m variables are subjected to ... factor analysis. But this technique … can also be inverted. We may concern ourselves with a population of N different tests (or other items), each of which is measured or scaled relatively, by M individuals. The $(M)(M–1)/2$ correlations again can be factorised by appropriate theorems. (Stephenson, 1936a: 344–5).

The key observation in the above extract is that the R methodological technique *can also be inverted*. This statement alludes to the possibility, in principle at least, of shifting analytical attention from the columns of our example data matrix (see Table 1.1) to its rows. In other words, we can potentially run *by-person* as well as by-variable factor analyses. This shift in analytical focus is the basis of Q methodology. The Q was initially adopted by the educational psychologist and statistician G.H. Thomson (Thomson, 1935). In factor analysis circles it signified any attempt to pursue correlations between persons, rather than correlations between tests or variables, as had been the case in R methodology. It can nonetheless be applied in a still wider sense, to indicate any method which inverts the R methodological tradition by employing persons as its *variables* and in which traits, tests, abilities and so on, are treated as the *sample* or *population*.

The simplest and most obvious means of conducting a Q methodological (or by-person) factor analysis is via 'the correlation and factorisation by rows of the same matrix of data

that in R is factored by columns' (Brown, 1980: 12–13). This approach is often called the *transposed matrix model* precisely because the 'normal data matrix is [effectively] turned on its side' (Kline, 1994: 78). It was championed by Cyril Burt, one of Stephenson's early employers and colleagues, and it is this form of Q technique factor analysis that ordinarily appears in mainstream textbooks. The approach is not well liked. Maxwell, for example, suggests that the Q technique has 'proved to be of little practical value' and that the 'procedure has been objected to on several grounds' (1977: 44–5).

The transposed matrix model fails because it manages to create a number of problems for the process of by-person factor analysis. The most fundamental of these is that a single matrix of data can properly be transposed – for factor analysis along the row as well as down the column – only where *a single measuring unit* is employed throughout the matrix (Brown, 1980). This means an R methodological data matrix, of the type we illustrated in Table 1.1, will almost never be accessible to Q methodological analysis. The main reason for this, as Stephenson confirms, is that 'it is not in the least essential to have one and the same measuring unit for all *attributes* or *tests*' in R methodology, 'it is merely essential that the unit for any one attribute should be … the same for the whole population of persons' (1936b: 207). As a consequence, every column of an R methodological data matrix is likely to be defined by a different unit of measurement.

We are already familiar with the statistical problem this creates for an R methodological, by-variable or by-column analysis of our example data matrix and that this can be overcome through the standardization process, but how about a Q methodological, by-person or by-row analysis of the same data matrix? Can we find a way to do this legitimately? The answer is '*No, not really*'. Stephenson (1936b) did propose a system of factor analysis in which the standardized scores produced during an R methodological study might subsequently be restandardized by-person for Q methodology (he calls it *System 3* in the context of this paper). However, this approach failed to deliver the holism Stephenson was seeking and it was abandoned almost immediately. The factors it produced, he said, 'can only be distorted, unreal, or potential, with respect to any individual' and its pursuit 'cannot lead [us] to a *whole* person' (Stephenson, 1936b: 202).

As Stephenson affirms, a Q methodological factor analysis does not require 'one and the same [measuring] unit for all *persons*', but it does demand 'that the unit for any one person should be the same for the whole population of attributes' (1936b: 207). This means that each row of our example data matrix *must* employ an identical measuring unit throughout for a Q technique factor analysis to become a viable possibility, but, as we have already noted, almost all R methodological data matrices contain different units of measurement in every column. The only conclusion you can reach, therefore, which Stephenson did very quickly, is that data gathered for R methodological purposes will not ordinarily be amenable or transformable for use in Q analysis.

Stephenson versus Burt, R versus Q

This creates a difficult situation for Burt's transposition procedure. In fact, Stephenson challenged Burt's approach from the outset (Stephenson, 1936a), a process that

culminated in a fascinating, jointly authored paper in which the two protagonists laid out their alternative views of correlations between persons (Burt and Stephenson, 1939). The paper begins by outlining six points of agreement, which are dealt with very briefly in just half a page of writing. This is followed by six pages of argument that outline 20 points of difference. A year later, in his seminal *The Factors of the Mind*, Burt is very complimentary about Stephenson and thanks him for his 'outspoken criticisms, and above all the opportunities we have had for personal discussion', but he also confirms that Stephenson is attacking by-person (or Q) correlation 'from an opposite angle instead of along identical lines' (1940: xi). Their joint paper makes this very obvious. The arguments it contains are nonetheless productive insofar as they allow the interested reader to appreciate the truly innovative and radical nature of Stephenson's methodological proposals.

The underlying differences between the two, we are told, 'may be summed up by saying that Stephenson insists on a sharp opposition between *r*-technique and Q technique, whereas Burt would regard them as involving much the same aims, methods, and theorems' (Burt and Stephenson, 1939: 274). Stephenson's Q methodological approach was to involve 'a complete break with the concepts of *r*-technique' and a focus on 'an entirely new set of problems' (Burt and Stephenson, 1939: 275).

Stephenson presents the individual differences tradition and 'the factors obtained in *r*-technique as defining the fundamental abilities or tendencies of men [*sic*]' (Burt and Stephenson, 1939: 278). He believes these abilities to be universal and hence that the factors obtained through their correlation as variables 'will be narrow and rare' (Burt and Stephenson, 1939: 278). This method and its factors, Stephenson proposes, might provide the basis for a general psychology interested primarily in the derivation of laws from statistical aggregates. Q methodology, in contrast, would focus on a completely new set of problems associated with a thoroughgoing and idiographic psychology of individuals. The concern, at all times, was to lie 'with whole *aspects* of persons, with the physical whole, the mood-condition whole, the cognitive whole and so forth' (Stephenson, 1936b: 208) and the primary aim was 'to map out the field into groups of persons who resemble one another with respect to whole aspects of their personality' (Stephenson, 1936b: 278).

In short, Stephenson is intent on using his new method as a means of systematically and holistically identifying different types of people, or different types of mood, types of viewpoint and so on, across different life domains and contexts. This tells us something further about his particular interest and initial motivation for developing the Q technique: he believes it might provide the basis for a completely new and original approach to psychology. There are, he says, 'possibly millions of *types*' which Q methodological factors might capture, 'common that is to several or many persons, but not necessarily to all' (Stephenson, 1936b: 209). The non-universality of these types would ensure, in marked contrast to the R technique, that the factors obtained 'in correlating persons … will be numerous and broad' (Burt and Stephenson, 1939: 274).

A new form of data for Q methodology: psychological significance and the delivery of holism

It is already clear that the Q technique could not operate effectively using data gathered for R methodological purposes. Transposing R methodological data matrices for Q analysis is statistically dubious. Stephenson also believed that the associated methodological 'view put forward by Burt … that the self-same traits that are used as variables in correlating traits can change in the twinkling of an eye into chameleon-like items of a statistical population when correlating persons … [was ultimately] a gratuitous assumption' (Burt and Stephenson, 1939: 276). A more radical change of direction was needed. If Q technique factor analysis and Stephenson's embryonic methodology were to flourish a completely *different form of data* would be required.

In fact, Stephenson (1936a) has already told us about this new and different form of data (see page 12). On the one hand, R methodological data is derived from a population or sample of individuals each of whom has been *subjected to measurement* using a collection of different tests. The new form of Q methodological data, on the other hand, is derived when a population or sample of tests (or other items) are *measured or scaled relatively* by a collection of individuals. Stephenson goes on to clarify the basic nature of his data gathering procedure in the following extracts:

> If, then, any list of heterogeneous measurements or estimates can be arranged in an order of some kind, or in a scale … [in terms of] their … significance for the individual, they may be held to be made homogeneous with respect to that individual. This last sentence opens the way for many applications of Q technique.

> The same procedure holds for any heterogeneous material whatsoever. We may consider fifty different personality traits, the [measurement] units for which are markedly dissimilar [in the context of R technique]. It is [nonetheless still] possible to put these in order for each individual, or possibly to fit them into a prearranged frequency distribution, those traits most characteristic of the individual being ranked or scored highly, whilst those of little relative significance are ranked or scored lowly. These ranks or orders can thereupon be correlated and supply Q correlations. (1936a: 346–7)

Instead of being passively subjected to measurement, as they would be in R methodology, it is clear that the participants in a Q methodological study are to be presented with a heterogeneous set of stimulus items or *Q set* (see Chapter 3) which they must actively rank order. This process is to be carried out from a subjective or first-person perspective using a 'new unit of quantification' called 'psychological significance' (Burt and Stephenson, 1939: 276). Items that have a high (or positive) psychological significance for a specific individual would then be ranked or scored highly, while those of lesser (or negative) significance would receive a correspondingly lower ranking. This process would yield a data matrix in which each row is constituted by the subjective evaluations of a single person. Since all the stimulus

items have been ranked or evaluated *relative* to one another, and in that way *made homogeneous* relative to the individual in question, each row of the matrix must also be treated as a single, holistic and gestalt entity. Stephenson had, in other words, manufactured exactly the type of holistic data his method required.

Standardization and the Q sort

The straightforward cleverness of this shift in procedure should not be underestimated. A Q methodological or by-person factor analysis requires the scores in the rows of a data matrix to be standardized in the same way that the column scores needed standardizing in R methodology. Standardization of scores by column was achieved relative to the entire population of scores *for a single variable*. In Q methodology, however, matters are inverted such that persons become variables. The standardization of scores by row must duly be achieved relative to the entire population of scores *for a single person*. Stephenson manages to achieve this by-row standardization, not after the event through a sleight of mathematical hand, but through the very nature of the data that he gathers. It's simple, but it is also a stroke of methodological genius.

The single unit of quantification that Stephenson introduces, based on the premise of psychological significance, ensures that every single score in a Q methodological data matrix has been made 'relative to the individual and to himself [*sic*] alone' (Stephenson, 1936b: 208). This was achieved because Stephenson very explicitly sought and 'demanded [a process] of quantification that could be confined to a single person, uniquely if need be' (1936b: 207). Q methodological studies can indeed be carried out in a single participant format, a subject to which we'll return in Chapter 3, but Stephenson didn't stop there. In the arguments cited above, he also insinuates that his new and ingenious means of data collection might be enhanced by the imposition of a 'prearranged frequency distribution'. This distribution is another notable, and ultimately very famous, innovation known as the *Q sort*. An example is illustrated in Figure 1.1.

As Figure 1.1 demonstrates, the prearranged frequency distribution serves to delineate and further standardize the ranking procedure. The Q methodologist provides a heterogeneous population of stimulus items each of which must be assigned a ranking position, relative to all the others, in the distribution provided. This process is carried out by every participant along 'a simple, face-valid dimension, for example [from] most agree to most disagree, most characteristic to most uncharacteristic, most attractive to most unattractive' (Stainton Rogers, 1995: 180).

The choice of dimension is important because it helps to define and standardize the nature of psychological significance within a particular study. The Q sort distribution ordinarily contains 9, 11 or 13 ranking values, ranging from +6, +5 or +4 for items that are, say, *most important* (or most psychologically significant for the individual), through zero, to –4, –5 or –6 for items that are considered *most unimportant*. It also dictates the number of stimulus items that can be assigned a particular ranking value. In the example below, two items can be ranked at the +5 position, three at +4,

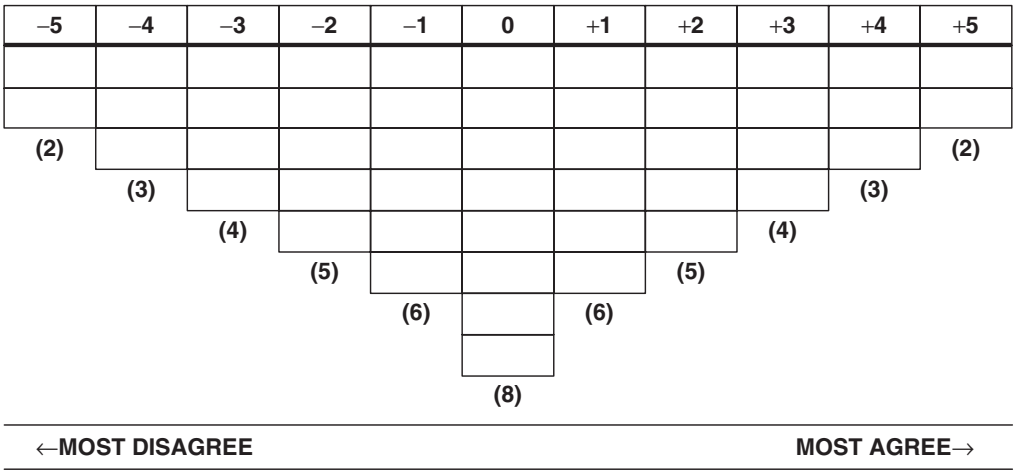

Figure 1.1 Example of a prearranged or forced-choice frequency distribution. This distribution or Q sort is designed for use with a set of 48 items and hence contains 48 spaces or ranking positions

and so on. For this reason, prearranged distributions are also known as *forced* or *forced-choice* distributions.

The shape of the distribution is also worthy of brief comment. Stephenson firmly believed that 'trait-measurements for one and the same person' would cohere to 'a distribution fitting the normal curve of error' (Burt and Stephenson, 1939: 279), in much the same way as many person measurements for a single trait tend to be normally distributed. It follows, therefore, that Stephenson presumed this general shape – which evidently forces a relatively large number of items toward the midpoint of the distribution and permits far fewer at the peripheries – to be the (pre)arrangement of choice for gathering Q methodological data.

The benefits (or otherwise) of prearranged distributions will be discussed at greater length in Chapter 4. At the moment, however, it is enough to know that the general type and shape of distribution illustrated in Figure 1.1 has become the house standard for Q methodologists, not necessarily because people accept the theoretical arguments outlined above, or even know about them, but simply because it represents a very convenient and pragmatic means of facilitating the subjective evaluations and item rankings on which Q methodology depends.

By-person factor analysis and Q methodology revisited

Stephenson's new and specialist form of data, gathered in this original and innovative way, provides a sound and effective basis for the conduct of Q-technique factor analysis. By applying correlation statistics to the rows of a matrix containing such data, it becomes possible to ascertain the degree of agreement, or disagreement, between the entire set of item rankings produced by any two persons. In other words, we can conduct a *direct* and *holistic* comparison of their respective Q sorts. An overall

correlation matrix is produced that enables us to observe the associations 'between persons or whole aspects of persons' (Stephenson, 1936a: 345).

A Q methodological factor analysis can then be applied to this correlation matrix as a means of reducing it to a smaller number of factors, but now the factor analysis is looking for groups of *persons* who have rank ordered the heterogeneous stimulus items in a very similar fashion. This covariation of their respective item rankings is then taken as a sign that the Q sorts of these otherwise disparate individuals might be better understood as alternative manifestations of a single latent factor. It follows that each revealed factor in Q methodology will potentially identify a group of persons who share a similar perspective, viewpoint or attitude about a particular topic, or who seem to be, in this context at least, of a similar *type*.

Taken together, the factors in a Q methodological study can be used to facilitate a greatly simplified, or reduced, explanation of the many manifest associations captured in the original Q sorts and correlation matrix. As we'll demonstrate in Chapter 7, Q methodology also allows us to interpret the emergent factors, and hence to understand the nature of the shared viewpoints we have discovered, to a very high level of qualitative detail. It is an elegant and very effective methodological system. The other major advantage of Stephenson's procedure is its sheer flexibility. The mode of data collection really does *hold for any heterogeneous material whatsoever.* It is fairly standard these days for the provided stimulus items to take the form of *statements* about the topic or issue at hand. In truth however, you can give your participants just about anything – any set of stimulus items you like – and they'll very probably be able to place them in order of personal salience. Stephenson (1936a) himself, for example, performed early illustrative studies looking at people's predilection for vases and the hedonic value of certain odours. The possibilities are truly endless.

William Stephenson: career and legacy

Fortunately, the ranking of odours represents a beginning rather than an end for the Q methodological story! It is true, however, that the early part of this story ends in disappointment. Stephenson never really managed to get his type of psychology off the ground, nor did he succeed in establishing his new method elsewhere within psychology. Q technique, or by-person, factor analysis is still little acknowledged and understood within the discipline and it is certainly underused. Suffice to say that the writing of this book will do little to ingratiate the first author with his employers or to improve his standing or career status. In psychology, Q methodology remains a fringe enterprise.

Having departed the University of London, Stephenson later developed and then directed the Institute of Experimental Psychology at Oxford. Thereafter, and following his being overlooked for an important post (which he very probably deserved), he left for the USA just after the Second World War leaving European psychology behind. We can't say we don't sympathize! More regrettably, however, the way was

left open for Burt's transposed matrix model to play the role of Q technique factor analysis in most European textbooks of psychology. This is particularly disappointing, since even Burt (1972) eventually acknowledged the frailties of his own approach (Febbraro, 1995).

Stephenson was then employed at the University of Chicago until 1955, where, in 1953, he wrote and published *The Study of Behaviour: Q Technique and its Methodology*, which serves as his most detailed and arguably his definitive statement about Q methodology. It is certainly a highly interesting, original and thought-provoking read. Following a brief departure from academia into the world of advertising, Stephenson was appointed as a Distinguished Professor in the School of Journalism at the University of Missouri. Much of his work during this period focused, not surprisingly, on issues of media and mass communication and on the establishment of Q methodology as the method of choice in these areas. Late in his career, in 1974, Stephenson accepted a Visiting Professorship at the University of Iowa and continued to publish heavily about Q methodology and subjectivity – often in journals of psychology, such as the *Psychological Record* – until his death in 1989, at the age of 87.

Perhaps Stephenson's most direct legacy, aside from his method and an outstanding corpus of research papers, is the establishment of the International Society for the Scientific Study of Subjectivity (ISSSS), which holds an annual conference each year dedicated to Q methodological discussion and research. The ISSSS also publishes the journal *Operant Subjectivity: The International Journal of Q Methodology*. Details of both the society and its journal can be found at: http://qmethod.org/about. Links to other Q-relevant online materials are provided at: www.qmethodology.net/. There is also a well-established Korean Society for the Scientific Study of Subjectivity, which publishes the Q-dedicated *Journal of Human Subjectivity*.

In addition, Stephenson has left us a large number of formar doctoral students who continue to champion the cause of Q methodology in a wide variety of disciplines. Deserving of special mention is Professor Steven Brown, the majority of whose career was spent in the Department of Political Science at Kent State University in the USA. Professor Brown's (1980) book about Q methodology, entitled *Political Subjectivity: Applications of Q Methodology in Political Science* is an absolute must-read for anyone interested in the method. We'll discuss this book in a little more detail at the beginning of Chapter 3. Now very sadly out of print, an electronic copy of *Political Subjectivity* is still available in PDF format, courtesy of Professor Brown. The relevant address is: http://qmethod.org/papers/Brown-1980-PoliticalSubjectivity.pdf.

Professor Brown has also, for a number of years, moderated an online discussion group for Q methodologists. This group and a host of other useful resources besides can be accessed at: www.lsoft.com/SCRIPTS/WL.EXE?SL1=Q-METHOD&H=LISTSERV.KENT.EDU.

The geographical and disciplinary spread of Q methodology

Stephenson's long-term presence in the USA made this the main geographical centre of Q methodological work for a great many years. Despite its inception in the UK, the

method effectively left the country with Stephenson in 1948. In fact, it wasn't to make any sort of concerted return across the pond until the late 1980s when it was reintroduced to psychology and, more specifically, to the study of health and childhood issues by the seminal work of Rex and Wendy Stainton Rogers (see Stainton Rogers, 1991; Stainton Rogers, 1995; Stainton Rogers, R. and Stainton Rogers, W., 1992).

Employing Q for critical and social constructionist purposes and essentially as a qualitative method, issues we'll discuss further in Chapter 2, Rex and Wendy provided inspiration for their own generation of doctoral students. These many collaborations produced another, very different, corpus of Q methodological work of considerable note (Capdevila and Stainton Rogers, 2000; Kitzinger and Stainton Rogers, 1985; Stenner and Stainton Rogers, 1998). This work includes two excellent collaborative and Q-relevant texts: *Social Psychology: A Critical Agenda* (Stainton Rogers et al., 1995) and *Textuality and Tectonics: Troubling Social and Psychological Science* (Curt, 1994), the latter being authored under the shared pseudonym of Beryl Curt as a means of paying a tongue in cheek tribute to the Q-related misdirection of Cyril Burt. More recently, a Google group has been set up to facilitate communication between British and Irish, as well as European, Q methodologists. This can be found at: http://groups.google.com/group/qusersuk/ (although membership is required to view the postings).

In the last 20 years or so Q methodological research has spread very fast from its geographical origins in the USA and the UK to a growing number of countries. For around 15 years there have been small groups of Q researchers active in Korea, Norway, Slovakia, Spain and the Netherlands, the last being informed by the notable work of Marten Brouwer and Job van Exel; and a steady trickle of Q-related PhD theses and studies have been published by researchers in Australia, Canada and New Zealand. More recently this has opened up to places such as Singapore (Amin, 2000) and Taiwan (Chung-Chu, 2008).

This geographical migration has also helped Q methodology to spread its disciplinary wings. Q research is now being published and funded in a seemingly ever-widening range of academic fields. A brief literature search reveals relevant papers applied to topics such as chronic pain (Eccleston et al., 1997; McParland et al., 2011; Risdon et al., 2003), childhood studies (Ernest, 2001), emergency medicine (Chinnis et al., 2001), human geography (Eden et al., 2005), the environment (Frantzi et al., 2009), organic farming (Zagata, 2009), policy analysis (Durning and Osuna, 1994), leisure studies (Grix, 2010), transport policy (Rajé, 2007), higher education (Bradley and Miller, 2010; Vincent and Focht, 2009), caregivers' attitudes (van Exel et al., 2007), health and lifestyle choices in diabetes (Baker, 2006), oral health (Vermaire et al., 2010), health-care management (Jedeloo et al., 2010), quality of life (Stenner et al., 2003), psychosis (Dudley et al., 2009), narrative therapy (Wallis et al., 2010), end-of-life care decisions (Wong et al., 2004), parent–child relationships (De Mol and Busse, 2008), clinical psychology (Meredith and Baker, 2007) and so on.

The broad appeal and growing popularity of Q methodology is also reflected in the emergence of many books and papers whose aim is simply to promote the method's usage within particular disciplines or in relation to particular topics. Books include McKeown and Thomas's (1988) excellent *Q Methodology: Quantitative Applications in the*

Social Sciences, which provides a very sound introduction to the method, as well as the volume by Addams and Proops (2000) focusing on environmental policy issues. Papers also exist which champion the cause of Q methodology for use in psychology (Watts and Stenner, 2005a), in relation to attitudes and attitude research (Cross, 2005; Müller and Kals, 2004), as a feminist methodology (Kitzinger, 1986; Senn, 1996), in health economics (Baker et al., 2006), health-care informatics (Valenta and Wigger, 1997), knowledge management (Meloche et al., 2006), dream research (Parker and Alford, 2010), nursing (Akhtar-Danesh et al., 2008; Dennis, 1986), nurse education (Barker, 2008), social work (Ellingsen et al., 2010), human geography (Robbins and Krueger, 2000), palliative medicine (Gaebler-Uhing, 2003), occupational therapy (Corr, 2001), disability research (McKenzie et al., 2011), communication science (Stephen, 1985), recreation research (Ward, 2010), public policy analysis (Durning, 1999; Durning and Osuna, 1994), tourism research (Stergiou and Airey, 2011) and rural research (Previte et al., 2007). The list undoubtedly goes on (and we apologize if we've left you out).

It is clear that the range of possible applications, and potential homes, for Q methodology is almost endless. This first chapter has offered just the merest taste of the remarkable ideas of William Stephenson and the incredibly interesting method and methodology he developed. He did a wonderful and lifelong job in the service of Q methodology and in inspiring a new generation of researchers. Our main hope in writing this book is to continue and develop that work through the promotion of Q methodological excellence. It is important that people use Q methodology, but it is doubly important that they use it well and to full effect.

Chapter summary

1. Q methodology made its first appearance in 1935 via a letter to the journal *Nature* authored by William Stephenson. It involves a simple yet innovative adaptation of Charles Spearman's method of factor analysis.
2. Factor analysis is a method that aims to reveal patterns of *association* between a series of measured variables.
3. The factor analysis procedure begins with the intercorrelation of all the measured variables. This process yields a variable-by-variable correlation matrix.
4. Different variables are ordinarily scored using different measuring units. It follows that the scores must be *standardized* to render them directly comparable (for purposes of correlation).
5. A standardized (standard or *z*) score is calculated as a mathematical expression of the distance between a particular absolute score and the mean average score of the measure sample. It is expressed proportionately in terms of a number of standard deviations.
6. R methodology is a generic name for methods that employ tests or traits as variables and which operate using a sample of persons.

7 R methodological (or by-variable) factor analysis aims to account for the many manifest associations captured in a correlation matrix through the identification of a greatly reduced number of underlying, explanatory or latent variables. These latent variables, so identified, are known as factors.

8 A factor in R methodology identifies a group of variables the measured scores of which have varied proportionately (or covaried) across a population of persons.

9 R methodological factor analysis has long been associated with the individual differences tradition in psychology. Stephenson argued, however, that its factors did not, and could not, reflect the differing personal characteristics of specific individuals. He was right. They reflect the associations and differences *between variables* mapped at the population level.

10 The R methodological system is not capable of defining specific individuals in a holistic fashion and so cannot facilitate a thorough comparison of their individual differences.

11 Q methodology is Stephenson's solution to the problem highlighted in Note 10 (above). The term can be used as a generic name for any method that *inverts* the R methodological tradition by employing persons as its variables and tests, traits or other items as its sample or population (of cases).

12 Q methodological, or by-person, factor analysis cannot ordinarily be applied to data gathered for R methodological purposes. It requires a new form of data, which is derived when a sample or population of items are *measured or scaled relatively* by a collection of individuals.

13 The scaling or ranking process is carried out from a subjective or first-person perspective using a new unit of quantification, which Stephenson called *psychological significance*. The relative ranking of the items is also important because it ensures the holistic or gestalt quality of the resultant data. This is in line with Stephenson's methodological desire to focus on 'whole aspects of persons' and to identify 'persons who resemble one another with respect to whole aspects of their personality' (Stephenson, 1936b: 208, 278).

14 The ranking of items can be further enhanced and standardized through the imposition of a prearranged frequency distribution. This distribution is known as a *Q sort*.

15 In Q methodology, the factor analysis procedure begins with the intercorrelation of all the gathered Q sorts. This yields a person-by-person correlation matrix. Such correlations allow us to ascertain the degree of agreement, or disagreement, between the entire set of item rankings produced by any two persons. In other words, we can conduct a direct and holistic comparison of their respective Q sorts.

16 A factor in Q methodology identifies a group of persons who have rank ordered the provided items in a very similar fashion or, in other words, a group of persons who share a similar perspective, viewpoint or attitude about the topic at hand.

17 The items provided for ranking purposes are usually *statements* (about the topic), but the procedure is very flexible. Just about anything can be provided as stimulus items and most participants will be able to rank them in order of personal salience.

18 If you only ever read two (other!) books about Q methodology, you should read Stephenson's (1953) *The Study of Behaviour: Q Technique and its Methodology* and Brown's (1980) *Political Subjectivity: Applications of Q Methodology in Political Science.* They're both marvellous. McKeown and Thomas's (1988) *Q Methodology (Quantitative Applications in the Social Sciences)* is strongly recommended if you have time for a third.