

Human-Centered Generative AI for Ethical and Sustainable Media Broadcasting

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ABSTRACT

The rapid expansion of generative artificial intelligence has transformed media broadcasting by enabling automated content creation, synthetic personalities, real-time production, and personalized audience interaction within decentralized digital ecosystems. However, this transformation also raises critical concerns regarding ethical accountability, audience trust, algorithmic transparency, energy consumption, and the sustainability of AI-driven broadcasting infrastructure. **This study aims to examine** how human-centered generative AI can support ethical and sustainable media broadcasting while maintaining creativity, journalistic integrity, audience engagement, and environmental responsibility. **The method** research employs a qualitative conceptual approach based on a structured literature review of recent studies on generative AI, digital media broadcasting, decentralized content systems, AI ethics, and green computing. The analysis is organized around key dimensions, including human-centered design, synthetic media governance, audience personalization, decentralized infrastructure, and energy-efficient AI implementation. **The Result findings** indicate that human-centered generative AI can enhance broadcasting innovation by improving content efficiency, adaptive storytelling, audience relevance, and interactive media experiences. At the same time, ethical safeguards such as AI labeling, provenance tracking, privacy protection, editorial oversight, and transparent algorithmic governance are essential to prevent misinformation, manipulation, and audience distrust. **The study also highlights** that sustainable broadcasting requires optimized AI models, green data centers, and responsible infrastructure management. This paper concludes that the integration of human-centered, ethical, and sustainable principles is necessary to ensure that generative AI strengthens media broadcasting ecosystems without replacing human values, creativity, and social responsibility.

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1. INTRODUCTION

The rapid development of generative artificial intelligence (AI) has transformed media broadcasting by enabling automated content creation, personalization, synthetic media, multilingual translation, and adaptive storytelling within decentralized digital ecosystems [1, 2]. Modern broadcasting has evolved from one-way

communication into interactive, platform-based, and data-driven environments, creating opportunities to improve production efficiency, audience engagement, and creative innovation [3, 4]. However, the widespread adoption of generative AI also raises critical challenges related to misinformation, deepfakes, algorithmic transparency, data privacy, editorial responsibility, and audience trust [5]. Therefore, human-centered AI is essential to ensure that technological innovation remains aligned with ethical values, human oversight, and social responsibility [6].

Decentralized digital ecosystems further increase the complexity of AI governance as audiences become active participants in creating, sharing, and distributing media content [7, 8]. While generative AI enhances accessibility, personalization, and real-time content adaptation, it also increases the risks of synthetic misinformation and identity manipulation [9, 10]. Moreover, AI-driven broadcasting requires substantial computational resources, making sustainability an important concern. Ethical and sustainable broadcasting therefore requires transparent governance, responsible AI deployment, energy-efficient computing, and environmentally sustainable digital infrastructure.

This study, entitled Human-Centered Generative AI for Ethical and Sustainable Media Broadcasting in Decentralized Digital Ecosystems, examines how generative AI can support ethical, sustainable, and human-centered broadcasting. The research addresses the limited integration of AI ethics, decentralized media governance, and sustainable digital infrastructure in existing studies. Although previous research has explored AI automation, personalization, media ethics, or green computing individually, integrated perspectives remain limited [11]. This study contributes a conceptual framework that connects these dimensions to support responsible AI-based broadcasting for media organizations, policymakers, and technology developers, positioning generative AI as a tool that enhances rather than replaces human creativity and ethical decision-making [12].

2. LITERATURE REVIEW

2.1. Generative Artificial Intelligence in Media Broadcasting

Generative artificial intelligence has become a transformative technology in media broadcasting by enabling automated content creation, modification, and personalization [13]. Its applications include automated scriptwriting, synthetic voice generation, AI-assisted video editing, real-time translation, virtual presenters, and interactive storytelling, shifting media production toward a collaborative human–AI workflow. This transformation improves production efficiency, multilingual distribution, and personalized content delivery, while also raising concerns about authorship, transparency, editorial accountability, and content authenticity. Therefore, generative AI should be viewed not only as an automation tool but also as a socio-technical system that reshapes the relationship between technology, media professionals, and audiences.

2.2. Human-Centered AI and Responsible Media Innovation

Human-centered AI emphasizes the design and implementation of AI systems that prioritize human values, fairness, transparency, accountability, and human oversight. In media broadcasting, this approach is essential because AI-generated content influences public knowledge, audience perception, and trust [14]. Human-centered AI ensures that generative AI supports rather than replaces human creativity while promoting editorial supervision, ethical decision-making, and transparent communication between media organizations and audiences [15, 16]. Accordingly, this study defines human-centered generative AI as an approach that integrates technological efficiency with human judgment, creativity, and professional responsibility.

2.3. Ethical Challenges of Generative AI in Journalism and Broadcasting

The integration of generative AI in broadcasting raises ethical challenges related to misinformation, deepfakes, bias, data privacy, synthetic identities, and declining audience trust [17]. AI-generated audiovisual content can imitate real individuals and influence public perception, increasing concerns about journalistic integrity and editorial responsibility [18]. Therefore, ethical broadcasting requires safeguards such as AI content labeling, provenance tracking, human editorial review, bias mitigation, and accountability mechanisms to ensure transparency, protect media credibility, and maintain public trust [19].

2.4. Synthetic Media, Deepfakes, and Content Authenticity

Synthetic media is one of the most important issues in AI-driven broadcasting because it blurs the boundary between authentic and artificial content [20]. Deepfakes, AI-generated presenters, synthetic voices, and digitally reconstructed scenes can create new creative possibilities, but they also introduce serious risks for

misinformation, identity misuse, and audience manipulation. The European Parliament (2023) emphasizes that watermarking AI-generated content can help identify the origin of synthetic media and support the detection of AI-generated disinformation. In addition, the International Telecommunication Union (2024) discusses the importance of watermarking standards, multimedia authenticity, and security protocols in responding to deepfakes and generative AI [21]. These discussions show that content authenticity is not only a media ethics issue but also a technical and regulatory challenge [22]. In decentralized digital ecosystems, content can be copied, modified, and redistributed rapidly across platforms, making it difficult to verify the original source. Therefore, broadcasting organizations need reliable authenticity mechanisms, including digital watermarking, metadata verification, content provenance systems, and transparent disclosure policies. These mechanisms are important to protect audiences, maintain public trust, and ensure responsible use of generative AI in media production.

2.5. Decentralized Digital Ecosystems and Audience Personalization

The development of decentralized digital ecosystems has changed broadcasting from a centralized one-way communication model into an interactive, platform-based, and audience-driven media environment. In traditional broadcasting, audiences mainly received content from television or radio institutions [23]. In contrast, decentralized ecosystems allow audiences to participate as viewers, users, creators, commentators, and distributors of content [1]. Generative AI strengthens this transformation by enabling personalized recommendations, adaptive storytelling, automated localization, and real-time audience interaction. Chen (2024) explains that AI has influenced news production and media creation through automation and personalization, while also creating ethical controversies in public communication [24]. In broadcasting, personalization can improve audience engagement by delivering content that matches audience preferences, language, location, and behavior. However, excessive personalization can also produce filter bubbles, algorithmic bias, emotional manipulation, and unequal content exposure. Therefore, audience personalization must be balanced with transparency, diversity, and ethical algorithmic governance. Human-centered AI provides an important foundation for ensuring that audience analytics and personalization engines support meaningful media experiences without exploiting user data or reducing audience autonomy [25].

2.6. Sustainable Broadcasting and Green AI

Sustainability has become an important dimension of AI-based broadcasting because generative AI systems require large computational resources, high-performance servers, cloud infrastructure, and continuous data processing [26]. Verdecchia et al. (2023) explain that the environmental impact of AI is increasingly significant, making it necessary to monitor energy use and carbon emissions during AI model development and deployment [27]. This concern is especially relevant for media broadcasting because the industry depends heavily on streaming platforms, content delivery networks, real-time rendering, and AI-powered audience analytics. MIT News (2025) also notes that the rapid deployment of generative AI creates environmental consequences, including increased electricity demand and water consumption [28]. Therefore, sustainable broadcasting requires the adoption of Green AI principles, such as model optimization, energy-efficient inference, responsible data storage, low-carbon cloud infrastructure, and green data centers. In this study, sustainable broadcasting is not limited to environmental protection but also includes responsible technological planning that balances innovation, efficiency, and ecological responsibility [29]. AI should help media organizations improve productivity without creating excessive energy burdens or unsustainable digital [30].

3. RESEARCH METHOD

3.1. Research Design

This study adopts a qualitative conceptual research design supported by a structured literature review. The approach is appropriate for developing a conceptual understanding of how human-centered generative artificial intelligence supports ethical and sustainable media broadcasting within decentralized digital ecosystems. Rather than examining statistical relationships, the study synthesizes and interprets existing literature on generative AI, media broadcasting, AI ethics, decentralized platforms, audience personalization, and green computing. This approach enables a comprehensive exploration of the socio-technical implications of generative AI in shaping media production, audience trust, editorial responsibility, infrastructure sustainability, and digital governance.

3.2. Research Approach

This study employs a structured literature review (SLR) to examine the emerging field of human-centered generative AI in media broadcasting [31]. The review focuses on publications from 2022 onward, including journal articles, conference papers, and institutional reports related to generative AI, AI ethics, synthetic media, audience analytics, decentralized media, green AI, and sustainable broadcasting [32, 33]. The review process involved identifying the research problem, defining search keywords, screening studies using inclusion and exclusion criteria, categorizing the selected literature into thematic areas, and synthesizing the findings into a conceptual framework that integrates generative AI, ethical governance, and sustainability in decentralized broadcasting ecosystems.

3.3. Data Sources and Literature Selection Criteria

The data in this study consist of secondary data obtained from academic and institutional literature. These sources were selected to establish a conceptual foundation rather than collect primary empirical data. Using the inclusion and exclusion criteria summarized in Table 1, the study included publications on generative AI, media broadcasting, AI ethics, synthetic media, decentralized digital ecosystems, and sustainable computing, while excluding studies that were unrelated to broadcasting, published before 2022, or lacked academic relevance and credibility [34, 35].

Table 1. Literature Selection Criteria

Criteria Type	Inclusion Criteria	Exclusion Criteria
Publication Year	Studies published from 2022 onward	Studies published before 2022
Topic Relevance	Studies related to generative AI, broadcasting, AI ethics, sustainability, and decentralized media	Studies unrelated to AI-based media broadcasting
Source Type	Journal articles, conference papers, academic books, and institutional reports	Opinion articles, non-academic blogs, and unsupported online sources
Language	English-language publications	Publications that cannot be interpreted clearly in English
Research Contribution	Studies offering theoretical, conceptual, technical, ethical, or sustainability insights	Studies with weak connection to the research objective
Accessibility	Sources with accessible abstracts, full text, or sufficient metadata	Sources with incomplete information or unclear publication identity

The literature was systematically identified through reputable academic databases and institutional publications [36]. The selection process focused on peer-reviewed journal articles, conference proceedings, academic books, review papers, and reports published by recognized organizations. Priority was given to recent publications to ensure that the conceptual discussion reflects the rapid evolution of generative AI technologies and their application in modern broadcasting environments. The selected studies collectively provide insights into AI-driven content generation, synthetic media, editorial governance, audience engagement, decentralized digital ecosystems, environmental sustainability, and responsible AI implementation.

3.4. Research Variables and Conceptual Dimensions

Although this study does not employ statistical variables, it identifies several conceptual dimensions to guide the analysis, as presented in Table 2. These dimensions include human-centered AI, generative media production, ethical broadcasting governance, decentralized digital infrastructure, and sustainable AI implementation. Human-centered AI emphasizes human oversight, transparency, creativity, and accountability, while the remaining dimensions address AI-driven content creation, ethical governance, decentralized broadcasting ecosystems, and sustainable technologies such as energy-efficient AI and green data

Table 2. Conceptual Dimensions of the Study

No.	Conceptual Dimension	Main Focus	Relevance to the Study
1	Human-Centered AI	Human oversight, creativity, accountability, and transparency	Ensures that AI supports rather than replaces human values
2	Generative Media Production	Automated content creation, synthetic media, and real-time production	Explains how AI transforms broadcasting workflows
3	Ethical Broadcasting Governance	AI labeling, privacy, provenance, bias control, and editorial review	Protects audience trust and journalistic integrity
4	Decentralized Digital Infrastructure	Cloud systems, platform ecosystems, distributed media, and audience interaction	Describes the technological environment of modern broadcasting
5	Sustainable AI Implementation	Green AI, energy-efficient models, and responsible infrastructure	Supports environmentally responsible broadcasting innovation

The first conceptual dimension is Human-Centered AI, which views artificial intelligence as a collaborative tool that enhances rather than replaces human capabilities. It emphasizes human oversight, transparency, explainability, accountability, creativity, and fairness in AI-assisted broadcasting while preserving editorial independence and ensuring that media professionals validate AI-generated content before publication.

3.5. Data Analysis Technique

This study applies thematic analysis to identify and interpret recurring patterns in the selected literature. The analysis involved reviewing publications, extracting key concepts, and grouping them into major themes, including technological transformation, human-centered AI, ethical governance, audience trust, decentralized infrastructure, and sustainability. As presented in Table 3, the process consisted of descriptive analysis, thematic classification, and conceptual synthesis to develop an integrated research framework [37]. The findings highlight that ethical and sustainable media broadcasting requires the integration of human-centered generative AI, transparent governance, responsible infrastructure, and sustainable AI practices to support trustworthy and resilient digital media ecosystems.

Table 3. Stages of Data Analysis

Stage	Analysis Activity	Expected Output
Stage 1	Identifying relevant literature on generative AI, broadcasting, ethics, and sustainability	Initial literature database
Stage 2	Screening literature based on inclusion and exclusion criteria	Selected relevant studies
Stage 3	Coding key ideas from each selected source	Thematic categories
Stage 4	Grouping themes into conceptual dimensions	Organized literature structure
Stage 5	Synthesizing themes into an integrated framework	Research methodology and conceptual model
Stage 6	Drawing conclusions based on thematic interpretation	Research findings and recommendations

The analysis involved reviewing selected publications to identify key theories, concepts, findings,

and research gaps related to generative AI in media broadcasting [38]. Relevant concepts, including human-centered AI, ethical governance, synthetic media, audience engagement, decentralized ecosystems, and sustainable computing, were extracted and coded based on conceptual similarities. The codes were synthesized into major themes, namely technological transformation, human-centered design, ethical accountability, audience trust, decentralized infrastructure, and environmental sustainability. This thematic synthesis provides a conceptual foundation for understanding the relationship between generative AI adoption, governance, and sustainable broadcasting ecosystems.

3.6. Research Methodology Framework

The methodology framework of this study illustrates the research process from problem identification to conceptual conclusion [39]. The process begins with identifying the research problem, namely the ethical and sustainability challenges of generative AI in decentralized media broadcasting. The next step is determining the research focus, followed by collecting relevant literature from recent academic sources. After the literature is collected, the sources are screened using inclusion and exclusion criteria. The selected literature is then analyzed thematically to identify key patterns and conceptual relationships.

The research process begins with problem identification, which focuses on the increasing adoption of generative AI technologies in media broadcasting and the associated ethical, governance, and sustainability challenges. These challenges include issues related to misinformation, synthetic media authenticity, algorithmic bias, privacy protection, editorial accountability, public trust, environmental impact, and the growing complexity of decentralized digital infrastructures. Identifying these issues establishes the research context and defines the need for a comprehensive conceptual investigation. Following problem identification, the study defines the research focus by specifying the key concepts and thematic boundaries to be examined. The research concentrates on the role of human-centered generative AI in supporting responsible broadcasting practices while maintaining transparency, accountability, audience trust, and environmental sustainability. This stage also determines the conceptual dimensions that guide the subsequent literature analysis.

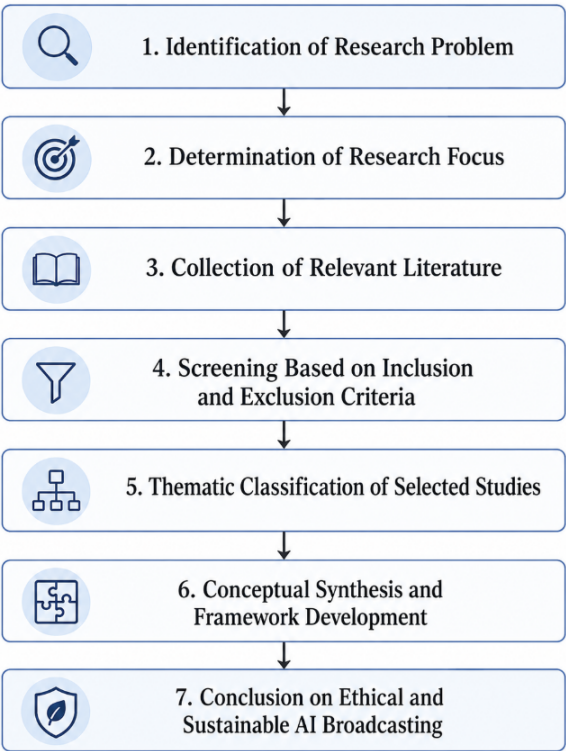


Figure 1. Research Methodology Framework

Figure 1 illustrates the conceptual framework of this study, explaining the relationship between generative AI implementation and responsible media broadcasting outcomes. Human-centered generative AI serves

as the primary foundation influencing three key areas: ethical governance, decentralized media infrastructure, and sustainable AI implementation. Ethical governance enhances audience trust, journalistic integrity, and content authenticity [40]. Decentralized infrastructure supports interactive media distribution, audience participation, and adaptive content delivery, while sustainable AI implementation promotes energy efficiency, green data centers, and responsible digital infrastructure. Together, these dimensions contribute to ethical and sustainable media broadcasting within decentralized digital ecosystems [41].

3.7. Conceptual Research Framework

The conceptual framework of this study explains the relationship between generative AI implementation and responsible media broadcasting outcomes. Human-centered generative AI acts as the main foundation that influences three important areas: ethical governance, decentralized media infrastructure, and sustainable AI implementation. Ethical governance supports audience trust, journalistic integrity, and content authenticity [40]. Decentralized infrastructure supports interactive media distribution, audience participation, and adaptive content delivery. Sustainable AI implementation supports energy efficiency, green data centers, and responsible digital infrastructure. These three areas collectively contribute to ethical and sustainable media broadcasting in decentralized digital ecosystems [41].

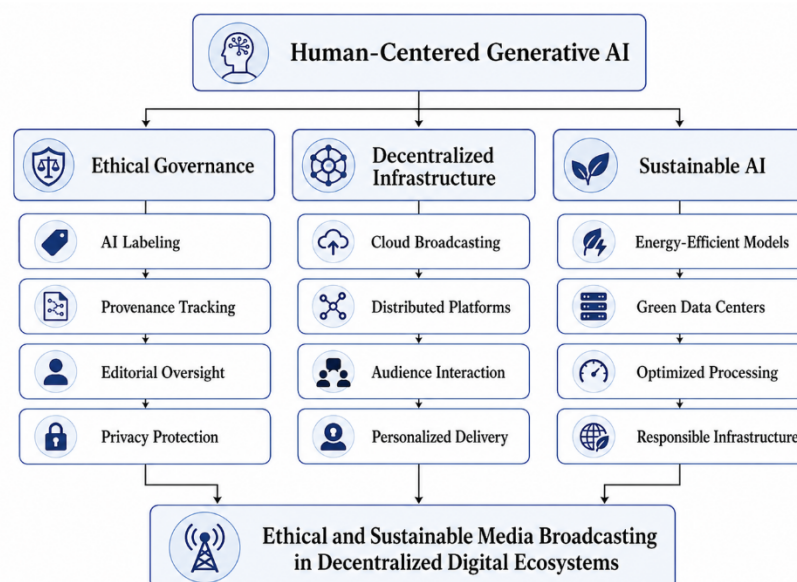


Figure 2. Conceptual Framework of the Study

As illustrated in Figure 2, human-centered generative AI influences three interconnected dimensions: ethical governance, decentralized media infrastructure, and sustainable AI implementation. Ethical governance encompasses AI transparency, algorithmic accountability, content provenance, privacy protection, bias mitigation, and editorial oversight, all of which strengthen audience trust, journalistic integrity, and the authenticity of AI-generated content [40]. Decentralized media infrastructure facilitates distributed content production, cloud-based broadcasting, audience participation, adaptive content delivery, and cross-platform media ecosystems, enabling more responsive and resilient broadcasting services. Meanwhile, sustainable AI implementation emphasizes the adoption of energy-efficient AI models, green data centers, optimized computing resources, and environmentally responsible digital infrastructure to reduce the ecological footprint associated with large-scale AI deployment.

3.8. Research Validity and Trustworthiness

To ensure validity and trustworthiness, this study applies source credibility, thematic consistency, and conceptual triangulation. Source credibility is maintained through recent peer-reviewed literature and reputable reports, while thematic consistency aligns the analysis with generative AI, ethical broadcasting, human-centered design, decentralized media ecosystems, and sustainability. Conceptual triangulation integrates perspectives from AI, digital media, journalism ethics, telecommunications, and green computing. This approach

provides a comprehensive understanding of responsible AI-based broadcasting that balances technological innovation, ethical accountability, social responsibility, and environmental sustainability.

4. RESULTS AND DISCUSSION

4.1. Thematic Results of Human-Centered Generative AI in Media Broadcasting

The results of this study show that human-centered generative artificial intelligence plays an important role in transforming media broadcasting within decentralized digital ecosystems. Based on the structured literature review and thematic analysis, generative AI is not only used as an automation tool, but also as a support system that helps media organizations improve creativity, production efficiency, audience interaction, and content personalization [42].

Table 4. Summary of Thematic Findings		
Theme	Main Findings	Practical Implication
Human-Centered AI	AI supports human creativity, decision-making, and editorial oversight rather than replacing human roles.	Ensures transparency, accountability, and human supervision throughout broadcasting workflows.
Broadcasting Innovation	Generative AI improves production efficiency, adaptive storytelling, multilingual content generation, and audience personalization.	Enables faster, more creative, and audience-oriented media production.
Ethical Governance	Responsible AI implementation requires transparency, AI labeling, provenance tracking, privacy protection, bias mitigation, and editorial review.	Strengthens audience trust, journalistic integrity, and content authenticity.
Audience Personalization	AI enables personalized recommendations, adaptive content delivery, and interactive audience engagement.	Improves user satisfaction while requiring fairness, diversity, and privacy protection.
Sustainable AI	Energy-efficient AI models, green data centers, optimized streaming, and responsible infrastructure reduce environmental impact.	Supports environmentally sustainable and resilient digital broadcasting ecosystems.

The findings presented in Table 4 show that generative AI supports broadcasting activities such as automated scriptwriting, synthetic voice generation, video editing, translation, news summarization, and adaptive storytelling, enabling faster production and more personalized media experiences [43]. However, these benefits require a human-centered approach to ensure that AI complements rather than replaces human creativity, editorial judgment, and professional responsibility. Human oversight remains essential in content planning, verification, ethical decision-making, and publication approval. Thus, human-centered generative AI can enhance broadcasting innovation while maintaining transparency, accountability, and human control.

4.2. Generative AI and Broadcasting Innovation

The second finding highlights that generative AI significantly enhances broadcasting innovation by enabling faster content production, flexible storytelling, and broader distribution across decentralized media ecosystems. The analysis identifies four main contributions: improving production efficiency through task automation, supporting creative experimentation with synthetic media, increasing audience relevance through personalization, and expanding accessibility through multilingual and inclusive content delivery [44]. However, these innovations require strong editorial oversight to prevent misinformation, manipulation, and bias [37]. Thus, AI-driven broadcasting innovation must be integrated with ethical responsibility and human control.

4.3. Ethical Governance in AI-Based Broadcasting

The third finding highlights that ethical governance is essential for the responsible implementation of generative AI in broadcasting. The literature reveals key risks, including misinformation, deepfakes, synthetic identity, algorithmic bias, privacy violations, and declining audience trust, particularly within decentralized digital ecosystems. The study identifies critical safeguards, including AI content labeling, provenance tracking, editorial oversight, privacy protection, and algorithmic transparency. These measures ensure content authenticity, accountability, and responsible AI use. Therefore, ethical governance serves as a fundamental requirement for maintaining journalistic integrity and audience trust in AI-driven broadcasting.

4.4. Audience Personalization and Trust in Decentralized Digital Ecosystems

The fourth finding indicates that generative AI enhances audience engagement through personalized content delivery while introducing risks when personalization is applied irresponsibly. In decentralized digital ecosystems, audiences become active participants who consume, distribute, and create media content. Generative AI supports personalization through content recommendations, adaptive narratives, interactive experiences, and localized communication, improving audience satisfaction and accessibility. However, excessive personalization may cause filter bubbles, algorithmic bias, manipulation, and reduced media diversity. Therefore, responsible personalization requires transparency, fairness, user autonomy, and data protection to maintain audience trust and balanced information access.

4.5. Integrated Conceptual Findings from the Thematic Analysis

Based on the thematic analysis, this study identifies five main conceptual dimensions that shape ethical and sustainable AI-based broadcasting: human-centered AI, generative media production, ethical broadcasting governance, decentralized digital infrastructure, and sustainable AI implementation. Human-centered AI provides the foundation for ensuring that AI supports human creativity, accountability, and editorial judgment. Generative media production explains how AI transforms broadcasting workflows through automated and synthetic content creation. Ethical broadcasting governance protects journalistic integrity, audience trust, privacy, and content authenticity. Decentralized digital infrastructure describes the modern broadcasting environment where platforms, cloud systems, distributed networks, and audiences interact dynamically. Sustainable AI implementation ensures that broadcasting innovation does not create excessive environmental costs. These five dimensions are interconnected. Human-centered AI strengthens ethical governance by ensuring that AI decisions remain supervised by humans. Ethical governance supports audience trust by requiring transparency, labeling, provenance tracking, and editorial review. Decentralized infrastructure expands media participation and distribution, but also requires stronger accountability mechanisms. Sustainable AI implementation ensures that technological innovation remains environmentally responsible.

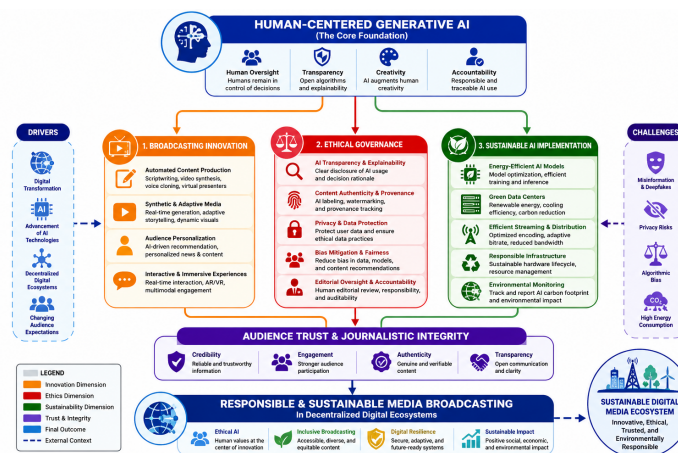


Figure 5. Integrated Findings of Human-Centered Generative AI for Sustainable Broadcasting

Figure 3. Integrated Framework for Ethical and Sustainable Media Broadcasting

As illustrated in Figure 3, this study also finds that sustainability in broadcasting is not limited to environmental protection. It also includes responsible infrastructure planning, efficient technology adoption, and long-term digital resource management. Therefore, sustainable broadcasting requires a balance between

innovation, operational efficiency, and ecological responsibility. Generative AI can support sustainability when it is implemented through optimized systems and environmentally conscious infrastructure.

5. MANAGERIAL IMPLICATIONS

The findings of this study provide practical implications for media organizations, broadcasting companies, technology developers, and policymakers implementing generative AI in broadcasting. Media organizations should adopt a human-centered AI approach in which generative AI serves as a collaborative tool that enhances the work of journalists, editors, and content creators rather than replacing human expertise. Human oversight should remain an integral part of content planning, verification, ethical evaluation, and publication to preserve editorial quality, accountability, and public trust. Broadcasting organizations should also establish comprehensive AI governance mechanisms that incorporate transparent AI disclosure, content provenance tracking, algorithmic accountability, privacy protection, and bias mitigation. These governance practices help reduce the risks of misinformation, deepfakes, and synthetic media manipulation while ensuring compliance with emerging AI regulations and strengthening audience confidence in AI-assisted broadcasting.

From an operational perspective, generative AI can be strategically integrated into broadcasting workflows to support automated scriptwriting, multilingual translation, adaptive storytelling, personalized content delivery, and real-time production. These capabilities enable media organizations to improve production efficiency, accelerate content distribution, and enhance audience engagement without compromising editorial standards or information diversity. The findings further highlight the importance of aligning AI adoption with sustainability objectives. Broadcasting organizations should prioritize energy-efficient AI models, optimized computing resources, green data centers, and environmentally responsible digital infrastructure to reduce operational costs and environmental impacts. Integrating ethical governance, human-centered AI principles, and sustainable infrastructure provides a practical roadmap for organizations seeking to build resilient, innovative, and trustworthy broadcasting ecosystems in the era of generative AI.

6. CONCLUSION

This study concludes that human-centered generative artificial intelligence has an important role in supporting ethical and sustainable media broadcasting in decentralized digital ecosystems. The findings show that generative AI can improve broadcasting innovation through automated content creation, synthetic media production, real-time translation, adaptive storytelling, and personalized audience experiences. However, the use of generative AI in broadcasting should not be understood only as a technological advancement, but also as a socio-technical transformation that requires human oversight, editorial responsibility, transparency, and ethical decision-making. Therefore, generative AI is most valuable when it functions as a support system that strengthens human creativity, production efficiency, audience engagement, and responsible media innovation without replacing human judgment and journalistic integrity. The research question of this study is answered by showing that human-centered generative AI can support ethical and sustainable broadcasting when it is implemented through three main principles: ethical governance, decentralized infrastructure management, and sustainable AI implementation. Ethical governance is needed through AI labeling, provenance tracking, privacy protection, bias mitigation, transparent algorithms, and editorial supervision to maintain audience trust and prevent misinformation, deepfakes, and synthetic manipulation. Sustainable broadcasting also requires energy-efficient AI models, green data centers, optimized streaming systems, and responsible digital infrastructure. Nevertheless, this study has limitations because it uses a qualitative conceptual approach based on structured literature review, so it does not include empirical data from media organizations, broadcasting professionals, AI developers, or audiences. As a result, the findings are conceptual and may require further validation through field research or case studies. Future research is recommended to conduct empirical studies that examine the real implementation of generative AI in broadcasting institutions, digital media platforms, and decentralized content ecosystems.

Further studies may use interviews, surveys, case studies, or mixed-method approaches to investigate how media professionals apply AI labeling, editorial oversight, audience personalization, and sustainability practices in actual broadcasting workflows. Future research can also develop measurable indicators for ethical AI broadcasting, audience trust, carbon efficiency, and governance readiness. In addition, comparative studies across countries, media platforms, or broadcasting models are needed to understand how regulation, infrastructure, culture, and audience behavior influence the responsible adoption of generative AI in media broadcasting.

7. DECLARATIONS

7.1. About Authors

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7.2. Author Contributions

Conceptualization: AN; Methodology: RF; Software: RY; Validation: RY and AN; Formal Analysis: RF and RY; Investigation: AN; Resources: RY; Data Curation: AN; Writing Original Draft Preparation: AN and RY; Writing Review and Editing: RY and RF; Visualization: AN; All authors, AN, RF, and RY, have read and agreed to the published version of the manuscript.

7.3. Data Availability Statement

The data presented in this study are available on request from the corresponding author.

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The authors received no financial support for the research, authorship, and/or publication of this article.

7.5. Declaration of Conflicting Interest

The authors declare that they have no conflicts of interest, known competing financial interests, or personal relationships that could have influenced the work reported in this paper.

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