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"Empowerment Through Open Learning"

A Practical Guide to Contemporary Mixed Methods Research

JOHN MBWIRIRE[1], LIGHTON DUBE[2]

[1]Great Zimbabwe University

[2]Zimbabwe Open University

*Corresponding Author's Email: tkjmbwirire@yahoo.com
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Abstract

Mixed Methods Research (MMR) has evolved from a contested paradigm into a sophisticated methodology essential for investigating complex phenomena across diverse disciplines. This comprehensive review synthesises contemporary developments in MMR. The philosophical underpinnings using the Research Onion model and aligning MMR designs with seven distinct research objectives were articulated. The paper provides an in-depth guide to data analysis, integration and presentation, with a specific focus on establishing rigour through joint displays. This paper advances the field of Mixed Methods Research (MMR) by providing a novel, actionable framework that effectively bridges theoretical concepts and practical applications. The strategic alignment of research objectives with design typologies and operationalises integration through joint displays, thereby enhancing the rigour and impact of mixed methods studies. The objective is to equip researchers with a clear, actionable guide for designing, executing and reporting rigorous mixed methods studies that generate impactful, nuanced evidence.

Keywords: Mixed Methods Research, integration, pragmatism, research design, joint displays, Research Onion, meta-inferences

Introduction

Mixed Methods Research (MMR) has transitioned from a contested methodological alternative to an established research paradigm, lauded for its capacity to address complex research questions through the systematic integration of quantitative and qualitative approaches (Creswell & Plano Clark, 2018). Its evolution has been marked by significant advancements in philosophical foundations, research designs and analytical techniques specifically engineered to facilitate meaningful integration. While excellent foundational textbooks and frameworks exist, researchers and students often grapple with the practical application of these concepts.

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offering a comprehensive, actionable framework that bridges theoretical foundations with practical implementation across diverse research objectives. Building on seminal works by Creswell and Plano Clark (2018), Fetters (2020), this work synthesises philosophical underpinnings, typologies of mixed methods design aligned with specific research goals and advanced integration strategies such as joint displays and legitimation frameworks. Unlike existing literature that focuses primarily on discrete design elements or philosophical debates, this paper provides an integrated, systematic approach that enhances methodological rigor, facilitates transparent integration and addresses validity concerns in a cohesive structure. This critical advancement addresses a gap in mixed methods methodology by equipping researchers with a clear roadmap for aligning design choices with research questions and ensuring rigorous meta-inferences from combined datasets, thereby advancing the practical utility and theoretical coherence of MMR.

This comprehensive review aims to bridge this gap between theory and practice. It synthesises contemporary developments in MMR by providing a clear, actionable guide for designing, executing, and reporting rigorous mixed methods studies. This paper offers a novel synthesis by:

- detailing philosophical underpinnings through the adaptable lens of the Research Onion model (Saunders et al., 2019)
- providing a clear framework for aligning seven distinct research objectives with specific MMR designs, and
- offering an in-depth, practical focus on integration and rigour through the use of joint displays and legitimation frameworks.

offering an in-depth, practical focus on integration and rigour through the use of joint displays and legitimation frameworksBy matching seven research objectives to suitable mixed methods designs, this paper demystifies the selection process for researchers and underscores how philosophical consistency should shape methodological decisions. It emphasises joint displays as a transformative tool for integrating data, since they enable meta-inferences that go beyond what single-method approaches can offer. This framework helps researchers in different fields design rigorous studies that produce elaborate evidence, ultimately improving both the quality and practical relevance of findings when examining complex social issues.

Theoretical and Philosophical Foundations

The legitimacy and efficacy of any research methodology are rooted in its philosophical coherence. For Mixed Methods Research (MMR), which intentionally bridges the paradigmatic divide between quantitative and qualitative approaches, this foundation is not merely academic but is fundamental to designing rigorous, credible and meaningful studies.

The Philosophical Imperative for Mixing Methods

MMR emerged from the pragmatic resolution to this conflict. Pragmatism, as a philosophical partner to MMR, sidesteps the contentious debate about the nature of reality by focusing on the consequences of research and the utility of methods (Morgan, 2007). From a pragmatic viewpoint, the value of a research method is determined by its appropriateness for answering the research question, not by its allegiance to a particular philosophical tradition. This "what works" ethos liberates researchers to select and combine methods based on practical needs, arguing that the research question should be the primary driver of methodological choice (Biesta, 2010; Feilzer, 2010).

Dominant and Alternative Philosophical Paradigms in MMR

While pragmatism is the most cited paradigm underpinning MMR, the field is enriched by other philosophical stances that provide different rationales for mixing methods.

Pragmatism

Often considered the primary philosophical foundation for MMR, pragmatism is associated with the work of John Dewey, William James and Charles Sanders Peirce. Its core tenets relevant to MMR include:

Pluralism

A rejection of dualisms (for example, subject-object, mind-world) and an acceptance that different perspectives and methods can yield valuable insights.

Practicality

The belief that the value of an idea or method lies in its practical consequences and its usefulness in solving problems.

Problem-Centeredness

The research question is paramount; it dictates the methods used, not the other way around.

Theory of Truth

Truth is not absolute but is what is considered warranted and useful based on current evidence (Morgan, 2014).

In practice, a pragmatic mixed methods researcher would argue that using a survey (quantitative) to identify a widespread problem and interviews (qualitative) to understand its context and meaning is justified because this combination provides the most complete and useful answer to the research problem.

Critical Realism

Stratified Reality

Critical realism posits a reality consisting of three domains: the real (underlying structures and mechanisms that generate events), the actual (events that occur, whether observed or not) and the empirical (those events that we observe and experience).

Causal Explanation

The goal of research is not just to identify patterns (as in positivism) or understand meanings (as in constructivism) but to discover the underlying causal mechanisms operating in the real domain that explain why those patterns and meanings exist.

Role of MMR

Quantitative methods are excellent for identifying patterns and relationships in the empirical domain (for example, a correlation between poverty and poor health). Qualitative methods are essential for exploring the mechanisms in the real domain that explain this correlation (for example, limited access to healthcare, stress, poor nutrition). Thus, MMR is necessary for developing a complete causal explanation.

Transformative-Emancipatory Paradigms

This family of paradigms, including feminist, participatory and critical theory approaches, places issues of power, justice and inequality at the centre of the research process (Mertens, 2007). The primary purpose of research is not just to understand the world but to change it for the better.

Axiological Priority

Values and ethics are not just acknowledged; they drive the research process. The goal is to produce knowledge that will benefit marginalised communities and challenge oppressive structures.

Table 1: Philosophical Paradigms in MMR

Paradigm Core Ontology (Nature of Reality) Core Epistemology (How we know) Rationale for Mixing Methods Key Thinkers/References

Pragmatism Reality is what is useful; focus on consequences. Knowledge is based on practical consequences and utility. The research question is paramount. Use "what works" to get the best answer. Dewey, James, Peirce; Morgan (2007)

Critical Realism A real, stratified world exists independently of our knowledge. Our understanding of the world is fallible and socially constructed. Quant methods identify patterns (empirical); Qual methods uncover causal mechanisms (real). Bhaskar; Maxwell & Mittapalli (2010)

Transformative-Emancipatory Reality is shaped by social, political and power structures. Knowledge is co-constructed and should serve emancipatory goals. Quant data documents inequality: Qual data gives voice to marginalised groups to drive change. Mertens (2007, 2015)

Role of MMR

These paradigms often employ a transformative design. Quantitative data is used to document the scale and scope of inequalities (for example, wage gaps, graduation rates, health outcomes), providing powerful evidence for advocacy. Qualitative methods are used to give voice to marginalised groups, contextualise the statistics and explore lived experiences of oppression and resistance. The integration of these methods creates a compelling case for social and political change.

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Transformative-Emancipatory	Reality is shaped by social, political, and power structures.	Knowledge is co-constructed and should serve emancipatory goals.	Quant data documents inequality: Qual data gives voice to marginalized groups to drive change.	Mertens (2007, 2015)

The model illustrates the nested decisions a researcher must make, from broad philosophical assumptions to specific techniques.

Layer 1: Research Philosophy

This is the outermost and most fundamental layer. As discussed above, the researcher must adopt and explicitly state a philosophy that justifies the use of multiple methods. The choice here—be it pragmatism, critical realism or a transformative paradigm—will influence every subsequent decision. A pragmatic philosopher would frame their rationale around the "what works" principle, while a critical realist would frame it around the need to explore both empirical patterns and causal mechanisms.

Layer 2: Research Approach

This layer concerns the logical reasoning that connects theory to data.

Deductive Approach

Typically associated with quantitative research, it involves developing hypotheses from existing theory and then testing them through data collection.

Inductive Approach

Typically associated with qualitative research, it involves collecting data to explore a phenomenon and then building theories or patterns from that data.

Abductive Approach

The most common approach in MMR (Haig, 2005; Timmermans & Tavory, 2012). It involves moving back and forth between theory and data to iteratively develop the best possible explanation for a surprising or puzzling observation.

Layer 3: Methodological Choice

This is the core choice to use a mixed methods strategy. This decision flows directly from the research philosophy and approach. The researcher must declare this choice explicitly and justify it based on the research questions.

Layer 4: Research Strategy

This layer involves selecting the overarching plan or architecture for the research. MMR is not itself a strategy but can be executed through various strategies. The Research Onion framework highlights that Mixed Methods Research (MMR) is not a single strategy but a flexible methodological choice that can incorporate various specific research strategies. This versatility allows researchers to adapt their approach to the specific needs of their study.

Experimental Designs

MMR can be integrated into experimental designs that embed qualitative components within intervention studies. This strategy allows researchers to move beyond simply measuring outcomes to understanding the underlying processes and contextual factors influencing them.

Survey Strategies

Another common MMR strategy is to use survey strategies that include open-ended questions alongside standardised measures. This approach leverages the strengths of both methods: the breadth of quantitative data and the depth of qualitative insights. The combination provides both statistical trends and rich, contextual information.

Case Studies

MMR can be applied to case studies that employ multiple data sources and types to provide a deep, holistic view of a single case. In this approach, researchers can triangulate findings by cross-validating evidence from different data types to increase the credibility of the results.

Ethnographic Approaches

A mixed-methods ethnographic approach combines the rich, contextual qualitative data from participant observation with structured quantitative data. This allows researchers to capture both the subjective experiences of a group and the measurable behaviours or characteristics.

Participatory Action Research

This strategy emphasises collaboration and community engagement by engaging stakeholders in both quantitative and qualitative components. It is often used in transformative designs that aim to address social justice concerns.

Layer 5: Time Horizon

A crucial decision in Mixed Methods Research (MMR) design is the time horizon, which refers to when the data for the different methodological components will be collected (Saunders, Lewis, & Thornhill, 2019). MMR studies can employ either cross-sectional design, which collect both data types simultaneously and longitudinal approaches, which sequence data collection over time. The choice between the two depends on the research questions and design. In a cross-sectional design, both quantitative and qualitative data types are collected concurrently, providing a

snapshot of the phenomenon at a single point in time (Creswell & Plano Clark, 2018). This approach is particularly useful for questions that require a holistic understanding of a phenomenon at a specific moment, such as assessing the relationship between employee morale (quantitative) and workplace culture (qualitative) in a company at the end of a fiscal year.

In contrast, a longitudinal approach involves sequencing the data collection over time, which is particularly useful for studying change or processes (Creswell & Plano Clark, 2018). This design is often employed when researchers want to investigate how a phenomenon evolves, how a program is implemented over time or how attitudes change in response to an event (Creswell & Plano Clark, 2018). The timing of data collection directly affects the opportunities for integrating the two datasets and must be carefully considered to avoid potential confounding factors (Creswell & Plano Clark, 2018).

Layer 6: Techniques and Procedures

This innermost layer involves the specific tools for execution.
Data Collection: Questionnaires, interview protocols, focus group guides, observation schedules, document analysis frameworks.
Data Analysis: Statistical techniques (for example, regression, factor analysis) and qualitative analysis techniques (for example, thematic analysis, narrative analysis).
Integration Procedures: The power of mixed methods truly emerges during the integration of data, where the whole becomes greater than the sum of its parts—a concept referred to as a "meta-inference" (Fetters & Freshwater, 2015). One of the most effective techniques for achieving this is the use of joint displays, a visual representation that merges quantitative findings with qualitative data side-by-side.

Research Design Typologies and Objectives
MMR designs can be categorised according to their sequencing, priority and integration points. Understanding these design options helps researchers select approaches that best address their research objectives.

Major MMR Design Types
Explanatory Sequential Design (QUANT → QUAL)
This design is characterised by a two-phase process where the quantitative method has priority and drives the subsequent qualitative follow-up. Researchers first collect and analyse quantitative data to identify significant results, patterns or outliers that require deeper explanation (Ivankova, Creswell & Stick, 2006). The qualitative phase is then specifically designed to elaborate on these initial quantitative findings, using them to frame the questions, select participants and guide the inquiry into the underlying reasons and contextual factors behind the statistical trends. This design is particularly powerful for explaining unexpected or complex results, as the qualitative data provides the "why" behind the "what" that the numbers reveal (Creswell & Plano Clark, 2018). The integration occurs at the interpretive stage, where qualitative findings are used to explain and provide context for the quantitative results, creating a more comprehensive and nuanced understanding of the phenomenon. The sequential explanatory design is highly intuitive, allowing researchers to use quantitative results to guide the focus of the qualitative phase (Ivankova, Creswell & Stick, 2006). However, this approach is often criticised for being time-intensive and potentially resource-heavy, as it requires two distinct data collection phases (Creswell & Plano Clark, 2018).

Exploratory Sequential Design (QUAL → QUANT)

This design reverses the sequence, beginning with an initial qualitative phase aimed at exploring a complex phenomenon where variables are unknown or a theory is underdeveloped. The qualitative findings are then used to inform the development of the subsequent quantitative phase, which may involve building a new instrument, identifying key variables or developing a classification system (Creswell & Plano Clark, 2018). The strength of this approach lies in ensuring that the quantitative tool or model is grounded in the lived experiences and perspectives of the target population, thereby enhancing its validity and cultural relevance (Morgan, 1998). The integration is achieved through the building process, where the qualitative insights directly shape the nature and content of the quantitative data collection.

Convergent Design (QUANT + QUAL)

In this design, often referred to as a concurrent or parallel design, the researcher collects both quantitative and qualitative data simultaneously in a single phase, prioritising them equally (Creswell & Plano Clark, 2018). The core purpose is to compare, contrast or merge the two datasets to develop a complete, holistic understanding of the research problem, seeking convergence, complementarity or contradiction between the findings. This design requires careful planning to ensure that the different forms of data can be effectively brought together during the analysis and interpretation phase, typically by a side-by-side comparison in a joint display (Guetterman, Fetters & Creswell, 2015). A key challenge is managing the potential for divergent findings, which, rather than being a weakness, can often lead to valuable new insights and a more refined understanding of the complexity inherent in the research topic. While the convergent design is efficient for comparing quantitative and qualitative findings (Creswell & Plano Clark, 2018), its major limitation lies in the difficulty of effectively integrating two independent datasets. Without a clear and intentional integration strategy, such as the use of joint displays, researchers risk simply reporting two parallel but disconnected findings, failing to achieve the synergistic insights unique to mixed methods (Tashakkori & Teddlie, 2010).

Complex or Multiphase Design

This sophisticated design involves a series of interconnected quantitative and qualitative phases conducted over time within a larger program of inquiry, often addressing a broad, complex objective. Researchers may combine elements of sequential and convergent designs across multiple studies, with the findings from each phase informing the next in an iterative, cumulative process (Fetters & Freshwater, 2015). This approach is common in large-scale evaluation research, longitudinal studies and community-based participatory research, where understanding a complex issue requires sustained engagement and multiple methodological approaches. The integration is ongoing and occurs at multiple points throughout the research program, as meta-inferences are built from the synthesis of results across the various phases. This design offers tremendous explanatory power but requires significant resources, time and careful logistical planning to execute effectively.

Intervention Design (Embedded Design)

This design involves embedding a qualitative component within a primarily quantitative experimental or quasi-experimental framework, or vice versa. The most common form is the embedded experimental design, where a quantitative trial (for example, a randomised controlled trial) is supplemented by a qualitative component to assess the intervention's implementation process, contextual factors or participant experiences (Creswell, Fetters, & Ivankova, 2004). The qualitative data provides crucial insights into how and why an intervention worked or did not work, moving beyond simply measuring its effects to understanding the mechanisms of change. The two components are integrated to provide a more complete picture of the intervention's

outcomes and processes, which is invaluable for translating research into practice and explaining variations in outcomes across different settings or populations.

Alignment with Research Objectives

The selection of an appropriate Mixed Methods Research (MMR) design is not arbitrary; it must be strategically driven by the overarching purpose or objective of the study. Different research questions demand different methodological configurations to yield meaningful and valid answers. The following seven objectives represent the primary rationales for employing a mixed methods approach, each aligning with specific design strengths to ensure the research strategy effectively addresses the intended goal (Creswell & Plano Clark, 2018). Understanding this alignment is crucial for justifying the choice of design and for structuring a coherent and compelling study.

Exploration

This objective is paramount when investigating a new, complex or poorly understood phenomenon where key variables, theories or hypotheses are not yet established. The qualitative phase is essential for exploring the topic in an open-ended way, allowing themes, concepts and the language of participants to emerge directly from the data without the constraints of pre-defined categories (Creswell & Plano Clark, 2018). These emergent findings then provide the necessary foundational knowledge to build a quantitative instrument, a classification system or a theoretical model that can be tested on a larger scale in a subsequent phase. This objective is best served by an Exploratory Sequential Design (QUAL → QUANT), as the qualitative exploration logically precedes and informs the quantitative development and testing (Morgan, 1998).

Description

The goal here is to provide a comprehensive, detailed and nuanced portrayal of a phenomenon, situation or case, answering both "what is happening" and "how is it happening" in rich detail. Quantitative data provides the broad, generalisable patterns and statistical descriptions of prevalence, frequency and correlation across a larger sample, effectively mapping the landscape of the phenomenon. Simultaneously, qualitative data offers deep, contextual and narrative descriptions that give meaning to the numbers, illustrating the textures, processes and lived experiences behind the statistical trends. This objective is most effectively achieved through a Convergent Design (QUANT + QUAL), where both datasets are collected concurrently and merged to create a complete, multi-faceted profile (Fetters, 2020).

Explanation

This objective seeks to elucidate the patterns, mechanisms and causal relationships behind a phenomenon, moving beyond identifying what the trends are to explain why they exist. The quantitative phase typically identifies significant results, puzzling correlations or unexpected outcomes within a larger population, effectively pinpointing what needs to be explained. The subsequent qualitative phase is then specifically designed to follow up on these quantitative results, using them to select participants (for example, outliers, extreme cases) and frame questions that probe the reasons, motivations and contextual factors underlying the initial findings. This objective is the hallmark of the Explanatory Sequential Design (QUANT → QUAL), where the purpose of the qualitative strand is to explain the initial quantitative results (Ivankova, Creswell & Stick, 2006).

Evaluation

This objective aims to assess the effectiveness, value, merit or worth of a program, policy or intervention, often for the purpose of guiding decision-making and improvement. Quantitative

data is crucial for measuring outcomes, comparing pre- and post-intervention scores and determining the program's overall impact and cost-effectiveness through rigorous metrics. Qualitative data is equally vital for understanding the process of implementation, identifying contextual barriers and facilitators and capturing unintended consequences or participant experiences that numbers alone cannot reveal. This objective often requires Complex or Multiphase Designs that may combine sequential and concurrent elements to both measure outcomes and understand processes (Greene, 2007).

Development

The focus here is on using the findings from one method to inform the procedural development of the other method, often to create a more valid, contextually appropriate or effective research tool or intervention. The qualitative phase is typically used to generate items, language and concepts that are culturally relevant and grounded in the authentic experiences of the target population. These insights are then systematically used to build or refine a quantitative instrument, such as a survey, scale or diagnostic tool, ensuring it accurately reflects the constructs of interest in that specific context. This objective is best served by an Exploratory Sequential Design (QUAL → QUANT), where the development process is the central purpose of the study (Creswell & Plano Clark, 2018).

Empowerment

This objective, rooted in transformative-emancipatory paradigms, seeks to collaborate with community stakeholders to address problems, challenge inequities, empower participants and create social change. Quantitative data provides powerful, often irrefutable evidence of systemic disparities, patterns of inequality or the scale of a problem, which can be used for advocacy and to demand accountability from institutions. Qualitative methods are essential for centring the voices, stories and lived experiences of marginalised communities, ensuring that the research process itself is participatory and that the findings reflect their perspectives and priorities. This objective often employs Transformative Designs, which can be sequential or convergent but are wrapped in a framework of social justice and participation (Mertens, 2007).

Prediction and Optimisation

This objective aims to not only forecast future outcomes or behaviours based on identified patterns but also to understand the mechanisms behind those predictions to improve them. Quantitative methods, including advanced statistical modelling and machine learning, are used to analyse large datasets and build predictive models that identify factors associated with a particular outcome. Qualitative data is then used to interpret, contextualise and explain the predictions made by the model, particularly in cases of false positives/negatives or for high-risk cases, thereby refining the model's accuracy and utility. This objective can be effectively addressed through an Explanatory Sequential Design (QUANT → QUAL), where the quantitative model is developed first and then explained qualitatively (Creswell & Plano Clark, 2018).

Table 2: Aligning Research Objectives with MMR Designs

Research Objective	Primary Goal	Recommended Design(s)
Exploration	To investigate a new, poorly understood phenomenon.	Exploratory Sequential (QUAL → QUANT)

Research Objective	Primary Goal	Recommended Design(s)
Description	To provide a comprehensive, nuanced portrayal.	Convergent (QUANT + QUAL)
Explanation	To explain quantitative results, mechanisms, or causality.	Explanatory Sequential (QUANT → QUAL)
Evaluation	To assess the merit and worth of a program or policy.	Complex/Multiphase; Embedded
Development	To inform the development of a quantitative instrument.	Exploratory Sequential (QUAL → QUANT)
Empowerment	To collaborate for social change and challenge inequities.	Transformative (Sequential or Convergent)
Prediction & Optimization	To forecast outcomes and understand the mechanisms behind them.	Explanatory Sequential (QUANT → QUAL)

Methodological Procedures and Integration Strategies

This section delves into the practical aspects of conducting MMR, covering the essential steps of data collection, the core analytical strategies for integration and the establishment of rigorous validation techniques to ensure the credibility and trustworthiness of the meta-inferences drawn from the study.

Data Collection Procedures

Sampling Strategies

The sampling design in MMR requires careful consideration to ensure that the quantitative and qualitative components can be logically and effectively integrated. Unlike mono-method studies, MMR often employs sophisticated sampling techniques that link the two strands, such as identical sampling (using the same participants), nested sampling (selecting a qualitative sub-sample from a larger quantitative pool), parallel sampling (selecting different butcomparable samples) or multilevel sampling (sampling different units of analysis) (Teddlie &Yu, 2007). The choice of strategy is dictated by the research design. This purposeful interconnection between samples is crucial for achieving sample integration legitimation, a key aspect of quality in MMR that ensures the relationship between the two samples is defensible and meaningful (Onwuegbuzie & Johnson, 2006).

Data Collection Timing

The temporal sequence of data collection is a fundamental decision that directly shapes the analytical possibilities and the overall logic of the study. In a sequential design (for example, QUANT → qual or QUAL → quant), the two phases are conducted in distinct, consecutive stages, allowing the findings from the first phase to directly inform the focus and procedures

of the second phase (Creswell & Plano Clark, 2018). In a convergent design (QUANT + QUAL), data collection occurs simultaneously or within a very close timeframe, which allows for the independent collection of both data types but requires advanced planning to ensure they can later be merged for comparison. The timing decision impacts resource allocation, the potential for participant attrition in longitudinal sequential designs and the ability to capture a snapshot of a phenomenon at a single point in time versus understanding its evolution.

Instrument Development

A unique strength of MMR, particularly in sequential designs, is the capacity for one method to inform the development of instruments for the other. In an exploratory sequential design (QUAL → QUANT), the initial qualitative findings are systematically used to build aquantitative instrument, such as a survey or scale, ensuring that the items are grounded in the authentic language, experiences and concepts of the study population, thereby enhancing its content and cultural validity (Creswell & Plano Clark, 2018). This might involve transforming emergent themes into Likert-scale items or using direct participant quotes to create response options. Conversely, in an explanatory sequential design (QUANT → QUAL), the results from the quantitative phase (for example, identifying outlier cases, significant factors) are used to develop the interview protocol or focus group guide for the qualitative phase, ensuring the follow-up questions are targeted and directly address the patterns revealed by the numbers.

Data Analysis and Integration

Integration Strategies

Integration is the defining characteristic and core analytical process of MMR, representing the point where the two strands are brought together to generate new insights. Fetters (2020) outlines several key integration strategies, including connecting (where the analysis of one dataset informs the data collection or analysis of the other, common in sequential designs), building (using the findings from one method to develop a framework for the other, such as qual to quant instrument development), merging (bringing the two datasets together for side by-side comparison to confirm, discord or expand findings, central to convergent designs) and embedding (nesting a smaller component of one type of data within a larger study dominated by the other method). The choice of strategy is not mutually exclusive and should be driven by the research questions and design, with the explicit goal of facilitating the drawing of meta inferences—conclusions that are derived through the integration of both datasets and are greater than the sum of the individual parts.

Joint Displays

The joint display is arguably the most significant practical innovation in MMR for achieving and representing integration. It is a visual tool, typically a table or figure, that organises quantitative and qualitative results side-by-side to facilitate a direct comparison and interpretive synthesis (Guetterman, Fetters & Creswell, 2015). A basic joint display structure includes at least three columns: one for the quantitative findings, one for the related qualitative findings and a third for the meta-inference or interpretation that arises from considering the two datasets together. This tool moves integration from an abstract concept to some concrete, documented analytical process, forcing the researcher to confront points of convergence, complementarity and contradiction. By making the integration process transparent, joint displays not only enhance the rigour of the analysis but also serve as a powerful communication tool in publications, allowing readers to see exactly how the mixed methods findings were developed and supporting the legitimacy of the meta-inferences (Fetters, 2020).

Establishing Methodological Rigour
Legitimation

In MMR, the concept of validity is expanded into the broader framework of "legitimation," which refers to the trustworthiness of the meta-inferences drawn from the integrated findings. Onwuegbuzie and Johnson (2006) developed a validation framework comprising nine types of legitimations, each addressing a different potential threat to quality in a mixed methods study. Key types include sample integration legitimation (the appropriateness of the relationship between the quantitative and qualitative samples), inside-outside legitimation (the ability to balance the insider's perspective with the outsider's view), paradigmatic legitimation (the philosophical consistency between the chosen methods and the researcher's stated paradigm) and integration legitimation (the effectiveness with which the qualitative and quantitative findings were integrated). Researchers should proactively address these potential threats in their study design and explicitly discuss how they were mitigated in their methodology and discussion sections, thereby providing a comprehensive argument for the validity of their conclusions.

Validation Techniques

To achieve the various forms of legitimation, MMR researchers employ a portfolio of validation techniques borrowed from both quantitative and qualitative traditions, applied in a complementary fashion. These techniques include member checking (returning to participants to validate the accuracy of qualitative interpretations and integrated findings), audit trails (maintaining a detailed log of all analytical decisions and procedures to allow for external verification), peer debriefing (engaging disinterested colleagues to challenge assumptions and review interpretations) and triangulation (using the convergence between the different methods to cross-validate findings) (Creswell & Plano Clark, 2018). The strength of these mixed methods techniques lies in using them together. For example, when a finding is backed by quantitative patterns and qualitative themes through triangulation and is further validated by participants via member checking, it carries much more weight than evidence from a single method. This intentional use of several validation strategies is key to establishing the rigourand credibility of mixed-methods research.

Practical Application of MMR Across Disciplines

Mixed Methods Research (MMR) is valuable because it tackles complex, real-world problems that a single methodological approach cannot fully explain. It is adaptable to the different epistemological and practical demands across fields, from the social sciences to applied disciplines. By combining quantitative trends with in-depth contextual insight, MMR builds a robust evidence base for technology development, policy design, program evaluation and theory building. The sections that follow show how MMR is applied in some key disciplines, demonstrating its role in producing actionable, nuanced insights that are both methodologically sound and socially relevant.

Table 3: Practical Application of MMR Across Professional Disciplines
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Professional Discipline	Application of MMR	Example Samples on Practical Application
Healthcare Research	Evaluating interventions and understanding patient experiences.	Using an explanatory sequential design to assess treatment efficacy through quantitative RCTs, followed by qualitative interviews exploring patient adherence.
Educational Research	Addressing multifaceted challenges in teaching and learning environments.	Combining quantitative surveys on student performance with qualitative interviews to understand factors influencing learning outcomes.
Business and Organisational	Gaining insights into consumer behaviour and optimising operations.	Merging quantitative data on sales trends with qualitative focus group feedback to understand consumer motivations behind purchasing decisions.
Social Sciences Research	Examining complex social phenomena and public policy impacts.	Utilising quantitative methods to assess policy outcomes, complemented by qualitative case studies to explore differential impacts among various communities.
Information and Communication Technology (ICT)	Understanding user experiences and system effectiveness.	Integrating quantitative usability metrics with qualitative user feedback to improve interface designs based on user interactions.
Engineering	Exploring socio-technical dimensions of projects and technologies.	Combining quantitative project data on costs and timelines with qualitative interviews to identify communication issues affecting project success.
Agricultural Sciences	Bridging biophysical science and farmer livelihoods.	Using quantitative surveys to measure adoption rates of sustainable practices alongside qualitative interviews to explore barriers to adoption among farmers.
Environmental Sciences	Studying complex interactions between natural systems and human societies.	Constructing quantitative vulnerability indices complemented by qualitative community assessments to identify the most affected social groups regarding climate change.
Public Health	Evaluating health programs and understanding community health issues.	Combining quantitative surveys on health outcomes with qualitative focus groups to explore community perceptions of health services.
Psychology	Understanding complex mental health issues and treatment effects.	Using quantitative measures of treatment efficacy alongside qualitative interviews to gain insights into patient experiences and coping strategies.
Political Science	Analysing voter behaviour and public opinion on policy issues.	Employing quantitative polling data to identify trends, complemented by qualitative

Professional Discipline	Application of MMR	Example Samples on Practical Application
		interviews to understand voter motivations and concerns.
Criminology	Examining crime patterns and the effectiveness of interventions.	Merging quantitative crime statistics with qualitative interviews of community members to explore perceptions of safety and the impact of policing strategies.
Marketing	Understanding consumer insights and brand perception.	Integrating quantitative market analysis with qualitative ethnographic studies to identify consumer attitudes and behaviours towards a brand.
Urban Studies	Exploring the dynamics of urban development and community engagement.	Using quantitative demographic data to assess urban changes alongside qualitative case studies of community participation in development projects.
Disability Studies	Investigating the experiences of individuals with disabilities and the effectiveness of support services.	Combining quantitative assessments of service usage with qualitative interviews to explore barriers and facilitators experienced by users.
Sports Science	Understanding athletic performance and training effectiveness.	Merging quantitative performance metrics with qualitative interviews of athletes to explore their subjective experiences and training challenges.

Ethical Considerations in MMR

Conducting mixed methods research introduces unique ethical complexities that extend beyond the standard considerations for single-method studies (Mertens, 2007). A primary challenge involves navigating potentially conflicting ethical requirements from institutional review boards (IRBs).

Table 4: Comprehensive Ethical Considerations in Mixed Methods Research

Ethical Area	Key Considerations	Practical Strategies & Solutions	Protections for Vulnerable Groups
Protecting the Researcher	Vicarious Trauma & Compassion Fatigue: Exposure to sensitive or traumatic content.	• Debriefing Protocols: Mandatory, regular debriefing sessions. • Access to Support: Providing information for counselling services. • Clear Boundaries: Training on recognising limits; referring participants to professional support.	• Cultural Safety: Researchers working with vulnerable groups may require specific training (e.g., on historical trauma, cultural protocols) to avoid causing harm and to protect their own well-being.
	Power Dynamics & Institutional Vulnerability: Pressure on junior researchers.	• Informed Consent for Researchers: Clear agreements on roles and the right to withdraw without penalty. • Supervisor Training: Ensuring PIs have a duty of care for their team.	• Community Guidance: When working with special groups, researchers should defer to community leaders or cultural advisors on appropriate protocols, which can reduce ethical missteps and researcher anxiety.
	Competence & Integrity: Conducting research beyond one's expertise.	• Collaboration & Training: Building a team with complementary expertise; seeking necessary training.	• Cultural Competence: Researchers must be trained in and sensitive to the cultural context of the vulnerable population they are studying.
Protecting Participants	Informed Consent Process: Complex due to multiple phases.	• Phased Consent: Clearly explaining each phase separately. • Ongoing Process: Re-checking consent at the start of each new phase.	• Children: Obtain assent from the child (age-appropriate agreement) and consent from a parent/guardian. Use simplified forms, visuals, or verbal explanations.

Ethical Area	Key Considerations	Practical Strategies & Solutions	Protections for Vulnerable Groups
			• People with Disabilities: Ensure consent process is fully accessible (e.g., easy-read documents, audio descriptions, support of a trusted advocate). • Cultural Variations: Understand that consent may be a collective community decision, not just an individual. Use appropriate language translators, not just family members.
	Confidentiality & Anonymity: Rich qualitative data increases identifiability.	• Data De-identification: Altering identifying details in transcripts. • Secure Linking: Using unique ID codes. • Data Aggregation: Reporting data in an aggregated form.	• Small/Close-Knit Communities: Aggregation may not be sufficient. Community review of findings may be needed to ensure no individual or family can be identified. Use broader demographic categories. • People with Rare Disabilities: Extra caution is needed as their specific condition and story may be highly identifying.
	Potential for Harm: Psychological or emotional distress.	• Screening & Support: Having a list of support services to provide. • Researcher Training: Training to recognise and respond to signs of distress.	• Vulnerable Groups: May have a higher risk of re-traumatisation. Use trauma-informed approaches in interviews. Ensure support services are culturally relevant and accessible (e.g., disability-friendly, language-specific).

Ethical Area	Key Considerations	Practical Strategies & Solutions	Protections for Vulnerable Groups
	Justice & Equity: Exploitation; research not benefiting participants.	• Community-Based Participatory Research (CBPR): Involving community stakeholders throughout the process. • Benefit Sharing: Returning results to the community in accessible formats.	• Core Ethical Principle: The research must be designed to benefit the vulnerable group, not just extract data. This includes capacity building, fair compensation for time, and advocating for resources or policy changes based on findings.
Protecting Data Storage	Secure Storage Systems: Protecting highly sensitive data.	• Encrypted Storage: Using password-protected, encrypted drives or secure servers. • Access Control: Limiting access to essential team members.	• High-Risk Groups: Data on undocumented immigrants, victims of abuse, or political dissidents may require the highest level of security and a pre-defined plan for safe data destruction. Anonymity may be a matter of safety, not just ethics.
	Data Linking & Re-identification: Combined datasets increase risk.	• Physical Separation: Storing consent forms separately from data. • Use of IDs: Only using participant ID codes within datasets.	• Cultural Sensitivities: Certain types of information (e.g., spiritual beliefs, clan affiliations) may be culturally sensitive and require special restrictions on access and storage, as dictated by community partners.
	Data Retention & Destruction:	• IRB Compliance: Following guidelines for data retention. • Secure Destruction: Using secure deletion	• Indigenous Data Sovereignty: For Indigenous communities, the principle of OCAP® (Ownership, Control, Access, Possession) may dictate that the community itself owns or co-owns the

Ethical Area	Key Considerations	Practical Strategies & Solutions	Protections for Vulnerable Groups
		methods after the retention period.	data and controls its retention and future use.
Protecting Data Reporting	Representation of Divergent Findings: Downplaying contradictory results.	• Intellectual Honesty: Actively reporting all findings. • Explaining Discordance: Attempting to explain why findings differ.	• Avoiding Stereotyping: Take extreme care that reporting qualitative quotes or quantitative findings does not reinforce negative stereotypes about vulnerable groups (e.g., disability, cultural background).
	Transparency in Methodology: Inadequate description prevents replication.	• Reporting Guidelines: Using frameworks like GRAMMS. • Detailed Accounting: Clearly describing design, sampling, and integration.	• Cultural validity: Report on how the research design and instruments were adapted for cultural validity or accessibility for the target group (e.g., translation process, use of assistive technologies).
	Ethical Representation of Qualitative Data: Misusing quotes or revealing identity.	• Contextual Integrity: Ensuring quotes reflect the participant's intent. • Final Anonymity Check: Reviewing quotes for identifying details.	• Cultural Appropriateness: Some stories or knowledge shared by participants may be culturally sensitive and not intended for public dissemination, even if anonymized. Obtain specific consent for the use of specific quotes.
	Plagiarism & Self-Plagiarism:	• Proper Citation: Ensuring all sources	

Current Challenges and Future Directions

Despite advances, MMR faces persistent challenges tied to its hybrid design, which also open doors for future development. Advancing MMR as a leading paradigm will require closing

gaps in methodology, training and technology. The next sections identify these challenges and suggest a collaborative, forward-looking approach to resolving them.

Integration Complexity

Effectively integrating quantitative and qualitative findings remains methodologically challenging and is perhaps the most critical hurdle for MMR (Fetters & Molina-Azorin, 2017). The complexity arises from the fundamental differences, such as the data, the epistemological assumptions behind their collection and the analytical processes involved. Simply placing quantitative results next to qualitative themes does not constitute true integration; rather, it requires a deliberate and sophisticated process of combining insights to form a more complete picture. Researchers often struggle with how to merge data in a way that generates "meta inferences," which are the new insights gained from the combination of findings that would not have been possible from either method alone (Tashakkori & Teddlie, 2010).

Methodological Training

A significant challenge for the future of MMR is the gap in methodological training, as most researchers are trained primarily in either quantitative or qualitative methods, creating ashortage of truly mixed methods experts. The traditional academic structure, which often separates departments and courses based on these single-paradigm approaches, reinforces this divide. As a result, many researchers attempt to conduct MMR without the necessary foundational knowledge in both methodologies, which can lead to flawed designs, inappropriate integration and compromised study quality. This educational reform is essential for building a new generation of researchers who are equipped to conduct rigorous and impactful mixed methods studies and to lead the field forward.

Publication Standards

Limited journal space often prevents researchers from fully reporting both the methodological components of a mixed-methods study and how they are integrated within one article, which undermines the dissemination of high-quality MMR. Conventional journals, with strict page and formatting constraints, were not built to accommodate the level of detail needed to describe both a quantitative analysis and a qualitative thematic analysis. As a result, researchers are forced to make compromises, frequently leaving out key information about their design, data collection or, most importantly, their integration approach. To address this, there is a growing consensus that the field needs to develop and adopt standardised reporting guidelines for MMR. Frameworks like the Good Reporting of a Mixed Methods Study (GRAMMS) framework were created to provide a structured approach to reporting and to ensure that all essential elements of an MMR study are included (O'Cathain, Murphy & Nicholl, 2008).

Technological Development

While a plethora of software exists for quantitative and qualitative analysis separately, integrated MMR software remains underdeveloped, posing a significant challenge for researchers. Researchers often find themselves using disparate programs, such as SPSS or R for statistical analysis and NVivo or ATLAS.ti for qualitative coding and then having to manually integrate the findings, a process that is time-consuming and prone to error. This lack of seamless integration hinders the ability of researchers to conduct more sophisticated analyses, such as "quantitising" qualitative data (turning qualitative themes into numerical data) or using quantitative variables to inform qualitative sampling. Future technological innovations should focus on creating platforms that are purpose-built for MMR from the ground up, allowing researchers to manage and analyse both data types within a single

environment.

Philosophical Debates

Ongoing discussions about philosophical compatibility continue to shape the mixed methods field and while some see this as a challenge, it also represents an opportunity for intellectual growth. The debate largely centres on whether a researcher can logically combine a positivist, quantitative approach with an interpretive, qualitative approach, which have historically been seen as incompatible (Morgan, 2014). Pragmatism, with its focus on the research problem rather than on philosophical purity, has emerged as a widely accepted paradigm for MMR, providing a practical foundation for methodological pluralism. Questions remain about how paradigms such as critical realism and transformative frameworks can shape mixed-methods research. Future work should expand philosophical frameworks that support both diversity and integration of methods and examine more closely how philosophical assumptions affect the entire research process rather than justifying the mix.

Conclusion and recommendations

Mixed Methods Research (MMR) stands as an indispensable and sophisticated paradigm for investigating the complex, multifaceted phenomena that define contemporary research across the social, health and applied sciences. The paper presented a clear, practical framework for MMR and explained how philosophical approaches like pragmatism and critical realism justify blending broad quantitative analysis with in-depth qualitative insight. The central, enduring principle remains that the research question must be the primary driver of methodological choice, not the reverse.

Design typologies, when strategically matched to specific research objectives, give scholars a clear framework for choosing methods that are both technically robust and philosophically consistent with the study's overall aim. Still, the real strength of MMR lies in intentional and thoughtful integration. As highlighted, techniques such as joint displays are central to this process, converting separate datasets into synergistic meta-inferences that produce a richer, more comprehensive understanding than a single method could provide.

By empowering researchers to navigate philosophical, design-based and ethical complexities with confidence, it aims to advance the quality and rigour of mixed methods practice. As the field advances, this guide offers a foundational framework for producing the precise and elaborate evidence needed to tackle today's most urgent and complex questions. It also reinforces MMR's ongoing relevance and strength within an increasingly interdisciplinary research environment.

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