Crafting Mixed Research: Interconnectivity of Design Decisions, Choice of Method, and Quality of Integration

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ABSTRACT

The goal of this article is to present an integrative approach to crafting mixed research (MR) studies that highlights the interconnectivity of design decisions, choice of method, and the quality of integration throughout the study. The first purpose is to discuss selective characteristics defining MR as a distinct methodology and include in this discussion the concept of integration. The second purpose is to detail selective examples of published design frameworks, namely, research, sampling, and validity designs, to illustrate their interconnectivity as it relates to integration. The third purpose is to present selective characteristics of a case study method to illustrate its applicability to support a MR design and, subsequently, integration. To provide empirical evidence of the applicability of the integrative approach toward impacting the quality of integration, I conducted a 4-phase analysis of a published study. I conclude by summarizing the points of integration noted in the analysis and commenting on the degree of transparency as it relates to design, method, and integration as presented in the write-up of the study.

KEYWORDS

Case study; design; integration; sampling; validity

The goal of this article is to present an integrative approach to crafting mixed research (MR) studies that highlights the interconnectivity of design decisions, choice of method, and the quality of integration throughout the study. Defining characteristics of MR are its distinction as a methodology that differs from a quantitative or qualitative research methodology and the importance of points of integration within the study. The first purpose is to discuss selective characteristics defining MR as a distinct methodology and include in this discussion the concept of integration. Design encompasses a set of interrelated decisions regarding the research, sampling, and validity designs of a study. The second purpose is to detail selective examples of published design frameworks, namely, research, sampling, and validity designs of a study. The second purpose is to detail selective examples of published design frameworks, namely, research, sampling, and validity designs of a study. The third purpose is to examine how choice of method, namely, a case study method, impacts design decisions and, subsequently, integration. My selection of the case study method was based on the method's versatility in terms of exploring, explaining, or describing phenomena, and developing theory or testing theory (Yin, 2014). Also, as noted by Yin (2014), the case study method is applicable for attaining quantitative and qualitative forms of evidence. Subsequently, it is a method that would support a MR design. To provide empirical evidence of the applicability of the integrative approach toward impacting the quality of integration, I conducted a four-phase analysis of a published study. I conclude by summarizing the points of integration noted in the analysis and commenting on the degree of transparency as it relates to design, method, and integration as presented in the write-up of the study. The dimensions of the integrative approach are presented in Figure 1.
Selective Characteristics Defining MR and Integration

In this section, selective characteristics defining MR and integration are discussed to set the stage for interpreting how researchers are interpreting these characteristics when making design decisions. Teddlie and Tashakkori (2009) conceptualize a mixed methodology as “… a broad approach to scientific inquiry specifying how research questions should be asked and answered … [that reflects the investigator’s] ‘worldview considerations, general preferences for designs, sampling logic, data collection and analytical strategies …’[and encompasses] ‘… guidelines for making inferences, and the criteria for assessing and improving quality’” (p. 21). Underpinning this conceptualization of MR is “methodological eclecticism,” whereby the researcher addresses the purpose and research question by “selecting and then synergistically integrating the most appropriate techniques from a myriad of QUAL, QUAN, and mixed methods” (Teddlie & Tashakkori, 2011, p. 286, italics in the original). Methodological eclecticism is one of the four “‘core’ characteristics” defining contemporary MR (Teddlie & Tashakkori, 2012, p. 775). This characteristic embodies the diverse array of research techniques, and rejects “the incompatibility of methods thesis” that aligns method with a particular paradigm and epistemology, thereby making the mixing of methods problematic (Teddlie & Tashakkori, 2012, p. 777, italics in the original). The second characteristic, paradigm pluralism, drives the researcher’s methodological decisions, and it guides a researcher’s interpretation of what constitutes appropriate data and the means to collect and to analyze data (Teddlie & Tashakkori, 2012). The third characteristic reflects the view that the MR process is “an iterative, cyclical approach to research,” and in that process a researcher applies deductive and inductive logic (Teddlie & Tashakkori, 2012, p. 781, italics in the original). The fourth characteristic is that MR designs represent “signature processes” involving distinct designs and analytical processes (Teddlie & Tashakkori, 2012, p. 782). These characteristics distinguish MR as a methodology, and the characteristic of signature processes, in particular, underscores that MR design is distinct from quantitative and qualitative designs. As noted by Greene (2015), the “possibility of mixing at multiple levels,” such as paradigms, methodologies, disciplines, is another distinct characteristic of MR, and enacting this possibility into practice allows multiple opportunities to “meaningfully engage with difference” (p. 607, italics in the original). When designing MR, researchers develop strands—qualitative and quantitative—that involve a series of inter-related decisions (Teddlie & Tashakkori, 2009). According to Teddlie and Tashakkori (2009), a strand encapsulates three iterative stages: conceptualization, experiential comprising methodological and analytical decisions, and inferential. Across all stages, the researcher monitors the degree that the quality criteria designed for that particular research question and that specific study validate decisions and lead the researcher to make credible conclusions and appropriate generalizations (Collins, 2015).
The integration of quantitative and qualitative approaches within a single study, however, predates the contemporary view of MR as a “third paradigm” (Maxwell, 2016, p. 13). The origin of combining approaches was for the purpose of triangulation (Campbell & Fiske, 1959, as cited in Maxwell, Chmiel, & Rogers, 2015). Jick (1979) summarized interpretations of triangulation into one of the following categories, with the purpose being enclosed in parentheses: scaling (“quantification of qualitative measures”), within-method, (“internal consistency”), between methods (“convergent validation”), and “holistic or contextual” (detecting “new or deeper dimensions”) (pp. 603-604). The intent underlying contextual triangulation is to combine approaches for the purpose of “uncovering paradox and contradiction” within the results, and to “initiate interpretations and conclusions” seeking the “provocative” (Rossman & Wilson, 1985, p. 633). Although triangulation is synonymous with mixing, more recently, the term has been criticized as being problematic in terms of it having multiple meanings (Archibald, 2016). Given the multiple interpretations of triangulation, Bazeley and Kemp (2012) recommend that researchers explicate their intention when specifying triangulation as a purpose for combining approaches. Teddlie and Tashakkori (2009) expanded the definition of triangulation in their textbook; however, they question the veracity of the term triangulation, and the degree that it is “still useful” (p. 33).

More recently, mixing has been interpreted as various forms of integration. Fetters and Molina-Azorin (2017) make the point that the “language of integration” in contrast to the interpretations of triangulation, reflects the actual work implemented by researchers as they conduct MR studies (p. 8). Their point supports Fetters and Freshwater’s (2015) metaphoric interpretation of integration as it relates to MR, as “1 + 1 = 3,” which symbolizes integration as “qualitative + quantitative = more than the individual components” (p. 116). They observe that opportunity abounds for pushing the integration envelope at multiple levels through theory, conceptual models, design, methods, analysis, interpretation, visualization, presentation, publication, and teams. The 1 + 1 = 3 integration formula also gives permission to question the assumptions of qualitative and quantitative disciplinary borders and blinders, to test the waters, and to create and discover new ways of thinking and producing mixed methods results. (p. 116)

Bryman (2007) notes that successful integration is characterized by the degree that “researchers genuinely integrate their findings … in such a way that the quantitative and qualitative components are mutually illuminating” (p. 8). Integration also has been perceived as a continuum that occurs at multiple junctures within a study (Creswell & Tashakkori, 2007; Yin, 2006). Successful integration is predicated on the degree that the researcher has made explicit the interrelationship of the rationale, purpose, and analysis (Bryman, 2006; Maxwell & Loomis, 2003). However, the text of published MR studies outlining decisions about design and method “often are potentially misleading with respect to the actual integration that occurred during the research,” a point made by Maxwell et al. (2015, p. 225). Subsequently, transparency of decisions also is a critical evaluative dimension of integration (O’Cathain, 2010). O’Cathain (2010) includes transparency as a subcomponent in five of the eight quality criteria (noted in parentheses) specific to MR. These subcomponents comprise: rationale and planning transparency (planning quality), design transparency (design quality), data transparency (data quality), interpretive transparency (interpretive rigor), and reporting transparency (reporting quality).

**Selective Examples of Design Frameworks**

In this section, selective examples of design frameworks are outlined to illustrate their interconnectivity as it relates to integration. A design framework is structured to provide a shared interpretation and a lexicon about design, thereby facilitating optimally communication among researchers and between researchers and research consumers (Collins & O’Cathain, 2009; Teddlie & Tashakkori, 2009). Paradoxically, however, a framework might constrain researchers’ choices if the characteristics of a particular study do not fit the typology’s design parameters (Guest, 2013; Maxwell et al., 2015; Maxwell & Loomis, 2003). Subsequently, the premise underpinning the integrative approach is that frameworks can be used to strengthen the interconnectivity of decisions regarding design (research, sampling, and validity) and choice of method, thereby facilitating successful integration—assuming that the design parameters in the selected framework address the characteristics of the study. In this section, designs, namely research, sampling, and validity designs, are discussed in the context of a selective sample of published design frameworks.

**Research Design**

Design typologies in MR include detailing the purpose for integrating (e.g., explanatory, exploratory, substance, or values), the role of methods (i.e., to drive the primary design—qualitatively or quantitatively driven, or as a...
follow-up to the primary phase), the relationship between strands (i.e., concurrent or sequential), the relationship between methods and points of integration within the design (i.e., fully mixed or partially mixed), weight or emphasis placed on each approach in terms of forming conclusions (i.e., approximately equal weight on results of both approaches or, conversely, placing more weight on one set of results generated by one approach when forming conclusions), and the number of strands within the study. Examples of typologies matching a selective composite of these dimensions of design are Creswell and Plano Clark (2011), Greene (2007), Leech and Onwuegbuzie (2009), Morgan (2014), and Teddlie and Tashakkori (2009). Another approach is to apply design guidelines to the decision process. Guidelines are presented in the form of specific types of designs: fixed or emergent (Creswell & Plano Clark, 2011; Morse & Niehaus, 2009). A fixed design is conceptualized prior to data collection and analysis. In an emergent design, the initial design is complemented by a design adaptation. This design adaptation reflects researchers’ perceptions that more data are required to interpret the initial findings and/or the situational context of the study requires an adaption of the initial design. Convergent parallel design involves implementing the strands independent of each other, and integration occurs at the interpretation stage (Creswell & Plano Clark, 2011). Typically, interpretation involves the researcher placing approximately equal weight on results generated from each strand, and the goal is to compare findings or to merge findings leading to an integrated and more complete set of conclusions. Explanatory sequential design involves collecting and analyzing qualitative data in the first phase of the study (Creswell & Plano Clark, 2011). Analysis of the qualitative data informs the following phase involving the collection of quantitative data. Weight is placed on the results of the qualitative data at the interpretation stage. Explanatory sequential design involves collecting and analyzing quantitative data in the first phase of the study (Creswell & Plano Clark, 2011). Analysis of the quantitative data informs the follow-up phase involving the collection of qualitative data. Weight is placed on the results of the qualitative data at the interpretation stage. Problematic, however, is the expectation, on the part of the researcher, that with the collection of one type of data, as in the case of collecting qualitative data first, the design, subsequently, will be exploratory as the study evolves and conclusions are drawn. Similarly problematic is the researcher’s expectation that with the collection of quantitative data first, the design, subsequently, will be explanatory as the study evolves and conclusions are drawn. At the initial stage of design, it is difficult to ascertain whether these expectations will play out as the study evolves. And, as noted by Guest (2013), a design’s purpose could be simultaneously exploratory and explanatory, depending on the complexity of the research question.

Greene (2007) proposes a typology that comprises two types of designs: component and integrated MR designs. The first variation of a component design is convergence. Convergent component designs incorporate two or more methods for the purpose of comparing results assessing the same phenomenon of interest. There is independence between the methods, and weight is placed approximately equally on findings generated by implementing each method. The second variation of a component design is extension. An extension component design allows the researcher to assess different phenomena, and it expands the choice of methods to accommodate the multiplicity of phenomena assessed. Below are examples of integrated designs, and embedded in parentheses are the components of the typology. An integrated design allows (a) the researcher to integrate different methods, such that findings generated by one method informs development of another method (iteration form); (b) the implementation of different methods to investigate different aspects of a single phenomenon, with the integration occurring during data analysis (blending form); (c) the implementation of a secondary method, which “adheres to key parameters of the primary method” (Greene, 2007, p. 127, italics in the original) and the integration occurs during data analysis (embedding or nesting form); and (d) the integration of methods to inform, and the integration is aligned to “substantive or ideological framework” (substance or values form) (Greene, 2007, p. 128).

Teddlie and Tashakkori (2009) have identified five families of designs. Their rationale for calling these designs “families” is based on their contention “that there could be numerous permutations of each design based on other design characteristics” (Teddlie & Tashakkori, 2009, p. 151, italics in the original). Parallel design occurs when the researcher implements one or more qualitative and quantitative strands and maintains independence between the strands, and integration occurs at the conclusion stage of the study. The intent is to interpret the results to respond to “... related aspects of the same questions” (Teddlie & Tashakkori, 2009, p.151). A sequential design involves implementing one strand, either qualitative or quantitative in Phase 1, analyzing the data collected, and using the results to inform design decisions in the subsequent strand, which involve potentially the formulation of research questions and type of data collected and analyzed. Subsequently, there is dependent relationship between the strands and another level of integration in the design. Conversion designs involve collecting one type of data, and the analysis of data comprises the application of both qualitative and quantitative techniques. The researcher’s intent is to interpret the results to respond to “related aspects of the same questions,” and to add another level of integration (Teddlie & Tashakkori, 2009, p. 151). The two remaining families
are multi-level “mixing occurs across multiple levels of analysis” and fully integrated designs, whereby “mixing occurs in an interactive manner at all stages of the study” (Teddlie & Tashakkori, 2009, p. 151). Guest (2013) proposes another approach, whereby the “point of interface between two data sets” occurring at any stage within the study is the focus of the design (p. 146, italics in the original). Guest (2013) also narrows the dimensions of existing typologies into two dimensions: relationship between data sets (i.e., timing) and purpose of integration. According to Guest (2013), timing provides useful information in terms of explicating the dependent (sequential) and independent (concurrent) relationship between data sets, and the purpose conveys the reason for integration.

Irwin (2008) points out the importance of considering other types of evidence that she refers to as macro to micro social processes as part of the process of analyzing and interpreting data. Irwin (2008) notes that “researching macro and micro [levels of a social phenomenon] is not just about ‘linking data’; it is an issue of how we conceptualize the phenomena we are investigating” (p. 415). Irwin (2008) supports this statement by arguing that to understand an individual’s values and subjective beliefs, we need knowledge of him or her as a person, knowledge of his or her proximate circumstances and experiences, and knowledge of the wider social structural contexts in which he or she is positioned. (p. 415)

Aligned to articulating the point of context within a design, Maxwell (2013) and Maxwell and Loomis (2003) recommend an interactive or systemic design model. Central to their model is the research question, and the bi-directional relationships among the following components: goals, questions, purposes, conceptual framework, methods, and validity, and the distinctive ways that each component is interpreted per approach. Maxwell and Loomis (2003) also identify contextual factors such as the researcher’s intrinsic characteristics (e.g., experiences, goals, skills) and theoretical framework detailing existing theories of interest, research setting, and funding goals. This approach reflects a dynamic view of design because it can accommodate the researcher’s design modifications that might occur based on the reality of conducting research in real-world contexts, and allows the researcher the flexibility to address complex designs that do not do not fit an existing typology’s design parameters.

As an illustration of how context can be mapped to design, Onwuegbuzie, Collins, and Frels (2013) mapped Bronfenbrenner’s (1979) ecological systems model onto the qualitative, quantitative, and MR designs. Specifically, Onwuegbuzie et al. (2013) coined the levels of micro-research design (i.e., Level 1 microsystem: context is the immediate environment of the individual [e.g., home]), meso-research design (i.e., Level 2 mesosystem: context represents other environments in which the individual spends time [e.g., classroom]), exo-research design (i.e., Level 3 exosystem: context represents a system where the individual might be influenced but of which she/he is not directly a member [e.g., relationships with teachers]), and macro-research design (i.e., Level 4 macrosystem: context represents the larger cultural world, which influences indirectly the individual [e.g., community]).

Another approach is to develop a design that builds on the combination of typological and systemic approaches, which Hall and Howard (2008) refer to as a synergistic approach. In their view, a synergistic approach comprises four core principles, which serve as standards supporting the integration of qualitative and quantitative strands, and includes a conceptual framework designed to illustrate the dimensions that reflect contextual and practical facets of conducting research. The core principles serve as the catalyst for integration of the two approaches, thereby becoming a synergistic process for designing MR. In their model, the core principles are “the concept of synergy, the position of equal value, the ideology of difference, and the relationship between the researcher(s) and the study design” (Hall & Howard, 2008, p. 250). They identify the following dimensions of their conceptual framework: epistemology in terms of defining the researcher’s philosophical stance, applying theory as an interpretive lens, planning and implementing methodology as the design framework, implementing methods as procedural tools, implementing analysis techniques, and interpreting results, which as a consequence of the application of a synergistic approach to design, “encourages robust internal and cross-paradigm analyses and presentation of results” (Hall & Howard, 2008, p. 254). Nastasi, Hitchcock, and Brown (2010) propose a framework that comprises the synergistic framework conceptualized by Hall and Howard (2008), selective typology criteria, and “professional collaborative and stakeholder participatory approaches” (p. 322). This multistage framework comprises 10 stages, and it encapsulates design decisions occurring iteratively, beginning at the conceptualization stage to the application stage of the research process (cf. Nastasi et al. [2010] for more details).
Sampling Design

Sampling design consists of two interrelated decisions: decide on the scheme to select the sample and decide on the sample size. These decisions impact the research question in terms of the type of question addressed and the objective in terms of the type of generalization viable given the type of scheme (i.e., random, purposive), and the sample size per strand. The goal is to achieve interpretive consistency, which refers to the degree of consistency between the conclusions and generalizations and the sampling design per strand (Collins, Onwuegbuzie, & Jiao, 2006, 2007). There are multiple types of generalizations. Specifically, they are external statistical generalizations (sample to population); internal statistical generalizations (key informant sample member to other sample members; Onwuegbuzie & Leech, 2007); internal generalizations (conclusions based on the sample and applied only to the sample; Maxwell, 1992); analytic generalizations (“corroborating, modifying, rejecting, or otherwise advancing theoretical concepts ... referenced in designing your case study” [Yin, 2014, p. 41]); naturalistic generalizations (based on individuals’ personal and vicarious experiences [Stake & Trumbull, 1982]); and moderatum generalizations (“the modest, pragmatic generalizations drawn from personal experience which, by bringing a semblance of order and consistency to social interaction, make everyday life possible” [Payne & Williams, 2005, p. 296]).

In MR encompassing two or more strands, the sampling design decisions are made per strand. Subsequently, the sampling design per strand impacts the degree that sufficient data are collected to address the research question, allows an appropriate level of analysis to occur, and facilitates integration of the results. Sampling integration is one of the nine quality criteria identified in Onwuegbuzie and Johnson’s (2006) quality criteria typology. To assist researchers in formulating the sample design and addressing sampling integration, I identified the interrelationship of five sampling criteria based on a synthesis of published sampling guidelines (Collins, 2010). The sources for defining each criterion are noted in parentheses. Criterion 1 denotes the relationship between the samples selected per strand and the time orientation (concurrent [independent], sequential [dependent]) of the strands within the design (Onwuegbuzie & Collins, 2007; Teddlie & Yu, 2007). Criterion 2 specifies the relationship between the samples per strand (Onwuegbuzie & Collins, 2007). The relationship in this context refers to identical samples (i.e., same sampling units participated in all strands of the study), parallel samples (i.e., different sampling units participated in each strand but the units were selected from a single population), nested samples (i.e., sampling units were selected to participate in one strand and a subset of the selected units participate in the other strand), and multilevel samples (i.e., different sampling units participated in each strand and represent different populations). Criterion 3 specifies the relationship between the sample schemes to select the sampling unit and the type of intended generalization of the results (Teddlie & Yu, 2007). Criterion 4 specifies the relationship between the “varying types of data collected, subsequently optimizing the diversity of data available to analyse in response to the research question (Teddlie & Yu, 2007)” (Collins, 2015, p. 364). Finally, Criterion 5 specifies the relationship between the weight or emphasis placed by the researcher when interpreting conclusions per strand and the quality of the meta-inferences and the credibility of the generalizations (Onwuegbuzie & Collins, 2007).

Validity Design

Researchers construct a validity design by choosing validity criteria representing multiple paradigms (quantitative, qualitative, mixed) and applying these criteria throughout the stages of the study (Collins, 2015; Collins, Onwuegbuzie, & Johnson, 2012; O’Cathain, 2010). Multiple validities, selecting validity criteria reflective of quantitative, qualitative, and mixed “validity types,” is one of the nine quality criteria identified in Onwuegbuzie and Johnson’s (2006) quality criteria typology (p. 57). In the following section, selective examples of validity design frameworks are detailed. These criteria are applicable for designing MR studies. However, these criteria also are applicable for quantitative qualitative, and multi-methods studies.

Teddlie and Tashakkori (2009) base their “integrative framework for inference quality” on two quality matters, namely, design quality and interpretive rigor (p. 301). Design quality comprises the following four criteria, and an “indicator or audit” is enclosed in parentheses: design suitability (“Are the methods ... appropriate for answering the research questions?”); “Does the ... design match the stated purpose?”; and “Do the strands address the same research questions [or closely related aspects of the questions?]”; design fidelity (“Are the ... procedures ... [e.g., sampling, data collection procedures, data analysis procedures] implemented with the quality and rigor necessary for ... capturing the meanings, effects, or relationships?”); within design consistency (“Do the components of the design fit together in a seamless manner” and “Do the strands ... follow each other [or are
they linked) in a logical and seamless manner?); and analytic adequacy (“Are the data analysis procedures/strategies appropriate and adequate [to address the] research questions”; and “Are the analytic strategies implemented effectively?”) (Teddlie & Tashakkori, 2009, p. 301).

Interpretive rigor comprises six criteria. These are interpretive consistency (“Do the inferences closely follow the relevant findings in terms of type, scope, and intensity?”; and “Are multiple inferences made on the basis of the same findings consistent with each other?”); theoretical consistency (“Are the inferences consistent with theory and state of knowledge in the field?”); interpretive agreement (“Are other scholars likely to reach the same conclusions on the basis of the same results?”; and “Do the inferences match participants’ constructions?”); interpretive distinctiveness (“Is each inference distinctively more credible/plausible than other possible conclusions …?”); integrative efficacy (“Do the meta-inferences adequately incorporate the inferences … in each strand …?”; and “If there are credible inconsistencies between the inferences … are the theoretical explanations explored … and possible explanations offered to address these inconsistencies?”); and interpretive correspondence (“Do the inferences correspond to the stated purposes/questions …?”; and “Do the meta-inferences meet the stated need for using a MM [mixed methods] design?”) (Teddlie & Tashakkori, 2009, pp. 301-302).

The remaining two frameworks were selected because each framework encompasses existing published typologies. The reader is encouraged to read these frameworks for details concerning sources contributing to their conceptual constructions. O’Cathain’s (2010) comprehensive framework applied Tashakkori and Teddlie’s (2008) conceptualization of inference quality as its base. It also included published guidelines to develop the content and organized the framework to align to Caracelli and Riggin’s (1994) domains of quality. O’Cathain (2010) designed a quality framework comprising eight domains of quality, which are implemented at five stages of the research process. The first domain is planning quality (planning stage). This domain comprises the following items: foundational element (“critical review of the literature … to situate the study and shape both the research question and methods”); rationale transparency (“justification for using a mixed methods approach”); planning transparency (“details should be given about the paradigm, planned design, data collection, analysis, and reporting”); and feasibility (“design, and each component, can be undertaken in the resources … available”) (O’Cathain, 2010, Chapter 21, Figure 21.3). The second domain is design quality (undertaking stage). This domain comprises the following items: design transparency (“description of key aspects of design”); design suitability (“design is appropriate for addressing … research question … matches the reason for combining methods, and is appropriate for the stated paradigm”); design strength (“strengths and weaknesses of methods are considered to minimize shared bias and optimize the breadth and depth of the study”); and design rigor (“methods are implemented in a way that remains true to the design”) (O’Cathain, 2010, Chapter 21, Figure 21.3).

The third domain is data quality (undertaking stage). This domain comprises the following items: data transparency (adequate detail per method is provided “including its role within the study”); data rigor/design fidelity (“extent to which methods are implemented with rigor”); sampling adequacy (sampling design per strand is “adequate in the context of the design”); analytic adequacy (data analysis techniques are adequate for addressing the research question, and they are implemented appropriately); and analytic integration rigor (“integration … at the analysis stage … is robust”). The fourth domain is interpretive rigor (interpreting stage). This domain comprises eight items, and each item is designed to ensure that the conclusions are supported by the findings. The eight items are interpretive transparency (“clear which findings have emerged from which methods”); interpretive consistency (“inferences are consistent with the findings”); theoretical consistency (“inferences are consistent with current knowledge or theory”); interpretive agreement (“others are likely to reach the same conclusions based on the findings presented”); interpretive distinctiveness (“conclusions drawn are more credible than any other conclusions”); interpretive efficacy (meta-inferences are supported by inferences made “from the quantitative and qualitative findings and inferences”); interpretive bias reduction (“explanations are given for inconsistencies between findings and inferences”); and interpretive correspondence (“inferences correspond to the purpose [and] …, research question”) (O’Cathain, 2010, Chapter 21, Figure 21.3).

The fifth domain is inference transferability (interpreting stage). This domain comprises four items, and each item is designed to indicate the transferability of the conclusions. The four items are ecological transferability (“transferability to other context and settings”); population transferability (“transferability to other groups and individuals”); temporal transferability (“transferability to the future”); and theoretical transferability (“transferability to other methods of measuring behavior”) (O’Cathain, 2010, Chapter 21, Figure 21.3). The sixth domain is reporting quality (disseminating stage). This domain comprises the following items: report availability (“study completed within allocated resources”); reporting transparency (“key aspects of [the] study reported”); and yield (“whole more than the sum of the parts”). The seventh domain is synthesizability, and the eighth domain is utility (application in the real world stage). Synthesizability comprises 15 quality criteria, and these criteria are categorized as applicable for qualitative research (n = 6), quantitative research—experimental research (n = 3),
and quantitative research—observational research \( n = 3 \), and MR \( n = 3 \). The domain utility reflects the degree that the findings are considered relevant by the research consumer (O’Cathain, 2010, Chapter 21, Figure 21.3).

Collins et al. (2012) continue the conversation about quality criteria by detailing what they call the “Holistic and Synergistic Legitimation Research Process” (p. 849, italics in the original). In their view, holistic indicates that legitimation criteria should reflect the published quality criteria defining MR as a distinctive methodology (Collins et al., 2012). Synergistic refers specifically to applying the four core principles defining synergistic approaches as proposed by Hall and Howard (2008) to the development of a validity design. Principle 1, the integration of multiple types of legitimation/quality criteria, leads to a validity design and an outcome superior to an individualized component approach to validity design (Collins et al., 2012). For Principle 2, the researcher applies a dialectical pluralistic interpretation (Johnson, 2017) of legitimation, specifically, “… multiple philosophical assumptions and stances are intertwined, when applicable” (Collins et al., 2012, p. 855). For Principle 3, the researcher views parity among the legitimation approaches within the validity design in terms of the value added to the study. For Principle 4, the researcher “balance[es] opposing quantitative-qualitative perspectives” relative to creating the validity design and interpreting the outcome (Collins et al., 2012, p. 855). Collins et al. (2012) also recommend two additional quality criteria. Criterion 1 is the researcher’s philosophical clarity concerning “the degree that the researcher is aware of and articulates her/his philosophical proclivities in terms of philosophical assumptions and stances in relation to all components, claims, actions, and uses in a mixed research study” (Collins et al., 2012, p. 855). Criterion 2 is the researcher’s awareness of the importance of incorporating, when applicable, values, perspectives, and quality criteria embraced by different research communities (e.g., postpositivist, social constructivist) into the validity design. This inclusive perspective to design reflects the dialectical pluralistic interpretation (Johnson, 2017) (Principle 2) of crafting legitimation, as noted earlier.

**Selective Characteristics of the Case Study Method**

An important component of the research process that supports all design decisions is the choice of method to collect data. As noted earlier, my selection of the case study method was based on its versatility in terms of exploring, explaining, or describing phenomena, developing theory or testing theory, and its applicability to support a MR design through the collection of both qualitative and quantitative data (Yin, 2014). In this section, selective characteristics of the case study method are outlined to illustrate its versatility and applicability to support a MR design. Typically, case study research is “an empirical inquiry that investigates a contemporary phenomenon (the ‘case’) in depth and within its real-world context,” and is considered an effective approach “… when the boundaries between phenomenon and context may not be clearly evident” (Yin, 2014, p. 16, quotes in the original). Stake (1995) refers to a case study method as an “integrated system” (p. 2). A single case design also can provide a unique perspective pertaining to the topic, leading the researcher to investigate an extreme or critical case. A replication design involves assessing multiple cases, and the rationale for this design is to view multiple cases as multiple experiments (Yin, 2014). Replication design involves selecting cases to predict comparable results referred to as a literal replication (Yin, 2014). In a theoretical replication design, case selection is predicated on obtaining anticipated contrasting findings associated with different patterns of observations (Yin, 2014). Multiple case design can add to the researcher’s confidence that the interpretation of the phenomenon of interest is credible—assuming that the findings are similar in the observation setting, in a comparable setting, and differs in a contrasting setting (Miles, Huberman, & Saldàña, 2014).

The rationale underpinning a case study method involves the collection of empirical data for the purpose of obtaining “extensive and ‘in-depth’ description” of some social phenomenon … by focus[ing] on a ‘case’ and retain[ing] a holistic and real-world perspective” (Yin, 2014, p. 4). The decision to use a case study method begins with the framing of research questions or aims (Yin, 2014). The research question “seeks patterns of unanticipated as well as expected relationships” (Stake, 1995, p. 41). Sampling decisions pertaining to data in a case study design include delimiting the information included and excluded in the database, selecting the data to be analyzed based on obtaining “special information” and “developing theory and applications” (Miles et al., 2014; Morgan, 2014, p. 129). According to Yin (2014), the type of data collected can be quantitative, qualitative, or mixed. An important design consideration is to determine the type of case study approach to be implemented. Choosing a case-oriented approach, the researcher interprets the case as a whole. The analysis focuses on the
“specific cases in specific contexts ... [and] ... build[s] knowledge of the general from knowledge of the specific” (Ragin, 2008, p. 5). According to Ragin (2008), this notion of case study research is the “middle path between quantitative and qualitative research” (p. 5). Choosing a variable-oriented approach, the researcher investigates the observed patterns across cases, and the “building blocks” are specific variables of interest and their probabilistic interrelationships in a population (Miles et al., 2014, p. 102). In this context, the researcher identifies themes occurring across the analysis of the cases (Miles et al., 2014). Both of these approaches can be used singularly or combined within a study.

Four-Phase Analysis

In this section, to provide empirical evidence of the applicability of the integrative approach toward impacting the quality of integration, I present the results of an analysis of a criterion sample comprising one MR study published in the Journal of Mixed Methods Research in 2014. The criteria for the study’s selection included: (a) aspects of published frameworks were used to guide design decisions, thereby providing an illustrative example of application of design frameworks in practice; (b) a case study method was implemented to collect data; and (c) the design was altered based on the dynamics occurring within the study, thereby representing an example of an emergent design.

As noted by Freshwater (2007), the interpretation of the written text is an individualized process enacted by the reader. Subsequently, in reading the article, I selected text that I interpreted as being responsive to the components structuring the analysis. However, at multiple points in the analysis, I used examples of the author’s terminology and aspects of the author’s exact phrasing to describe the decisions, thereby illustrating the design from the author’s perspective. In Phases 1 through 3, analysis of the author’s decisions and points of integration were structured across three levels: formulation, planning, and implementation, which are detailed in the methodological framework designed by Collins, Onwuegbuzie, and Sutton (2006).

The study was conducted by Reid Kerrigan (2014). The topic explored was the potential relationship between the organizational capacity of community colleges and the implementation of data-driven decision making (DDDM). At Phase 1, I identified the formulation decisions (i.e., goal [stated broadly], objective specifying the intended generalization of the findings, rationale for integration, purpose for integration, and research question). These decisions serve as a persuasive argument that the topic of interest in this study is addressed optimally by a MR design. And, as noted by Bazeley (2015), the “substantive purpose of the study, reflected in its aims, objectives, and questions,” should serve as a guide for the write-up, and ensure the “the message being presented” is clarified to the research consumer (p. 311). At Phases 2 and 3, the decisions served to illustrate how the author strategized the best way to address the research questions, given the resources available and the context of the research. At Phase 2 of the analysis, I documented design decisions regarding planning in terms of specifying the initial MR research design, the rationale for case selection, and the sampling design (sampling scheme—random, purposive and the sample size per strand). At Phase 3, I detailed the author’s decisions related to data collection, analysis, and developing the validity design. Also, at this phase, I detailed the author’s decision to analyze further the qualitative data, thereby creating an emergent design. At Phase 4, I conclude by summarizing the points of integration noted in my analysis and commenting on the degree of transparency surrounding the design decisions as presented in the write-up of the study.

Phase 1: Formulation Level. The goal for implementing a MR study was “to gain a fundamental understanding of the influences on DDDM in community colleges” (Reid Kerrigan, 2014, p. 342). The objective in terms of the intended generalization was that the “theory generated by [the] case study [method as an approach to design] contribut[ed] to a theoretical framework that may be applied to other cases” (Reid Kerrigan, 2014, p. 358). Reid Kerrigan’s (2014) rationale for implementing a MR design was that a MR design permits researchers to ask both confirmatory and exploratory questions within a single study (Teddle & Tashakkori, 2009). The first purpose for conducting a MR study was that “together the qualitative (QUAL) and quantitative data (QUAN) shed light on the relationship between capacity and the extent of data to inform decisions at four community colleges” (Reid Kerrigan, 2014, p. 342). The second purpose was that a MR design would allow the opportunity to transform data through a “convergent analysis process ... to gain a more complete understanding of the phenomenon of DDDM at the participating community colleges” by creating an integrative data set (Reid Kerrigan, 2014, p. 346). The following research questions structuring the study were confirmatory and exploratory: (a) “What factors influence the organizational capacity for [DDDM] at community colleges?” and (b) Do these factors account for the extent of DDMM in the community colleges in this study?” (Reid Kerrigan, 2014, p. 342).

Phase 2: Planning Level. Reid Kerrigan (2014) detailed a conceptual framework “that shaped the convergent parallel mixed methods design ... within a multiple-case study approach” (p. 342). Also noted was that “the
sampling and analytic strategies ... informed the research design” (p. 342). The case selection process involved applying replication with the intent to develop theory (Yin, 2014). Specifically, cases were selected to predict similarity of results (literal replication) and to predict contrasting results across the cases (theoretical replication). Subsequently, this specific approach to a case study method led to development of propositions detailing “conditions under which a particular phenomenon is likely to be found (a literal replication) [and] conditions when it isn’t likely to be found (theoretical replication) (Yin, 2008, p. 50)” (p. 342, italics in original). Although not stated specifically, the write-up of the study suggests that Reid Kerrigan (2014) implemented an interactive or systemic research design (Maxwell, 2013; Maxwell & Loomis, 2003). Specifically, the write-up details the interconnections among the study’s components: questions, purposes, conceptual framework, methods, and designs (research, sampling, and validity), and the level of detail indicates the distinctive ways each component was interpreted in the planning and the execution of the study.

A “concurrent nested MR sampling design” (Reid Kerrigan, 2014, p. 346) was implemented. A three-stage sampling design was used to select the cases. In Stage 1, states in the United States were selected using a critical case sampling scheme based on two criteria. Criterion 1, the selected states were situated in “higher education accrediting regions” and “were characterized as moderate pressure” in accordance to “the accrediting agencies[’] ... well-established guidelines about the use of data and evidence ...” (Reid Kerrigan, 2014, p. 346). Criterion 2, funding legislation passed in the selected states “required colleges to collect and report data pertinent to performance and outcomes in order to receive a percentage of their funds” (p. 346). Subsequently, these criteria “established a moderate pressure environment for [selected] colleges to be data driven ... that is consistent with a critical case sampling approach ...” (p. 346).

In Stage 2, two states, one located in the western United States and one located in the southern United States, were selected. Two community colleges were chosen from each of the selected states using a maximum variation sampling scheme, resulting in the selection of two colleges ranked at the top third (n = 2) and bottom third (n = 2) in terms of their capacity for data use. In Stage 3, administrators and faculty were selected. All full-time administrators at the four colleges were invited to participate. Faculty members at colleges with less than 150 members were invited to participate. Faculty members at colleges with more than 150 faculty members were selected randomly and invited to participate. Full-time administrators (n = 120) and faculty (n = 151) representing the four colleges served as the source for the quantitative strand, which comprised completion of a questionnaire. A form of criterion-based sampling was implemented to select interviewees for the qualitative strand. The selection criteria were based on the administrators’ and faculty members’ roles at their respective colleges and the degree that these participants could provide “insight about data use” (Reid Kerrigan, 2014, p. 348). To augment the selection of faculty, Reid Kerrigan also implemented a snowball scheme by asking faculty for recommendations to target potential interviewees. Integration occurred in the sampling design because a subset of the sample who participated in the quantitative strand participated in the qualitative strand.

**Phase 3: Implementation Level.** Data collection comprised quantitative questionnaire data, and qualitative data consisting of responses to semi-structured interviews. The analysis was designed in accordance with an “integrative analytic approach for a convergent, parallel mixed methods study using quantitized data” (Reid Kerrigan, 2014, p. 342). Initially, the quantitative and qualitative data were analyzed independently. Integration occurred at the points of “data merging and transformation” (p. 345). Specifically, a content analysis of the interview data was implemented, and the data were quantified to allow for a joint analysis of data obtained from both strands. The within-case analysis that reflected the merging of data sets through transformation was a point of integration because it “brought together the qualitative and quantitative data through the examination of the relationship between the predictor and dependent variables” (p. 353). Interpretation of the merged data presented interpretive inconsistencies. Subsequently, the design became an emergent design. Reid Kerrigan (2014) “returned to the qualitative data and inductively analyzed the data for emergent themes by looking for repetition of concepts ... not readily apparent from the directed content analysis” (p. 353). Integration of conclusions from both strands led to “the findings [that] suggest[ed] that community colleges’ organizational capacity for [DDDM] is a function of human and social capital but not physical capital” (Reid Kerrigan, 2014, p. 341).

In Phase 3, assessed were matters of validity, namely, the appropriateness of the validity design. In constructing the research design, design suitability, one of the criteria classified under design quality in Teddlie and Tashakkori’s (2009) typology, was “addressed through this discussion of the research design, which illustrates the appropriateness of a convergent parallel design for the research questions” (p. 346). Design fidelity, another of the criteria classified under design quality in the Teddlie and Tashakkori’s (2009) typology, was addressed in the discussion surrounding the data collection procedures that were selected “to ensure consistency with the stated design approach” (p. 346). Additionally, the author designed and implemented a coding scheme to ensure consistency in the coding of the qualitative data. Inter-rater reliability was calculated to determine the degree
of consistency between coders (85% consistent). Inter-rater reliability of the quantitative data was calculated (i.e., .90). Analytic adequacy was addressed by detailing the process of the “parallel and conversion mixed data analysis approach (Teddlie & Tashakkori, 2009)” implemented “to enable the mixed analysis of the data” (p. 350).

Reid Kerrigan (2014), in devising the MR sampling design, selected multiple cases and applied replication logic to select the cases, in contrast to using a sampling logic. According to Yin (2014), implementation of replication logic “to inform case selection in a multiple case design ... is more robust than a single case design” based on sampling logic (p. 342). State selection was based on specific criteria. The colleges were selected “with the intent to achieve literal and theoretical replication” and according to specific criteria (Reid Kerrigan, 2014, pp. 346-347). Reid Kerrigan (2014) noted that the choice of a multiple case design combined by the purposive sampling “permit[ed] the exploration and testing of a new framework ... [of community college organizational capacity for DDDM] through a mixed methods study” (p. 358).

The sampling design represented a nested design (Onwuegbuzie & Collins, 2007). Administrators (n = 120) and faculty members (n = 151) participated in the quantitative strand, and a subset (n = 38) of the administrators and faculty members who participated in the quantitative strand were interviewed. In the discussion section, results per strand were merged when forming conclusions. The difference in sample sizes per strand is problematic when forming inferences based on conclusions drawn from both strands unless the researcher specifies the relationship between the weight placed on conclusions drawn from each strand when forming meta-inferences and generalizations. Including this degree of detail in the write-up would allow Reid Kerrigan (2014) to address sample integration, one of the nine criteria in Onwuegbuzie and Johnson’s (2006) quality criteria typology. Not doing so can lead to interpretive inconsistency between the sampling design and the integration of conclusions derived from both strands (Collins et al., 2006, 2007). The qualitative sample was augmented using a snowballing sampling scheme. However, as noted by Small (2009), a snowballing sampling scheme can introduce into the sampling design potential bias because the selection of sample members based on the suggestions of other members of the sample can lead to a sample signifying an “in-network connection” (p. 14). This potential bias should be noted in the write-up.

In Phase 4, my analysis revealed that integration occurred at each level of the study. At the formulation level, the purpose for designing a MR study was integration—to allow transformation of data, thereby leading to an integrated data set to enhance interpretation. At the planning level, integration occurred within the sampling design comprising an initial sample surveyed at Strand 1, and a nested subset of these participants were interviewed in Strand 2. At the implementation level, integration occurred when the qualitative data were quantified to allow for a joint analysis of data obtained from both strands. Finally, results per phase were integrated at the conclusion stage when forming inferences.

The level of transparency in the write-up allowed implementation of Phases 1 through 4 of the analysis. The write-up modeled an appropriate level of transparency because the quality of the detail conveyed Reid Kerrigan’s (2014) logic underpinning her design decisions and choice of method. Transparency of decisions at each of the levels of the analysis addressed the following transparency subcomponents identified by O’Cathain (2010): rationale and planning transparency, design transparency, data transparency, interpretive transparency, and reporting transparency. As noted, by Greene (2007), “the writing-up phase constitutes the heart of the communication and presentation process” (p. 181). Subsequently, the degree of transparency surrounding the researcher’s decisions in the write-up is a quality criterion embedded within the validity design. At the implementation level, the research design became an emergent design, and Reid Kerrigan (2014) provided a rationale for the change and detailed how the design had been changed. This information adds another level of transparency to the research process, and it reflects what actually occurred in the implementation of the study. At the conclusion stage, results from the analyses were integrated and findings explicated in terms of addressing the research questions.

**Conclusion and Future Directions**

Fetters and Freshwater (2015) call for researchers to incorporate within design decisions “intentional choices that can leverage integration” (p. 116). The design decisions and choice of method made by Reid Kerrigan (2014) illustrate application of this call into practice. My analysis exemplifies how application of aspects of the published design frameworks can inform decisions leading to successful integration and transparency. The analysis also detailed how the author’s choice of method, namely, a case study method employing multiple cases based on replication logic, can create a more robust sampling design in the context of a MR design. Subsequently, interpreting interconnectivity of decisions regarding research, sampling and validity designs, and case study method
allowed me to identify multiple points of integration in the published study. These results support the plausibility of applying an integrated approach toward design as a means of enhancing the quality of integration in MR studies as well as multi-methods studies.

The complexity of MR design likely will entail that researchers approach design from an eclectic perspective. Researchers’ perspectives also likely will be informed by the dialogue surrounding design that signifies how the individual researcher’s chosen intellectual community interprets research, sampling, and validity designs, methods of data collection and analysis, and points of integration in mixed and multi-method studies. Future directions for researchers are to continue to examine parameters surrounding design decisions and choice of method, and to “dialogue with different paradigms and intellectual research communities,” thereby creating opportunities to address complex questions within dynamic contexts (Collins, 2015, p. 253).

References


