A Multi-Methodological Framework for the Design and Evaluation of Complex Research Projects and Reports in Business and Management Studies

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Abstract: The paper addresses the methodological commonalities linking quantitative and qualitative methodologies. It offers a three dimensional framework of research methodology that spans the assumed divide and shows that quantitative and qualitative research approaches can be mutually complementary and offer a more nuanced approximation of the truth. The framework, *Research methodology in 3D* (*3D Framework*), is based on a meta-methodological analysis and consists of three root dimensions. The first root dimension comprises the constituent components presented in all forms of research (concepts, questions/hypotheses, observation/measurement and communication). The second dimension of the framework comprises the core set of criteria that all scientific research must comply with (reliability, validity, 'objectivity' and replicability), each may be expressed under different labels and in different forms depending on the specific research tradition. The third dimension represents the basic goals of research, namely to describe, to explain or to understand. A three-dimensional framework emerges when the above three dimensions are combined. The framework shows some of the tangent planes between quantitative and qualitative scientific research and suggests possible complementarity between research approaches. The framework furthermore serves at least the following functions: firstly, as map to assist students in charting their way through a maze of new concepts. Secondly, the *3D Framework* can serve as a useful planning instrument for comprehensive and complex research programmes. Thirdly, the framework can be utilized as a useful guide in evaluating research proposals on the one hand and research reports, on the other (an example of the latter is offered)

Keywords: research methodology, quantitative research, qualitative research, mixed methods

1. Introduction

According to Bryman, "combining quantitative and qualitative research has become unexceptional and unremarkable in recent years" (2006: 97). His content analysis of over 200 articles showed that the main reasons offered by authors for combining quantitative and qualitative research methodological approaches were 'enhancement' (to augment either quantitative or qualitative findings), sampling (to facilitate the sampling of respondents or cases) and triangulation (to cross-validate).

Against the background of Bryman's observation, it would be interesting to identify research methodological preferences, if any, in Business and Management Studies. Since the European Conference on Research Methodology (ECRM) represented one the premier annual scholarly gatherings in Europe in these fields, it could be expected that these conferences should reflect methodological preferences. A relatively simple content analysis was consequently done of the papers presented at the most recent two conferences in 2011 and 2012 (see Ashwin, 2011 and McClean, 2012 for the proceedings). More specifically, the goal of the content analysis was to identify the relative popularity of qualitative, quantitative and multi-methodological approaches on the one hand and empirical and conceptual ones on the other (see the table note for the definitions). An associate of the author also coded a random sample (11) of the ECRM 11 papers to establish the reliability of the content analysis; she used the definitions of the different categories reflected in the note attached to Table 1. There was 91 percent agreement between the two sets of codings which was judged satisfactory given the relatively abstract nature of the categories. The results of the content analysis are summarised in Table 1.

An inspection of Table 1 shows several interesting aspects of research in business and management studies of which the following four are perhaps the most relevant from the perspective of the present paper. Firstly, over the two years of these two conferences qualitative empirical papers predominated, followed by quantitative empirical and qualitative conceptual papers. Secondly, conceptual papers represented 50 percent of all the papers presented at ECRM in Caen and Bolton. Thirdly, only two papers were presented that dealt with quantitative conceptual issues, i.e. theoretical and

Reference this paper as: Marais, H. "A Multi-Methodological Framework for the Design and Evaluation of Complex Research Projects and Reports in Business and Management Studies" *The Electronic Journal of Business Research Methods* Volume 10 Issue 2 2012 (pp 64-76), available online at www.ejbrm.com

methodological underpinnings of research – as opposed to 25 or 17 percent that addressed qualitative conceptual issues. (Perhaps, one wonders, whether this can be attributed to the relatively long history of conceptual questions of a quantitative nature and what seems to be a more recent item on the qualitative agenda of methodologists.) Fourthly,

Table 1: Distribution of papers presented at ECRM 10 (2011) and 11 (2012)

ECRM 10								
Category	Empirical papers			Conceptual papers				Total
	Qual (%)	Quan (%)	Multi (%)	Qual (%)	Quan (%)	Multi (%)	Plan (%)	
Paper	19 (29)	19 (29)	4 (6)	8 (12)	0	10 (15)	6 (9)	66
PhD	8	1	0	2	0	0	1	12
Total	27	20	4	8	0	10	7	78
ECRM 11								
Paper	17 (31)	13 (24)	4 (7)	15 (27)	2 (4)	4 (7)		55
PhD	4	2	3	2	0	0	2	13
Total	21	15	7	17	2	4	2	68
Totals and Row Percentages of ECRM 10 + 11								
Total (%)	48 (33)	35 (24)	11 (7)	25 (17)	2 (1)	14 (10)	9 (6)	146

Notes:

1. *Empirical papers*: Reports on completed research projects involving some quantitative or qualitative form of observation/measurement was used for information gathering. *Conceptual papers*: Those that considered theoretical and methodological underpinnings of research or set out project plans (Plan) and did not report an empirical research project. *Qual*: Papers that dealt only with qualitative research; *Quan:* Papers that dealt only with quantitative research; *Multi*: Papers that covered both qualitative and quantitative empirical or conceptual research

2. Percentages have been rounded-off and up and do not necessarily add up to 100 percent.

Less than one fifth of the papers could be classified as being of a multi-methodological type (25 or 17 percent). Clearly, while multi-methodological research did receive a fair amount of attention, qualitative studies still predominated, In this regard, one is reminded of Blumberg, Cooper and Schindler's comment, "Many scholars show a strong preference for either type of study. However, these preferences more likely reflect their own capabilities and experiences than a general idea about which type of research is more useful" (2008: 192). The present paper offers a three-dimensional framework of research methodology based on the assumption of complementarity rather than irreconcilability between different research approaches. This framework could further facilitate the incorporation of combinations of qualitative and quantitative research approaches to research and thus offer a more nuanced approximation of the truth. The paper, however, does not deny the value of good mono-methodological research irrespective of the methodological orientation or the important differences between the two approaches in, for example, the nature of the problem to be investigated, the researcher's position in the research setting, theoretical orientation, research design, scope, information-gathering techniques and others (see, e.g., Denzin and Lincoln, 2005: 11–12).

There are many reasons why attention should be focused on complementarity between research approaches. Five methodological reasons include, firstly, the rationale underpinning the convergent and discriminant validation approach (e.g. Campbell and Fiske, 1958) and the parallel qualitative requirement of triangulation (e.g. Denzin, n.d.; Denzin and Lincoln, 2005) which highlights the benefits to validation of incorporating different methodological approaches into a study. A second justification for multiple methodologies is the growing importance of mixed-method designs as 'a third methodological movement…as a pragmatic way of using the strengths of both movements' [i.e. quantitative and qualitative], as Tashakorri and Teddlie described mixed methods (2003: ix). A third challenge to research methodology – and project management – emerges from the growing importance of multi-, inter- and especially transdisciplinary research (cf. Hadorn et al., 2008), as researchers address increasingly complex scientific and socially relevant problems, partly in response to the dynamics of science, technology and innovation policy, including international scientific collaboration programmes, and governments' expectations that publicly funded research should show a positive return on investment by addressing national and even international problems (cf. OECD, 2007; Rosenfield, 2009). Fourthly, the possibility of constraints on public funding of universities in many countries, could stimulate multi- and interdisciplinary research as a strategy for ameliorating the effects of cuts in research funds particularly in countries, such as South Africa, where some academic departments and disciplines have had to amalgamate. Finally, 'MMRD [mixed methods] may dislodge ossified positions primarily maintained by identity politics associated with QL [qualitative] and QN [quantitative] methods' to quote Bergman (2011: 275).

2. Main argument

The paper argues that national and institutional science policies increasingly challenge researchers to address complex socially relevant problems, and that such problems often require at least a multidisciplinary research design. The paper further argues that although caution is generally required in utilising different methodological approaches in the same study (see, e.g., Cameron, 2011, for some of the challenges), this should not necessarily inhibit researchers from venturing into the territory of multiple methodologies to find more comprehensive answers and solutions. It is further suggested that representations of quantitative and qualitative methodological approaches are often ideal types developed by philosophers of science and strong proponents of either side, but that they seldom occur in pure form in everyday research. Finally, the paper argues that there are indeed interfaces and sufficient commonalities between accountable methodological approaches to justify multiple methodological approaches, provided that this is done within an explicit methodological framework such as the *3D Framework* proposed in this paper.

3. Objectives of the study

The main objective of the study was to develop a framework that could be used as an instrument to identify the interfaces between different methodological approaches and thereby utilise a broader spectrum of approaches than would otherwise be the case.

4. Information base of this paper

A brief note on the process that was followed in drafting this paper may be appropriate. The material, analyses, interpretations, conceptions and results reported in this paper are the result of critical reading of publications on research methodology, interactions with colleagues, active self-initiated and commissioned research, teaching of research methodology courses, research supervision, and research evaluation ranging from research proposals submitted for funding by a public research funding agency to completed research reports. In one sense, this paper represents a qualitative insider perspective on the subject, but in another sense it reflects a modest attempt at integrating in a fair way a wide spectrum of published knowledge on the process of research.

5. Conceptual framework

At the risk of offering redundant information, definitions of key concepts as used in this paper are provided:

- Research: The uncovering of the truth about a phenomenon (and/or its relationship with other phenomena) by means of scientific methods. The term 'research' as used in this paper equates to scientific research and includes qualitative research; it includes both theory building and testing.
- Empirical research: Research that relies on one or more forms of observation/measurement for gathering information, ranging from qualitative research (e.g. participant observation) to quantitative research (e.g. psycho-physiological indicators).
- Science: The accumulated published information generated by means of scientific methods, on the validity of which the peers in the particular field have reached consensus; the concepts 'science' and 'scientific research' cover all science cultures.
- Social science: The subset of science that focuses on human, social and cultural behaviour, including business and management studies.
- Qualitative research: Research that approaches phenomena from the perspective of the insider or subject in order to understanding the phenomena in their natural context. This approach uses qualitative 'indicators' such as words, stories, pictures and other communicative representations as non-numerical symbolic information on phenomena; its methodologies are normally less formalised, rigid, specific and explicated, but more comprehensively recorded.
- Quantitative research: Research that approaches phenomena from the perspective of the outsider in order to explain and predict the phenomenon under study in isolation. This approach uses numerical indicators of abstract concepts; its methodology is normally relatively formalised, rigid, cross-referenced and explicated, but more parsimoniously recorded by means of statistics.

6. Root dimensions of research methodology

To make comparisons between different methodological approaches requires the identification of a limited set of necessary and sufficient properties, attributes or characteristics of the scientific research process that could serve as the basis for comparison. From phenomenological and systems perspectives, and based on analyses of textbooks on research methodology, research publications and relatively wide research experience, a limited number of root dimensions that qualify research as 'scientific' were identified. These were further developed into a framework that would not define scientific research as a discreet point in the knowledge space – implying an all-or-nothing character – but would acknowledge that research can take a range of legitimate forms, in other words suggesting the existence and promotion of the utilisation of multiple approaches to generating scientific knowledge. A careful reading of methodological publications yields possible overlaps (e.g. Cresswell's, 2003, three dimensions of knowledge claims, strategies of enquiry and methods), but also further conditions, although these can mostly be subsumed under one of the three root dimensions or are, upon closer inspection, particular to a very special research design. The root dimensions are summarised below, and a conceptual framework, *Research Methodology in 3D* (*3D Framework*), is offered in a later section.

Three root dimensions emerged from the conceptual analyses:

- Constituent components or basic building blocks of the scientific research process: concepts/constructs, hypotheses/theses, measurement/observation and communication of the research
- Epistemic criteria that scientific research should comply with: reliability/dependability, validity/credibility, 'objectivity'/confirmability and replicability
- The primary purposes for which research is normally undertaken: description of a phenomenon and its relationship with other phenomena, explanation of causal relationships between phenomena, and in-depth understanding of phenomena.

6.1 Root dimension 1: Constituent components of the scientific research process

Most, if not all, human behaviour, ranging from everyday behaviour, to the arts and to scientific research, consists of at least the following four generic components (cf. e.g. Marx, 1963; Mouton, 1996):

- Linguistic and para-linguistic representations of phenomena (words, concepts, constructs, symbols of all types): Differences in the nature of concepts as used by qualitative and quantitative researchers have been debated by prominent scholars (see Mouton, 1996, for a useful summary), but it is important to note the obvious: concepts represent a necessary component in both qualitative and quantitative research traditions, although the labels and exact criteria may differ. In scientific research, concepts should meet the criterion of explication and operational specificity as far as possible.
- Questions about phenomena (conjectures, theses, hypotheses): Hypotheses (and their variants) serve to direct research and are key components of both qualitative and quantitative research. A hypothesis or thesis should be testable, and more specifically 'rejectable', to be useful in scientific research.
- Observation of phenomena (sensory perception, experience, measurement): Observation can range from participant observation to relatively sophisticated measurement of behavioural or even psycho-physiological responses. The criterion of control equates to 'objectivity', meaning that the researcher shows her/his autonomy in the observation process and is not merely ventriloquising.
- Communication of what has been observed (general discussions, news reports, scholarly publications): This component is seldom included as a basic component of research, but since the earlier definition of science refers to 'published' information on which 'peers have reached consensus', communication is elevated here as a key component of the scientific research process. This position is strengthened by the common observation that whether a particular research project qualifies as 'scientific', as well as its quality, are taken to be reflected by the journal – more specifically, the impact factor of the journal – in which the work was published or the conference at which it was presented!

The first three constituent components were originally summarised in this form by Marx (1963: 10) as being 'basic elements of theory construction'. Specific criteria applicable to each of the components differentiate between forms of behaviour (e.g. distinguishing between a short story, an investigative journalism article and a research report). Each of the four components represents a continuum, and different research methodological approaches need not be, and usually are not, located at the same point on each of the continua (see the definitions in the previous section). The four components are shown in Figure 1 as continua, with the process criteria on the far right of each continuum and the arts on the extreme left of each continuum (cf. Marx, 1963: 11; Mouton and Marais, 1988: 157).

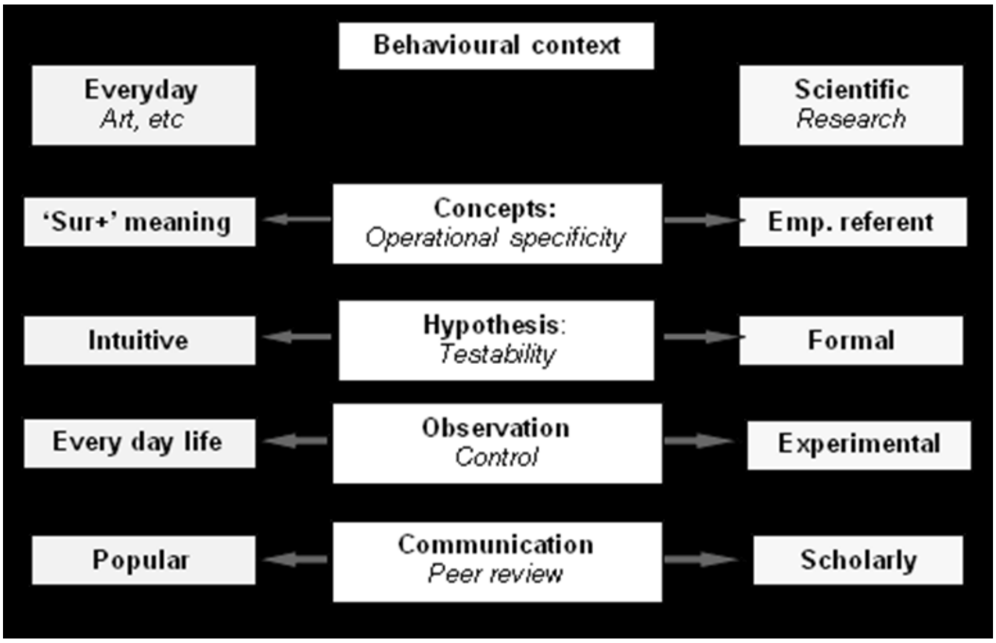

Figure 1: Constituent components and criteria of scientific research (adapted from Marx, 1963: 11)

The following brief notes on aspects of Figure 1 may be important in the context of this paper:

- The four constituent components are, of course, not independent of one other, and can perhaps be described as the results of a conceptual unfolding analysis (to use a concept originally coined by Coombs, 1964) of the core components of human behaviour in general and scientific research in particular.
- Furthermore, the representation offered in Figure 1 assumes that scientific research is a special form of human behaviour, the main difference between it and other forms of human behaviour (e.g. everyday conversations, different forms of art, and investigative journalism) being the specific content given to the italicised criteria in that figure. Also, the representation offered in Figure 1 allows for a range of social research methodological approaches – in general, qualitative research such as phenomenological studies would tend to be located to the left of experimental psychological studies, which would normally be closer to the extreme right of the continuum.
- Each of the components is expressed as a continuum – rather than an absolute point in some idealistic semantic space – with the obvious implication that different research methodological approaches could be located along the various continua, reminding one of Cresswell's (2003) conclusion that qualitative and quantitative research are located on a continuum. In Figure 1, physics is theoretically positioned at the far right as the 'ideal', but this does not preclude, for example, history somewhere to the left and closer to the middle of the continuum.
- The key criterion for scientific research is italicised. Implicitly or explicitly, scientific research strives to be as specific as possible with regard to its concepts, to deal with testable research questions/hypotheses, not to engage in random observation or measurement, and to accept the validity of that on which peers in a particular research field have reached consensus.
- Generally speaking, and with reference to good research, experimental research (especially laboratory research) would be closer to the right extreme of the four components, while qualitative research would tend to be located somewhere to the right of the midpoint of each of the continua.

- Scientific research takes place when these four components, each complying with the scientific criterion, interact in a systematic way.

6.2 Root dimension 2: Epistemic criteria that scientific research should comply with

The second root dimension of the framework is represented by the core set of criteria that all research, whether quantitative or qualitative, must comply with in order to qualify as scientific, as defined in section 5. Figure 1 reflects a process criterion for each of the four components of scientific research, namely: concepts should be operationalised as specifically as possible, preferably in terms of empirical referents; hypotheses should be testable; observation should be as controlled as possible; and, finally the communication of the findings should be subjected to peer review. These process criteria, however, do not specify the actual quality required of scientific research as the search for truth. For this, one should drill deeper into the nature of the scientific research process, as reflected in methodology textbooks and courses, as well as criteria applied to the assessment of dissertations/theses, journal articles, and conference papers. To supplement the author's own conceptions and research practices, selected textbooks on research methodology for both quantitative and qualitative research were scanned to identify the primary criteria for scientific research (e.g. Alasuutari, Bickman, and Branner, 2008; Babbie and Mouton, 2001; Blumberg, Cooper and Schindler, 2008; Mouton, 1996; Mouton and Marais, 1988; Remenyi, Williams, Money and Swartz, 1998; see Marais, Pienaar-Marais and Gathua, 2011, for further sources consulted). These and other textbooks generally agree on two important issues. Firstly, both quantitative and qualitative methodologies subscribe to the same core set of epistemic criteria , secondly, different terms are used by proponents of those methodologies to label the criteria and, thirdly, the operationalisation of those criteria might differ (see Table 1). The criteria are, however, in the words of Babbie and Mouton (2001: 276), 'all bootstrap conceptions of a sort. Although we should strive with everything in our power to do truly valid, reliable, and objective studies, the reality is that we are never able to attain this completely', but, one might add, *should pursue this in all research undertaken and explicitly report on it* in all presentations. Table 2 offers an overview of the key criteria, using 'bilingual' nomenclature for the criteria, definitions and indicators, as normally used by quantitative and qualitative researchers respectively.

Table 2: Key epistemic criteria

Quantitative research		Qualitative research	
Criterion	*Meaning* and procedure	Criterion	*Meaning* and procedure
Reliability	*Same findings upon replication?* Test-retest & interrater reliability	Dependability; trustworthiness; consistency	*Similar context yields similar findings?* Inquiry audit
Internal validity	*Measured what intention was?* Experimental control; statistical triangulation	Credibility	*Compatibility between respondents' and reported perceptions?* Prolonged engagement; member checks; quality record; narrative triangulation
External validity	*Generalisability to population?* Random sampling	Transferability	*Applicable to other cases and contexts?* Purposive sampling; detailed descriptions of process
'Objectivity'	*Reflecting own views?* Control over subjective factors	Confirmability	*Findings not function of biases of researcher?* Audit trail; trust & rapport with subject; intersubjectivity
Replicability	*Can next researcher replicate the study*? Peer reviewed publication	Replicability	*Clear description of procedures?* Appropriate peer-reviewed publication

Table 2 highlights, four main points. In the first place, the epistemic criteria, normally associated with quantitative research, have their equivalents in qualitative research (also see Golafshani's, 2003, overview). It would be reasonable to define each of the criterion continua as unidimensional. In other words, each of the four epistemic criteria can be used to assess the quality of research irrespective of whether it is quantitative or qualitative. In the second place, notwithstanding the 'universality' of the epistemic criteria, it should be noted that the ways of determining whether the criteria have been met, differ between qualitative and quantitative research, and are expressed differently (hence the reference to 'bilingual nomenclature' earlier), but that should not detract from the *equivalence* between the two sets. There is a greater degree of standardisation of the criteria in the quantitative than the qualitative approaches. In the third place, meeting the criteria – in each methodological approach – sets the limits of the extent to which the studies involved qualify as scientific, and it therefore becomes an imperative in each study to report the outcomes of determining or testing the reliability/dependability, internal validity/credibility, external validity/transferability and 'objectivity'/confirmability of the study. (Even some quantitative survey studies omit to report the reliability and internal validity of the survey questionnaire used in the particular study, which implies conclusions such as, 'We are 95% certain that we can generalise our findings to the relevant population – unfortunately we are not sure what we are generalising!') In the fourth place, the fact that all the cells in Table 2 could be populated supports the argument offered earlier in this paper, namely that there is sufficient complementarity between quantitative and qualitative approaches to justify the argument that the utilisation of methodological approaches from both could contribute to a more nuanced approximation of the truth.

6.3 Root dimension 3: Primary purposes for which research is normally undertaken

Even a superficial reading of reports on research projects shows that a recurring characteristic that differentiates research projects is the goal of the project, or the so-called 'teleological function' of research. Lead researchers and senior academics classify research designs in a wide variety of ways (e.g. Blumberg, Cooper and Schindler, 2008: 196). These classifications are generally useful, but use different facets of research as the basis, such as research design, research setting, and information-collection techniques, to mention three. The Dutch social psychologist, Van Leent, as far back as 1965, offered a useful and, it is suggested, still relevant classification of the purpose of research that captures the teleological dimension, while allowing for linkages between quantitative and qualitative research. (Perhaps, this linking of quantitative and qualitative research should come as no surprise, since Van Leent wrote during the period of the flowering of phenomenology in northern Europe!).

Van Leent (1965) proposed a three-dimensional typology of the social sciences in general, and social psychology in particular. More specifically, he argued that the teleological function was a meaningful differentiator between various research traditions pursued in the social psychology of the day – and, we would argue, in the social sciences today - , and he identified the following basic goals of research:

6.3.1 Descriptive research

Many social scientific projects, including business and management studies, have the primary goal of describing a phenomenon (e.g. how many instances of the phenomenon exist in a population as found in a survey, such as marketing research). Normally, inductive theories (e.g. typologies) emerge from such research.

6.3.2 Explanatory research

A relatively small percentage of social scientific research tries to explain the exact nature of the relationship between phenomena (i.e. to determine cause–effect relationships), and an even smaller portion of those uses one of the traditional experimental designs to show the effect of the independent variable or cause on the dependent variable (Campbell and Stanley, 1963). In quantitative research, hypothetico-deductive theories normally emerge from this type of research design.

6.3.3 Understanding (German: 'verstehende') research

Describing the incidence or properties of a phenomenon (e.g. how many jobs have to be cut for a business to survive) and/or explaining the causal relationships among phenomena (e.g. the reasons for the need to reduce the workforce significantly) – important as they may be – does not tell us what it means to a loyal and hardworking employee to learn that one has been declared redundant. Qualitative research approaches, such as phenomenological, ethnographic and related designs and methods, can often contribute to in-depth understanding of the experience - retrenchment in this case. Descriptors of qualitative research (such as insight and understanding from the perspective and experience of the subject) bring this goal of research quite well to the fore.

6.3.4 Summary of teleological dimension

Normally, but not always, quantitative research approaches take the form of descriptive or explanatory studies, while qualitative studies are more focused on in-depth understanding of one or more phenomena. Van Leent's (1965) original typology of social psychology – and, as this paper implies, the larger part of research methodology in the social sciences in general – can be represented by the three axes of a cube (Figure 2).

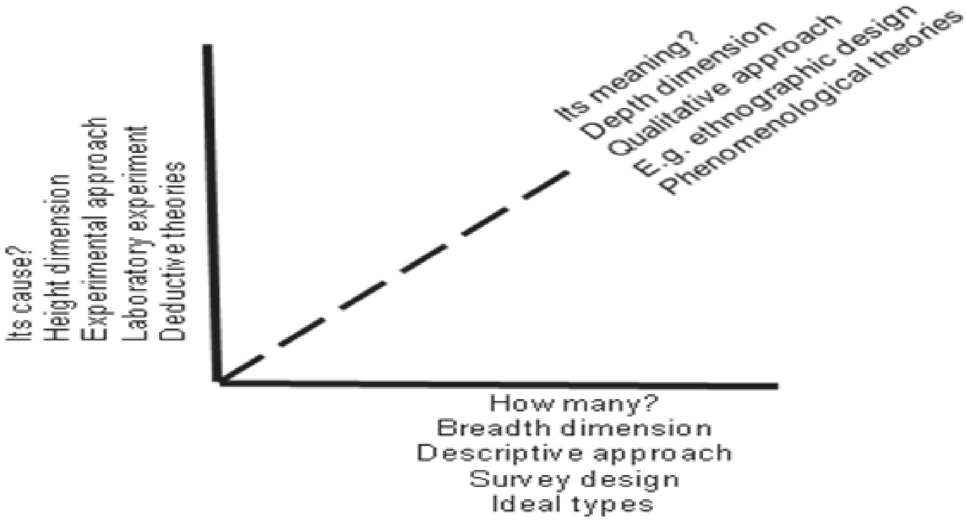

Figure 2: Three fundamental goals of scientific research (adapted from Van Leent, 1965)

7. The framework: Research methodology in 3D

A three-dimensional framework emerges when the three root dimensions, namely constituent components, epistemic criteria and primary goals of research, are joined up, as shown in Figure 3.

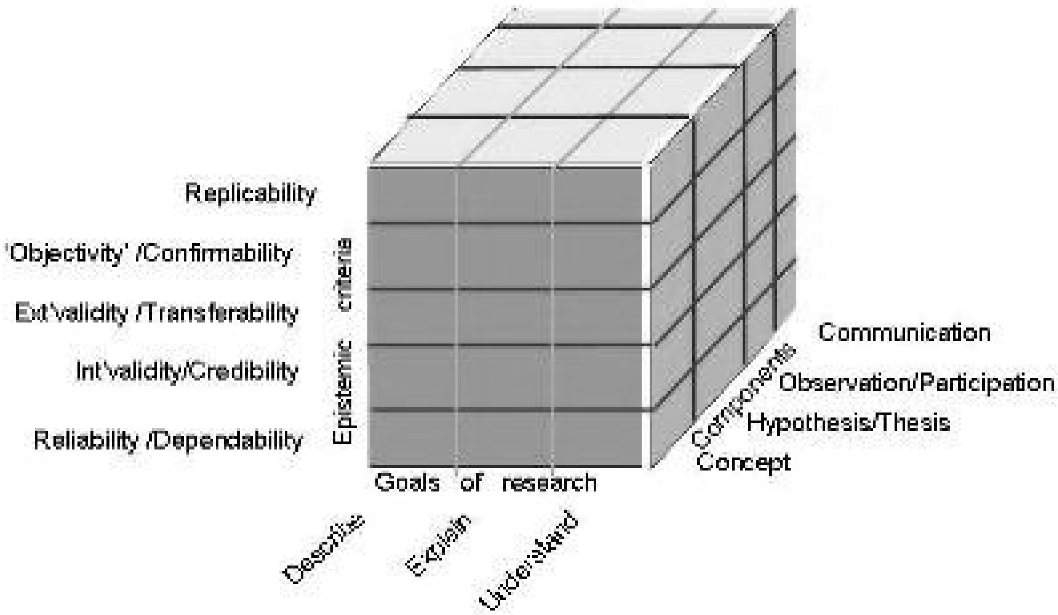

Figure 3: Research methodology in 3D

Figure 3 reflects the following salient aspects:

- The framework can be considered as a decision-making tool for both planning and evaluating research.
- Each of the dimensions summarises the building blocks that constitute scientific research and simultaneously shows the equivalences between qualitative and quantitative research.
- Each of the dimensions can be – and normally is – used individually as specifications in planning, undertaking and/or assessing a project of limited scope.

- However, the framework offers a 'joined-up' space that facilitates the planning of complex multi-, inter- and transdisciplinary research projects, especially if the boundaries between qualitative and quantitative approaches have to be crossed in the same venture. The framework highlights the elements that initially have to be identified and the criteria that have to be specified. Experience shows that an interdisiplinary academic research project would not follow exactly the same routes as a commissioned transdisiplinary research project, but both would have to account for each of the checkpoints in the cube (i.e. components and process criteria, epistemic criteria and research goal). Planning of such complex research projects requires the plotting of each of the research approaches to be utilised (quantitative and qualitative) on each of the three root dimensions to determine their compliance with the three sets of scientific requirements (components, criteria and research goals). A useful tool for this purpose would be a radar or spider chart, being a two-dimensional representation of multivariate information (e.g. Wikipedia, 2012); the use of such a conversion of the *3D Framework* to a radar chart is shown in section 8.1.
- The *3D Framework* could also be useful in assessing all the elements included in the project design of a comprehensive multi-methodological research project.
- Finally, the framework could be used as a set of planning specifications irrespective of whether the researcher's orientation is qualitative or quantitative.

8. Potential contribution of the 3D Framework

The paper shows that the root dimensions constituting the framework comply with expositions of research methodology found in most standard textbooks on this vast area of study, but go beyond some by, firstly, explicitly relating the three root dimensions and their subsets to form an interlinked framework. Secondly, the paper assumes and demonstrates salient tangent planes between approaches to scientific research that have traditionally been assumed to be mutually exclusive, namely quantitative and qualitative research. Thirdly, the framework perhaps goes further than many traditional presentations and partially reinforcing more recent ones (e.g. Cresswell, 2003) by demonstrating the possible complementarity between research approaches. Finally, the framework further addresses latent imbalances that emerged from the modest survey of the papers presented at the ECRM 10 and 11 conferences (see section 1).

The framework, as it stands, has its limitations. In the first place, the author of the paper probably could not escape from his own socialization in quantitative methodological approaches. Secondly, the framework has been developed and utilised in a behavioural and social sciences context only and has not been subjected to a thorough cross-disciplinary peer review process. Thirdly, an inherent limitation of the framework is that it is selective to the extent that it incorporates what the author regarded as the most important and salient elements. Other scholars, depending on their own methodological preferences, might argue that other elements should have been incorporated in the framework. Fourthly, the relative complexity of the *3D Framework* as represented in Figure 3 should be noted, but developing radar or spider charts would largely compensate for this factor. These and other limitations are receiving further attention.

The following section demonstrates the application of the framework by means of a radar chart.

8.1 Comparative evaluation of two projects

Two dissertations that were completed under the supervision of the author in 2000 were subjected to trial evaluations using the *3D Framework*. These two projects formed part of a comprehensive research programme in a deep-rural part of South Africa, the Role of Education and Training in Rural Human Development (RETiRHD; Marais, 2001), which consisted of nine master's projects – three qualitative studies, incl. one focus group-based project; three field experiments; one quantitative correlational study; one regional postal survey (n=500); one youth survey (34 villages, n=500); and one regional survey (random sample, n=1 000, covering an area of ±11 000km^2). The two projects were selected because they represented a qualitative and a quantitative approach, respectively. The qualitative project (referred to here as 'School Gov Skills') was aimed at unpacking the role of rural school governing skills in the achievements of deep-rural schools and relied on focus group techniques for information gathering, The second project (referred to here as Small Business Skills) was designed to determine the effectiveness of training deep-rural people in small business skills over five days and used a quantitative correlational design.

For the purposes of the present demonstration the three root dimensions (i.e. constituent components, epistemic criteria and primary goal of the research) were allocated equal weights.on the assumption that a wrong decision on any of the three or an incorrect application of the components of each would have negative effects on the 'scientificness' of the project. The components of each of the root dimensions were allocated the following weights:

- Constituent components: Each of the four components (see Figure 1) was allocated a maximum weight of 5.
- Epistemic criteria: Each of the five epistemic criteria (see Table 2) was given a maximum weight of 4.
- Primary goal of the research: The appropriateness of the goal, that is largely the design of the project (see Figure 2) and the correct application thereof were each given a weight of 10, totalling 20.

The sources of information upon which the specific scores for each of the two projects were based, were the original assessment of the supervisor (author of this paper) supported by information gleaned from the examiners' reports. Figure 4 summarises the results of this application of the *3D Framework*.

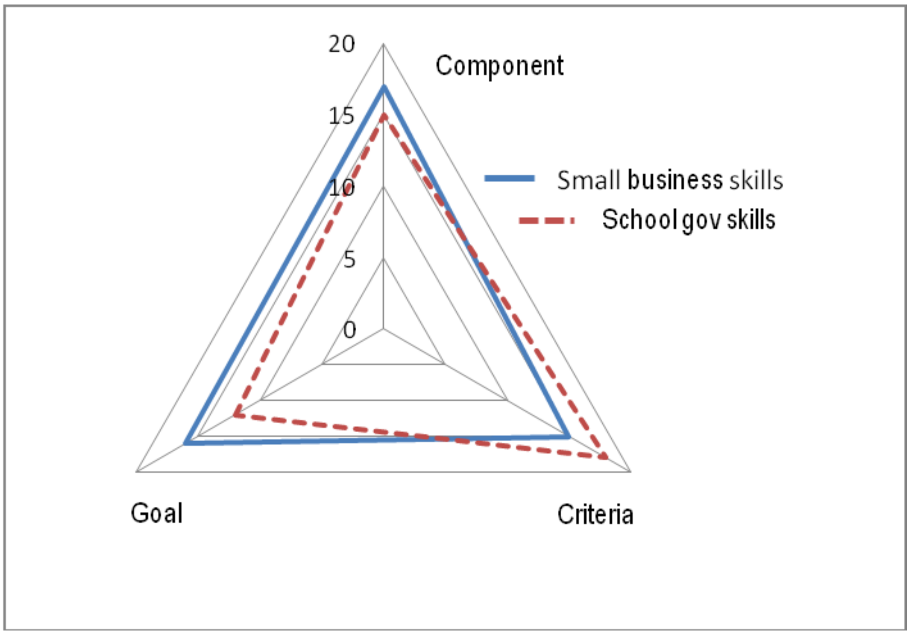

Figure 4: Application (radar chart) of the 3D Framework to two projects

This outcome of comparing two projects by means of a radar chart application of the *3D Framework* is self-explanatory, but the following points are worth highlighting: Firstly, the performance of projects on the root dimensions of the *3D Framework* can be plotted on a two-dimensional plane. Similarly, the extent to which the root dimensions are represented in a research proposal can be determined. Secondly, Figure 4 shows the similarities and differences between the two illustrative projects and this could serve as a useful quality control measure in the original project planning and subsequently in the research evaluation phase. Thirdly, the radar chart shows that the qualitative study met the epistemic criteria to a somewhat greater extent than did the quantitative study, while the latter was judged to be located closer to the process criteria of the constituent components as reflected in Figure1. Fourthly, for illustrative purposes the root dimensions were given equal weights, but from a methodological perspective one could argue that differential weights would be more appropriate. Finally, it should be reiterated that this comparative analysis was undertaken by the author, who was the programme leader of RETiRHD, the programme of which these two projects formed part, the supervisor of the two master's students whose dissertations have been used as examples, as well as having been one of their examiners. This section is consequently intended as an example of how the *3D Framework* could be applied, rather than as an empirical test of that framework.

9. Functions of the framework

The root dimensions have served as a framework for the author as an active researcher and teacher for many years, but in a linear rather than integrated mode. This paper is the first attempt at linking the three so-called root dimensions to form an integrated three-dimensional framework. The root dimensions, individually and in combination have proved to be facilitating mechanisms in teaching, project planning and evaluation.

9.1 Teaching of research methodology

The root dimensions and framework have proved useful as a map to assist teachers in systematising the logic of the research process at public universities (with relatively inexperienced students) and private universities (where students tend to come from professional occupations) and to aid students in charting their way through what some experience as a maze of new concepts and seemingly contradictory criteria (see Mkansi, Acheampong, Qi and Kondadi, 2012 for an analysis of some of these contradictions and the dilemmas students experience in this regard).

9.2 Project and research programme planning

The framework has proved useful as a planning instrument for complex research programmes – e.g. a programme matrix of 40 individual projects from which overarching integrated conclusions and recommendations were required (see HSRC, 1987: 3–8). Clearly, the root dimensions, individually and in combination, can serve equally useful project planning functions when critical questions on the scientific constituent components, scientific criteria and purpose of the project have to be considered.

9.3 Evaluation of research proposals and reports

The combination of root dimensions, as reflected in the *Research Methodology in 3D* framework, can serve as a useful assessment guide in evaluating research proposals and reports. In this regard, the framework represents a logical set of evaluative dimensions that can be checked, irrespective of the specific methodological approach of the researcher, especially but not exclusively in the evaluation phase of what Venable and Baskerville (2012) referred to as a design science of research methods. In practice, this means that each of the first two root dimensions could be transformed to a set of five and four summative rating scales, while the third root dimension would normally consist of two subscales measuring the appropriateness and the correctness of application of the chosen research goal, producing 11 rating scales in total. (The demonstration in section 8.1 summed the rating scales over each of the three root dimension.)

9.4 Other functions of the framework

A number of further functions can be listed, such as serving as a common framework for debates between proponents of different methodological orientations within the social sciences and between the social and natural sciences and as a framework for identifying apparent commonalities and differences between, for instance, scientific research and the creative arts.

10. Conclusions

None of the individual pieces of information offered in this paper should come as new knowledge to the experienced researcher and perceptive teacher of research methodology. The paper is an integration of existing knowledge, as the dates of some of the references should show! The paper may open three perspectives for some readers – in varying degrees for advanced research students, active researchers and teachers of research methodology. Firstly, broad agreement on the definition of scientific research and its essential properties could take the sting out of the main, and often unproductive, debate between proponents of quantitative and qualitative approaches to research. Secondly, most social scientific research (including business and management fields) is multi-faceted and requires multi-method designs, which would include quantitative and qualitative approaches. This would apply even more in the event of possible practical, economic, human and associated consequences related to the eventual implementation of the research findings. Thirdly, the emerging framework, *Research Methodology in 3D*, brings to the fore the interaction effect between the three seemingly independent root dimensions of research, thereby offering a conceptual instrument for relating quantitative and qualitative approaches to research.

The following conclusions seem justified: Firstly, typologies of research approaches (e.g. qualitative and quantitative research) are often the results of conceptual exercises rather than empirical analyses of actual published research reports and consequently do not necessarily represent research as practiced. Secondly, the framework offers a conceptual tool that could be used to find interfaces between methodological approaches, while at the same time highlighting the unique contribution of each. Finally, perhaps the time has come to seek complementarity between approaches rather than spending time trying to defend one's own approach and losing sight of the potential contribution of other approaches – even within one's own paradigm.

Acknowledgements

Financial and other support of the University of Pretoria' Graduate School of Technology Management is gratefully acknowledged. Tinus Pretorius (University of Pretoria) and Magdal Pienaar-Marais (National Research Foundation) are thanked for their constructive comments on a draft of the paper. Marlene Mulder (University of Pretoria) is thanked for the design of some of the figures and the copy-editing done by Robyn Arnold deserves a special word of appreciation.

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