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Medavers: A Digital Transformation Model for Media in the Metaverse

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ABSTRACT

The emergence of the Metaverse challenges media organizations' sustainability and digital transformation, demanding a fundamental rethinking of governance and content ecosystems. Despite major media players entering this space, a native, integrated model for media digital transformation remains absent. Addressing this gap, this study proposes "MedaVers"—the first comprehensive model for digital transformation in the Metaverse—developed through Grounded Theory and Interpretive Structural Modeling. Based on interviews with 17 experts (qualitative phase) and causal analysis conducted by 11 experts (quantitative phase), the model comprises 19 key components structured in an eight-layer hierarchy across three dimensions: strategic drivers ('Strategy' and 'Integration'), 'Resilient Organizational Culture' as a central bottleneck, and a bidirectional 'Content↔Business Intelligence' loop optimizing UX via biometric data. Validated abductively through Actor-Network Theory, AI Marketing, and Media Convergence, the model emphasizes "post-data media." It guides media managers from isolated tech initiatives toward engineering intelligent, human-centered systems via dynamic, three-dimensional frameworks and strategic leverage design.

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1. Introduction

The metaverse ecosystem is constructing a parallel, interactive, living, immersive, and self-sustaining world that—by leveraging algorithmic governance, generative artificial intelligence, decentralized architectures, a tokenized economy, and deepening human–machine symbiosis—aims to reinvent the Internet and social-network ecosystem. In this transformative environment, media organizations must pioneer their establishment in the metaverse to preserve their social influence and strategic identity within this realm. Unlike the digitization and platform migrations of Web 2.0 and Web 3.0, this represents an unprecedented, disruptive digital transformation. Such a transition demands the redesign of organizational processes, the media value chain, and governance frameworks in alignment with metaverse principles. Consequently, digital transformation in the Darwinian-competitive space of the metaverse constitutes an existential challenge to the adaptability, resilience, and survival of media organizations.

Despite the accelerated development of the metaverse since 2022 (Li, 2024), experts regard its widespread adoption and deployment by individuals, industries, and organizations over the next decade as inevitable (Rachmadtullah et al., 2023). The global metaverse market was valued at approximately USD 146.6 billion in 2024 and is projected to reach USD 1.1 trillion by 2030, based on a compound annual growth rate (CAGR) of 39.3 percent (Research and Markets, 2025). Likewise, the media and entertainment segment is expected to grow from USD 40 billion in 2023 to about USD 280 billion by 2032 (DataIntelo, 2023; Kour & Rani, 2023). Industrial analyses indicate a significant surge in enterprise investment budgets for the metaverse—from 7 percent in 2023 to 19 percent in 2024—yielding tangible economic and transformative outcomes, including 55 percent revenue growth, 43 percent customer-service improvement, 39 percent operational-cost reduction, and 32 percent operational efficiency gains (S&P Global, 2024). These explosive increases stem not only from advances in technological infrastructure but also from the investments made by leading media giants (Meta, Microsoft, Tencent, Walt Disney, Warner Music, Accenture, Alphabet, and Apple), government-allocated budgets for industrial, operational, and research development, and growing user demand for value creation in the metaverse (Gupta & Pal, 2023; Jiang, 2024; Stein, 2024; Wang & Yarovaya, 2024). Nevertheless, critics argue that the metaverse has yet to reach maturity, underscoring the need to investigate the factors influencing its adoption, investment for digital transformation, and success—especially regarding the risk that power concentration in a single actor within any industry may enable that entity to dominate global superpowers (Duffey, 2023).

The scholarly literature on media digital transformation within the metaverse predominantly focuses on descriptive imperatives for transition and offers fragmented, single-layer proposals devoid of metaverse-native frameworks (Hashem et al., 2024). These studies face serious limitations in converging traditional media with the metaverse ecosystem. While the multidimensional nature of the metaverse—encompassing technical, economic, cultural, social, and legal facets—necessitates a profound understanding of complex concepts such as phygital co-existence, quantum-enabled digital asset management, digital identity construction, and the creation of sustainable interactive experiences, an integrated digital-transformation model tailored to the metaverse's unique requirements (e.g., intelligent neuro-spatial networks, edge-computing architectures, algorithmic governance) remains undeveloped. This theoretical-conceptual gap has led to strategic ambiguity, computational errors, siloed innovations, and high-risk trial-and-error approaches, severely threatening the survival of media organizations in the post-physical era.

This study aims to fill the theoretical gap by proposing a multilayered, data-driven, and organization-oriented model. Initially, the model identifies the key drivers linking media to metaverse architectures—such as technology convergence, algorithmic governance, phygital experience design, and content-nature reinvention—to shape the various dimensions of digital transformation. subsequently, by representing causal relationships among conceptual dependencies of these dimensions, it introduces a novel logic for resource allocation and process prioritization. Finally, by delineating an operational roadmap derived from empirical findings and theoretical foundations, it facilitates strategic leadership in digital transformation for media within the metaverse ecosystem. These contributions arise from addressing the following essential inquiries: What key drivers are essential for developing effective infrastructures in digital transformation? What is the main bottleneck to success or failure in the digital transformation process of media organizations within the metaverse?

What theoretical and practical mechanisms exist in the realm of producing content tailored for the metaverse?

To address these questions, we employed a two-phase mixed-methods research design: a qualitative stage based on grounded theory and expert interviews to construct an initial conceptual framework, yielding profound practical insights and elucidating core concepts via inductive analysis, and a quantitative stage utilizing interpretive structural modeling (ISM) to derive an eight-layer hierarchical model from a network of causal relationships among components. To ensure theoretical rigor, we conducted deductive analysis of this model with respect to three supporting theories: Actor–Network Theory (ANT), Artificial Intelligence Marketing (AIM), and Media Convergence theory. This research not only provides a framework for digital transformation but also acts as a decision support tool for media-organization managers and policymakers to assess the maturity, growth, and viability of each layer—or to guide remediation—during the pre-maturity phase.

The article is organized as follows: Section 2 reviews the conceptual literature, prior research, and underlying theories. Section 3 details the research methodology, emphasizing justifications for method selection, the coding process in grounded theory, and the application of ISM for systematic component analysis. Section 4 presents the qualitative and quantitative/structural findings. Section 5 highlights the theoretical and practical contributions of the final “MedaVers” model through comparisons with prior studies and evaluations using the supporting theories. Section 6 concludes with a discussion of limitations, theoretical implications, managerial recommendations, and strategic guidelines for media organizations to achieve competitiveness and sustainable value creation in the metaverse ecosystem.

2.Theoretical Background

2-1. Theoretical Foundations

2-1-1. Metaverse Ecosystem

An emerging communicative experiential paradigm: an integrated ecosystem of virtual worlds that delivers immersive experiences to users and, from economic, environmental, social, cultural, and managerial perspectives, recreates and redefines innovative value propositions (Kontogianni & Anthopoulos, 2024). From the standpoint of organizational power, the metaverse—by promoting distributed infrastructures and user-centric ownership—holds the potential to temper the monopolies of Web 2.0 and mitigate the effects of state censorship (Alshurideh et al., 2023; McStay, 2023). Accordingly, it is recognized as an inherently transformative force within the structure of media industry.

2-1-2. Digital Transformation in Media

It refers to a disruptive, paradigmatic, and evolution-oriented process that engages in the thorough and ongoing transformation and restructuring of workflows, structures, processes, and media methodologies through integration with key catalysts (digital technologies). This transformation is fundamentally more profound than mere digitization, signifying a rethinking and operational redefinition of the processes governing how media content is created, distributed, and consumed (Novikov & Zohrabyan, 2023).

2-1-3. The Digital Transformation of Media in the Metaverse

The relationship between the metaverse and digitalization efforts is symbiotic: each drives and supports the development of the other (Xi et al., 2023). Therefore, the metaverse is both a product of digital transformation and a facilitator and accelerator of digital transformation within media organizations. Conversely, media organizations, through their digital transformation, expedite the advancement of the metaverse. The fusion of these concepts forms the core construct of this research: “Digital Transformation of Media in the Metaverse.” This construct denotes a strategic, organized process whereby media organizations engineer a symbiosis between physical and virtual spaces, fundamentally redesigning their infrastructures, processes, values, and structures to align with the metaverse ecosystem (Hwang, et al., 2022; Ritonga et al., 2024; Xi et al., 2023).

2-2. Analytical Literature Review

Given the absence of an existing model for digital transformation of media in the metaverse within the scholarly literature, we analyzed related studies that articulated either the effective components of transformation or the necessity thereof: the first category included studies emphasizing the initial challenges of digital media—organizational resistance to technology and acceptance inhibitors. Waiswa (2024) identified challenges such as reliance on analog content production, lack of customer loyalty solutions, weak revenue diversification, and digital marketing deficiencies. Jamil (2022) addressed these barriers by advocating media convergence, technological convergence, and workforce training to boost human audience engagement. These studies collectively argue that, prior to initiating transformation, organizations must cultivate structural and cultural readiness toward technology and users; otherwise, “digital first” remains mere rhetoric.

The second category included research developing technical architectures and actor based theoretical frameworks to advance transformation through the simultaneous convergence of human technology. Druzhinin (2021) emphasized the integration of technologies, platforms, and algorithms within a network to enhance the “infosphere” and “technosphere.” Abd Elkareem et al. (2024) proposed a scalable, secure three-layer metaverse architecture—comprising physical, control, and application layers. These studies indicate that, in digital transformation, technology and human actors co-create the competitive advantage of organizations.

The third category included proposals for innovation in marketing, user experience, and sensory interactions to foster metaverse adoption and digital transformation: Alshurideh et al. (2023) reported that innovative marketing via avatar experiences and tokenized incentives accelerates digital transformation as well as metaverse acceptance among employees and end users. Lin (2022) stressed innovations in interface design and alignment of digital media terminals with visual information. Nunkoo et al. (2024) and Mishra et al. (2021) highlighted multisensory immersion and haptic feedback as critical to value propositions offered by organizations. Dewan and Gagare (2024) introduced “story living,” suggesting that media consumers should inhabit simulated or parallel realities, not merely observe them. These studies indicate that success in digital transformation hinges on trust building and employee engagement, achieved through innovative content marketing strategies and advanced security assurances.

Finally, since leading media and technology firms often restrict open research dissemination through proprietary models, keyword-based searches yielded no directly applicable findings. Therefore, developing a specialized model for the digital transformation of media in the metaverse addresses this gap and offers valuable insights for future studies.

2-3. Supporting Theories

A review of the extant theoretical literature revealed that no single theory possesses the capacity to fully encompass the complexity of the digital transformation process in media. Accordingly, grounded theory was employed to allow the data itself to guide theory development through inductive reasoning, providing subsequent support for theoretical frameworks after exploratory analysis, rather than relying on preconceived assumptions. Therefore, these theories are applied only after establishing the hierarchical structure of factors by interpretive structural modeling, functioning as analytical instruments and lenses through which to interpret the data-driven findings.

Given the inability of existing theories to comprehensively address the technological, economic, cultural, experiential, and structural dimensions of media digital transformation within the metaverse, the following supporting theories are integrated in a complementary manner:

- Artificial Intelligence Marketing (AIM): to elucidate mechanisms of real time responsiveness to user data.
- Actor–Network Theory (ANT): to explicate the relationships between human and non-human actors within the metaverse architecture.
- Media Convergence Theory: to describe the integration of technologies in the production and distribution of multimedia content.

2-3-1. Media Convergence Theory

This theory addresses the dissolution of boundaries between traditional and digital media, technologies and audiences. It envisions the reconstitution of an interactive ecosystem for bi-directional content exchange, free from the exclusive control of any single media outlet or third-party platform, enabling direct communication between producers and consumers (Li et al., 2025). It comprises five principal dimensions:

- Technological: infrastructure integration and content digitization
- Industrial: consolidation of media corporations
- Social: participatory engagement of audiences
- Textual: redefinition of narrative formats
- Political: challenges in policy and governance

2-3-2. Actor–Network Theory

Actor–Network Theory examines socio-technical relationships among human and non-human entities within a fundamental, heterogeneous, and co-constitutive network. Each element functions as an interdependent "actant," and the emergent properties of the system can be understood only through the analysis of the interactions among all actants (Gumede & Tladi, 2023). The core components include:

- Actant: any human or non-human entity that exerts influence within the network
- Network: the assemblage of interrelated actants
- Translation: the process by which actors converge toward a shared objective
- Mediator: the mechanisms of transmission, interpretation, and transformation of messages
- Inscription: the coding or protocolization enabling actant interaction
- Black boxing: the stabilization of a technology or process as an integrated, taken-for-granted unit

2-3-3. Artificial Intelligence Marketing (AIM)

AIM leverages autonomous agents for data mining and employs artificial intelligence to generate actionable insights, thereby enhancing customer relationships (Yau et al., 2021). The AIM framework comprises three principal components:

- Pre-processor: preparation of structured data
- Core Processor: processing and reasoning over the data received from the pre-processor
- Memory Storage: retention of processed knowledge

AI plays a pivotal role by enabling hypothesis generation, learning pattern identification, and novel modes of human–machine interaction.

In Figure 1, the rationale for selecting these theories as supporting frameworks is examined, with particular attention to their respective contributions and limitations.

2-4. Conceptual Framework

This framework serves as a theoretical backdrop or mental map, presenting hypothetical relationships among key concepts based on the literature and supporting theories (Figure 2). At its center, stands "Media Digital Transformation in the Metaverse," structured hierarchically as follows:

- Technological Infrastructure: The technical foundation required to link physical spaces with the virtual layers of metaverse, enabling data generation and exchange.
- Network Structure: At this level, principal actors interact within a dispersed yet cohesive network.
- User Experience & Content: The design of interactive, multisensory multimedia content flows within a three-dimensional environment, signaling a transition for traditional media businesses towards the metaverse.

After utilizing ISM as the analytical tool to extract the hierarchical factor structure, the framework is then applied:

Role in the Media Digital Transformation Model within the Metaverse	Name of the Theory	Limitations When Applied Independently
Extracts user-interaction insights from XR and blockchain to personalize user experiences Delivers real-time content and advertising recommendations Defines tokenized revenue models based on collective user behavior patterns	AI-based Marketing (AIM)	Focuses exclusively on numerical and algorithmic data, neglecting network interactions, decentralized governance, and cultural factors Lacks an analytical framework for designing multidimensional multimedia content and distribution Fails to model macro-level value flows within the metaverse ecosystem
Represents organizational elements and entities as a network of actants Describes interaction flows among avatar users, content creators, technological infrastructures, and stakeholders Explains the formation of smart contracts and institutional protocols	Actor–Network Theory (ANT)	Concentrates solely on network structure, lacking the mechanisms for optimizing user experience, branding, and governance Overlooks AI-driven intelligence, algorithmic processes, real-time data analytics, and content personalization Fails to model multidimensional links among multimedia entities
Provides mechanisms for designing content-flow pipelines Establishes regulations for simultaneous production and distribution of multimedia content and sensory interactions Explains narrative transfer from linear media to interactive metaverse spaces	Media Convergence	Tailored to two-dimensional web platforms; lacks token-economy analysis, experiential economy models, smart-contract frameworks, and digital-ownership constructs Emphasizes 2D content and user experience; overlooks ecosystem-level interactions, and governance process Fails to define data-driven or AI-driven revenue models

Fig. 1. Justification for the Selection of Supporting Theories

- AIM: Real-time user data analytics to tailor personalized experiences and manage vast volumes of data.
- ANT: Through symbiotic network interactions, these data and technical capabilities form a value creation cycle and decentralized governance propositions.
- MC: Ensures the flow of content between producers and consumers through the synergy of infrastructure, redesigned content formats, and personalized user experiences.

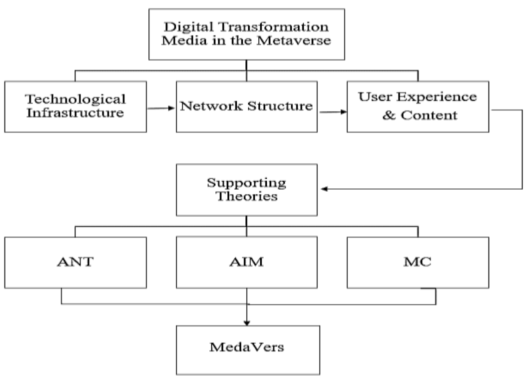

Fig. 2. Conceptual Framework.

3. Materials and Methods

We adopted a proactive, exploratory approach by integrating the Grounded Theory (GT) proposed by Strauss and Corbin, along with Interpretive Structural Modeling (ISM) in a case-driven, mixed-methods framework to illuminate the complex dynamics of media digital transformation in the metaverse. Noting that existing theoretical models offer limited direction in this rapidly evolving domain, we first applied GT inductively to uncover practitioner-grounded concepts, then employed ISM deductively to organize and map their interdependencies.

3-1. Qualitative Phase (GT)

We used Strauss and Corbin's three-stage coding process—open, axial, and selective—within MAXQDA 2022 to construct a conceptual paradigm of virtual environment transformation. Through theoretical sampling, we recruited seventeen specialists (eight chief executives, four digital-transformation strategists, three metaverse developers, and two content creators), each with at least four years of relevant experience and demonstrated familiarity with emergent media technologies. Semi-structured interviews (90–120 minutes) comprised twelve core questions and ten follow-up probes covering the following topics:

Drivers and barriers to digital transformation, multidimensional content production and branding strategies, attention economy, innovative media management practices in the metaverse were explored. We reached theoretical saturation after completing 15 interviews, with new codes accounting for less than four percent. All interviews were transcribed verbatim (102 pages). Without any theoretical background, we engaged in open coding to identify and categorize significant units—key sentences and phrases—enabling us to grasp distinct concepts. During axial coding, we collapsed overlapping codes into broader categories, yielding coherent dimensions. In selective coding, we focused on identifying the central concept of a media organization's ability to facilitate comprehensive digital transformation within the metaverse. We then aligned each aspect within the framework established by Strauss and Corbin. Ultimately, we constructed a conditional matrix that connects causal factors, contextual elements, intervening circumstances, strategic reactions, and ensuing outcomes.

3-2. Quantitative Phase (ISM)

Building on our qualitative paradigm, we operationalized the identified dimensions as input variables for ISM using MICMAC software. We convened a purposive panel of eleven experts—six senior media executives and five governance managers (59% industry, 41% academia)—each meeting rigorous criteria: a minimum of five years of relevant experience, active involvement in digital-transformation initiatives, and specialized metaverse expertise.

Emplying a structured questionnaire, panelists evaluated pairwise influences among components on a four-point scale (0=no relationship; 1=I influences J; –1=J influences I; 2=reciprocal).

We first constructed a Structural Self-Interaction Matrix (SSIM) by recording the modal expert response for each component pair. The SSIM was then converted into an Initial Reachability Matrix as follows: positive influences (codes 1 and 2) were designated as "1," while absent or negative influences (codes –1 and 0) were assigned "0," with diagonal entries set as "1." Applying transitivity rules—wherein if A influences B and B influences C, then A influences C—yielded the Final Reachability Matrix, capturing both direct and indirect interdependencies and underpining our analyses.

3-3. Hierarchical Level Determination

From the Final Reachability Matrix, we extracted the reachability set of each component (including itself and those it influences) and the antecedent set of each component (including itself and those influencing it).

We calculated the intersection set of each component and identified the cases where intersection equals reachability. These were then placed at the top ISM level, reflecting no upward influence. After removing top-level elements, we repeated this procedure iteratively to delineate all levels, producing a clear, multi-tiered hierarchy of transformation drivers.

3-4. Influence-Dependency Diagram and Interaction Network

Using the Final Reachability Matrix, we computed the influence score of each component (the sum of outward links) and the dependency score of each component (the sum of inward links).

Plotting these in a four-quadrant influence-dependency diagram classified components as autonomous (low influence, low dependency), dependent (low influence, high dependency), independent (high influence, low dependency), and linking (high influence, high dependency).

We also generated an interaction network graph to visualize complex relationships, providing stakeholders with an interpretable map of strategic leverage points.

3-5. Validation and Reliability

The processes followed to ensure validation and reliability included:

Triangulation through field observations in metaverse environments (e.g., virtual concerts, brand activations) to corroborate interview insights; peer checks by independent researchers to verify coding consistency; expert feedback from three additional domain authorities, whose recommendations were integrated into our final model; and using Cohen’s Kappa coefficient to evaluate quantitative reliability, confirming high inter-expert agreement in the relationship matrix.

3-6. Theoretical Integration

The phases of data extraction and the construction of the ISM model were executed in a fully data-driven manner. At the conclusion, after the formation of the eight-level model, structural analysis and validation of the model were confirmed through the theories of AIM, ANT, and MC.

3-7. Ethical Statement

The ethical standards of this study included getting informed consent from interviewees, maintaining confidentiality, and ensuring data protection.

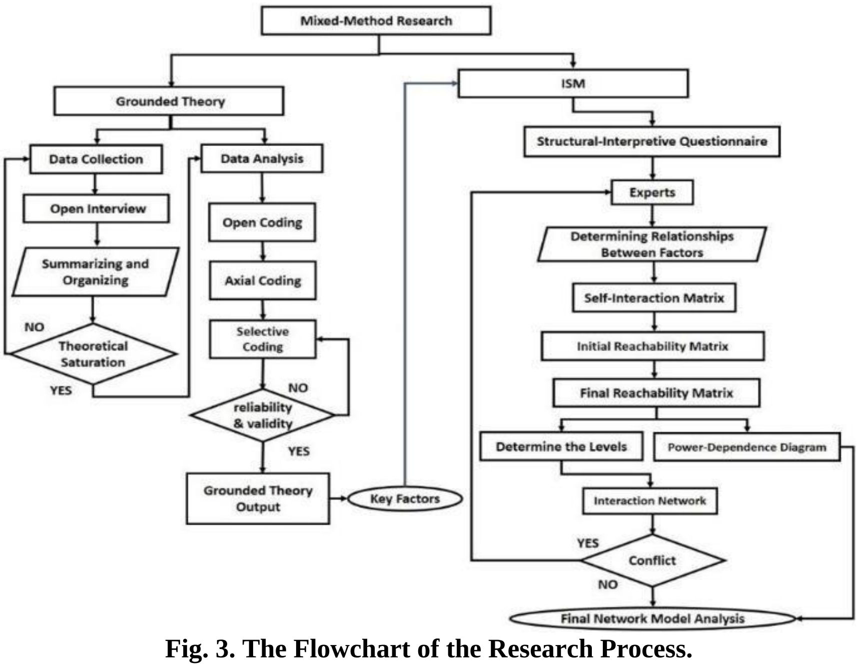

Fig. 3. The Flowchart of the Research Process.

4. Results

4-1. Findings of the Qualitative Phase: Grounded Theory

Based on the study findings, 810 semantic units were extracted, with 369 concepts identified during the open coding phase. Subsequently, in the axial coding phase, these concepts were categorized into 76 key components. After defining the central phenomenon, in selective coding, 19 dimensions were identified and integrated into the six principal axes of the Strauss and Corbin theoretical framework. Ultimately, a comprehensive theoretical model for media digital transformation in the metaverse was developed. Data triangulation and the utilization of multiple sources provided a holistic understanding of the subject's various dimensions, minimized inconsistencies, and enhanced the credibility of the qualitative findings. Experts also evaluated and confirmed the reliability and validity of the paradigmatic model. Additionally, the qualitative coding process underwent peer review, and ultimately, 93% of the extracted codes received final approval. Then, causal conditions, contextual factors, intervening conditions, the central phenomenon, strategic responses, and outcomes were analyzed, as illustrated in Figures 4 to 8. Finally, the paradigmatic model of media digital transformation in the metaverse is represented in Figure 9.

4-1-1. Central Phenomenon

The central phenomenon, which constitutes the focal point of this research, is the primary driver shaping the codes and categories. In this study, the interviews repeatedly highlighted the challenge of media organizations failing to implement digital transformation in order to enter the metaverse. Additional categories, such as technology convergence, process innovation, and change management, contributed to elaborating and understanding this issue. Ultimately, the central phenomenon was articulated as the challenges faced by media organizations in achieving an integrated and intelligent digital transformation to join the metaverse, with an emphasis on technology convergence. This inability leads to adverse outcomes, including falling behind competitors, loss of market share, decreased innovation, and weakened customer loyalty. Therefore, the central phenomenon serves as the starting point for comprehending the key concepts and components necessary for model development.

4-1-2. Causal Conditions

The causal conditions (Figure 4) that exacerbate challenges in media digital transformation comprise organizational deficits, including financial and competitive constraints and inability to attract audience. Financial and competitive constraints arise from smart competition, marketization, and technical factors. In such contexts, the absence of strategic intelligence leads to superficial and incomplete imitation of advanced governance models found in major media conglomerates, lacking a thorough understanding of internal processes. Additionally, restructuring efforts without alignment to organizational strategic objectives can lead to trend exhaustion and a reluctance to embrace innovation. Interviewees identified the absence of a transformational and innovative mindset, along with deficiencies in the continuous development of competitive strategies, as key structural barriers to organizational transformation. Furthermore, they cited the inability to implement ecosystem-oriented approaches, coupled with underinvestment in infrastructure enhancement and digital human capital development, as critical limitations rooted in financial and human resource constraints.

Interviewees attributed the inability to attract audience to the absence of robust strategies, limited user engagement, inability to model demographic data, particularly regarding local and cultural preferences, and consequently, to the lack of personalized experiences.

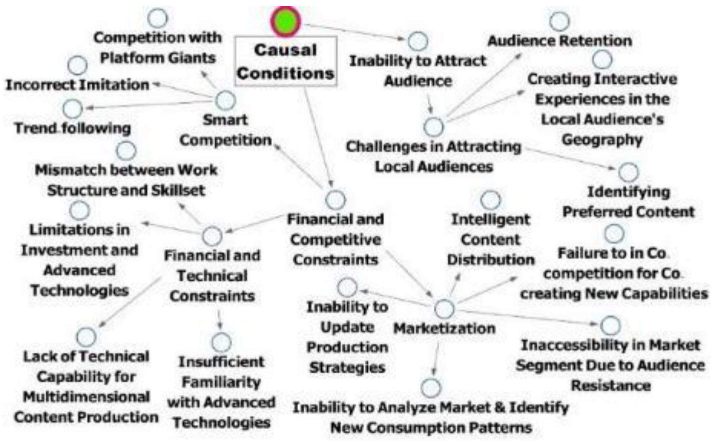

Fig. 4. Overview of Causal Conditions Influencing the Core Phenomenon

4-1.3. Contextual Conditions

The contextual conditions (Figure 5) indicate the situations requiring strategic interventions for improvement. Resilient organizational culture, non-digital work structures, and the developments followed by industrial revolution were identified as influential factors in media digital transformation.

Organizational lack of resilience impedes the process of transformation. Therefore, to ensure employees' alignment with the organization's transformative journey, it is essential to institutionalize approaches such as innovation, agility, flexibility, adaptability, and sustainability within the organizational culture. Another challenge in digital transformation is intergenerational conflict around adopting industrial revolution values; millennials lean toward sharing economies, freelancing, and robotic assistants, while Generation Y exhibits resistance to adopting these new business models.

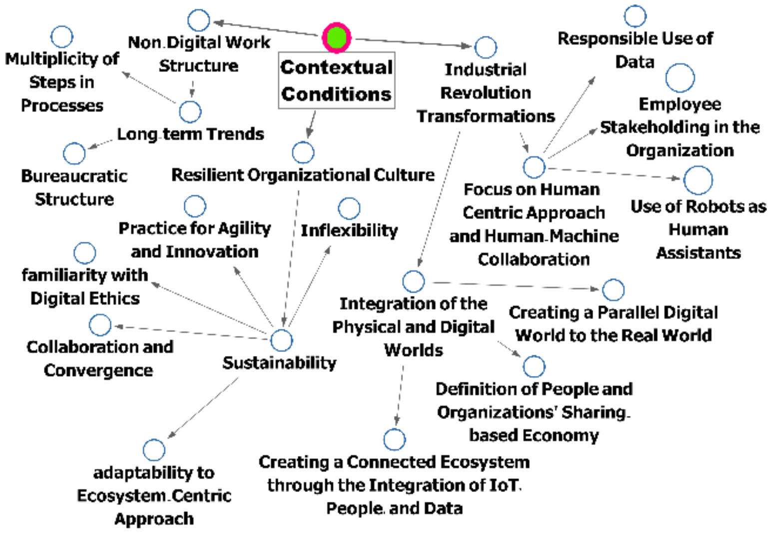

Fig. 5. Overview of Contextual Conditions Influencing the Core Phenomenon

4-1-4. Strategies

Strategies refer to the design of targeted actions based on causal conditions to confront the central phenomenon, guide managerial decisions, and develop operational strategic programs. According to Figure 6, human capital, business operations, strategy, user experience, and business intelligence were identified as key strategic dimensions. Almost all participants asserted that strategic human capital empowerment is fundamental in co-creating organizational technological capabilities during the transformation process. Therefore, the primary focus of HR managers should be on aligning employees with transformational objectives by developing and rethinking soft skills. Redesigning job structures with emphasis on improving work experience, mapping competency profiles, and nurturing organizational culture are examples of adaptable human capital solutions.

Conversely, employee and customer/user experience was recognized as the cornerstone of digital transformation: media organizations should leverage neurophysiological and affective data to decode user needs and identify personality archetypes. Adaptive AI can synchronize media content and interactions in real time with user behaviors and lifestyles. Through group behavior analysis and collective interaction modeling, collective experiences tailored to diverse audience personas can be crafted. Finally, by creating multidimensional digital avatars based on machine vision capabilities (with haptic feedback, cross-platform interoperability, self-learning, and automated digital twin construction), the pathway to enduring identity representation and digital immortality is paved.

Ultimately, media organizations must prepare for a future where every physical object—even parts of the human body such as skin or teeth—becomes a digital terminal.

According to one interviewee, an organization without an innovative strategy will not survive in the metaverse era. Attracting digital talent, breaking down silos, formulating policies and protocols requires creativity in selecting appropriate strategies. In advancing business operations, leveraging digital twins can significantly contribute to business re-engineering and the intelligent agile transformation of organizations.

To thrive in a hub-centric ecosystem, it is crucial to forge strategic partnerships with stakeholders and rival organizations to facilitate the exchange of data, expertise, and tools.

Furthermore, utilizing business intelligence enables the creation of digital life experiences, such as virtual travel to tourist destinations (as depicted in the film). Additionally, leveraging intelligent marketing strategies based on digital twins allows one to forecast the likelihood of purchasing before producing content. This enables understanding whether users need psychological priming to transform attention into desire, or distraction techniques to redirect them towards alternative services. Finally, empowering employees as brand ambassadors for customer engagement and retailer acquisition through customer profiling analytics was recognized as another key strategy in creating smart markets.

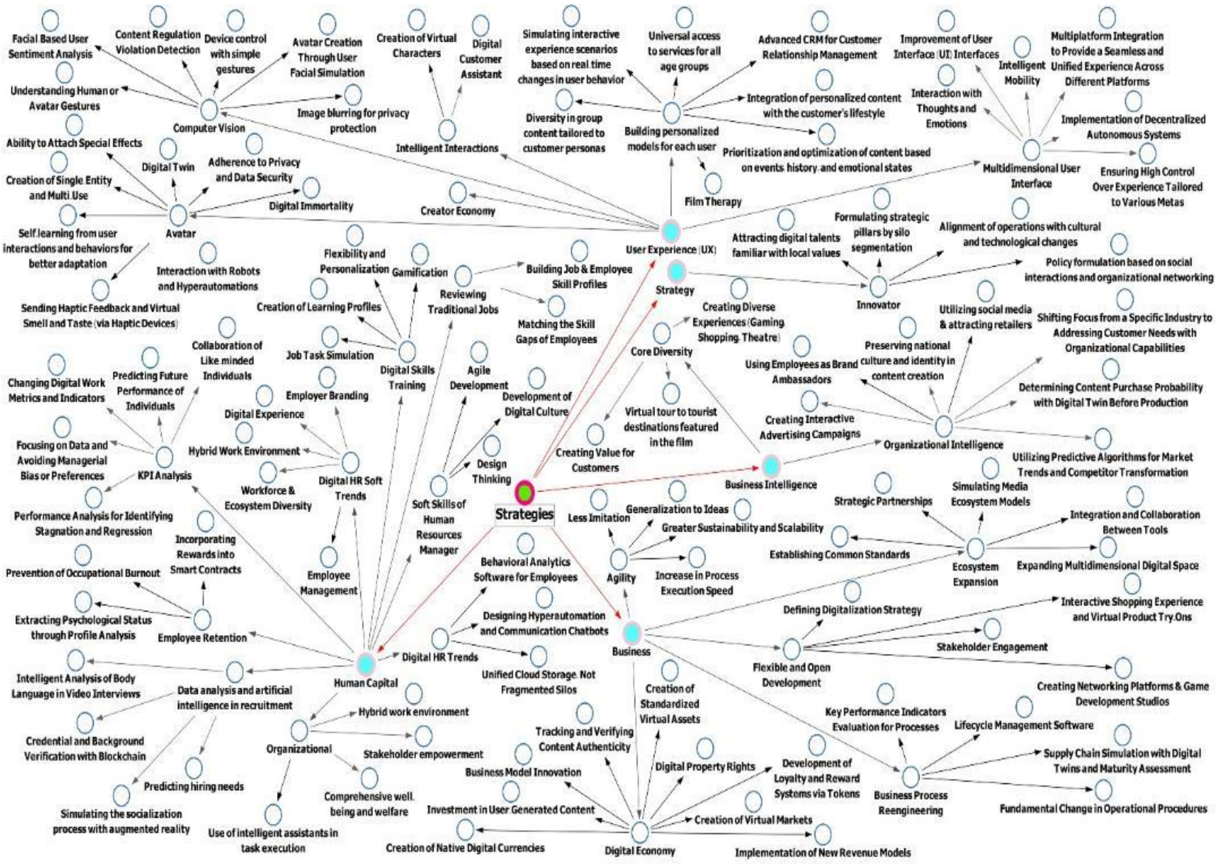

Fig. 6. Overview of Strategies Influencing the Core Phenomenon.

4-1-5. Intervening Conditions

Intervening conditions, defined as facilitators or inhibitors of strategies with direct impact (Figure 7), are dispersed across technological, organizational, and human dimensions:

Based on the findings, governance intervention—a multistage business transformation process—is most effective when aligning governance structures and digital leadership. Cross-silo collaboration enhances horizontal interactions across departments and removes traditional barriers, elevating teamwork. Identifying key ecosystem actors increases synergy capacity. Digital leadership, utilizing self-regulation mechanisms in innovation hubs and individual growth pathways, guides the transformation of governance foundations, including policy and security protocol development, to ensure effective monitoring and long-term sustainability. Additionally, a "digital ambassador" in each organizational unit fosters connections between stakeholders and the metaverse ecosystem, while a digital transformation management office (DTMO), along with the chief digital officer (CDO) and joint governance units, streamline resource allocation and policy execution to operationalize projects.

Multi-dimensional Branding: Organizations can strengthen brand identity by issuing NFTs or exclusive tokens to customers as brand ambassadors. As one interviewee noted, investing in the experience economy is vital for leadership in a transformative market.

Workplace Environment: This intervention encompasses compatibility with diverse devices and platforms, monitoring digital evolution, remote collaboration, and pervasive connectivity to engage employees and users. Virtual offices and studios serve as essential organizational and operational infrastructure for CMS management as well as the creation of custom brand and customer environments. Designing and developing mirrored and virtual worlds with accurate physical representations enables the creation of complex 3D ecosystems aligned with the metaverse.

Participants considered multichannel digital security intervention as indispensable for overcoming metaverse adaptation barriers and ensuring comprehensive security in complex digital environments.

Technological Architecture Transformation: This refers to the synergistic integration of emerging technologies aimed at harmonizing virtual and physical environments, thereby facilitating the transmission of multi-sensory and biotic data. By leveraging digital twins and lightweight artificial intelligence models, the intervention seeks to optimize and enhance communication within virtual workspace environments.

Production of Metaverse-Compatible Content: This refers to the transformation of content nature to create multi-dimensional and immersive experiences. Key aspects include the development of 360-degree content that allows for active user participation in real-time content modification, dynamic and non-linear storytelling, and content reconstruction based on the multi-sensory actions of the user. In the metaverse, content possesses a living, evolving existence. In advanced scenarios, "interactive nanointelligences" serve as interfaces connecting users' physical bodies to digital environments, tailoring content based on the unique biological makeup of each user.

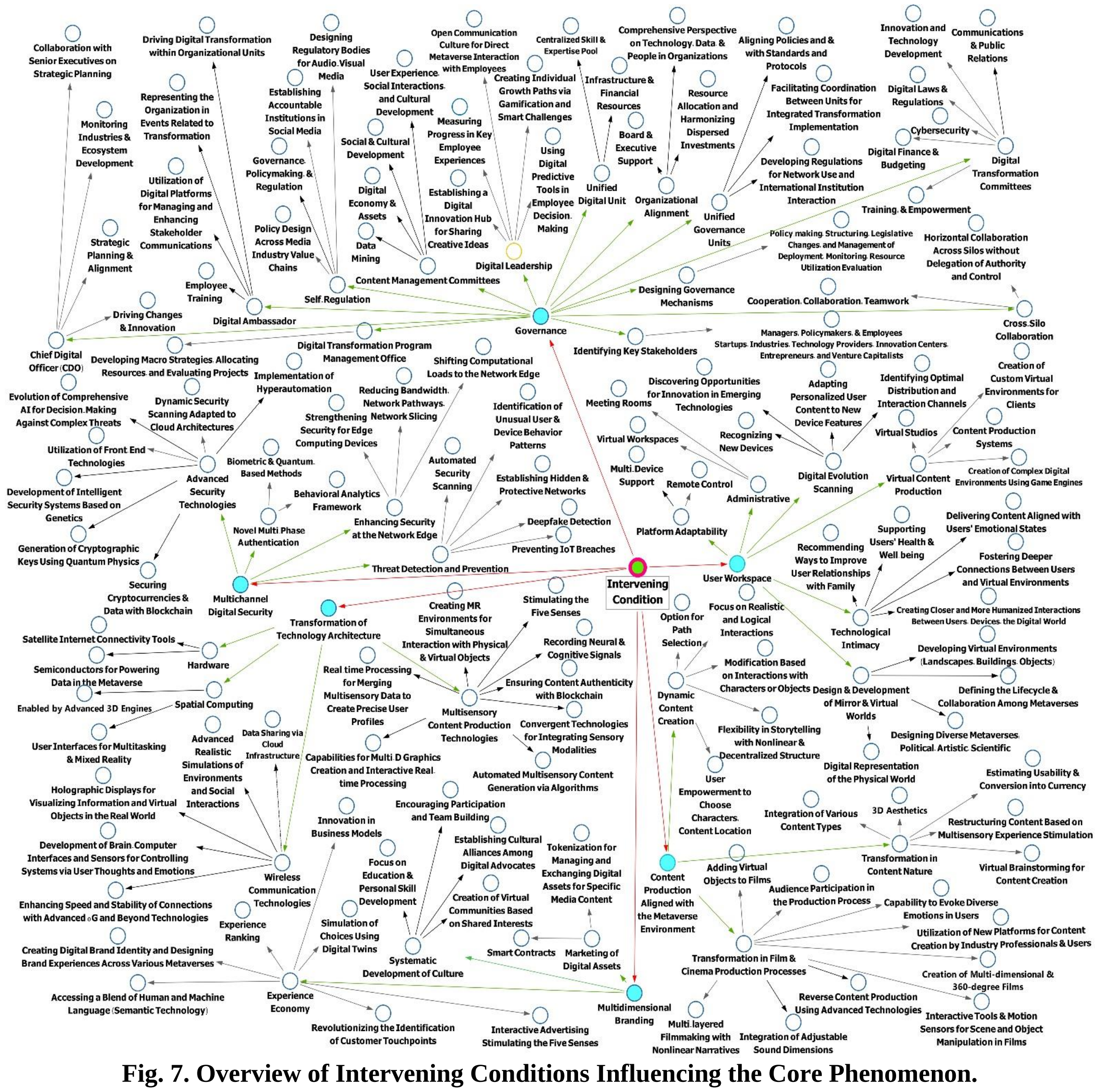

Fig. 7. Overview of Intervening Conditions Influencing the Core Phenomenon.

4-1-6. Consequences

The components integration, emergence of digital wisdom, and failure in digital transformation, depicted in Figure 8, represent the paradigmatic model outcomes. Based on statements from participants, media organizations that strategically implement targeted interventions and leverage contextual enablers are able to achieve seamless integration of algorithms, intelligent systems, and user experiences. On the other hand, the failure to establish comprehensive integration across educational and communication processes leads to a developmental lag. Digital transformation can be defined as the frictionless convergence of technology, human resources, and organizational structures.

One highly detrimental trend is fragmented learning, arising from the fundamental tension between the need for coherent training models and the inherently dispersed nature of digital educational resources.

Similarly, communication breakdowns between business units requiring rapid innovation and IT units prioritizing system stability create organizational silos that block collaboration and weaken metaverse readiness. Conversely, leading media organizations utilize advanced AI algorithms and big data analytics to convert raw data into actionable insights for strategic decision-making. These intelligent insights, alongside organizational intelligence and advanced data analytics, directly enhance an organization's capacity to converge with the metaverse and related technologies.

Critical enablers of this process include user-generated big data, business intelligence–based analytics, and the prevention of information gaps, all constituting the granular digital infrastructure required for sustainable competitive advantage. Furthermore, the integration at multiple levels, including intelligence, technology, and organizational experience, reduces internal friction, strengthening the smart core (digital brains, social intelligence, intelligent content generation, and innovation engine). This results in continuous data updates, the creation of convergent databases, and provides real-time, holistic visibility of the global media landscape.

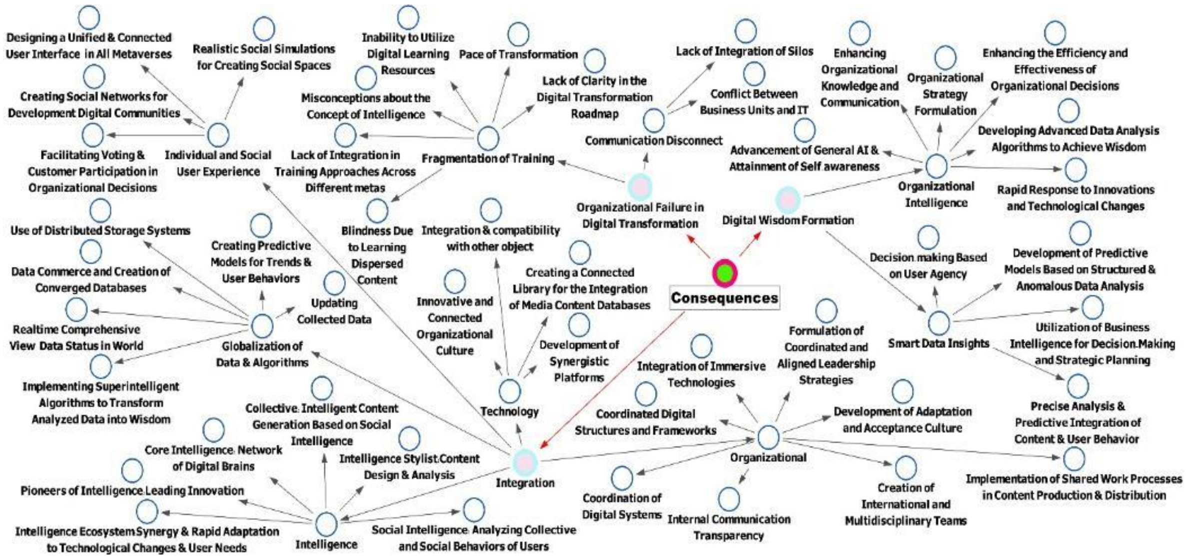

Fig. 8. Overview of Consequential Factors Influencing the Core Phenomenon

4-1-7. Paradigmatic Model in Grounded Theory

After the validation of the findings by the experts, the paradigmatic model was developed, as presented in Figure 9.

4-2. The Transfer of Grounded Theory Findings to ISM

Based on the paradigmatic model derived from Grounded Theory, key system components (C-1 to C-19) were identified and structured within the interpretive structural modeling (ISM) framework to examine interdependencies and prioritize strategic relationships for media digital transformation.

4-2-1. The Results Generated Using the ISM Approach

At this stage, ISM was applied to analyze the relationships among these key components, as evaluated by experts. The structural self-interaction matrix (Figure 10) initially indicated that component C-7 (technological architecture transformation) exerted the strongest influence, while component c-13 (non-digital work structures) had the weakest direct impact.

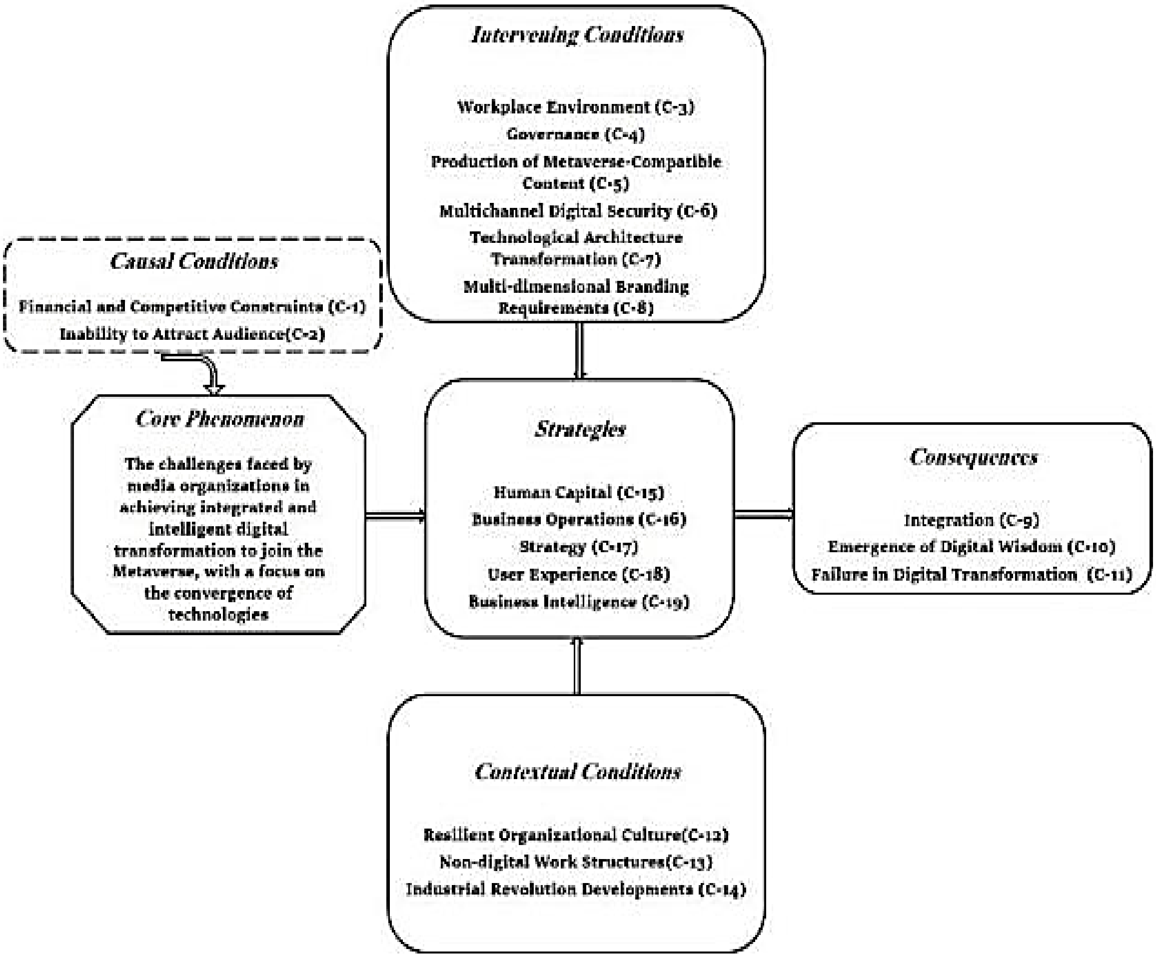

Fig. 9. Paradigmatic Model

Through transitivity rules, the final reachability matrix (Figure 11) was generated, uncovering both direct and indirect relationships. The results revealed that components c-14 (industrial revolution developments) and c-15 (human capital) had the highest influence, while components c-8 (multi-dimensional branding requirements) and c-2 (inability to attract audience) exhibited the greatest dependency.

C-19	C-18	C-17	C-16	C-15	C-14	C-13	C-12	C-11	C-10	C-9	C-8	C-7	C-6	C-5	C-4	C-3	C-2	C-1	
0	0	-1	1	-1	-1	0	-1	1	0	0	1	1	0	0	-1	1	1	1	C-1
0	-1	0	0	0	0	0	0	1	-1	0	1	-1	0	-1	0	-1	1	-1	C-2
0	-1	0	1	-1	-1	0	-1	0	0	0	0	-1	0	1	-1	1	1	-1	C-3
0	0	1	0	-1	-1	0	-1	0	-1	-1	-1	2	1	0	1	1	0	1	C-4
1	-1	0	0	-1	-1	0	0	0	-1	0	1	-1	-1	1	0	-1	1	0	C-5
0	0	0	0	0	-1	0	0	0	-1	-1	0	-1	1	1	-1	0	0	0	C-6
1	0	0	1	0	-1	0	-1	1	2	-1	1	1	1	1	2	1	1	-1	C-7
-1	1	-1	0	0	0	0	0	0	-1	0	1	-1	0	-1	1	0	-1	-1	C-8
0	0	-1	0	0	0	0	0	1	2	1	0	1	1	0	1	0	0	0	C-9
-1	1	0	1	2	2	0	0	0	1	2	1	2	1	1	1	0	1	0	C-10
0	0	-1	0	0	0	-1	-1	1	0	-1	0	-1	0	0	0	0	-1	-1	C-11
0	-1	0	0	-1	-1	1	1	1	0	0	0	1	0	0	1	1	0	1	C-12
0	0	0	1	0	0	1	-1	1	0	0	0	0	0	0	0	0	0	0	C-13
0	0	0	1	-1	1	0	1	0	2	0	0	1	1	1	1	1	0	1	C-14
0	-1	-1	2	1	1	0	1	0	2	0	0	0	0	1	1	1	0	1	C-15
1	1	-1	1	2	-1	-1	0	0	-1	0	0	-1	0	0	0	-1	0	-1	C-16
-1	1	1	1	1	0	0	0	1	0	1	1	0	0	0	-1	0	0	1	C-17
-1	1	-1	-1	1	0	0	1	0	-1	0	-1	0	0	1	0	1	1	0	C-18
1	1	1	-1	0	0	0	0	0	1	0	1	-1	0	-1	0	0	0	0	C-19

Fig. 10. SSIM matrix

Convergence	C-19	C-18	C-17	C-16	C-15	C-14	C-13	C-12	C-11	C-10	C-9	C-8	C-7	C-6	C-5	C-4	C-3	C-2	C-1	
14	1	1	0	1	1	0	0	0	1	1	0	1	1	1	1	1	1	1	1	C-1
5	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	1	0	1	0	C-2
9	1	1	0	1	1	0	0	0	1	0	0	1	0	0	1	0	1	1	0	C-3
16	1	1	1	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	C-4
9	1	1	1	0	0	0	0	0	1	1	0	1	0	0	1	1	0	1	0	C-5
5	1	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	1	0	C-6
17	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	C-7
12	0	1	1	0	1	0	0	1	0	0	0	1	1	1	1	1	1	1	1	C-8
17	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	C-9
18	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	C-10
1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	C-11
15	1	0	1	1	0	0	1	1	1	1	0	1	1	1	1	1	1	1	1	C-12
6	1	1	0	1	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	C-13
19	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	C-14
19	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	C-15
14	1	1	1	1	1	1	0	1	0	1	0	1	0	0	1	1	1	1	1	C-16
18	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	C-17
16	1	1	0	1	1	1	1	1	1	1	0	1	1	0	1	1	1	1	1	C-18
18	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	C-19
	16	16	12	14	14	9	5	9	16	13	8	17	12	12	16	15	14	17	13	Dependency

Fig. 11. Final matrix.

Table 1 demonstrates how the components were allocated across eight hierarchical levels, established through the intersection of the reachability set and the antecedent set. In turn, these hierarchically structured tiers—categorized as foundational, intermediate, and output—propel the model's development.

Table 1. Identifying the Levels in ISM Hierarchical Model

Component	Subscription collection	Preliminary collection	Received collection	Iteration
		First		
C1	1,4,7,8,10,15,16, 18,19	1,4,7,8,9,10,12,14,15,16, 17,18,19	1,2,3,4,5,6,7,8,10,11,15, 16,18,19	
C2	2,4,8,18	1,2,3,4,5,6,7,8,9,10,12, 14,15,16,17,18,19	2,4,8,11,18	
C3	3,8,15,16,18,19	1,3,4,7,8,9,10,12,14,15,16,17,18,19	2,3,5,8,11,15,16,18,19	
C4	1,2,4,5,7,8,9,10, 15,16,17,18,19	1,2,4,5,7,8,9,10,12, 14,15,16,17,18,19	1,2,3,4,5,6,7,8,9,10,11, 15,16,17,18,19	
C5	4,5,8,10,17,18,19	1,3,4,5,6,7,8,9,10,12,14, 15,16,17,18,19	2,4,5,8,10,11,17,18,19	
C6	6,8,19	1,4,6,7,8,9,10,12,14,15,17,19	2,5,6,8,19	
C7	1,4,7,8,9,10, 14,15,17,18,19	1,4,7,8,9,10,12, 14,15,17, 18,19	1,2,3,4,5,6,7,8,9,10,11,14, 15,16,17,18,19	
C8	1,2,3,4,5,6,7, 8,12, 15,17,18	1,2,3,4,5,6,7,8,9,10,12, 14,15,16,17,18,19	1,2,3,4,5,6,7,8, 12,15,17, 18	>Level 1
C9	4,7,9,10,14, 15,17,19	4,7,9,10,14, 15,17,19	1,2,3,4,5,6,7,8,9,10,11,14, 15,16,17,18,19	
C10	1,4,5,7,9,10,12, 14,15,16,17,18,19	1,4,5,7,9,10,12, 14,15,1617,18,19	1,2,3,4,5,6,7,8,9,10,11,12, 14,15,16,17,18,19	
C11	11	1,2,3,4,5,7,9,10,11, 12,13,14,15,17,18,19	11	> Level 1
C12	8,10,12,16,17,19	8,10,12,14,15,16,17,18,19	1,2,3,4,5,6,7,8,10,11, 12, 13,16,17,19	
C13	13,15,18	12,13,14,15,18	11,13,15,16,18,19	
C14	7,9,10,14,15,16,17,18,19	7,9,10,14,15, 16,17,18,19	1,2,3,4,5,6,7,8, 9,10,11,12,13,14,15,16,17,18,19	
C15	1,3,4,7,8,9, 10,13,14,15,16,17,18,19	1,3,4,7,8,9,10,13, 14,15,16,17,18,19	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19	
C16	1,3,4,10,12,14, 15,16,17,18,19	1,3,4,7,9,10,12,13,14,15, 16,17,18,19	1,2,3,4,5,8,10,12,14, 15,16,17,18,19	
C17	4,5,7,8,9,10,12, 14,15,16,17,19	4,5,7,8,9,10,12, 14,15,16, 17,19	1,2,3,4,5,6,7,8,9,10,11, 12,14,15,16,17,18,19	
C18	1,2,3,4,5,7,8,10,13, 14,15,16,18,19	1,2,3,4,5,7,8,9,10, 13,14, 15,16,17,18,19	1,2,3,4,5,7,8,10,11,12, 13,14,15,16,18,19	
C19	1,3,4,5,6,7,9,10, 12,14,15,16, 17,18,19	1,3,4,5,6,7,9,10, 12,13,14,15,16, 17,18,19	1,2,3,4,5,6,7,8,9,10,11, 12,14,15,16,17,18,19	

		Second		
C1	1,4,7,10,15,16,18,19	1,4,7,9,10,12,14,15,16,17,18,19	1,2,3,4,5,6,7,10,15,16,18,19	
C2	2,4,18	1,2,3,4,5,6,7,9,10,12,14, 15,16,17,18,19	2,4,18	> Level 2
C3	3,15,16,18,19	1,3,4,7,9,10,12,14,15,16 ,17,18,19	2,3,5,15,16,18,19	
C4	1,2,4,5,7,9,10,15,16, 17,18,19	1,2,4,5,7,9,10, 12,14,15,16,17,18,19	1,2,3,4,5,6,7,9, 10,15,16, 17,18,19	
C5	4,5,10,17,18,19	1,3,4,5,6,7,9,10,12,14,15,16,17,18,19	2,4,5,10,17,18,19	
C6	6,19	1,4,6,7,9,10,12,14,15,17,19	2,5,6,19	
C7	1,4,7,9,10,14,15, 17,18,19	1,4,7,9,10,12,14,15,17,18,19	1,2,3,4,5,6,7,9,10,14,15, 16,17,18,19	
C9	4,7,9,10,14,15,17,19	4,7,9,10,14,15,17,19	1,2,3,4,5,6,7,9,10,14, 15, 16,17,18,19	
C10	1,4,5,7,9,10,12, 14,15,16,17,18,19	1,4,5,7,9,10,12,14,15,16, 17,18,19	1,2,3,4,5,6,7,9,10,12, 14, 15,16,17,18,19	
C12	10,12,16,17,19	10,12,14,15,16,17,18,19	1,2,3,4,5,6,7,10,12,13,16,17,19	
C13	13,15,18	12,13,14,15,18	13,15,16,18,19	
C14	7,9,10,14,15,16,17,18,19	7,9,10,14,15,16,17,18,19	1,2,3,4,5,6,7,9,10,12, 13, 14,15,16,17,18,19	
CC15	1,3,4,7,9,10,13, 14,15,16,17,18,19	1,3,4,7,9,10,13,14, 15,16, 17,18,19	1,2,3,4,5,6,7,9,10,12, 13, 14,15,16,17,18,19	
C16	1,3,4,10,12,14,15,16,17,18,19	1,3,4,7,9,10,12,13,14,1516,17,18,19	1,2,3,4,5,10,12,14,15,16, 17,18,19	
C17	4,5,7,9,10,12,14, 15,16,17,19	4,5,7,9,10,12,14,15,16, 17,19	1,2,3,4,5,6,7,9,10,12, 14, 15,16,17,18,19	
C18	1,2,3,4,5,7,10,13, 14,15,16,18,19	1,2,3,4,5,7,9,10,13,14, 15,16,17,18,19	1,2,3,4,5,7,10,12,13, 14,15,16,18,19	
C19	1,3,4,5,6,7,9,10, 12,14,15,16,17,18,19	1,3,4,5,6,7,9,10,12,13, 14,15,16,17,18,19	1,2,3,4,5,6,7,9,10,12,14, 5,16,17,18,19	
		Third		
C1	1,4,7,10,15,16,18,19	1,4,7,9,10,12,14,15,16,17,18,19	1,3,4,5,6,7,10,15,16,18,19	
C3	3,15,16,18,19	1,3,4,7,9,10,12,14,15,16, 17,18,19	3,5,15,16,18,19	
C4	1,4,5,7,9,10,15,16,17,18,19	1,4,5,7,9,10,12,14,15,16, 17,18,19	1,3,4,5,6,7,9,10,15,16,17,18,19	
C5	4,5,10,17,18,19	1,3,4,5,6,7,9,10,12,14,15,16,17,18,19	4,5,10,17,18,19	> Level 3
C6	6,19	1,4,6,7,9,10,12,14,15, 17,19	5,6,19	
C7	1,4,7,9,10,14,15, 17,18,19	1,4,7,9,10,12,14,15,17,18,19	1,3,4,5,6,7,9,10,14,15,16,17,18,19	
C9	4,7,9,10,14,15,17,19	4,7,9,10,14,15,17,19	1,3,4,5,6,7,9,10,14,15,16,17,18,19	
C10	1,4,5,7,9,10,12, 14,15,16,17,18,19	1,4,5,7,9,10,12,14, 15,16, 17,18,19	1,3,4,5,6,7,9,10,12, 14,15,16,17,18,19	
C12	10,12,16,17,19	10,12,14,15,16,17,18,19	1,3,4,5,6,7,10,12,13,16,17,19	
C13	13,15,18	12,13,14,15,18	13,15,16,18,19	
C14	7,9,10,14,15,16,17,18,19	7,9,10,14,15,16,17,18,19	1,3,4,5,6,7,9,10,12,13,14,15,16,17,18,19	
C15	1,3,4,7,9,10,13, 14,15,16,17,18,19	1,3,4,7,9,10,13,14, 15,16, 17,18,19	1,3,4,5,6,7,9,10,12,13,14,15,16, 17,18,19	
C16	1,3,4,10,12,14,15,16,17,18,19	1,3,4,7,9,10,12,13,14,15,16,17,18,19	1,3,4,5,10,12,14,15,16,17,18,19	
C17	4,5,7,9,10,12,14, 15,16,17,19	4,5,7,9,10,12,14,15,16,17,19	1,3,4,5,6,7,9,10,12,14,15,16,17,18,19	
C18	1,3,4,5,7,10,13,14,15,16,18,19	1,3,4,5,7,9,10,13,14,15,16,17,18,19	1,3,4,5,7,10,12,13,14,15, 16,18,19	
C19	1,3,4,5,6,7,9, 10,12,14,15, 16,17,18,19	1,3,4,5,6,7,9,10, 12,13,14,15,16,17,18,19	1,3,4,5,6,7,9,10,12,14,15, 16,17,18,19	> Level 3
C1	1,4,7,10,15,16,18	1,4,7,9,10,12,14,15,16,17,18	1,3,4,6,7,10,15,16,18	
		Fourth		
C3	3,15,16,18	1,3,4,7,9,10,12,14,15, 16,17,18	3,15,16,18	> Level 4
C4	1,4,7,9,10,15,16,17,18	1,4,7,9,10,12,14,15,16,17,18	1,3,4,6,7,9,10,15,16,17,18	
C6	6	1,4,6,7,9,10,12,14,15,17	6	> Level 4
C7	1,4,7,9,10,14,15,17,18	1,4,7,9,10,12,14,15,17,18	1,3,4,6,7,9,10,14,15,16,17,18	
C9	4,7,9,10,14,15,17	,4,7,9,10,14,15,17	1,3,4,6,7,9,10,14,15,16,17,18	

C10	1,4,7,9,10,12,14, 15,16,17,18	1,4,7,9,10,12,14,15,16,17,18	1,3,4,6,7,9,10,12,14,15,16,17,18	
C12	10,12,16,17	10,12,14,15,16,17,18	1,3,4,6,7,10,12,13,16,17	
C13	13,15,18	12,13,14,15,18	13,15,16,18	
C14	7,9,10,14,15,16,17,18	7,9,10,14,15,16,17,18	1,3,4,6,7,9,10,12,13,14,15,16,17,18	
C15	1,3,4,7,9,10,13,14,15,16,17,18	1,3,4,7,9,10,13,14,15,16, 17,18	1,3,4,6,7,9,10,12,13,14,15,16,17,18	
C16	1,3,4,10,12,14,15,16,17,18	1,3,4,7,9,10,12,13,14,15, 16,17,18	1,3,4,10,12,14,15,16,17, 18	> Level 4
C17	4,7,9,10,12,14,15,16,17	4,7,9,10,12,14,15,16,17	1,3,4,6,7,9,10,12,14,15,16,17,18	
C18	1,3,4,7,10,13,14, 15,16,18	1,3,4,7,9,10,13,14,15,16, 17,18	1,3,4,7,10,12,13,14,15,16,18	
Fifth				
C1	1,4,7,10,15,18	1,4,7,9,10,12,14,15,17,18	1,4,7,10,15,18	> Level 5
C4	1,4,7,9,10,15,17,18	1,4,7,9,10,12,14,15,17,18	1,4,7,9,10,15,17,18	> Level 5
C7	1,4,7,9,10,14,15,17,18	1,4,7,9,10,12,14,15,17,18	1,4,7,9,10,14,15,17,18	> Level 5
C9	4,7,9,10,14,15,17	4,7,9,10,14,15,17	1,4,7,9,10,14,15,17,18	
C10	1,4,7,9,10,12,14, 15,17,18	1,4,7,9,10,12,14,15,17,18	1,4,7,9,10,12,14,15,17,18	> Level 5
C12	10,12,17	10,12,14,15,17,18	1,4,7,10,12,13,17	
C13	13,15,18	12,13,14,15,18	13,15,18	> Level 5
C14	7,9,10,14,15,17,18	7,9,10,14,15,17,18	1,4,7,9,10,12,13,14,15,17,18	
C15	1,4,7,9,10,13,14, 15,17,18	1,4,7,9,10,13,14,15,17,18	1,4,7,9,10,12,13,14,15,17,18	
C17	4,7,9,10,12,14,15,17	4,7,9,10,12,14,15,17	1,4,7,9,10,12,14,15,17,18	
Sixth				
C9	9,14,15,17	9,14,15,17	9,14,15,17,18	
C12	12,17	12,14,15,17,18	12,17	> Level 6
C14	9,14,15,17,18	9,14,15,17,18	9,12,14,15,17,18	
C15	9,14,15,17,18	9,14,15,17,18	9,12,14,15,17,18	
C17	9,12,14,15,17	9,12,14,15,17	9,12,14,15,17,18	
C18	14,15,18	9,14,15,17,18	12,14,15,18	
Seventh				
C9	9,14,15,17	9,14,15,17	9,14,15,17,18	
C14	9,14,15,17,18	9,14,15,17,18	9,14,15,17,18	> Level 7
C15	9,14,15,17,18	9,14,15,17,18	9,14,15,17,18	> Level 7
C17	9,14,15,17	9,14,15,17	9,14,15,17,18	
C18	14,15,18	9,14,15,17,18	14,15,18	> Level 7
Eighth				
C9	9,17	9,17	9,17	> Level 8
C17	9,17	9,17	9,17	> Level 8

Ultimately, based on the hierarchical levels outlined in Table (1) and the values derived from the final matrix, the definitive model, as depicted in Figure 12, is constructed. We refer to this model as "MedaVers." This final model constitutes a complex network of interdependencies that serves as a systematic foundation for formulating digital transformation strategies. The hierarchical structure of the model is organized as follows:

Level 1 components serve as the primary accelerators and integrators of the digital transformation process:

- "Strategy" delineates priorities for resource allocation (financial, human, data, and technological).
- "Integration" provides the context for linking siloes, organizational facets, data, and more.

Direct influences of Level 1 components on Level 2:

- Industrial Revolution Developments: Level 1 decisions catalyze the emergence of technological infrastructures in Level 2.
- Human Capital: Knowledge transfer and workforce readiness strategies, including resource allocation, are determined.
- User Experience: The enhancement of immersive and multidimensional experience design is impacted by the convergence of “strategy” and “integration.”

Level 2 components act as technological and human infrastructures:

- “Industrial Revolution Developments” provide the necessary technical infrastructures for entering the metaverse.
- “Human Capital” supplies the skills required to manage and advance digital transformation initiatives.
- Operational Feedback via “User Experience” informs managerial levels, identifying strategic gaps and prompting revisions in organizational structures and processes.

Effective feedback from the interaction of these three components fosters a culture of continuous learning and risk acceptance, ultimately strengthening a resilient organizational culture in the face of environmental challenges.

This culture serves as the core convergence node and key mediator, possessing the highest number of relational accesses (influenced by three Level 2 components and influencing four Level 4 components), filtering and facilitating layer interactions.

This culture activates or suppresses Level 4 components:

- Governance: A resilient culture accelerates and refines decision-making processes, thus enabling more agile governance structures.
- Technological Architecture Transformation: A resilient organization, by reducing resistance, intensifies the redesign and development of technological infrastructures.
- Emergence of Digital Wisdom: A resilient culture internalizes data-driven decision-making and intelligence support for performance.
- Financial and Competitive Constraints: A resilient organization allocates resources flexibly and with agile policymaking to counter pressures.
- Non-digital Work Structures: A resilient culture counters traditional structures and enhances agility and speed in digitalizing processes.

In summary, the absence of a "Resilient Organizational Culture" entails resistance to governance reform, technological redesign, and data-centric adoption, which, compounded by financial pressures or persistent traditional structures, disrupts subsequent levels and undermines the entire digital transformation process.

Therefore, the relationships among components at Level 4 indicate the coherence of the reform chain and the efficiency of components, each of which can independently affect the formation of Level 5 components:

- Workplace Environment: Governance reform and technology architecture redesign develop the infrastructures necessary for creating a metaverse-ready workplace.
- Multichannel Digital Security: Governance policies and security requirements shape security standards specific to organizational units and various metaverse contexts.
- Business Operations: The emergence of digital wisdom, the digitalization of work structures, automation processes, and intelligent, multidimensional business model transformation convey the evolution of operations.

These three components have direct impact on forming the capability loop at Level 6. The "Workplace Environment" provides a metaverse-aligned infrastructure for stakeholder collaboration, content production, and organizational management. Without an appropriate and secure "Workplace Environment," inefficient or inaccurate data would feed into the BI system.

- Multichannel Digital Security, by securing user avatars against data infiltration, enhances user trust and provides secure frameworks for employee data mining.

- Business Operations, based on digital wisdom, gathers actionable data and channels it into BI systems for personalized content generation. Inefficiencies in this process hinder access to real data and result in content misalignment with user needs.

A synergistic bidirectional relationship exists among Level 6 components: BI analytics offers profound insights into user personality, emotions, and behavior for personalized content, while BI-driven content production ensures alignment with user needs. Business intelligence continuously evaluates content quality by generating insights from secure environmental data.

Overall, the lack of effective bidirectional interaction between Level 6 and supporting levels 4 and 5 leads to inefficient content personalization or imprecise BI analytics, exacerbating the "Inability to Attract Audience." This can indicate accumulated weaknesses across the entire causal hierarchy.

The outcome of this component distinguishes the humanistic path (leading to a strong brand) from the technological path (leading to failure) and determines the continuation of the digital transformation journey:

Multidimensional Branding: Enhancing "Audience Satisfaction" (via BI and content production) fosters audience acquisition and retention, consolidating the organization's brand identity within the metaverse ecosystem.

Failure in Digital Transformation: In the absence of audience acquisition and retention, misaligned governance policies, technological efforts, and investments in supporting components (Levels 1–6), which are relative to the organization's status and metaverse ecosystem, result in missed metaverse opportunities.

Overall, the Level 6 components represent the ultimate effectiveness of the media digital transformation model for metaverse entry.

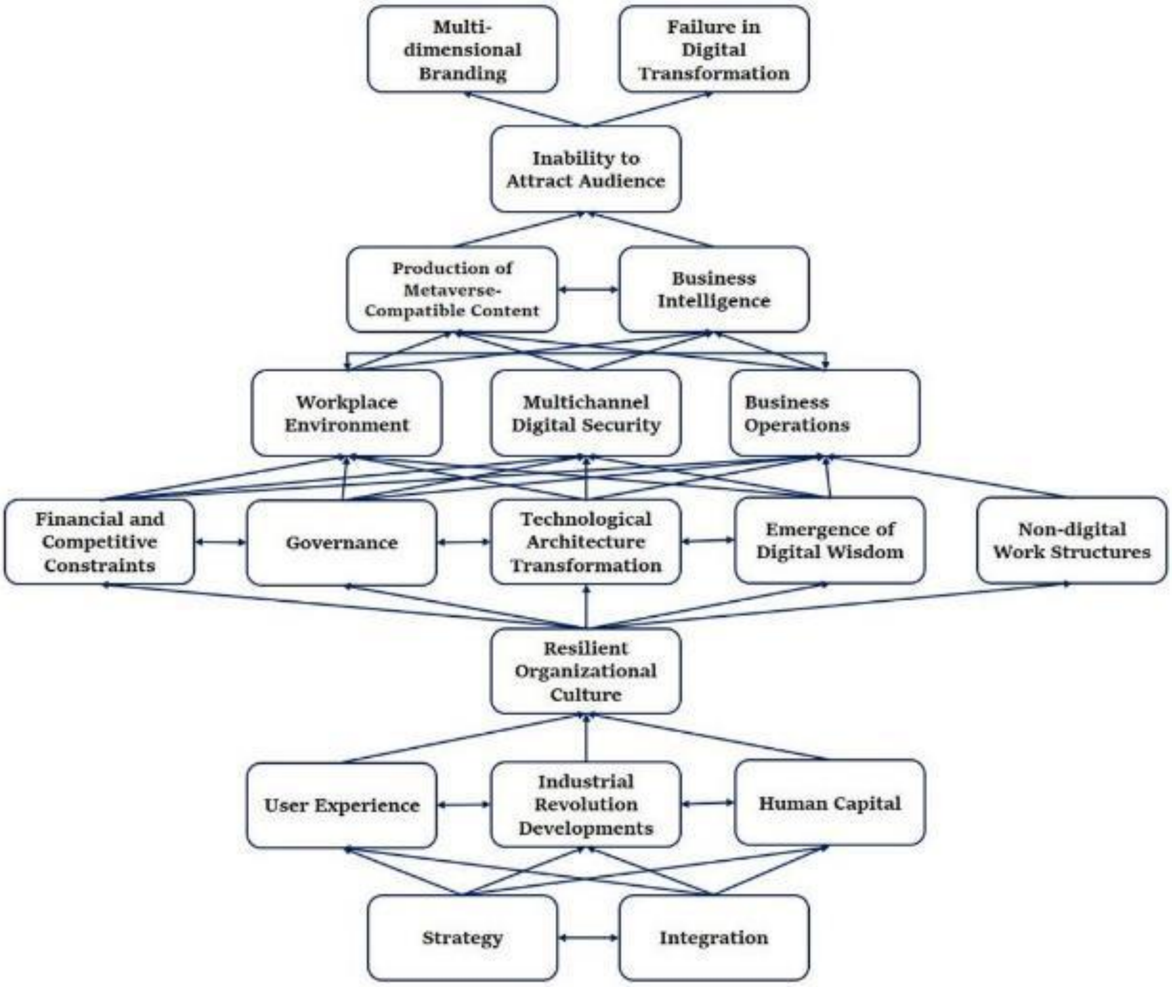

Fig. 12. medaverse Model

Using the MICMAC diagram (Figure 13), we determined the relative positioning of key components by analyzing their influence–dependency dynamics. This analysis is based on the dependency and convergence values of each component presented, which were obtained during the process of constructing the final matrix.

As illustrated in Figure 13:

- The "Non-Digital Work Structure" component resides in the Autonomous Zone (1), characterized by low influence and low dependency, signifying minimal connections.
- Components such as "Inability to Attract Audience," "Workplace Environment," "the Production of Metaverse-Compatible Content," "Multi-Channel Digital Security," and "Failure in Digital Transformation" fall into the Dependent Zone (2), reflecting low influence but high dependency.
- "Resilient Organizational Culture," "Integration," and "Industrial Revolution Developments" are categorized in the Independent Zone (3), with high influence and low dependency.
- Finally, components such as "Financial and Competitive Constraints," "Governance," "Technological Architecture Transformation," "Multi-Dimensional Branding Requirements," "Emergence of Digital Wisdom," "Human Capital," "Business Operations," "Strategy," "User Experience," and "Business Intelligence" occupy the Linking Zone (4), indicating high influence and strong interdependencies, which are essential for decision making due to their bidirectional relationships with other components.

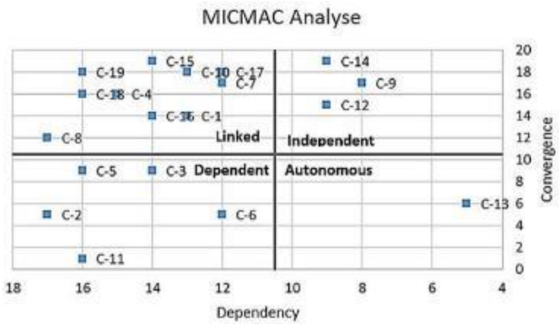

Fig. 13. MICMAC Analyse

To ensure the model's validity, three independent experts reviewed and confirmed its alignment with theoretical foundations. Furthermore, its reliability was reinforced through a Cohen's kappa coefficient of $\kappa=0.82$ (very strong agreement) and an inconsistency rate below 5%, demonstrating statistical stability and high inter-rater convergence.

5. Discussion

The integrated and pioneering "MedaVers" framework provides an eight-layer roadmap for media digital transformation in the metaverse, guiding organizations from policy formulation through implementation. Given the fragmented coverage of all dimensions of media digital transformation in the metaverse and the island-like operation of related theories, we employed a trifecta integration of Actor–Network Theory (ANT), Artificial Intelligence Marketing (AIM) marketing, and Media Convergence theory within a synergistic conceptual matrix. Through inductive, deductive, and integrative analyses, medaverse not only bridges the gaps of the aforementioned theories but also transcends their individual limitations by concurrently addressing strategic, economic, cultural, and technological imperatives. In this section, we present a systematic, comparative, and critical interpretation and evaluation of the medaverse model.

Aligned with the content-centric mission of media organizations, the primary contributions of the medaverse model revolve around three pivotal value-adds: (1) the redefinition of the strategic drivers "Strategy" and "Integration"; (2) conceptualizing Resilient Organizational Culture as the central network hub; and (3) establishing the bidirectional Content ↔ BI loop for real-time, multisensory lived experience optimization.

These achievements were developed in response to three main questions:

- **What key drivers are essential for developing effective infrastructures in digital transformation?**

During the grounded theory phase, field coding identified “strategy” and “integration” as key transformational drivers. Subsequent interpretive structural modeling (ISM) placed their bidirectional relationship atop the medaverse causal hierarchy matrix, thereby enabling both technological and human capital innovations. Causal influence dynamics between these two drivers, grounded in media convergence theory, rest upon two principles:

a) Data Infrastructure

MedaVers leverages media convergence theory but extends it beyond the traditional emphasis on convergence between organizational silos and a two dimensional environment. Here, integration functions as the mediator of data and process convergence across all organizational dimensions—from structural connectivity of intelligent networks and global data streams to synergistic alignment of human capital, user profile homogenization, technologies, and metaverse ecosystems—thereby ensuring multidimensional convergence (technological, cultural, economic). While Jamil (2022) analytically emphasized restructuring educational and technological frameworks without pursuing real-time, system-wide data flow synergy, medaverse harnesses the capabilities of the fifth and sixth industrial revolution (IoT infrastructures, digital brains, social intelligence) to facilitate cross-silo synergy, secure platform interoperability, and hybrid working models. Real-time data flows are generated and employed for strategic decision making, policy formulation, and digital transformation roadmapping.

b) Real Time Data Chain Creation

Crafting transparent strategies for synchronous real time data flow convergence across all ecosystem channels—organizational silos, competitor and collaborator organizations, and co-existing entities—is a prerequisite for operational agility in decision making and personalized content production. While Waiswa (2024), based digital transformation success strategies on infrastructure and marketing, provided incomplete protocols for inter- and intra-organizational real-time data synergy, medaverse underscores the necessity of bio-sensory data generation and real-time chains to enable immediate content tracking and rapid environmental responsiveness. Therefore, strategy in medaverse maps each silo’s trajectory from internal structures to open metaverse standards, defining cross functional collaboration protocols. Prioritizing adaptive human capital empowerment, resource allocation plans, human–machine decision framework design, and dynamic service development, this component articulates a long-term vision for content innovation and participatory economies.

Ultimately, medaverse has the potential to foster integration and synergy across technological advancements, cultural values, and process reengineering, driving the intelligent development of all organizational dimensions, including digital infrastructures, technologies, and internal silos. Accordingly, it can extend organizational integration vertically, enhance intelligence horizontally, and create an overarching umbrella of technological convergence that spans both the length and breadth of the organization.

- **What is the main bottleneck to success or failure in the digital transformation process of media organizations in the metaverse?**

In the grounded theory coding process, out of the 810 identified semantic units, more than 70 units—either directly or indirectly—referred to concepts such as cultural convergence, workforce trainability, institutionalization of agility, and innovation centricity. All of these concepts underscored the pivotal role of enhancing human resource resilience in the success of digital transformation and ultimately led to the emergence, at the field level, of the organizational culture of resilience construct. In the ISM analysis, this construct was identified as the central bottleneck, due to its fundamental influence on techno-human interactions and its assurance of organizational sustainability in the face of cultural rifts and security threats.

Tajeddini et al. (2020) argue that human resources are the most crucial factor for activating other resources and serve as a fundamental tool in stimulating organizational behaviors. Accordingly, our field findings also indicate that, given the critical role of human resources within the organization, efforts to establish fifth and sixth generation technologies without prior cultural preparedness and aligned infrastructure—despite providing digital skills training—create a profound divide among marketing, technical, and content units. This, in turn, yields disproportionate responses to user needs (per the AIM framework).

Given the critical role of organizational culture within the networked organizational structure, the theoretical grounding at this research level rests upon actor–network theory (ANT). According to ANT, human actors (e.g., data managers, analysts, digital ambassadors, chief digital officers) and non-human actors (e.g., algorithms, optical devices, XR systems, smart contracts, blockchain protocols) interact through the mechanisms of translation and blackboxing. In this model, resilient organizational culture is positioned as the intermediary hub, facilitating and sustaining secure, bidirectional interactions among all actors and, by virtue of its infrastructural function, accelerating the blackboxing of techno-human relationships.

Drouzinin (2021) emphasizes resource transparency and the role of human–non-human networks, but does not propose a mechanism for preserving resilience amid disturbances. In contrast, the medaverse model leverages this cultural construct to bridge technological and operational layers, addressing multichannel security gaps through decentralized governance and multilayered safety considerations, thereby integrating smart contracts with user trust. This approach secures network sustainability in the face of organizational resistance and environmental shifts within the metaverse ecosystem.

Consistent with the imperative of ensuring security, Abd Elkareem et al. (2024) proposed a scalable framework to counter technical barriers and maintain safe data flows, but overlooked the influence of cultural infrastructure—perhaps assuming that addressing organizational culture would detract from the security focus. Conversely, the medaverse model conceptualizes resilience not only as an outcome but also as a prerequisite—and indispensable condition—for network sustainability. Resilient culture, independent of being limited to training or technical tools, enables continuous, secure actor interactions and preserves network dynamism through the iterative refinement of sustainable safety and security considerations with a user-centric orientation.

- **What theoretical and practical mechanisms exist in the realm of producing content tailored for the metaverse?**

By employing an inductive coding approach, key elements, such as content dynamism, content multidimensionality, and simulation of touristic environments, were conceptualized to establish the foundations of “metaverse-aligned content production” for advancing competitive, content-centric media. Stimulating multisensory experiences, enhancing customer value, simulating content acceptance via digital twins, developing “digital bioprofiles,” and leveraging the efficiencies of business intelligence all served to boost audience/user engagement.

The medaverse model identifies the critical causal synergy between metaverse-aligned content production and business intelligence (BI) as the pivotal inflection point transitioning from operational infrastructure layers (Levels 4 and 5 of the ISM model) to mid-term outcomes (Level 7). Unlike the traditional media convergence theory—which emphasizes mere linear overlap or integration between media content and distribution platforms—our model underscores three-dimensional convergence across “Content,” “Technology,” and “User Experience” within a nonlinear, multidimensional framework.

The medaverse model elevates the classic media convergence from structural aggregation to functional interactivity within the metaverse era: content is reproduced through a bidirectional loop between real-time bio-sensory data (“Bio Profile Digital”) and BI logic. To further enrich user experience within this loop, we have enhanced the matching phase of the AIM (Awareness–Insight–Matching) model, shifting it from behaviorally aligned, insight-focused matching to a hybrid perceptual–experiential–cognitive paradigm. recognizing that conventional AIM approaches rely primarily on simple machine learning algorithms and behavioral data, we integrate multisensory data types (eye tracking, physiological parameters, affective metrics) into the processing pipeline. This augmentation significantly enhances the efficacy of content personalization algorithms and interactive experiences. Absent uninterrupted flows of these rich data streams, no algorithm can generate truly immersive, live interactions. Consequently, machine learning algorithms at the BI core ingest integrated multisensory data, thereby ensuring faster translation of strategy into content production execution. This analysis aligns with Dewan and Gagare (2024), who validated interactive, narrative-driven, rhizomatic storytelling in multidimensional content creation.

Operationalization mechanisms are explicated via “technological translation” (drawn from actor–network theory) and “communication blackboxing” as intermediary hubs facilitating the bidirectional loop between BI and content production. Thereafter, the “resilient culture” construct from ANT is integrated as the activating substrate that guarantees loop sustainability amid technological fluctuations and security threats.

The infrastructural prerequisites for maintaining loop coherence include data governance frameworks, a fully digitalized “workspace,” and multichannel digital security; otherwise, breaks in the data transmission chain will result in the lack of access to real-time data. Although Alshurideh et al. (2023) neglected infrastructural security and treated innovative marketing as an independent, unidirectional driver of digital transformation, the medaverse model identifies any deficiencies in collecting bio-sensory data as impairing BI accuracy, thereby yielding irrelevant or non- personalized content and culminating in failed engagement and inability to attract audiences/users.

Given the impact of immersion on interactive experience, numerous studies have stressed the need for devising engaging, interactive structures; examples include Mishra et al. (2021) on affective visual KPIs in augmented reality, and Nunkoo et al. (2022) and Lin (2022) on innovative UI design for multidimensional UX. In medaverse, by incorporating KPIs based on biometric, affective, perceptual, and cognitive feedback, we have elevated interactive metrics to an advanced level. Continuous tracking of user responses enables an intelligent, ongoing update of the experience and marketing insight loop, ultimately generating content tailored to each user’s digital lifestyle profile within the metaverse.

Overall, the self-reinforcing loop between content and BI activates machine insight patterns grounded in three core constructs: resilient culture, dynamic cybersecurity, and fluid data translation. It also redefines the operational paradigm of media convergence from the user experience–technology–content loop to a human–machine–media interaction loop, transforming the content producer’s role from a static creator to an intelligent touchpoint with the audience.

6. Conclusion

This research, through the introduction of the medaverse model, takes a significant step in addressing theoretical gaps in media management and digital transformation literature within the metaverse ecosystem. This integrated framework leverages a hybrid inductive-deductive methodology (grounded theory and interpretive structural modeling) to construct an organization-oriented structure that encompasses human-machine interaction, organizational culture re-engineering, and reinforcement of the content-business intelligence loop.

The medaverse model resolves existing literature gaps through three integrated theoretical contributions. First, it transcends the reductionism of one-dimensional theories such as actor-network theory (ANT) and artificial intelligence marketing (AIM), developing a network structure that facilitates dynamic human-machine interactions, multidimensional experience creation, and systemic integration. Second, by introducing the bidirectional feedback loop "Business Intelligence ↔ Content Production" as a transformation catalyst and elevating media convergence theory from a one-dimensional paradigm to a dynamic three-dimensional interaction, it evolves content producers from traditional static roles to an integrated level of perceptual-experiential-cognitive agency. Third, by positioning "Cultural Resilience" as the central bottleneck with the highest causal relational accessibility, it establishes a novel cognitive architecture that precisely explains the sustainability of human-non-human interactions in metaverse-based ecosystems.

The theoretical contributions of this model include addressing the challenge of isolating digital transformation as a concept by overcoming technically-oriented limitations in explaining the role of cultural infrastructure and bridging the theory-practice gap evident in previous research. This creates a new foundation for reconstructing object/human interactions in post-physical environments.

Beyond converting multisensory and biometric data into comprehensible personal experiences, the medaverse model explicates the adaptive symbiosis between humans and machines in transforming audiences into co-creative agents through continuous self-reinforcing feedback loops. This model establishes the groundwork for "post-data media" theory—media that transforms content's existential nature, designing it not only for consumption but also as an intelligent ecosystem compatible with the metaverse environment.

From a practical perspective, medaverse functions as a strategic decision-support tool providing a path-oriented and policy-adaptable model for transitioning to the metaverse ecosystem. Media managers by implementing this model can shift from isolated technological initiatives toward engineering intelligent, human-centered systems. According to the model, the first step and prerequisite for initiating digital transformation is establishing cultural resilience as the network core. This structural bottleneck demonstrates the precedence of transformation management over technology. In the absence of cultural acceptance by human resources, even the most advanced technologies will encounter implementation challenges. Therefore, investment in re-engineering decentralized and hybrid governance and adaptive learning with AI assistance becomes essential for digital transformation.

Second, the impact-dependency matrix analysis in the model, beyond revealing strategic leverage points, enables improved resource allocation performance and targeted development of components with the maximum systemic effect (especially in quadrant 4 of the matrix). Consequently, investment gradually shifts from foundational layers (strategy/convergence) to operational ones (content production/branding).

Third, managers can enhance audience/user participation, resilience, and loyalty by analyzing outputs from cognitive systems (content personalization and multisensory, adaptive experiences through business intelligence) and monitoring biometric KPIs.

Finally, media managers and strategists utilizing this roadmap can evaluate organizational status, identify transformation bottlenecks, eliminate parallel initiatives, minimize redundant costs, and improve market transition and adaptation speed. Policymakers can design flexible architectures for transformations from macro-level strategy formulation to micro-level interactive content production. This requires standardizing biometric data, developing decentralized data governance protocols, ensuring equitable platform access, protecting privacy, and standardizing ethical regulations for biometric sensors. Additionally, designing dynamic validation mechanisms to ensure fairness in media algorithms, establishing standards for security and cyber infrastructure reinforcement, and implementing adaptive oversight are requirements for responsible governance within this framework.

For future research, we recommend conducting longitudinal studies to quantitatively measure the model's operational capability in real media organizations with variables such as human resource resilience and content attractiveness; field testing AI learning algorithm architectures and developing multi-channel quantum security; an empirical examination of cognitive loop outputs from adaptive learning and personalized user perception sustainability perspectives; extending the model to adjacent industries and combining it with emerging technologies such as identifying critical model points through digital twins; designing multidimensional key performance indicators (KPIs) to measure model comprehensiveness; investigating cross-cultural and policy adaptability to assess the model's global scalability in media organizations with an understanding of local differences in human resource resilience and privacy governance; and conducting studies on content evolution and experience through the synergy of multisensory-biological content and cognitive interactions in post-metaverse paradigms.

Despite addressing theoretical gaps, the medaverse model faced limitations due to the metaverse being in the early stages of industrial maturity, the inability to access a global sample in model construction, the lack of an established theoretical framework for utilizing its results, the impracticality of testing the model in real-world conditions, and an initial focus on organizational transformation processes of new business models and ethical-legal dimensions.

References

Abd Elkareem, N., Selim, M., & Shalaby, A. (2024). Software-Defined Metaverse (SDM) architecture. *Journal of Metaverse, 4*(2), 146-156. http://doi.org/10.57019/jmv.1541821

Alshurideh, M. T., Akour, I. A., Al Kurdi, B., Hamadneh, S., & Alzoubi, H. M. (2023). Impact of metaverse and marketing innovation on digital transformation. In *2023 International Conference on Business Analytics for Technology and Security* (pp. 1-5). IEEE. https://doi.org/10.1109/ICBATS57792.2023.10111241

DataIntelo. (2023). *Metaverse in entertainment market report: Gl*. https://dataintelo.com/report/metaverse-in-entertainment-market

Dewan, M., & Gagare, A. (2024). From storytelling to story living: Exploring the metaverse and its implications for the new age communicator. *Journal of Visual and Performing Arts, 5*(6), 65–80. https://doi.org/10.29121/shodhkosh.v5.i6.2024.1117

Druzhinin, A. M. (2021). Digital transformation of the russian media business under uncertainty. *Digital Sociology, 4*(4), 50-59. https://doi.org/10.26425/2658-347X-2021-4-4-50-59

Duffey, C. (2023). *Decoding the metaverse: Expand your business using Web3*. Kogan Page Publishers. https://koganpage.com/digital-technology/decoding-the-metaverse-9781398609044

Gumede, N. P., & Tladi, B. (2023). Socio-technical systems: using actor-network theory to make the social more tangible in a technical space. *South African Journal of Industrial Engineering, 34*(3), 140-155. https://doi.org/10.7166/34-3-2957

Gupta, R., & Pal, S. K. (2023). Metaverse platforms and use-cases. In *Introduction to metaverse: Technology landscape, applications, and challenges* (pp. 67-90). Springer Nature Singapore. https://doi.org/10.1007/978-981-99-7397-2_4

Hashem, F. S. E. A., Hassan, A., Hamed, E. M., & Seyadi, A. Y. (2024). Exploring the potential of metaverse in mass communication: A comprehensive review. *Business Development Via Ai and Digitalization*, *1*, 373-382. https://doi.org/10.1007/978-3-031-62102-4_32

Hwang, I., Shim, H., & Lee, W. (2022). Do an organization's digital transformation and employees' digital competence catalyze the use of telepresence? *Sustainability, 14*(14), 8604. https://doi.org/10.3390/su14148604

Jamil, S. (2022). Digital transformation in journalism: implications of media convergence for journalists' work in pakistan's mainstream news media. In N. Alm, P. Murschetz, & F. weder, & M. Friedrichsen (Eds.). *Die digitale Transformation der Medien* (pp. 443-458). Springer Fachmedien Wiesbaden. https://doi.org/10.1007/978-3-658-36276-8_21

Jiang, R. (2024). The metaverse strategy of the walt disney company. *Journal of Education, Humanities and Social Sciences, 43*, 66–72. https://doi.org/10.54097/y7ntp297

Kontogianni, E., & Anthopoulos, L. (2024). *Towards a standardized metaverse definition: Empirical evidence from the ITU metaverse focus group*. IEEE Engineering Management Review. https://doi.org/10.1109/EMR.2024.3416331

Kour, M., & Rani, K. (2023). Challenges and opportunities to the media and entertainment industry in metaverse. In M. Gupta, K. Shalender, & B. Singla (Eds.). *Applications of neuromarketing in the metaverse* (pp. 88-102). IGI Global. https://doi.org/10.4018/978-1-6684-8150-9.ch007

Li, C., Ali, M. N. S., Rizal, A. R. B. A., & Xu, J. (2025). A bibliometric analysis of media convergence in the twenty-first century: Current status, hotspots, and trends. *Studies in Media and Communication, 13*(1), 313-331. https://doi.org/10.11114/smc.v13i1.7236

Li, H., & Li, B. (2024). The state of metaverse research: A bibliometric visual analysis based on CiteSpace. *Journal of Big Data, 11*(1), 14. https://doi.org/10.1186/s40537-024-00877-x

Lin, J. (2022, May). On the innovative design of digital media under the background of the metaverse. In *International Conference on Comprehensive Art and Cultural Communication* (pp.158-163). Atlantis Press. https://doi.org/10.2991/assehr.k.220502.034

McStay, A. (2023). The metaverse: Surveillant physics, virtual realist governance, and the missing commons. *Philosophy & Technology*, *36*(1),13. https://doi.org/10.1007/s13347-023-00613-y

Mishra, A., Shukla, A., Rana, N. P., & Dwivedi, Y.K. (2021). From "touch" to a "multisensory" experience: The impact of technology interface and product type on consumer responses. *Psychology & marketing, 38*(3), 385-396. https://doi.org/10.1002/mar.21436

Novikov, R. Y., & Zohrabyan, E. P. (2023). Digital transformation of media: Challenges and opportunities. *Journal of Digital Economy Research, 1*(4), 102–125. https://doi.org/10.24833/14511791-2023-4-102-125

Nunkoo, R., Shukla, A., & Mishra, A. (2024). The role of temporal distance, conspicuous consumption, and multisensory interfaces on consumer judgments in metaverse. *Journal of Retailing and Consumer Services, 81*, 104037. https://doi.org/10.1016/j.jretconser.2024.104037

Rachmadtullah, R., Setiawan, B., Wasesa, A. J. A., & Wicaksono, J. W. (2023). Elementary school teachers' perceptions of the potential of metaverse technology as a transformation of interactive learning media in

Indonesia. *International Journal of Innovative Research and Scientific Studies, 6*(1), 128-136. https://doi.org/10.53894/ijirss.v6i1.1119

Research and Markets. (2025). *Metaverse – Global strategic business report.* https://www.researchandmarkets.com/reports/5548465/metaverse-global-strategic-business-report

Ritonga, M., Farid, A. S., & Manda, V. K. (2024). Media convergence and the development of interactive broadcasting with metaverse technology. *Feedback International Journal of Communication, 1*(4), 238-249. https://doi.org/10.62569/fijc.v1i4.103

S&P Global. (2024, October). *Industrial metaverse research study*. https://assets.new.siemens.com/siemens/assets/api/uuid:f6a7c220-bc7e-4bb7-a348-aa2d07c21d77/S-P-Siemens-Industrial-Metaverse-Research-Study-Technology-2024.pdf

Stein, H. (2024). Embracing the next genesis trend: An investment perspective on the metaverse. In *Global Perspectives in the Metaverse: Law, Economics, and Finance* (pp.145-164). Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-54802-4_8

Tajeddini, K., Martin, E., & Altinay, L. (2020). The importance of human-related factors on service innovation and performance. *International Journal of Hospitality Management, 85*, 102431. https://doi.org/10.1016/j.ijhm.2019.102431

Waiswa, E. (2024). Exploring the challenges and opportunities of digital transformation in media organizations: A case of nation media group Uganda. (Unpublished master's dissertation). Aga Khan University, East Africa. https://ecommons.aku.edu/theses_dissertations/2293

Wang, L., Li, Y., & Yarovaya, L. (2024). Interdependence and portfolio scheme of emerging industry of metaverse. *SSRN 4707682*. https://dx.doi.org/10.2139/ssrn.4707682

Xi, N., Chen, J., Gama, F., Riar, M., & Hamari, J. (2023). The challenges of entering the metaverse: An experiment on the effect of extended reality on workload. *Information Systems Frontiers, 25*, 659–680. https://doi.org/10.1007/s10796-022-10244-x

Yau, K. L. A., Saad, N. M., & Chong, Y. W. (2021). Artificial intelligence marketing (AIM) for enhancing customer relationships. *Applied Sciences, 11*(18), 8562. https://doi.org/10.3390/app11188562