

Quality frameworks and procedural checklists for mixed methods research

Roslyn Cameron

Central Queensland University
Gladstone, QLD, Australia.

ABSTRACT

Procedural checklists and quality frameworks for research are very useful pedagogic tools for teaching new researchers foundational aspects of research process and final product reporting. They are also very helpful to established researchers in assisting with the review of research papers and articles submitted to conferences and journals as well as for the examination of research dissertations. The purpose of this paper is to provide an overview of research quality criteria in quantitative and qualitative research before presenting a synthesis of quality frameworks and procedural checklists emerging from the field of mixed methods research. Cameron (2010) studied the methodological incidence of research approaches utilised in Australian vocational education and training (VET) based research and found that qualitative (45%) and mixed methods research (15%) were dominant. The recent development of mixed methods research quality frameworks is presented and compared to those used in quantitative and qualitative research paradigms. The quality frameworks emerging from the mixed methods research movement include: a set of four criteria developed by Sale and Brazil (2004); quality prompts from Bryman, Becker and Sempik (2008) and; a six item framework developed by O’Cathain, Murphy and Nicholl (2008) referred to as, Good Reporting of a Mixed Methods Study (GRAMMS). The paper concludes with some future projections on research training for new VET researchers.

Keywords: mixed methods research; VET research; quality criteria; rigor; trustworthiness; postgraduate research training

Introduction

A common question in academia and the VET research community is: “What constitutes good research?” The concept of rigour is often referred to along with theoretical and methodological robustness when reference is made to making some form of evaluation or critique of research as process (act) and research as product (publication). Andrews and Halcomb (2009, p. xvi) define rigor as “The thoroughness, accuracy, confirmability and ethical soundness of all aspects of a study’s design”. This paper will discuss the potential utilisation of quality criteria for three sets of stakeholders in the VET research community: higher degree research students; early career and established researchers and; research funding bodies. This will be followed by a brief comparison of the criteria for evaluating research funding proposals from three VET relevant funding bodies: NSW Department of Education and Training (DET); the National Centre for Vocational Education Research (NCVER) and; the Australian Research Council (ARC). A brief overview of commonly agreed quality criteria of quantitative research and the multiple stances taken by qualitative researchers in terms of quality criteria will be presented before focusing on the quality criteria that has emerged from the mixed methods movement and corresponding procedural

checklists. The paper will conclude with some insights into the implications this has for the research training and capacity building of new VET researchers.

Use of quality criteria

Quality criteria and frameworks for research are useful for different stakeholders engaged in VET based research and for different reasons. For higher degree research students and doctoral candidates quality criteria can provide the following:

- Guidelines and standards for the design and conduct of research (process)
- Guidelines for critiquing research (process) and literature (product)
- Tool for reflexivity
- Guiding criteria for the planning and production of the research product (conference papers, journal articles and the research dissertation).

Early career and established researchers can utilise quality criteria for the following:

- Pedagogic tool for teaching research methodology
- Assisting in roles such as: reviewing conference papers, journal articles and research reports
- A guide to dissertation/thesis examination
- A self reflective tool for own research and research reporting
- Assisting in writing research grant applications and proposals
- Judging research proposals/applications.

Research funding bodies can use quality criteria to assist in determining the following:

- Writing of funding grant descriptions and selection criteria and the call for tenders for research funding
- Assessments of research proposals and research funding applications
- Evaluation of research reports and publications
- The use, practical value and relevance of research.

Some examples of how these criteria may vary from one funding body to another is now detailed. Two of these are national research funding programs and the third is state based. NSW was randomly chosen as the state based example. Other state based examples could have been included but this would have defeated the purpose of the limitations placed upon the paper length. The NSW Department of Education and Training (NSW DET) funds research into NSW government schools and TAFE NSW. The department states its position in terms of research as follows: “[NSW DET] strongly values educational research and is committed to the benefits which quality research can deliver to the development of its education policies and the quality of teaching and learning. We welcome research that is of high quality and will apply criteria in judging the merits of proposals to conduct research” (<https://www.det.nsw.edu.au/>). NSW DET has produced a document titled: *Criteria for Quality Research*, in which the department gives equal value to both quantitative and qualitative methods and has listed criteria for judging the quality of research under two main areas: *Methodological and theoretical robustness* and; *Value and impact*, of the research. The criteria under the banner of: *Methodological and theoretical robustness* includes 12 main dot

points whilst the *Value and impact* has three. In comparison, NCVET (2010, pp 14-15) criteria for judging National Vocational Education and Training Research Evaluation (NVETRE) funding proposals comprises a set of essential and desirable criteria, as depicted in Table 1. Due to limitations of paper length the descriptors for each of these criteria has not been included.

Table 1: NVETRE Funding Criteria

Essential Criteria	Desirable Criteria
1. Proposed research program 2. Research questions, methodology and timeframe 3. Research experience, expertise & related research 4. Project quality assurance and risk management 5. Value for money	1. Research team composition and skills 2. Value adding and dissemination 3. Data analysis skills for research programs proposing a large quantitative component

Source: NCVET (2010)

The Australian Research Council (ARC) is a statutory authority within the Australian Government's Innovation, Industry, Science and Research (IISR) portfolio. Its mission is: to deliver policy and programs that advance Australian research and innovation globally and benefit the community. The ARC utilises weighted selection criteria for assessing and ranking ARC Linkage Project research proposals and these are depicted in Table 2.

Table 2: Selection Criteria for ARC Linkage Project proposals commencing in 2011

Criteria	Description	Weighting
Investigators	a. Research opportunity and performance evidence. b. Capacity to undertake and manage the proposed research.	20%
Proposed project content	a. Significance and innovation (25%) b. Approach and Training (20%) c. National Benefit (10%)	55%
Nature of the alliance, commitment from Partner Organisation(s) and Budget	a. Is there evidence that each of the Partner Organisation(s) is genuinely committed to, and prepared to collaborate in, the research project? b. Will the proposed research encourage and develop strategic research alliances between the higher education organisation(s) and other organisation(s)? c. Value for money and budget justification.	25%

Source: ARC (2010)

This brief overview of funding body quality/selection criteria demonstrates the many different frameworks and weighting systems that exist for judging VET related research

funding applications. The paper will now provide an overview of the key quality criteria for quantitative and qualitative research.

Literature Review: Quality frameworks in quantitative and qualitative research

This section of the paper will trace the quality criteria developed for quantitative and qualitative research traditions before presenting the quality criteria emerging from the mixed methods movement.

Quality criteria in quantitative research

It would appear that a majority of the discussion on quality frameworks in quantitative research is implicit, rather than explicit and is often referred to in the products of research as part of the stages of the research process (e.g, sampling and measures). Most research methods textbooks will refer to the concepts of validity and reliability which are rooted in the positivist and quantitative traditions of “scientific method”. The commonly agreed to criteria for judging quantitative research is listed in Table 3.

Table 3: Quality criteria for judging quantitative research

Criteria	Description
Validity	The degree to which a research tool measures what it is supposed to measure
Reliability	The degree of consistency with which a research tool measures what it is supposed to measure
Replicability	The same interpretation will be drawn if the study is repeated by different researchers with different respondents following the same methods
Generalisability	The degree to which we can infer the findings from the research sample to the population

Source: Andrews and Halcomb (2009)

Quality criteria in qualitative research

Bryman, Becker and Sempik (2008) in a study on the use of quality criteria across quantitative, qualitative and mixed methods research in social policy research in the UK, noted that there is an absence of consensual agreement between qualitative researchers as to what criteria can be used to assess qualitative research. They stated, “...the rise of qualitative research over the last 25-30 years represents one of the reasons for the growing interest in research quality criteria because it is widely assumed that whereas quality criteria for quantitative research are well known and widely agreed, that is not the case for qualitative research” (2008, p. 262).

There seems to be three broad stances in terms of quality criteria for judging qualitative research: qualitative research should be judged according to the same criteria as quantitative research; qualitative research should be judged using its own criteria (Lincoln and Guba 1985) and; the appropriateness of any predetermined criteria for judging qualitative criteria is questioned (Rolfe, 2006; Sandelowski & Barroso, 2002). Some types of qualitative research have developed their own quality criteria. For example, in reference to grounded theory,

Charmaz (2006) proposes four quality criteria for judging grounded theory: credibility; originality; resonance and; usefulness. Neuman (2006) goes to great lengths to describe and distinguish between how quantitative and qualitative research addresses validity and reliability. Burns and Grove (2005) argue against applying traditional quantitative quality criteria to qualitative research:

Scientific discipline or rigor is valued because it is associated with the worth of research outcomes and studies are critiqued as a means of judging rigor. Qualitative research methods have been criticized for lack of rigor. However, these criticisms have occurred because of attempts to judge the rigor of qualitative studies using rules developed to judge quantitative studies. Rigor needs to be defined differently for qualitative research since the desired outcome is different (Burns & Grove, 2005, p. 55).

Generally speaking qualitative researchers tend to prefer the term trustworthiness as opposed to rigor. Andrews and Halcomb (2009, p. xvii) define trustworthiness as, “the degree of confidence that the researcher has that their qualitative data and findings are credible, transferable and dependable”. Trustworthiness was a term proposed by Lincoln and Guba (1985) and is often referred to as a ‘goodness of fit’ criteria which parallels the term rigor in quantitative research. Lincon and Guba (1985) devised a set of four criteria upon which to determine the trustworthiness of qualitative research: *credibility*; *transferability*; *dependability* and; *confirmability*. *Credibility* (in preference to internal validity) is one of the most important factors in establishing trustworthiness and is about determining how congruent the findings are with reality. *Transferability* (in preference to external validity/generalisability) requires the researcher to provide sufficient data and context to enable the audience to judge whether the findings can be applied to other situations and contexts. *Dependability* (in preference to reliability) refers to having sufficient details and documentation of the methods employed so that the study can be scrutinised and replicated. *Confirmability* (in preference to objectivity) refers to ensuring that the study’s findings are the result of the experiences of the informants rather than the preferences of the researcher(s) and can be achieved through an audit trail of the raw data, memos, notes, data reduction and analysis.

Bryman et. Al. (2008, p. 266) make the point that the Lincoln and Guba criteria are not “universally accepted as appropriate criteria for qualitative research ...however, the Lincoln and Guba criteria have the advantage of parsimony and they are frequently referred to in the literature”. Table 4 documents the ways in which qualitative researchers can ensure the four criteria for qualitative research outlined by Lincoln and Guba (1985), can be met.

Table 4: Quality Criteria for Qualitative Research

Credibility	Transferability	Dependability	Confirmability
Prolonged engagement of site	Identical elements	Multiple data collection methods-triangulation	Use triangulation
Persistent observation	Theoretical/purposive sampling		Practice reflexivity
	Thick description		Confirmability audit through member

Peer briefing Triangulation			checking
Member checks			

Source: Guba and Lincoln (1985)

Sandelowski and Barroso (2002) and Rolfe (2006) question the appropriateness of any predetermined criteria for judging qualitative research as there is no unified qualitative research paradigm. “We need to either acknowledge that the commonly perceived quantitative-qualitative dichotomy is in fact a continuum which requires a continuum of quality criteria, or to recognize that each study is individual and unique, and that the task of producing frameworks and predetermined criteria for assessing the quality of research studies is futile’ (Rolfe, 2006, p. 304).

Quality issues in mixed methods research

Teddle and Tashakkori (2010, p. 5) define mixed methods research (MMR) as:

The broad inquiry logic that guides the selection of specific methods and that is informed by conceptual positions common to mixed methods practitioners (e.g., the rejection of “either-or” choices at all levels of the research process). For us, this definition of methodology distinguishes the MMR approach to conducting research from that practiced in either the QUAN or QUAL approach.

Cameron (2010) refers to added value mixed methods research provides through a more comprehensive and richer understanding of the research problem being investigated. This is achieved through exploration of the research problem through the different lenses and perspectives offered by mixing qualitative and quantitative research techniques.

Mixed methods research designs are gaining in usage and influence and this has accelerated over the last 10 years. Creswell and Plano Clark (2007) have mapped a brief history of mixed methods research and its evolution to date and have posited four, often overlapping, time periods in the evolution of mixed methods. These four time periods are the: Formative period (1950s - 1980s); Paradigm debate period (1970s - late 1990s); Procedural development period (late 1980s – 2000) and; the Advocacy as a separate design period (2000+).

The continued development and evolution of mixed methods has seen an increasing interest and attention to the issue of quality in mixed methods studies. Sale and Brazil (2004) sought to identify criteria to critically appraise the quality of mixed methods studies as documented in the health sciences. The overall goal of the authors being to: “promote standards for guiding and assessing the methodological quality of [mixed methods] studies” (Sale & Brazil, 2004, p. 361). The quality criteria identified for mixed methods studies includes:

- *Truth value (Credibility vs. Internal validity)*
- *Applicability (Transferability/Fittingness vs. External Validity/Generalizability)*
- *Consistency (Dependability vs. Reliability)*

- *Neutrality (Confirmability vs. Objectivity)*

(Sale & Brazil, 2004, p. 358-360).

The Sale and Brazil (2004) criteria appears to be a result of an exercise in combining or aligning established quality criteria for single method or monomethod quantitative and qualitative research. This criteria could be said to be a result of what Cooksey (2008) refers to as the distortion or recasting of quantitative quality criteria:

*In the social and behavioural sciences, there is a continuing debate about the criteria one should use to judge the research quality, impact and contribution. The crux of this debate has centred on the different meanings held for the criteria of ‘validity’ and ‘generalisability’ within various research traditions or paradigms ... Meanings of ‘internal validity’ and ‘external validity’, two of the dominant criteria in the positivistic or ‘normative’ paradigm, have been **borrowed, distorted and recast** to fit different expectations and paradigm assumptions (Cooksey, 2008, p.4).*

Table 5 aligns the commonly agreed to quantitative quality criteria with the often quoted qualitative quality criteria of Lincoln and Guba (1985) and the Sale and Brazil (2004) quality criteria for mixed methods research.

Table 5: Alignment of quality criteria across quantitative, qualitative and mixed methods research

QUANT Criteria	QUAL Criteria	MMR Criteria-Sale & Brazil (2004)
Internal validity	Credibility	Truth value
External validity/ Generalisability	Transferability/Fittingness	Applicability
Reliability	Dependability	Consistency
Objectivity	Confirmability	Neutrality

Since the publication of the Sale and Brazil (2004) criteria other members of the MMR community have developed more specific mixed methods quality criteria. Bryman, Becker and Sempik (2008, p. 275) explored quality criteria for quantitative, qualitative and mixed methods research in social policy research from within the UK and devised the following quality criteria for mixed methods research:

- *mixed method research should be relevant to the research question*
- *the procedures employed in doing mixed method research should be transparent*
- *mixed methods findings need to be integrated and not left as distinct quantitative and qualitative findings*
- *a rationale for using a mixed methods approach should be outlined.*

O’Cathain, Murphy and Nicholl (2008) have developed a set of essential components for reporting MMR. It is also useful as a set of quality criteria questions for reporting mixed

methods studies in health services research under the banner of: Good Reporting of a Mixed Methods Study (GRAMMS). This six-item guidance framework includes prompts about the “success of the study, the mixed methods design, the individual qualitative and quantitative components, the integration between methods and the inferences drawn from completed studies” (O’Cathain et. al. 2008, p. 92). The GRAMMS includes the following set of quality prompts/guidelines:

1. *Describe the justification for using a mixed methods approach to the research question*
2. *Describe the design in terms of the purpose, priority and sequence of methods*
3. *Describe each method in terms of sampling, data collection and analysis*
4. *Describe where integration has occurred, how it has occurred and who has participated in it*
5. *Describe any limitation of one method associated with the presence of the other method*
6. *Describe any insights gained from mixing or integrating methods*

The GRAMMS framework is very useful as a set of procedural guidelines for: the design and conduct of mixed methods research; as a mechanism for researcher self reflexivity; a framework to ensure a high level of methodological congruence; and a framework upon which to judge both the process (act) and product (publication) of a mixed methods study.

Procedural checklists for mixed methods research

Along with the emergence of quality criteria for mixed methods has been the emergence of procedural checklists for the process (act) of mixed methods research. Table 6 aligns two recently developed mixed methods procedural checklists by Collins and O’Cathain (2009): Ten points for designing a mixed methods study, and Andrews and Halcomb (2009): Planning a mixed methods study (research design elements).

Table 6: Procedural checklists for mixed methods research

Collins and O’Cathain	Andrews and Halcomb
Research Formulation Phase: <ol style="list-style-type: none"> 1. Importance of a definition 2. Importance of a mental model for mixing 3. Utilizing typologies of designs 4. Selecting the reason, rationale, and purpose for mixing 5. Determining the research question 	Planning a mixed methods study: Purpose and relevance Theoretical orientation Research questions
Research Planning Phase: <ol style="list-style-type: none"> 6. Selecting a mixed methods design 7. Determining the sampling design 	Sampling strategy Methods of investigation

<p>Research Implementation Phase:</p> <p>8. Collecting data</p> <p>9. Conducting data analysis</p> <p>10. Legitimizing inferences and formulating generalizations</p>	<p>Methods of analysis</p>
--	----------------------------

Sources: Collins and O’Cathain (2009, p.2-6) and Andrews and Halcomb (2009, p. 35)

The Andrews and Halcomb checklist could be said to be a more universal checklist for research while the Collins and O’Cathain is more specific to mixed methods research. Nonetheless, these checklists are very useful guiding tools for those wishing to utilise mixed methods and for the teaching of research methods. Some journals publishing mixed methods research have incorporated these into their respective review processes.

Conclusions

A key message from this paper aims to convey is that there are several approaches to addressing the quality of research and quality criteria can range from commonly agreed to sets of criteria for mono-method quantitative positivist traditions, to a much more contested terrain within qualitative research. The manner in which research funding bodies assess quality also ranges and has been noted. The paper presented the three main stances taken in qualitative research and hinted at quality criteria that has been developed for specific qualitative methodologies (e.g, for grounded theory). Mixed methods is a relatively recent and emerging movement and yet members of the mixed methods research community have begun to develop quality criteria and frameworks to enable the evaluation of a mixed methods study in terms of process (act) and product (publication). Those engaged in the teaching of research methods and/or of building research capacity need to become familiar with the emerging mixed methods movement and its associated theoretical underpinnings, designs, nomenclature and the quality frameworks and criteria that is being developed within. As noted in the research conducted by Cameron (2010) in her methodological scan of VET based research, the most dominant approaches were qualitative (45%) and mixed methods (15%). This is evidence in itself of the need to embed quality frameworks and criteria into research training and capacity building.

The main insights to be gained from this analysis are: VET researchers need to be aware of this array of quality criteria and they need to acknowledge this when choosing and arguing for a set of criteria that they apply to their own research and: that those in charge with building research capacity in the VET research community be cognisant of this array of criteria and the need to impart this knowledge to novice VET researchers.

References

- Andrew, S. and Halcomb, E. (2009). *Mixed Methods Research for Nursing and Health Sciences*, Wiley-Blackwell, London.
- ARC (2010). Linkage Projects Funding Rules for funding commencing in 2011, Australian Government, Canberra.
- Bryman, A. Becker, S, and Sempik, J. (2008). Quality criteria for quantitative, qualitative and mixed methods research: A view from social policy. *International Journal Social research methodology*, 11(4), October, 261-276.
- Burns, N. and Grove, S. (2005). *The Practice of Nursing Research Conduct Critique and Utilization*, 5th Edition, Elsevier Saunders, Missouri.
- Cameron, R. (2010). Mixed Methods in VET Research: Usage and quality. *International Journal of Training Research*, 8(1), June, 25-39.
- Collins, K. and O’Cathain, A. (2009). Ten points about mixed methods research to be considered by the novice researcher. *International Journal of Multiple Research Approaches*, 3(1), 2-7.
- Cooksey, R. (2008). Paradigm-independent meta-criteria for social and behavioural research. *Proceedings of the 2nd Annual postgraduate research Conference*, University of New England, Armidale, NSW, 4-17.
- Creswell, J.W. and Plano Clark, V.L. (2007). *Designing and Conducting Mixed Methods Research*, Sage, Thousand Oaks, CA.
- Golafshani, N. (2003). Undersnading reliability and validity in qualitative research. *The Qualitative Report*, 8(4), December, 597-607.
- Lincoln, Y. S. & Guba, E.G. (1985). *Naturalistic inquiry*. Beverly Hills, CA: Sage Publications, Inc.
- Mårtensson, A. and Mårtensson, P. (2007). Extending Rigor and Relevance: Towards Credible, Contributory and Communicable Research. In *Proceedings of the Fifteenth European Conference on Information Systems (Österle H, Schelp J, Winter R eds.)*, 1325-1333, University of St. Gallen, St. Gallen.
- NCVER. (2010). *National Vocational Education and Training Research and Evaluation Program Instructions for applicants Research centres or consortia undertaking a program of research August 2010*, NCVER, Adelaide.
- Neuman, W.L. (2006). *Social research methods qualitative and quantitative Approaches*, 6th Edition, Pearson, Boston.
- NSW DET. (n.d). *Criteria for Quality Research* , accessed 20 January, 2011, <https://www.det.nsw.edu.au/about-us/statistics-and-research/research-partnerships/>

O’Cathain, A, Murphy, E. and Nicholl, J. (2008). The quality of mixed methods studies in health services research, *Journal of Health services Research and Policy*, 13(2), 92-98.

Rolfe, G. (2006). Validity, trustworthiness and rigour: quality and the idea of qualitative research. *Methodological Issues in Nursing Research*, 304-310.

Sale, J. and Brazil, KA. (2004). A strategy to identify critical appraisal criteria for primary mixed-method studies. *Quality & Quantity*, 38(4), 351-365.

Sandelowski, M. and Barroso, J. (2002). Reading qualitative studies. *International Journal of Qualitative Methods*, 1(1), Article 5.

Teddlie, C. and Tashakkori, A. (Eds.) (2003), *Handbook of Mixed Methods in Social & Behavioral Research*, Sage, Thousand Oakes, CA.

Teddlie, C. and Tashakkori, A. (2010). Overview of contemporary issues in mixed methods research, in Tashakkori A and Teddlie C (Eds.) (2010) *Handbook of Mixed Methods in Social & Behavioral Research*, 2nd Edn, Sage, California, 1-44.