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Are 'Qualitative' and 'Quantitative' Useful Terms for Describing Research?

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Abstract

We examine the concepts of quantitative research and qualitative research, and argue that this dichotomy has several dimensions which are often, erroneously, assumed to coincide. We analyse two of the important dimensions – statistical versus non-statistical, and hypothesis testing versus induction. The crude quantitative-qualitative dichotomy omits many potentially useful possibilities, such as non-statistical hypothesis testing and statistical induction. We also argue that the first dimension can be extended to include establishing deterministic laws and the consideration of fictional scenarios; and the second to include 'normal science' research based on questions defined by an established paradigm. These arguments mean that the possible types of research methods are more diverse than is often assumed, and that the terms 'quantitative' and 'qualitative' are best avoided, although other, more specific, terms are useful. One important sense in which the term 'qualitative' is used is simply to refer to the use of data which yields a deep and detailed picture of the subject matter: we suggest the use of the word 'rich' to describe such data.

Key words: Qualitative research, quantitative research, hypothesis testing, induction, statistics, fiction

Introduction

There is a seemingly inevitable tendency to divide research methods into two types. The labels for the first type include quantitative, positivist and objectivist, and for the second type, labels include qualitative, phenomenological, social constructionist, subjectivist, relativist and interpretivist. The various labels for the first type do have different meanings, as do the labels given for the second type (see, for example, Mautner, 2005, Thorpe and Holt, 2008), but these differences often tend to be glossed over by the implicit assumption that there are only two basic types of research

It is true that the distinction is widely regarded as problematic or an over-simplification, but it occurs frequently in the names of journals, courses, websites, and so on, so, despite the problems, it is a distinction which is likely to have a substantial impact on the practice of research. Some researchers and projects stick to what they call 'quantitative' research, and others stick to 'qualitative' research. However, there is now increasing awareness that both styles of research may have a contribution to make to a project, which leads to the idea of *mixing* quantitative and qualitative methods – but still making use of the distinction between quantitative and qualitative research (see, for example, Creswell et al, 2008; Denscombe, 2008)

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The aim of this article is to consider whether this distinction between two types of research method is meaningful and helpful. There are many dimensions along which quantitative and qualitative methods are said to differ: for example, statistical versus non-statistical, hypothesis testing versus induction, objective versus subjective, and so on. In this article we analyse the first two of these dimensions. One of the conclusions to which this leads is that the two dimensions do not define the same dichotomy – for example, statistical induction is an obvious approach which seems to be 'quantitative' because it is statistical, but 'qualitative' because it is inductive. This means that the quantitative versus qualitative dichotomy is not clearly defined, and is likely to be unhelpful in many contexts because it excludes such potentially useful approaches. Our argument in this paper is that the terms 'quantitative' and 'qualitative' (and similar labels such as those mentioned in the previous paragraph) are best avoided because the possible types of useful research do not divide neatly into two categories.

This leads on to a discussion of some further, related, concepts which we feel are helpful, and to a less structured perspective on research. Our contention is that the mixture used in mixed methods research should be a more a complex one than a simple mixture of just two distinct, but ill-defined, types.

It is important to acknowledge that many previous authors have pointed out flaws in the quantitative versus qualitative dichotomy, but in many cases they go on using these labels. For example, Reichardt and Cook (1979: 27) talk about going 'beyond the dialectic language of qualitative and quantitative methods', but they go on to say that this 'may well call for a combination of qualitative and quantitative methods' which seems to be sticking with the old terminology! Our argument in this paper is that the terms 'qualitative' and 'quantitative' should be avoided. If we mean research involving the detailed analysis of a small sample using 'rich' *data*, we should say this, and not use the term 'qualitative research' – which may be interpreted as implying that the research *methods* are also inductive, not statistical, and based on subjective data, which may not be the case.

An exception to the general rule that even authors who criticize the qualitative-quantitative distinction end up using it is Vogt (2008) who explains 'how the quant-qual distinction distracts us from consideration of more important issues, and tends to constrain opportunities for innovation'. The present paper extends this argument.

Our focus when writing this article was management research, and the examples used come from this field. However, as one of the reviewers pointed out, very similar issues apply to other areas such as education, health and many others. It is also important to emphasize that our focus is on research *methods* – the words 'quantitative' and 'qualitative' applied to *data* are not problematic in the same way.

Dimensions of the difference between quantitative and qualitative methods

There are many dimensions along which the two broad types of research are said to differ. For example, Easterby-Smith et al (2002 : 30) list eight differences between positivism and social constructionism, Robson (2002) lists eight assumptions of positivism (p.20) and eight 'characteristic features' of 'relativistic qualitative' approaches (p.25), and Morgan and Smircich (1980) describe five dimensions of difference between subjectivist and objectivist approaches. All three of these sources actually point out that that the distinction is over-simplified or misleading, but each explains the distinction in sufficiently clear terms to contribute to this oversimplification.

The contents of these lists are very mixed, including assumptions about ontology, epistemology and human nature, as well as 'favored metaphors' and tactics for research such as the way in which concepts are operationalized. And there are many other similar schemes in the literature, with some authors analysing ontology, epistemology, research design choices, etc in separate lists. But it all usually boils down, in practice, to something very like the quantitative versus qualitative distinction.

To take one example, Easterby-Smith et al (2002) list eight bipolar dichotomies in which one end describes positivism and the other end social constructionism. The positivist poles of these dichotomies are:

The observer	must be independent
Human interests	should be irrelevant
Explanations	must demonstrate causality
Research progresses through	hypotheses and deductions
Concepts	need to be operationalized so that they can be measured
Units of analysis	should be reduced to simplest terms
Generalization through	statistical probability
Sampling requires	large numbers selected randomly

This scheme implicitly asserts that there are only two kinds of research: the first, positivist research has the features above , and the second, social constructionist, type of research has the opposing feature (observer is 'part of what is being observed', human interests are 'the main drivers of science', etc) in each case. In practice, the positivist end of this dichotomy is often described as quantitative, and the opposing end as qualitative – although, as we argue here, these terms confuse a number of different concepts.

This scheme could, however, be interpreted in a much more flexible way. We might, for example, use an approach which takes the qualitative end of the 'human interests' pole (so these are 'the main drivers' of research) and the quantitative end of the other dichotomies. This would be hard, objectivist research, but driven by what people need to know – which seems to us an eminently reasonable style of research. Similarly we might take the quantitative end of the first four dichotomies, and the qualitative end of the last four. There 256 (2^8) such combinations, at least some of which seem likely to correspond to sensible approaches to research. The one dimensional perspective seems unduly restricted as it excludes 254 of these 256 possibilities. This is only considering eight dichotomies: Reichardt and Cook (1979) and Vogt (2008) describe a number of similar examples using other supposed dichotomies.

A very similar point applies to schemes where the dimensions are continua rather than dichotomies. Morgan and Smircich (1980) produce a table with six gradations on each of their five dimensions. The layout of the table implies there are six types of research – one corresponding to the extreme subjectivist (qualitative) position on each dimension, the next corresponding to the slightly less extreme subjectivist position, and so on. If we assume that a position on one dimension can be combined with any of the positions on the other dimensions we have a total of 7776 (6^5) types of research of which all but 6 (7770) are excluded from consideration.

The point of this is not to criticise particular schemes, but simply to point out that *any* perspective like these can be interpreted flexibly, so as to allow many other possibilities, at least some of which are likely to be viable.

The counter-argument to this is that there are *necessary* links between the different dimensions. For example, it might be argued that:

1. If human interests drive research, then the observer 'must be part of what is being observed'.
2. If one is testing hypotheses then statistical methods are necessary – this is implied by the list discussed above in Easterby-Smith et al (2002: 30) because both statistical methods and hypothesis testing are on the same, positivist, side of the dichotomy.

Some such arguments may be good arguments, whereas others may be bad ones. We will argue below that the second argument above – concerning the link between hypothesis testing and statistics – is a very bad argument and that it is unreasonable to assume it is valid. Similarly with the first argument, there seems no *a priori* reason why one should not take the view that human interests are the main drivers of research, and yet still want an independent observer to judge how best to meet these human interests (on some occasions at least). While there may be some necessary links between different dimensions which rule out some

combinations, there seems no reason at all to accept that the number of viable types of research is as restricted as is often supposed.

Comments on two dimensions

We turn now to a more detailed consideration of two important dimensions which are, we think, often taken as defining the essence of the supposed quantitative versus qualitative distinction. Quantitative research is widely assumed to involve using *statistical methods* to *test hypotheses.* On the other hand qualitative methods are widely assumed to use *qualitative data analysis* and *induction*. This leads to two dimensions – the first being statistical versus 'qualitative' or non-statistical methods (we will return to the relationship between the terms 'qualitative' and 'non-statistical' below), and the second being hypothesis testing versus induction. These are, roughly, the fourth and seventh of Easterby-Smith et al's (2002) dichotomies, although they contrast statistics with 'theoretical abstraction'.

This is not to belittle the other dimensions along which approaches and assumptions vary – e.g. the subjectivist versus objectivist dimension, or the realism versus idealism dimension. We believe that issues with similar implications apply to many of these other dimensions, but we need to start somewhere and the two chosen dimensions seem to us to be at the core of distinction between quantitative and qualitative research methods as it is often understood.

To see what these two dimensions look like in practice, we'll start with a very brief overview of the approach used by a few examples of research reported in the literature – this is in Table 1. This sample of research articles was purposefully selected to illustrate the different possible types of research – a style of investigation discussed below under the heading 'Demonstrating possibilities'. (Obviously we are making no claims that this sample is statistically representative.)

Table 1. Four examples of published management research

Example	Reference	Research aim	Method/findings
1	Glebbeek and Bax (2004)	To test the hypothesis 'that employee turnover and firm performance have an inverted U-shaped relationship: overly high or low turnover is harmful.'	They analysed the performance of '110 offices of a temporary employment agency' by the statistical technique of regression, and did in fact find the hypothesised curvilinear relationship.
2	Britten et al (2000)	To identify categories of 'misunderstandings in prescribing decisions in general practice'.	They used a series of interviews with patients and doctors to identify fourteen categories of 'misunderstandings'. These categories emerged from the data and were viewed as illustrating important possibilities with implications for the training of doctors. However, no attempt was made to estimate how common each category was – just the fact that they had occurred, and so it could reasonably be assumed that they might occur again, was sufficient.
3	Meyer and Altenborg (2007)	To investigate the impact that a 'spirit of equality or balance' has on the merger process.	The authors used a case study of a failed international merger. They found that 'the principle of equality had the reverse effect on social integration to that predicted in the literature … negatively influencing social integration.'
4	Moutafi et al (2007)	To investigate the relationship between personality and managerial level.	They got 900 participants to complete two personality tests and looked at the relationship between the results and their managerial level. There were four hypotheses – the first of which was that 'conscientiousness should be positively correlated with level of management' – but these hypotheses were not mentioned in the abstract, which simply listed personality traits which were found to correlate – positively or negatively – with managerial level.

Table 2 shows how the two dimensions discussed in this paper lead to four possible types of research, each of which is illustrated by one of the examples in Table 1 – this categorization is discussed in more detail in the sections below. The two types of method which would be excluded by a crude dichotomy between quantitative and qualitative methods are statistical induction and non-statistical hypothesis testing. Yet these are both eminently sensible approaches. Statistical techniques are designed to investigate patterns in data – which is precisely what induction is. And 'qualitative' analyses of particular cases may be used as the basis for hypotheses about a more general context, or they may be used as a test of hypothesis (E.g. 3 above, and the 'prospective case study design' proposed by Bitektine, 2008).

Table 2. Categorisation of the four research papers in Table 1 on two dimensions

	Hypothesis testing	**Inductive**
Statistical	E.g. 1: Glebbeek and Bax (2004)	E.g. 4: Moutafi et al (2007)
Non-statistical	E.g. 3: Meyer and Altenborg (2007)	E.g. 2: Britten et al (2000)

We turn now to a more detailed analysis of these two dimensions.

Statistical versus non-statistical / qualitative approaches

This is at the heart of what is usually meant by the quantitative – qualitative split. Of the examples above, 1 and 4 adopt a statistical approach, while 2 and 3 are non-statistical or 'qualitative' (used here as the antithesis of statistical, not in any more general sense) None of these papers adopts the mixed methods approach of combining statistical and qualitative approaches, despite the obvious potential benefits. For example, a qualitative analysis of the different ways in which staff turnover may affect performance would be an obvious addition to Example 1, and a statistical analysis of the frequency of different misunderstandings would be an obvious extension to Example 2.

The definitions of both sides of this dichotomy are confused. The word quantitative is not synonymous with statistical, but when people refer to quantitative methods in areas such as management and education they generally mean statistical methods. (The word 'statistics' also refers to numbers which summarize data such as the mean income in a country or the number of deaths from a disease; however we are concerned here with statistical *methods*.) Wood (2009: 3-4) explains the nature of statistical methods in these terms:

> 'According to the *New Fontana Dictionary of Modern Thought, s*tatistics, in the sense of statistical methods, is 'the analysis of … data, usually with a probabilistic model as a background' (Sibson, 1999). This seems a good starting point, although the probabilistic model may be an implicit, possibly unrecognised background. Statistical research methods typically work from a sample of data, and use this data to make inferences about whatever is of concern to the researchers. Other, non-statistical, approaches to research also make inferences from samples of data; the distinguishing feature of the statistical use of samples of data is that the results, the 'statistics' derived (such as means, medians, proportions, *p* values, correlations or regression coefficients) depend on the *prevalence* of different types of individual in the sample – and these prevalences reflect probabilities'.

For example, an analysis of the cost of a project would be quantitative if it involved summing the various costs, but it only becomes statistical if concepts like probabilities or averages or correlations come into the picture. These concepts are 'variable based' and depend on looking at the same variables in different cases in order to detect any patterns of interest. Statistical methods range from the very simple (e.g. working out averages) to the relatively complex (e.g. factor analysis, multiple regression).

The big sample – small sample distinction is related, but not the same. Example 2 used a fairly large sample, but the approach is not statistical. Similarly, variable-based techniques are not synonymous with statistical techniques. Qualitative comparative analysis (Rihoux and Ragin, 2009) is a variable based method, but one

based on logical methods (boolean algebra) not probability models like statistics. (Although Edwards (2007) claims that 'QCA can enable researchers to look statistically at the patterns that exist in their data …', QCA itself is an approach distinct from the methods of statistics.)

The other, 'qualitative', pole of the contrast, represented by Examples 2 and 3 above, involves a detailed analysis of a usually relatively small number of particular cases or events. This is described as 'qualitative' data, presumably because the focus is on the *qualities* of each case, typically described in words not numbers. The task of qualitative methods is then to 'draw valid meaning from qualitative data' (Miles and Huberman, 1994: 1).

However, the definition of qualitative data seems hazy – it is difficult to envisage data which does not refer to qualities of some kind, many qualities can be measured as numbers, and numbers themselves describe qualities of the world. In addition, there seems no reason why the fact that the data is 'qualitative' (whatever that means) should suggest that special methods necessarily have to be employed. The 'variety and plurality' of qualitative methods is widely acknowledged (e.g. Easterby-Smith et al, 2008: 420), but the idea that qualitative methods represent a coherent category of approaches to research tend to be taken for granted. For example, Easterby-Smith et al (2008) introduce a collection of four articles on the theme of the 'determination of quality in qualitative research' – this enterprise presupposes that 'qualitative research' is a well-defined type of approach.

This suggests that it is sensible to distinguish between qualitative *data* and the methods used to analyse it – and to avoid the term qualitative applied to *methods*. We would also suggest, more tentatively, using the phrase 'rich data' instead of 'qualitative data' (following the idea of a 'rich picture' in soft systems methodology) to avoid the halo of extraneous implications which may come with the word 'qualitative', and because the adjective 'rich' seems to convey better the idea that the data has a deep and detailed meaning.

In practice, rich data has a number of obvious uses. It may be used simply to provide an illustration of what is possible: for example, of the kinds of misunderstandings between doctor and patient that can occur. This has been dubbed 'illustrative inference' (Wood and Christy, 1999 and 2001; Christy and Wood, 1999) – using empirical illustrations to infer what is possible – in contrast to statistical inference which concerns frequencies or probabilities.

Rich data may also be used as the basis for statistics like '60% of cases are of Type X'. This means that the 'qualitative' *data* are being analysed statistically (and there are statistical methods, such as the χ^2 test, designed specifically to deal with such categorical data), which makes the idea of using 'qualitative' *methods* as the antithesis of statistical methods potentially misleading. Rich data may also be relevant to formulating and testing hypotheses – which we will come to in the next section.

There are also two less obvious categories of possible research which are not statistical. First, there is the possibility of establishing *deterministic laws* such as Einstein's $E=mc^2$: these are meant to apply *exactly* to *every* case, without exception, so they are different from typical management statistical research which typically deals in concepts such as averages and correlations, and makes no claim to making an exact prediction or explanation for every case. In practice, useful deterministic laws in social research are likely to be be very rare, but this is still an important pattern to keep in mind as it exemplifies the common ideal of science. (In theory, Qualitative Comparative Analysis (QCA) is a deterministic technique because the Boolean logic it uses deals in certain inferences rather than the probabilistic inferences of statistical models. In practice, however, QCA tends to be used in a more tentative way to 'allow researchers to ask more focused 'causal' questions' (Rihoux and Ragin, 2009: 65) rather than providing a deterministic answer to those questions.)

The other possibility is potentially more interesting. This is the use of invented, or fictional, cases or events as 'data'. We have seen above that exhibiting empirical illustrations of possibilities can be used to infer that something is possible. Sometimes it may be reasonable to do the same with invented cases or events – as a trivial example of this consider the assertion above that qualitative analyses may be used as the basis for statistics like '60% of cases are of a Type X' – we have not exhibited a real example but have made one up and trust the reader to accept that this is the sort of thing which might happen. Statistical methods typically

use large samples of data; this fictional method requires no formal data at all. We will return to this idea below.

To summarise, the statistical – non-statistical dimension is often thought of as statistical – qualitative, but this is misleading for the reasons discussed above. So-called qualitative research involves rich data, but this may (or may not) be the basis of statistical analysis. Perhaps the term 'statistical' has no useful antithesis? It seems more helpful to distinguish four categories of research results: those that *always happen* (described by deterministic laws), those that *sometimes happen* (described by statistical analysis), those that *have happened at least once* (described by rich data used to illustrate what is possible), and those that are *conceivable* (although they may only have happened in fiction).

Hypothesis testing versus induction

This distinction is usually described in terms such as:

> 'Inductive analysis aims to systematically generate theory grounded in specific instances of empirical observation. As such it sharply contrasts with hypothetico-deductive methodology in which a conceptual and theoretical structure is constructed prior to, and is tested through, observation.' (Johnson, 2008: 112)

The hypothetico-deductive, or hypothesis testing, approach is normally (in management) associated with quantitative research, whereas the inductive side is associated with qualitative research.

The hypothesis testing style of research is sometimes described as 'deductive' (e.g. Bryman and Bell, 2003: 10; Saunders et al, 2007: 117). This is misleading. Mautner (2005) explains the 'modern sense' of a valid deduction as an inference in which 'the conclusion is a necessary consequence of the premises'. As a simple example, if we have one group of four objects, and another group of three objects, if we combine them we can deduce, using our knowledge of arithmetic, that we will have 4+3 or 7 objects. This style of reasoning has its role in management research. For example, we might build a model of the costs of an inventory system by deducing the consequences of assumptions about the costs of holding stock, the costs of ordering stock and the costs of running out of stock, and so on. Provided these assumptions are valid, and the logic, or the mathematics, underlying our reasoning is secure, the conclusions are necessarily true. This is an example of research as *deduction from accepted premises*.

The hypothetico-deductive approach, or hypothesis testing, is different in that the goal is to test the premises, or the hypothesis, on which the deduction is based, rather than to produce the result of the deduction. Hypothesis testing involves proposing a *hypothesis* and then *deducing* its consequences (hence the use of the term 'deductive') in a particular context and comparing these consequences with what actually happens. If these consequences coincide with the observed happening, this is supporting evidence for the hypothesis; if they do not coincide it provides evidence against the hypothesis, which may then need modifying or abandoning. This is different from the deductive research described in the above paragraph in that the aim is not to produce the result of the deduction (7 in the arithmetical example above) but to test the premises, the hypothesis, on which it is based. This format is followed by Example 1, which we will use as an example to illustrate two points about hypothesis testing.

First, the hypothesis is not derived from any data collected in the research reported. The hypothesis in this case stems from an analysis of the literature, which is turn is 'inspired' (Glebbeek and Bax, 2004: 278) by thoughts such as the idea that staff turnover is sometimes costly but at other times may be beneficial. The second point is that the validity of this hypothesis is not assessed by examining the evidence that led up to it, but by testing whether it leads to correct predictions in particular circumstances. This confirmation of the validity of the hypothesis is, of course, less than conclusive, because the hypothesis may not be true in general (it may fail with another sample), or because the predictions which are tested may also be predicted by another hypothesis.

Example 4 also appears to use a hypothesis testing format. However, this seems almost an afterthought: the hypotheses are not mentioned in the abstract, and the paper could be rewritten without mentioning the hypotheses and without changing any of the results or their interpretation.

Example 3 is also an example of hypothesis testing – the hypothesis being derived from the literature – although the word hypothesis is not used in the paper. Despite this, the argument is very clear: predictions from a hypothesis from the literature are compared with data from a case study and found not to fit. This leads on to a modification of the original hypothesis to incorporate situations where equality has a 'disintegrating effect'.

The usual contrast to hypothesis testing is the inductive approach. Induction can be defined as 'inference from a finite number of particular cases to a further case or to a general conclusion' (Mautner, 2005). The data are used to derive theories, and the justification for accepting these theories stems from an analysis of the process by which they were derived from the data. A standard philosophical example of induction would be the process that starts from the observation of a large number of swans, and leads to the formulation of the theory that all swans are white. This conclusion is not, of course, certain – there is always the possibility that some swans, not among the group observed, may be some other colour (as, in fact, is the case). Example 2 above follows this inductive pattern. In management research, a commonly adopted version of induction is *grounded theory* (Glaser and Strauss, 1967; there is a convenient summary in Locke, 2008).

One commonly assumed feature of the inductive approach is that the researcher keeps an 'open' mind and does not make use of a particular theoretical perspective. In Example 2, no mention is made of theoretical perspectives which would generate hypotheses about misunderstandings: these categories simply emerge from the data.

On the other hand, other researchers would maintain, reasonably we think, that there can be no such thing as a truly open mind: there are always questions of interest and pre-existing concepts from the academic literature and elsewhere – and these provide an inescapable backdrop which moulds the conclusions which emerge from the data.

Regardless of the precise interpretation of induction, an important difference between the hypothesis testing approach, and the inductive approach lies in the attitude to trying to make the research rigorous. In the hypothesis testing approach, the rigour lies in the testing. Where the hypotheses or the theory comes from is irrelevant. On the other hand with the inductive approach the rigour comes from the process of collecting the data – hence the importance of describing details of interviews and so on as part of the process of building the case for the theory grounded in these data. Questions about the effectiveness and usefulness of these two approaches to rigour are certainly worth posing.

The distinction between induction and hypothesis testing is muddier than it often appears. How did Britten et al (Example 2 above) derive their categories from the data? Perhaps by coming up with informal guesses, or hypotheses, and then checking to see if they fitted the data? And perhaps these guesses stemmed in part from previously held hunches, or common-sense theories, about doctor-patient interaction? In Example 4, data from the 900 participants is used to derive conclusions about relationships between personality and management level, and the strength and direction of these relationships – all of which feels more like induction than testing the hypotheses that are stated (but not emphasised) in the paper. Arguably, most productive thought involves the formulation and testing of hypotheses. So perhaps hypothesis testing is a good way to do induction, and possibly even psychologically inevitable?

The association of hypothesis testing with hard, quantitative approaches, which are often implied to be boring, and induction with soft, rich, informal approaches is also rather odd in some ways. The famous hypotheses of natural science – Archimedes', Copernicus's, Newton's and Einstein's for example – were the result of inspired guesswork. They were not produced by a formal process and meticulous collection of data, but by immersion in the problem, and then coming up with a bold, imaginative guess. Archimedes was supposedly lying in his bath – literally immersed in the problem – when inspiration struck, and one of Einstein's starting points were thought experiments – an example of the use of fictional data we mentioned above. This does not sound like the stereotypical positivist! However the point may simply be that in social research the inductive

methods often make use of richer data – interviews and conversations, for example, instead of questionnaire surveys – and these may be fun and socially engaging in a way that the statistical testing of a null hypothesis may not be. But there is certainly no a priori reason why the hypotheses tested should not be imaginative, interesting … and fun.

In practice much management research involves neither testing hypotheses nor inducing general theories from the data. A common pattern is that a framework is used to define and pose questions that the research seeks to answer. Example 4 above uses the framework provided by the personality tests to pose and answer questions about how personality is related to management level. This is neither blank slate induction, nor is it hypothesis testing (although hypotheses are posed in the article, they are not emphasised or mentioned in the abstract).

The term 'paradigm', originally used by Kuhn (1970) in the context of much broader and deeper frameworks in natural science, has gained popularity as a general description of these frameworks. Kuhn's analysis emphasised the fact that scientists working in a paradigm tended to accept the fundamental assumptions without criticism and devoted their energies to solving puzzles defined by the paradigm – and Example 4 is a good illustration of this in management research. Kuhn referred to this style of science as normal science, presumably to emphasise that it was the normal pattern. Some deductive research, such as the inventory control example above, would also fall in this category.

What concepts are worth carrying forward?

The arguments above suggest that the terms quantitative and qualitative as applied to research methods are not sufficiently clearly defined to be useful. Table 2 shows examples of statistical induction and non-statistical hypothesis testing – both of which cut across the quantitative – qualitative distinction. Adding further dimensions to Table 2 would obviously have the potential to expand the menu of possibilities still further.
In addition, our discussion above shows that the two dimensions analysed are hazier than they might appear at first sight. Research which focuses on a detailed exploration of individual cases is often described as qualitative, but as we have seen, this analysis may be the basis for some crude statistics or for a hypothesis or a hypothesis test – which is contrary to the spirit of the word 'qualitative' as it is often used. Similarly, quantitative is often assumed to be synonymous with the use of formal statistical techniques, but this idea is confused by the fact that some quantitative research is not statistical, and some so-called qualitative research does involve statistics.

The assumption that concepts are bipolar is also potentially misleading. Qualitative is taken as the opposite pole to quantitative which is assumed to be a synonym of statistics, and it is implicitly assumed that all useful research is somewhere on this dichotomy (or continuum). The difficulty is that this leaves out the possibility of using fictional data and the possibility of aiming for general, non-probabilistic, laws as in natural science. Similarly, the hypothesis testing – inductive dimension leaves out the whole possibility of research that aims to ask questions within a paradigm or conceptual framework. In other walks of life there is no automatic assumption that any concept can be paired with its opposite to provide a framework to describe all possibilities in a useful way – the opposite of boat, for example, is perhaps 'non-boat' but the boat – non-boat dichotomy is of little obvious use.

Many of the labels used for general approaches have a tendency to vagueness and misinterpretation. We have mentioned the misuse of the term 'deductive' above. Similarly 'positivism' is a word notoriously difficult to pin down, and the term 'induction' is vague about the extent to which pre-existing framework are used. Vagueness is useful in some contexts but not, we would suggest, here. The danger is that many of these terms come with a halo of prejudices which are not analysed and may be unhelpful. In relation to these three examples, if we mean 'hypothetico-deductive' this is the term to use, 'positivism' is a word best avoided, and it may often be better to think of working within a framework or paradigm, rather than using induction, as this draws attention to the importance of the framework.

These problems suggest that any categorization of concepts for research should be viewed with some skepticism. However, this discussion does suggest Table 3.

Table 3: Expanded version of the two dimensions in Table 2.

<table>
<tr><td colspan="2"></td><td>Hypothesis testing</td><td>(Induction)</td><td>Following a framework / paradigm</td><td>…?</td></tr>
<tr><td>Deterministic: (what always happens)</td><td rowspan="3">May use data of varying degrees of richness</td><td rowspan="4" colspan="4"></td></tr>
<tr><td>Statistical (what sometimes happens)</td></tr>
<tr><td>Possibilities: (illustrative examples)</td></tr>
<tr><td colspan="2">Conceivable (fiction)</td></tr>
<tr><td colspan="2">…?</td><td colspan="4"></td></tr>
</table>

Like Table 2, of course, Table 3 omits many other dimensions – e.g. the other six dichotomies listed in Easterby-Smith et al (2002: 30). The symbols in the final row and column of Table 3 are also intended to indicate that this categorization should not be regarded as in any sense final, the parentheses around 'induction' are to indicate that this is a concept which should perhaps be avoided, and the lack of cells in the main body of the table are intended to avoid any (potentially misleading) assertions about how the two dimensions relate to each other. The next seven subsections give a brief summary of the concepts in this table – with the exception of deterministic approaches which are of little relevance to management.

Rich data

This is one of the core, and important, features of qualitative research as it is normally understood. The term 'rich data' implies that the data is rich in detail and meaning, and avoids making additional assumptions that may be implicit in the word 'qualitative' (e.g. that statistical methods are not relevant).

Statistical approaches

Statistical concepts and techniques are widely used in management research, sometimes wisely, sometimes less so. There are a number of issues about statistical analyses in management research – about implicit assumptions and difficulties with commonly used methods such as significance (null hypothesis) tests, for example – which deserve consideration (see, for example, Mingers, 2006). These are the subject of a further article (Wood, 2009), but we will mention two issues which are important for Examples 1 and 4.

The first point is that the hypothesis tested in Example 1 is, like many others in management research, in a sense, fairly trivial. If the turnover rate in an organization were 100% or even more, then performance would fairly obviously suffer; similarly if nobody ever left performance would very probably suffer because of the lack of input of newcomers; the optimum seems, fairly obviously, to be a low turnover rate but one which is greater than zero – in other words, the graph of performance against turnover rate is likely to show a curvilinear shape, as hypothesised. What could make the results interesting, however, is information about how large the impact of different turnover rates are, and what level of turnover is optimum. From this point of

view, the aims should not simply be to *test* the hypothesis, but to *measure* these parameters. So called quantitative research is often strangely short of useful quantities!

The second point is that research like Examples 1 and 4 is very context dependent. The results in Example 1 are based on one organization in the Netherlands, and those in Example 4 are based British adults at 10 companies in the early 2000s. Different contexts, different places or times, may have different factors at work, and the pattern may be very different. The emphasis on statistics and generalisability may, paradoxically, disguise the fact that many statistical results in management cannot realistically be generalised to different contexts.

It is also important to remember that so called 'qualitative' research often involves asking questions about the prevalence of the qualities. 'Do you prefer tea or coffee?' is perhaps a qualitative question, but it may then be useful to ask how many people prefer tea, which is a statistical question and should be treated as such.

Demonstrating possibilities

So called qualitative research, and case study research, is often aimed at demonstrating and fleshing out what is possible (Wood and Christy, 1999 and 2001; Christy and Wood, 1999). This is an important aim for research. For example, if it was widely believed that a particular management innovation was impractical and could never work, a detailed study of a situation in which it is working would be of obvious value. The examples of research in Table 1 are intended in this spirit – they are just examples of what is possible.

Use of fictional / hypothetical data

Sometimes it is possible to base useful research on imagined events or situations. These may be conclusions derived from works of literature, or thought experiments in the style of scientists, or philosophers, or mathematics based on starting points like 'suppose the cost of holding stock is given by …'. When the fictional 'data' is plausible – everyone agrees it could have happened – there is little point in devoting time and energy to finding if, when and where it actually did happen. Also, over-reliance on establishing details of what has actually happened may blind us to possibilities which have not occurred to date but may occur in the future, and it is the latter that are arguably of greatest interest for management. Possibilities may be more interesting and important than facts, particularly when they lead to useful innovations.

Fictions may be studied on two levels. For example, Denning's (2004) *Squirrel, inc* is a 'fable of leadership through storytelling'. Various possible leadership scenarios are illustrated by a story about squirrels. The fictional events in this book can be regarded as illustrating, and helping to explain, possibilities that may exist in the real world, in the same way that James Bond or Sherlock Holmes, despite their fictional status, may be useful for exploring aspects of human behaviour. In his preface Denning explains why he is doing this – because he argues it is likely to be a more effective means of communication – which is the second level of exploring facts or claims *about* fiction. Similarly, Gabriel's (2000) *Storytelling in organizations* is largely on this second level of theorising *about* stories, although inevitably the two levels are like to get mixed up to some extent. It is the first level of use of fictions which is of interest to us here.

Hypothesis testing

As we have seen, this should *not* be regarded as being concerned only with statistical research – Example 3 above tests a hypothesis without a statistic in sight. A hypothesis which is tested by the usual approach to statistics is always a *null hypothesis*, but there are very strong arguments against null hypothesis testing in many contexts (e.g. Lindsay, 1995; Mingers, 2006; Morrison and Henkel, 1970; Wood, 2003; Wood, 2005; Wood, 2009) (One of these arguments is explained above in relation to Example 1.) It is usually far more sensible to use statistical methods to measure key features of the situation (like the direction or strength of the relationships between personality and managerial level in Example 4) than to test hypotheses.

Disregarding statistical null hypotheses, it is useful to think of two categories of hypothesis. The first is the *guiding hypothesis* – this is a hypothesis which guides and motivates the research. Example 4 above can be regarded as guided by the hypothesis that personality is an important determinant of managerial level. Alternatively we might want, for example, to explore the hypothesis that people working at home are more productive, or that female university lecturers are more ambitious for promotion than males. In each case, the aim is to explore the hypothesis and see how its truth depends on factors like the nature of the work, or the home, or the woman. The hypothesis is a vague expectation, which structures the research by suggesting things that should be investigated.

The other type is the *formal hypothesis.* The research then aims simply to establish whether the hypothesis is true or false. Much has been written in the philosophy of science literature about this process. One influential strand is due to Karl Popper (Popper, 1972) who insisted that a hypothesis of any useful level of generality could never be conclusively verified (because we can never be sure that it won't fail the next test), but it can be falsified if it fails to fit the data. Popper argues that the correct method for science is to propose bold hypotheses or conjectures, and then try as hard as possible to falsify them. At any point in time, the best hypothesis is then the one which has best withstood these attempts to disprove it.

It is important to note here that although a null hypothesis is a formal hypothesis, it is not a type of hypothesis which is of interest to Popper. He was interested in bold, interesting conjectures, not the 'nothing happening, it's all chance' style of the null hypothesis.

There are several problems with Popper's argument (see, for example, Chalmers, 1999, chapter 6; Lakatos, 1970) even when applied to natural science. In management, the situation is even muddier because the statistical nature of most hypotheses means that a single case cannot serve to disprove the hypothesis, so it seems unreasonable to assume that falsification is any more conclusive than the other approach, verification. We can propose a hypothesis, then get the data, and then see if the data supports or opposes the hypothesis.

However, Popper's approach does have two important implications for management research. The first is the principle of ensuring that a formal hypothesis makes sufficiently definite predictions to be falsified. Some hypotheses are so vague that they are consistent with any conceivable data, so they end up telling us nothing. For example suppose we have a hypothesis that Management Method X will make organizations more successful, and suppose we came across an organization which seems to be using X, but is not successful. The proponents of Method X might then claim that the method is not being used properly, which prompts the suspicion that if any organization is not successful it will be claimed that X is not being implemented properly. This makes the hypothesis 'unfalsifiable', and the argument becomes circular (Method X always works because when it doesn't it's not really Method X) and tells us nothing helpful.

The second aspect of Popper's approach which is potentially important for management research is his insistence that rigour comes *only* from the process of testing a hypothesis, not from the process by which it is derived. This is directly contrary to the inductive style of much 'qualitative' management research, and at the very least suggests an alternative approach. Instead of analysing, for example, interview transcripts carefully by coding mention of particular points, and taking care to get quotes accurate and correctly attributed, Popper's approach would suggest mulling over the interview data *informally* and using it to derive hypotheses or conjectures – not null ones, but interesting ones, of course. The next step is then to test these hypotheses in whatever way seems appropriate, but almost certainly using different data. The rigour of the research, the reason why readers should believe it, then stems from the rigour of this testing process. This approach seems to be used rarely for issues which are not statistical, perhaps because of the unwarranted linking of statistical methods and hypothesis testing.

Induction

We have argued above the distinction between induction and hypothesis testing is muddier than it may appear. Similarly, avoiding prior beliefs when making unductive inferences is arguably unrealistic, so induction also

merges with the idea of following a framework or paradigm. For these reasons, the concepts in the previous and next sections seem more important in practice.

Following a framework or paradigm

Any research is inevitably based on a conceptual framework or paradigm which is used to define variables and ways of measuring them. Example 4 above is based on the framework defined by the personality measures, for example. Sometimes the framework may be largely common sense, sometimes it may be based on explicit theory, but it is always obviously a good idea to be aware of, and critical of, the role of the theoretical framework. One difficulty of the idea of induction is that it may encourage researchers to ignore their theoretical (and other) presuppositions; from this perspective being explicit about the framework seems helpful.

Conclusions

This article starts with a deeply flawed perspective on management research – that there are two basic types of research, often called quantitative and qualitative. We then consider two of the dimensions on which this dichotomy is supposedly based – the statistical versus qualitative dimension, and the hypothesis testing versus induction dimension. This leads to the conclusion that there is much useful research that has some of the features of one pole and some of the features of the other – e.g. hypothesis testing that does not use statistical methods, and inductive research that does use statistics. We do not discuss other dimensions on which the two types differ – such as realist versus idealist – but we believe that, had we done so, the conclusions would have been similar. This obviously leads to a much broader range of possibilities than the two basic types.

We also argued that many of the dimensions on which research is categorised are flawed, either in the sense that it is difficult to define them clearly, or in the sense that they appear to give a comprehensive categorisation of all possibilities, but do in fact leave important possibilities out. This leads to us suggesting a number of concepts, stemming from our analysis of the two dimensions, which are useful for analysing the research process as long as we avoid unwarranted assumptions about their scope and how they relate to each other. These concepts (see Table 3) are the use of rich data, statistical approaches, demonstrating possibilities (e.g. using case studies of particular instances to illustrate what may be possible), the use of fictional or hypothetical data, hypothesis testing, and following a framework or paradigm. It seems wise to avoid words with potentially misleading or ambiguous implications such as ‘qualitative’ and ‘quantitative’.

This perspective is much messier, much less of a ‘grand narrative’ than the perspective which suggests just two basic types of research. It is also consistent with the anarchic spirit of avoiding strict adherence to methodological rules which have worked in some ways in some contexts in the past, because other approaches may be better for future projects. In the words of Feyerabend (1993: 5, writing about the physical sciences), ‘the only principle which does not inhibit progress is: anything goes.’ Law (2004) and McCall and Bobko (1990) put forward similar arguments in the context of social science.

But how much does this matter? Isn’t the distinction between qualitative and quantitative research a useful dichotomy that is helpful for practitioners, students and for the builders of grand narratives? Our answer is a definite *No*. Research starting from this dichotomy runs the risk of being based on inappropriate assumptions (e.g. statistical research and hypothesis testing go hand in hand), and of excluding from consideration many potentially fruitful avenues (e.g. statistical induction, or deriving and testing hypotheses using rich and detailed data based on small samples). Research based on the quantitative versus qualitative distinction, even mixed methods research, may be seriously impoverished, and needs to be liberated.

So what would we recommend for researchers and students of the research process? First, general labels for research methods, like quantitative and qualitative, should be avoided because their meaning is confused. If we want to distinguish between a study involving a very large sample, and a study involving a more detailed analysis of a smaller sample, then we should say this and not use potentially misleading terms like qualitative

and quantitative. Second, more specific concepts should be used when appropriate without making unwarranted assumptions about how these concepts are related to each other. We may, for example, be gathering some rich data to illustrate an interesting possibility, or to test a hypothesis, or we may be using statistics to analyse some psychometric data within a clear psychological framework, or we might be inventing fictional scenarios to explore how a mathematical model might work.

References

Bitektine, A. (2008) Prospective case study design: qualitative method for deductive theory testing. *Organizational Research Methods,* 11(1): 160-180.

Britten, N., Stevenson, F. A., Barry, C. A., Barber, N., and Bradley, C. P.(2000) Misunderstandings in prescribing decisions in general practice: qualitative study. *British Medical Journal,* 320: 484-488.

Bryman, A., and Bell, E. (2003) *Business research methods*. Oxford: Oxford University Press.

Chalmers, A. F. (1999) *What is this thing called science? (3rd edition)* Buckingham: Open University Press.

Christy, R., and Wood, M. (1999) Researching possibilities in marketing. *Qualitative Market Research, 2*(3), 189-196.

Creswell, J. D.; Plano Clark, V. L.; Gutmann, M. L.; Hanson, W. E. Advanced mixed methods research designs. (2008) In: Plano-Clark, V.L.; Creswell, J. D., eds. (2008) *The mixed methods reader*. Los Angeles: Sage: 161-196. [Reprinted from *Handbook of mixed methods in social and behavioral research* (Tashakkori and Teddie, 2003)]

Denning, S. (2004) *Squirrel Inc. A fable of leadership through story telling*. San Francisco: Jossey-Bass, Wiley.

Denscombe, Martyn. (2008) Communities of practice: a research paradigm for the mixed methods approach. *Journal of Mixed Methods Research, 2*, 270-283.

Easterby-Smith, M., Thorpe, R., and Lowe, A. (2002) *Management Research: an introduction.* London: Sage.

Easterby-Smith, M., Golden-Biddle, K., and Locke, K. (2008) Working with pluralism: determining quality in qualitative research. *Organizational Research Methods,* 11(3): 419-429.

Edwards, Gemma. (2007) *ESRC Research Programme: Methodological Challenges for the Twenty First Century. Case-based versus variable-based methods (Theme 2)* Retrieved on 13 January 2010 from http://www.ccsr.ac.uk/methods/events/challenges/documents/ESRCTheme2Report.doc .

Feyerabend, P.K. (1993) *Against method: an outline of an anarchistic theory of knowledge (3rd edition)* London: Verso.

Gabriel, Y. (2000) *Storytelling in organizations: facts, fictions and fantasies*. Oxford: Oxford University Press.

Glaser, B. G. and Strauss, A. L. (1967) *The discovery of grounded theory: strategies for qualitative research.* Hawthorn, NY: Aldine de Gruyter.

Glebbeek, A. C., and Bax, E. H. (2004) Is high employee turnover really harmful? An empirical test using company records. *Academy of Management Journal,* 47(2): 277-286.

Johnson, P.(2008) Entry on Inductive analysis. In R. Thorpe, and R. Holt (eds*), The Sage dictionary of qualitative management research* (pp.112-115) London: Sage.

Kuhn, T. S. (1970) *The structure of scientific revolutions (2nd edition)* Chicago: University of Chicago Press.

Lakatos, I. (1970) Falsification and the methodology of scientific research programmes. in I. Lakatos, and A. Musgrave (eds), *Criticism and the growth of knowledge* (pp.91-196) Cambridge: Cambridge University Press.

Law, J. (2004) *After method: mess in social science research*. Abingdon and New York: Routledge.

Lindsay, R. M. (1995) Reconsidering the status of tests of significance: an alternativecriterion of adequacy. *Accounting, Organizations and Society*, 20(1), 35-53.

Locke, K. (2008) Entry on Grounded theory. In R. Thorpe, and R. Holt (eds*), The Sage dictionary of qualitative management research* (pp.112-115) London: Sage.

Mautner, T. (2005) *The Penguin dictionary of philosophy*. London: Penguin.

McCall, M. W. Jr. and Bobko, P. (1990) Research methods in the service of discovery. In: Dunnette, M. D. and Hough, L. M., eds. *Handbook of industrial and organizational psychology, 2nd edition, Vol 1.* Palo Alto: Consulting Psychologists Press.

Meyer, C. B., and Altenborg, E. (2007) The disintegrating effects of equality: a study of a failed international merger. *British Journal of Management,* 18, 257-271.

Miles, M. B. and Huberman, A. M. (1994) *Qualitative data analysis: an expanded sourcebook (2nd edition)* London: Sage.

Mingers, J. (2006) A critique of statistical modeling in management science from a critical realist perspective: its role within multimethodology. *Journal of the Operational Research Society,* 57(2), 202-219.

Morgan, G., and Smircich, L. (1980) The case for qualitative research. *Academy of Management Review,* 5(4), 491-500.

Morrison, D. E., and Henkel, R. E. (1970) *The significance test controversy*. London: Butterworths.

Moutafi, J., Furnham, A., and Crump, J. (2007) Is managerial level related to personality? *British Journal of Management,* 18: 272-280.

Popper, K. R. (1972) *Conjectures and refutations: the growth of scientific knowledge (4th edition)* London: Routledge and Kegan Paul.

Reichardt, C. S., and Cook, T. D. (1979) Beyond qualitative versus quantitative methods. In T. D. Cook and C. S. Reichardt (eds.), *Quantitative methods in evaluation research.* Beverly Hill, CA: Sage.

Rihoux, B., and Ragin, C. C. (2009) *Configurational comparative methods: qualitative comparative analysis (QCA) and related techniques*. Los Angeles: Sage.

Robson, C. (2002) *Real World Research (2nd edition)* Oxford: Blackwell.

Saunders, M., Lewis, P., and Thornhill, A. (2007) *Research methods for business students (4th edition)* Harlow: Pearson Education.

Sibson, R. (1999) Statistics. in A. Bullock, and S. Trombley (eds), *The new Fontana dictionary of modern thought*. London: Harper Collins.

Thorpe, R., and Holt, R. (eds) (2008) *The Sage dictionary of qualitative management research*. London: Sage.

Vogt, W. P.(2008) Quantitative versus Qualitative Is a Distraction: Variations on a Theme by Brewer and Hunter (2006) *Methodological Innovations Online*, 3(1)

Wood, M. (2003) *Making sense of statistics: a non-mathematical approach.* Basingstoke: Palgrave.

Wood, M. (2005) Bootstrapped confidence intervals as an approach to statistical inference. *Organizational research methods*, 8 (4)

Wood, M. (2009) The use of statistical methods in management research: suggestions from a case study. *arXiv:0908.0067v1 [stat.AP]* (http://arxiv.org/abs/0908.0067v1)

Wood, M., and Christy, R. (1999) Sampling for possibilities. *Quality and Quantity*, 33: 185-202.

Wood, M., and Christy, R. (2001) Prospecting research: knowing when to stop.*Marketing Letters*, 12(4): 299-313.

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