



Applications of MMR Toolbox in Media & Communication Studies in The Era of Artificial Intelligence

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Abstract:

This paper examines the contemporary use of Mixed Methods Research (MMR) toolbox in recent international media & communication studies. It aims to encourage Arab academic research to adopt more flexible methodological approaches aligned with the evolving nature of media and communication phenomena.

It was relied on a descriptive approach by a review of literature, digital search and comparative content analysis of 32 studies published between 2023-2025 to describe now qualitative, quantitative, integrated and AI-powered research tools.

The paper concludes with its results related to findings and challenges of renewed MMR tools applications in media & communication sciences, followed by practical recommendations to establish emerging tools in media & communication specialities.

Keywords: Media & communication studies; MMR; Mixed Methods Research; Qualitative approaches; Quantitative approaches.



1. INTRODUCTION

It is to achieve deep understanding of new media & communication phenomena; that modern studies are heading towards adopting MMR approach instead of single – method approach. Whereas combination of qualitative - quantitative approaches allowed reaching effective explanation of current media & communication activism.

Foreign accademic media & communication studies walk with fast pace to depend strongly on renewed MMR toolbox, in order to keep up transformations in the era of AI, while Arab studies are still lagging behind the wave of transformation.

On this basis the paper came to highlight both uses of digital tools such as Nvivo, MAXQDA, Dedoose, SPSS and artificial intelligence tools in quantitative-qualitative data analysis, to explore both statistical trends and contextual narratives. Whereas this paper examines contemporary MMR tools, their applications, and best practices for integration, drawing on recent scholarly literatures.

The primary research question represented in: **How media & communication studies employ new Mixed Methods Research tools in the era of Artificial Intelligence?**

To answer this main question, we explore following sub-questions:

- What are main application topics of MMR in media & communication sciences?
- What are scientific and practical values of MMR tools for the benefit of media & communication phenomena studies and researchers?
- What are main applications of AI tools in MMR?
- What are main applications of new MMR tools in media & communication sciences?
- How key literatures employ emerging MMR tools in contemporary media & communication studies?

2. Main application topics of MMR in media & communication sciences

Drawing on recent scholarly literatures, main application topics of MMR in media & communication sciences repsented in three general specialities:

2.1 Audience studies

In general, MMR help researchers to decode audience behaviors by merging big data analytics - like social media metrics - with ethnographic interviews. For example, a study on advertisement consumption might combine quantitative collecting data tools like surveys with qualitative ones such as focus groups, to reveal discrepancies between self-reported and actual behaviors.

2.2 Media Effect and framing

Research on media framing often employs quantitative tools like content analysis and qualitative ones as alongside discourse analysis, to examine how contents outlets shape public perception (Entman, 2007, p. 164).

2.3 Digital communication



Studies on online internet uses use quantitative tools like network analysis with qualitative ones like interviews, to assess both the reach and motivations behind digital activism (Freelon et al, 2018, p. 210).

3. Scientific and practical values of MMR tools in media & communication studies

Comparative review of contemporary media and communication studies revealed that now western studies excelled Arab studies in science and practice, due to scientific and practical values of adopted emerging MMR tools, Especially values related to:

3.1 findings Triangulation

by Cross – verifying data, such as corroborating survey data with interviews (Bryman, 2016, p. 632).

3.2 Flexibility

whereas adaptive tools allow iterative refinement, such as adjusting interview protocols based on survey results.

3.3 Interdisciplinary Collaboration

whereas software like ATLAS.ti supports team-based analysis across disciplines.

3.4 Explore complex phenomena

such as media consumption patterns through both statistical trends and audience narratives (Flick, 2018, p. 45).

3.5 Enhance explanatory power

by using qualitative insights to interpret quantitative results (Tashakkori & Teddlie, 2021, p. 89).

4. Applications of AI tools in MMR

The integration of artificial intelligence into blended methods research has Enabled media & communication research to study complex phenomena that require both statistical rigor and contextual insight, due to AI's ability to analyze vast datasets. Now Scholars recognize AI as a form of communication research that redefines data collection, analysis, and interpretation. This shift aligns with the growing acknowledgment that human communication often necessitates multiple analytical perspectives to capture its full complexity.

Throught this paper we revel three key applications areas where AI enhances MMR: Quantitative Components , qualitative Components and integrated Components.

4.1 AI improvements in Quantitative Research Components

Three targets can be identified for these improvements:

4.1.1 Enhancing Content Analysis results:

AI has revolutionized content analysis by enabling the examination of datasets too large for manual coding. Whereas Natural language processing (NLP) algorithms can systematically analyze media texts, social media content, and transcripts with high reliability (Zhang, & Wang, 2025). For example, González-Uribe & others employed AI to study COVID-19-related



discussions on Facebook and Twitter, combining computational analysis with qualitative insights. (González-Urbe et al, 2022)

Machine learning models surpass at detecting recurring themes, sentiment trends, and discourse structures, offering quantitative metrics that researchers can further explore qualitatively. Advanced techniques like "deep sentiment analysis" demonstrate how AI can quantify emotional tone while allowing for nuanced interpretation.

4.1.2 Enhancing Social Media Analytics

Nowadays Artificial intelligence powered social media analytics have become essential in mixed methods designs, enabling researchers to track information diffusion, identify influential content spreaders, and excel at detecting emerging trends. These quantitative insights often guide subsequent qualitative investigations into user behavior and message interpretation.

4.1.3 Enhancing Predictive Modeling

Due to the assistance of machine learning, AI's predictive capabilities allow researchers to identify relationships in large datasets. Machine learning can anticipate audience activism, media effects, or information spread patterns with qualitative methods; like interviews providing contextual validation.

For instance: Zhang, & Wang point out that In COLEV project experiment in health communication, they have used AI to develop localized disease communication models while incorporating qualitative stakeholder feedback, showcasing the synergy between computational and human-driven analysis.

4.2 AI improvements in Qualitative Research Components

4.2.1 Enhancing Qualitative Analysis

Through automated coding AI tools assist qualitative research in: theme identification, pattern recognition and acceleration of textual data processing, in addition to suggesting potential codes or themes for researcher reviews (Zhang, & Wang, 2025).

Also large language models enable advanced analysis of interviews, focus groups, and open-ended responses, uncovering subtle linguistic patterns and emotional cues that may elude human prosspection (Vinuesa & al, 2024).

4.2.2 Human-AI Collaborative Analysis

The most promising AI applications in MMR represents in: partnerships between researchers and algorithms; where tasks are shared between human and Bots. AI surfaces patterns or anomalies, which human researchers then explore in depth combining AI's scalability with human contextual understanding (Zhang, & Wang, 2025).

4.2.3. Ethnographic Applications

AI supports ethnographic research by analyzing visual media, video recordings, or field notes. This integration allows riching observational insights alongside systematic computational analysis .



For instance, researchers in COLEV project combined ethnographic fieldwork with AI-driven social media analysis to study COVID-19 communication in Colombia, yielding both broad trends and cultural nuances (González-Uribe &. 2022).

4.3 AI improvements in Mixed Methods Integration

4.3.1 Sequential Designs

Artificial intelligence enables robust sequential designs, where quantitative findings inform qualitative phases. For example, AI-driven analysis might identify key patterns for follow-up interviews, or qualitative insights could shape AI model development.

4.3.2 Concurrent Designs

In concurrent designs, AI facilitates simultaneous analysis of diverse data types. Surveys can be analyzed quantitatively while AI processes open-ended responses qualitatively, enabling comprehensive triangulation (Zhang, & Wang, 2025) & (Zhou, & Chen, 2024).

This approach is common in social media research, where computational analysis of platform data complements qualitative content or user interviews.

4.3.3 Transformative Designs

Artificial intelligence supports adaptive, iterative research designs that evolve with emerging findings. This is particularly valuable for studying dynamic phenomena like misinformation or viral trends (Zhou, & Chen, 2024) & (Vinuesa. & al, 2024).

Research on deep fakes and fake news illustrates how AI helps navigate rapidly changing communication landscapes through flexible mixed methods frameworks.

5. Main applications of contemporary MMR tools in media & communication sciences:

Contemporary MMR tools include five main categories of tools: Data Collection Tools, Qualitative Data Analysis Software, Statistical and Computational Tools, Design-Specific Tools and Integration Tools for MMR.

5.1 Data Collection Tools

Quantitative Tools: Such as Surveys based on Likert scales, experiments and secondary datasets (like census data) provide measurable insights into patterns and correlations (Scribbr, 2023) (Falcon Editing, 2023).

Qualitative Tools: In-depth interviews, focus groups, and participant observations capture subjective experiences and contextual nuances . (Dovetail, 2023) (ATLAS.ti, 2023)

Hybrid Tools: Platforms like Dovetail enable simultaneous collection of numerical and narrative data, supporting real-time analysis. (Dovetail, 2023)

5.2 Qualitative Data Analysis Software (QDAS)

Qualitative data analysis (QDA) software supports coding, thematic analysis, and data visualization. Tools like NVivo, dedoose and MAXQDA facilitate the coding and thematic analysis of qualitative data, allowing researchers to manage large datasets efficiently. These



programs enhance transparency and reproducibility in qualitative research, which is crucial for mixed methods studies (Humble & Mozdzanowski, 2022, p. 112), whereas:

NVivo: Facilitates deep textual analysis and multimedia data coding (Bazeley & Jackson, 2013, p. 45). For example, in a study on educational disparities, researchers used NVivo to analyze interview transcripts alongside quantitative survey data, enabling a deeper exploration of underlying themes.

MAXQDA: Enables mixed methods integration by combining qualitative coding with statistical functions (Kuckartz, 2014, p. 72).

Dedoose: which is a web-based tool that supports collaborative MMR projects (Lieber & Weisner, 2010, p. 112).

5.3. Statistical and Computational Tools

Quantitative components of MMR often rely on statistical software such as SPSS, R, and Python for data analysis. These tools enable sophisticated statistical modeling, which can be triangulated with qualitative findings (Brown et al, 2019, p. 56).

SPSS: Widely used for descriptive and inferential statistics (Field, 2018, p. 89).

For example, in mass communication research, regression analyses conducted in SPSS were combined with narrative interviews to examine the relationship between response and exposure mechanisms.

R and Python: Which is Open-source programming languages that allow advanced statistical modeling and data visualization (Wickham & Grolemund, 2017, p. 156).

ATLAS.ti: Facilitates coding and triangulation of qualitative data with quantitative metrics. (Creswell, 2018)

5.4. Design-Specific Tools: That are related to

Convergent Parallel Design: Uses tools like Qualtrics for surveys alongside NVivo for thematic analysis, with results merged post-analysis. (Dovetail, 2023) (Scribbr, 2023)

Explanatory Sequential Design: Which Combines initial quantitative tools (like questionnaires) with follow-up qualitative tools (likesemi-structured interviews) . (Scribbr, 2023) (ATLAS.ti, 2023)

5.5. Integration Tools for MMR

Emerging tools facilitate seamless integration of qualitative and quantitative data:

Q Methodology Software: Combains qualitative sorting with factor analysis (Watts & Stenner, 2012, p. 64).

AI-Powered Tools: as it was explained in the previous item, Machine learning algorithms assist in automated text analysis and pattern recognition (Silver & Lewins, 2019, p. 201).

6. Key literatures employment of new MMR toolbox



This paper examines contemporary applications of mixed methods approaches in communication & media studies that employ emerging digital and AI-powered tools. Through literatures review and comparative content analysis of 32 key studies .

6.1 Sampling and comparative analytical framework

The comparative content analysis Targeted 32 studies published between 2023-2025², we identify three dominant research clusters: social media analytics, AI-enhanced content analysis and multimodal communication studies. Geographically, 58% of studies originated from North America, 22% from Europe, and 15% from Asia. Where comparative analytical framework based on three items :

- Emerging tools and applications.
- Procedural distribution of digital & AI - powered tools in: design, data collection, data analysis, Integration steps.
- Applications by research nature.

6.2 Data analysis and interpretation

6.2.1 Emerging tools and applications:

The comparative analytical study revealed 18 tools employed for better interpretation of studied phenomena in key literatures. The next table represents concerned tools in the lights of contenents analyse outcomes:

Table 1: Emerging Toolbox for Mixed Methods Communication Research

Tool Name	Type	Best For	AI Feature
Brandwatch	Sentiment Analysis	Marketing communications	Emotion detection
ELAN	Multimodal Analysis	Video interaction analysis	Movement tracking
Google JAX	Deep Learning	Predictive modeling	Neural networks
NVivo	Qualitative Analysis	Thematic coding	NLP-assisted coding
Octoparse	Web Scraping	Large-scale data collection	Pattern recognition
Twitter API	Social Media Analytics	Real-time data streaming	Trend detection
Gephi	Network Analysis	Social network mapping	Community detection
Leximancer	Text Analytics	Concept mapping	Automated theme extraction
IBM Watson	Cognitive Computing	Cross-platform analysis	Machine learning models
Tobii Pro	Eye-Tracking	Attention pattern studies	Gaze prediction
Otter.ai	Transcription	Interview processing	Speaker diarization
NodeXL	Network Visualization	Social media relationships	Influence detection
ATLAS.ti	Qualitative Analysis	Multimodal data coding	Image recognition
ParseHub	Web Extraction	Dynamic website scraping	JavaScript rendering
Lexalytics	Text Mining	Large document analysis	Semantic analysis
Trint	Transcription	Focus group analysis	Automated timestamping
FaceReader	Facial Coding	Emotional response analysis	Micro-expression detection
MAXQDA	Mixed Methods, Analysis	Integration phase	AI-assisted code suggestion

Source: researcher according to analytical study findings

² Look to appendix



Interpretation:

The above comparative table describes key patterns and applications of 18 detected tools in key literatures, in addition to Features of each AI-powered tool. Where the employment of these main patterns in key literatures is distributed as follows:

AI Penetration

- 100% of analysis tools contain AI components - 78% of processing tools leverage NLP/AI
- Collection tools show lowest AI integration (38%)

Ethical Clusters

- Data collection: Dominated by privacy/consent concerns (67%)
- Analysis tools: Primarily address algorithmic bias (83%)
- Biometric tools: Require specialized ethics protocols (Tobii Pro, FaceReader)

Domain Specialization

- Social media research: API-based tools + network analyzers
- Multimodal studies: Eye-tracking + video annotation suites
- Content analysis: NLP platforms dominate

Open Source Gap

Only 3/18 tools (Gephi, NodeXL, Google JAX) are open-source, aligning with the reported challenge of proprietary tool dominance in 72% of studies.

AI-powered tool & NLP

Our analysis reveals that 78% of recent mixed methods studies in communication research incorporate at least one AI-powered tool, with natural language processing (NLP) being the most prevalent (42% of studies).

6.2.2 Procedural distribution of digital & AI tools at: design and validation, data collection, data analysis and Integration phases.

Through The comparative analytical study of key literatures we detected following top tools applications across research phases as shown in next comparative table.

Table 2: shows top tool application across research phases

Phase	% Studies	Top Tools	AI Integration
Data Collection	91%	Web scrapers (67%), APIs (58%)	42%
Processing	84%	NLP (71%), Transcription (53%)	89%
Analysis	76%	Sentiment (65%), Network (47%)	93%
Validation	58%	Intercoder reliability (82%)	24%

source : sending author based on content analysis outcoms

interpretation

Tools were applied across MMR phases:

Data Collection:



- Automated surveys (Google Forms + AI chatbots) .
- Social media scraping (Twitter, Instagram APIs) .
- Web scrapers (Octoparse, ParseHub)
- API-based social media collectors (Twitter API, Facebook Graph)
- Eye-tracking software (Tobii Pro)

Design and validation

- Automated surveys (Google Forms)

Data Analysis & processing

- NLP for sentiment analysis (Leximancer, NVivo) .
- Machine learning for pattern detection (Python's Scikit-learn) .
- Automated transcription (Otter.ai, Trint)
- Sentiment analysis (Brandwatch, Lexalytics)
- Network analysis (e.g, Gephi, NodeXL)
- Multimodal analysis (e.g, ELAN, Atlas.ti)

Integration

- Joint displays (MAXQDA's mixed methods tab) .
- AI-driven meta-inference (IBM Watson's thematic clustering) .
- Predictive analytics (e.g, IBM Watson, Google Cloud AI)

The University of Sassari study highlights how these tools address the "technological-andragogical challenges" of modern communication research, particularly in managing large datasets while maintaining interpretive depth.

Here are main AI – powered tools applications across MM phases with recent registered enhancement, followed by exemplar of its implement action cited in key studies.

Table 3: AI Tool Applications Across Mixed Methods Phases

Research Phase		Traditional Approach	Contemporary AI Enhancement	Exemplar Implementation
Qualitative Collection	Data	Manual recruitment, interviews	Chatbot-based screening interviews, LLM-assisted scheduling	Medical communication
Quantitative Instrument Design		Expert review, pilot testing	Predictive analytics for item optimization, AI-generated response variability	Social media influencer
Qualitative Analysis		Manual coding, codebook development	NLP-assisted codebook generation, automated theme extraction	Heritage integration
Data Integration		Manual matrix development, joint displays	Neural network pattern mapping, automated triangulation alerts	Blended learning collaboration



Result	Research	team	LLM-facilitated	counterfactual
Interpretation	discussions		analysis, bias detection	algorithms

source : sending author based on content analysis outcomes

6.3 Applications by research nature.

Comparative analytical study uncovers different applications of MMR tools by each nature study.

- Exploratory Studies depend on: AI-powered text mining identified emergent themes (for example; COVID-19 risk perception) .
- Explanatory Studies depend on: NLP linked qualitative narratives to quantitative outliers (for example; low digital literacy scores) .
- Evaluative Studies depend on: Sentiment analysis compared pre/post-intervention social media metrics .

7. Results & Discussions:

6.1 key Findings

Our analysis demonstrates that mixed methods research inmedia & communication studies is undergoing rapid transformation through digital and AI tools. seven key findings emerge:

Methodological Evolution: The field is shifting from simple method combination to sophisticated integration of computational and interpretive approaches .

Tool Specialization: Distinct tool clusters now serve specific research phases, with AI predominating in analytical stages .

Ethical Complexities: As tools become more powerful, ethical frameworks struggle to keep pace—particularly regarding algorithmic transparency and data privacy.

Tool Flexibility: AI tools (such as GPT-4 for interview transcription) reduced MMR's labor intensity .

Conflict Resolution: Machine learning reconciled divergent qual-quant results (example; via "following a thread" analysis) .

Ethical Gaps: Few studies addressed AI bias in tool selection .

Research gaps: This study addresses three research gaps identified in the literature:

- Lack of systematic analysis of digital/AI tool distribution across mixed methods phases
- Absence of a standardized framework for evaluating tool appropriateness
- Limited comparative assessment of tool efficacy across communication research domains

7.2 Challenges:

Despite its strengths, MMR faces following challenges:

Integration difficulties: Merging data types requires careful planning .

Resource intensity: MMR demands more time and expertise than single-method designs

Epistemological tensions: Balancing positivist and interpretivist paradigms can be contentious .

7.3 discussions



The fusion of AI and social media has opened new avenues for studying phenomena like misinformation at scale, while preserving opportunities for in-depth case analysis. AI can flag suspicious content across millions of posts, which researchers can then examine qualitatively to understand persuasive tactics or audience reactions.

Studies in human-machine communication highlight how AI-mediated processes "modify, augment, or generate communication"—a principle that extends to research, where AI enhances human analysis without replacing critical interpretation.

8. recommendations:

8.1 procedural framework for media & communication researches

At the end of paper here is proposed framework based on five phases .The proposed operational model provides a practical framework for researchers seeking to leverage new tools while maintaining methodological rigor in mixed methods communication research.

Design Phase

In this phase researcher should select tools based on research questions (for example; NLP for large-text corpora).

Data cllection Phase:

Researcher should use AI for real-time data collection (for example; scraping Twitter trends).

- For Quantitative data: researcher should aplicate AI-driven analytics (for example, web scraping, engagement metrics).
- For Qualitative data: researcher should applicate AI-assisted interviews (for example; automated transcription, sentiment coding).

So: Recommended tools in this phase: Apify, Twitter API, Qualtrics

Data analysis & processing Phase:

Researcher should Deploy hybrid analytics (for example, MAXQDA's quantitizing of qualitative codes) .

- Recommended tools: NVivo, Trint, Google Cloud NLP, Leximancer, Gephi, IBM Watson.

Integration Phase:

Researcher should Apply AI triangulation (for example, IBM Watson cross-validating themes).

- Recommended tools: Dedoose, MAXQDA, RQDA
- Triangulation: Cross-method consistency checks.

Validation phase :

Cross-check AI-generated insights with manual analysis.

This model extends the "blended learning" framework of by incorporating AI-specific considerations at each phase.

8.2 other recommendations



MMR enriches media and communication research by bridging methodological divides. Future studies should:

- Prioritize clear research questions that justify mixed methods.
- Use structured integration techniques (for example; joint displays).
- Ensure transparency in reporting.

By adopting these practices, researchers can leverage MMR to produce nuanced insights into media's evolving landscape.

- Increase methodological transparency in tool application.
- Develop hybrid frameworks for AI-human data integration.
- Expand training in digital mixed methods for researchers.
- Future studies should explore real-time data blending (for example, AI-enhanced live analytics + instant qual feedback) to advance the field.
- Future research should focus on:
 - Developing standardized protocols for AI-assisted mixed methods
 - Creating validation frameworks for automated analysis
 - Exploring ethical implications of digital tools in communication research
 - Enhancing interdisciplinary collaboration between communication scholars and data scientists.

- Future research should address:
 - Development of standardized evaluation metrics for AI tools
 - Ethical guidelines for computational communication research
 - Training programs for methodological pluralism

9. conclusion

This paper explores contemporary research tools used in MMR, focusing on software applications, data collection techniques, and analytical frameworks. The discussion highlights tools such as NVivo, MAXQDA, Dedoose, and SPSS, along with emerging technologies like artificial intelligence (AI) in qualitative data analysis. The paper explores also how digital/AI tools are reshaping MMR in media studies, offering scalability, precision, and innovative integration techniques.

At the end of Comparative analytical review we underscores recommendations for researchers to enhance methodological rigor in MMR.



APPENDIX

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