

Integrating Data Analyses in Mixed Methods Research

Epistemological Concerns in Integration

Although the epistemological arguments of the “paradigm wars” sharpened our thinking about issues related to mixed methodology, their lingering legacy has been to slow the progress of integration of methods. All mixed methods studies, by definition, attempt some form of integration, but the paradigm debates have made many researchers nervous about integrating the various strands of their research before they reach the point of drawing conclusions. There has, indeed, been a degree of illogic in the way some researchers have dealt with the issue of integration of data sources and analyses, where it has been considered epistemologically unacceptable to combine these, and yet desirable to corroborate or integrate conclusions drawn from data generated through diverse perspectives. In any case, as noted many years ago by Miles and Huberman (1994), these arguments are largely unproductive. From a pragmatic perspective, the primary issue is to determine what data and analyses are needed to meet the goals of the research and answer the questions at hand. Alternatively, a realist perspective encourages one to seek both process- and variable-oriented data to both detect regularities and understand the mechanisms by which they occur (Maxwell, 2008).

The Continuum of Qualitative and Quantitative

Recent writing has tended to present conflicting rhetoric, advice, and practice on the issue of integration. The rhetoric that it is desirable to combine qualitative and quantitative elements at all stages of a mixed methods project is often matched by advice that one should conduct each of these elements separately prior to any combination of elements. In describing their approach to concept analysis as an integrative mixed method, Kane and Trochim (2007) suggest that

Rather than simply combining qualitative and quantitative methods, [concept analysis] challenges the distinction between these two and suggests that they may indeed be more deeply intertwined. In some sense it is a method that supports the notion that qualitative information can be well represented quantitatively and that quantitative information rests upon qualitative judgment. (p. 177, reviewed in *JMMR* by Dixon, 2009)

If *quantitative* and *qualitative* are poles on a multidimensional continuum, as is now widely recognized, then emphasis on the separate definition of these components (and inclusion of both) in a mixed methods study can create unhelpful boundary issues and potentially impede analytic integration.

Defining Integration

Drawing largely on Bryman's (2007) work, Woolley (2009) defined integration as follows:

Quantitative and qualitative components can be considered "integrated" to the extent that these components are explicitly related to each other within a single study and in such a way as to be mutually illuminating, thereby producing findings that are greater than the sum of the parts. (p. 7)

Yin (2006) illustrated the value of integrating though all steps in a mixed methods study—the research questions being addressed, the definition of the units of analyses, the structure of the samples being studied, the instrumentation and data collected, and the analytic strategies. Integration requires interdependence in reaching a common theoretical or research goal, so that complementary or sequenced components in a study, not necessarily involving integration, may consequently not be considered to be mixed methods (Moran-Ellis et al., 2006; Yin, 2006).

Limitations and Benefits of Integration

In the short history of the *JMMR*, early articles noted difficulties mixed methods researchers have faced in integrating the different strands of their work (e.g., Bryman, 2007; O'Cathain, Murphy, & Nicholl, 2007). My (as yet untested) impression is that the extent to which authors are employing integrated analysis strategies is increasing, and these are now more evident in *JMMR* than in mixed methods articles published in some disciplinary journals. The benefit that can come from integrating strategies through data collection, analysis, and interpretation is evidenced, for example, in Green, Statham, and Solomou's (2008) working paper reporting methodological issues in rating satisfaction with health services following diagnosis of fetal abnormality. In contrast, in studies where thematic and scaled or other numeric data are each available and could have been matched for each participant in a study, to not do so results in lost potential and possibly in misleading conclusions (examples are provided in Bazeley, 2009).

Strategies for Integration

Integration in mixed methods can take multiple forms. Where integration is intentional, the mix of methods might occur through iteration, blending, nesting, or embedding or through serving a common substantive (holistic) or ideological (transformative) purpose (Greene, 2007). All mixed methods research involves, as a minimum, integrating conclusions that are drawn from various strands in the research. Meshing of multiple data sources used to reach those conclusions is commonly employed, but blending data or meshing analyses has been much less common and "few authors focus on the process through which the combined value is achieved" (Jones & Bugge, 2006, p. 613; Woolley,

2009). Nevertheless, one of the more constant comments in articles where integration during analyses does occur is that this was the key to unfolding the complex relationships in the topic of study. Additionally, such integration encourages serendipity, stimulates theoretical imagination, and initiates new ideas (Brewer & Hunter, 2006; Greene, 2007).

Strategies for integrating data specifically through analysis, rather than as a conclusion to analysis, include the following (Bazeley, 2009; Caracelli & Greene, 1993; Creswell & Plano Clark, 2007; Greene, 2007; Miles & Huberman, 1994; Teddlie & Tashakkori, 2009):

- Intensive case analysis
- Employment of the results from analysis of one form of data in approaching the analysis of another form of data (referred to by some as typology development)
- Synthesis of data generated from a variety of sources, for further joint interpretation
- Comparison of coded or thematic qualitative data across groups defined by categorical or scaled variables (matched, where possible, on an individual basis)
- Pattern analysis using matrices
- Conversion of qualitative to quantitative coding to allow for descriptive, inferential, or exploratory statistical analysis
- Conversion of quantitative data into narrative form, most often for profiling
- Creation of blended variables to facilitate further analysis
- Extreme and negative case analysis
- Inherently mixed data analysis, where a single source gives rise to both qualitative and quantitative information, such as in some forms of social network analysis
- Often flexible, iterative analyses involving multiple, sequenced phases where the conduct of each phase arises out of or draws on the analysis of the preceding phase

The use of manual methods for analyzing qualitative (textual) data is often a limiting factor in effectively integrating those with categorical or other statistical data. For example, to integratively combine and compare scaled and interview data on social support in widowhood, Scott et al. (2007) examined a small purposively selected subsample of just four participants (from a total of 28) on a case-by-case basis. Other authors describe an exhaustive process of reading, rereading, and checking transcribed text to arrive at a series of themes and subthemes, often then used simply to elaborate items already gathered through a questionnaire and, much less often, sorted to compare the views of different subgroups.

Software Contributions

Mixed methods researchers wanting to integrate analyses can find assistance from a range of software packages, and although using a computer for analysis does not guarantee integration of sources or analyses—any more than it guarantees the quality of the analysis—it can certainly help. Excel is a widely available and most useful tool for mixed methods tasks involving synthesis of varied forms of data from a range of sources (Niglas, 2007), and at least two software programs designed primarily for qualitative analysis (NVivo, <http://www.qsrinternational.com>; MAXQDA, <http://www.maxqda.com>), as well

as QDA Miner (<http://www.provalisresearch.com>), support combination of quantitative variable data within the qualitative database for matrix-based analyses of coded text and conversion of qualitative coding to variable data (Bazeley, 2006).

Computer-based coding of qualitative data is typically more complex and more detailed than manual thematic sorting and so often leads to greater insight in itself, but more particularly, use of software allows for instructive within-case, cross-case, and comparative analyses using coded data, with just a few clicks. Once data are coded, it can become a simple matter, for example, to compare how cases with different characteristics discuss an issue, to review changes in individual experience over time on a case-by-case or grouped-cases basis, to consider the impact of changing settings on the evolution of an experience, and to have text, tabular, and charted output from these analyses (Bazeley, 2007). In some circumstances, it may be appropriate to examine the interrelationship of exported codes using, for example, multidimensional scaling, to reveal further patterns or underlying dimensions in the data. In any of these strategies, the underlying text is always available for perusal and verification.

Newer versions of these qualitative software products have eased the process for combining or transforming coding information, and so they are contributing indirectly to the development of innovative new strategies for analysis, sometimes referred to as case-oriented quantification (Kuckartz, 1995). Taking a quite different approach, but moving toward the same goal, Ragin (2000) has sought to bridge the divide between small-*n* and large-*n* studies through his work in developing quantitative comparative analysis. Quantitative comparative analysis relies on good case-level knowledge, which is then supported by the application of Boolean algebra to “truth tables” built from dichotomously categorized qualitative or variable data. Using this technique, one can build a minimum set of interrelated prime implicants of general significance for a given outcome from a moderate-*n* database, and do so with greater sensitivity and reliability than through using more traditional qualitative or quantitative techniques alone (Ragin, Shulman, Weinberg, & Gran, 2003).

Moving Forward

Greene (2007) noted that the interaction challenge within various elements of integrated designs is undertheorized and understudied and yet constitutes the heart of integrative mixed methods inquiry. One of the ways in which the maturing of mixed methods as a third methodological movement will be evidenced is in moving on from a literature dominated by foundations and design typologies to work in which there are advances in conceptualization and breakthroughs derived from analytic techniques that support integration. Ever increasing software capacity and alternative technologies will contribute significantly to this development. More important, however, is the human capacity to ask interesting questions and challenge conventions—and then there is the simple need for “ordinary” researchers to be prepared to fully use the opportunities for integration that their data present to them.

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