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## VIRTUAL REALITY IN FILM AND TELEVISION PRODUCTION: A BIBLIOMETRIC - INFORMED LITERATURE REVIEW OF WEB OF SCIENCE PUBLICATIONS

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### Abstract:

Although virtual reality (VR) has increasingly influenced audiovisual production practice, the intellectual structure, research trends, and thematic development of VR applications in film and television production remain insufficiently mapped. This study aimed to analyse the characteristics of VR research related to film and television production indexed in the Web of Science Core Collection, applying bibliometric performance analysis, citation analysis, keyword analysis, and thematic mapping. A title-field search combining a VR term block and a film and television term block retrieved 243 documents on 29 June 2026. The records were restricted to English-language articles and early-access articles and screened for topical relevance, resulting in 60 articles for analysis. The analysis examined publication trends, source journals, Web of Science categories, citation patterns, contributing regions, author-keyword structures, and the thematic evolution of the field. The results showed that the corpus was recent, with most articles published from 2017 onward and an output peak in 2025. The Journal of Screenwriting and Frontiers in Virtual Reality were the most frequent sources, and the Web of Science categories were dominated by computer science alongside film, radio and television. Mainland China contributed the largest share of corresponding-author articles, indicating the growing role of Asian research communities in shaping VR production studies. The most-cited article examined movie editing and cognitive event segmentation in VR video, suggesting that early

scholarly impact has favoured the craft and perceptual questions of the medium. Seven themes were identified, namely production pipelines and virtual production; cinematography and directing; editing and sound in post-production; narrative, storytelling and screenwriting; viewer experience, presence and guidance; social and live-television applications; and education and training for production. The study provides a production-oriented map of this emerging field and a research agenda for future investigations, particularly multi-database syntheses and primary empirical studies of production and post-production learning outcomes.

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Bibliometric Review, Cinematic Virtual Reality, Film Production, Immersive Media, Television Production, Virtual Reality



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## Introduction

Virtual reality (VR) has gradually moved from a peripheral curiosity toward a practical instrument in several parts of the film and television value chain. Head-mounted displays, 360-degree capture, real-time game engines, and cinematic virtual reality (CVR) now intersect with how moving-image content is conceived, shot, edited, and delivered. The interest is practical as well as scholarly. Production houses experiment with virtual production stages and volumetric capture, broadcasters test immersive and social viewing formats, and educators ask whether VR can shorten the path from novice to competent practitioner. Yet the resulting literature is dispersed. It is written partly by computer scientists who report tools and pipelines, and partly by media and communication scholars who study narrative, presence, and audience response. These communities cite different journals and use different vocabularies, which makes it difficult to see the field as a whole.

A literature review is an appropriate response to this fragmentation, because it can consolidate what is known, expose where the evidence is thin, and organise scattered contributions into a usable structure (Snyder, 2019). Review work is not monolithic, and the choice of review type shapes what a study can claim (Grant & Booth, 2009). The present review is narrative in its synthesis but bibliometric in its preparation, characterising a defined publication set with descriptive indicators before reading the records thematically. This combination follows established guidance on bibliometric analysis as a way to map a field transparently and reproducibly (Donthu et al., 2021; Zupic & Čater, 2015), while retaining the interpretive reading that a young and uneven field still needs.

To the best of our knowledge, no review has mapped the Web of Science literature on VR specifically within film and television production, as opposed to the broader and better-covered topic of VR for entertainment consumption. The few existing reviews inside the present corpus concentrate on the viewer experience of CVR or on a single post-production craft rather than on the production process as a whole, a point developed in the next section. This study aimed to analyse the characteristics of VR research related to film and television production indexed in the Web of Science Core Collection, and to organise that research thematically. Three questions guided the work. First, what are the bibliographic characteristics of the field in terms of output over time, source journals, subject categories, citation performance, and contributing regions? Second, what themes structure the production-oriented literature? Third, where are the gaps, and what should future work address? The remainder of the article presents the conceptual background, the review approach, the bibliographic profile and thematic discussion, and the conclusion.

## Literature Review

This section clarifies the constructs that bound the review and situates the study against prior synthesis.

### *Virtual Reality and Cinematic Virtual Reality in a Production Context*

VR in film and television production is not a single technology but a family of practices. At one end sits CVR, in which live-action 360-degree footage is captured and presented in a head-mounted display so that the viewer sits inside the scene rather than in front of it (Rothe et al., 2019). At the other end sits virtual production, in which game engines, real-time rendering, and volumetric capture are used to build or augment scenes during, rather than after, the shoot (Heagerty et al., 2024; Liang & Han, 2026). Between these poles lie hybrid uses such as previsualization, virtual location scouting, animation creation, and tool-assisted editing. The constructs matter because they carry different production consequences. CVR tends to remove the fixed frame and to unsettle conventional cutting, which appears to challenge long-standing conventions of cinematography and editing (Ross & Munt, 2018; Zhang & Weber, 2023), whereas virtual production largely preserves those conventions while changing where and when they are exercised.

### *Prior Reviews and the Position of This Study*

Synthesis in this area has so far been partial. Yu and Lo (2023) reviewed the viewer experience of CVR, and Zhang et al. (2025) extended that line with a systematic review and meta-analysis of viewing modalities, both concentrating on reception rather than creation. Chaurasia and Majhi (2024) mapped sound design for CVR bibliometrically, a single craft within post-production. Useful as these are, they leave the production process unmapped, and they do not connect the computer-science and media-studies strands that this review treats together. The present study therefore positions itself as a production-oriented map of the field rather than a reception study, and it treats the existing reviews as both evidence and a point of comparison.

## Review Approach

### *Data Source and Search Strategy*

Data were drawn from the Web of Science Core Collection (Clarivate Analytics), which indexes peer-reviewed journals and conference proceedings with consistent bibliographic fields and annual citation counts. The search was conducted in the document-title field and combined two concept blocks with the Boolean operator AND. The first block captured the technology (VR OR "Virtual Reality"); the second captured the domain ("Film", "Film Industry", "Filmmaking", "Film Production", "Television", "TV", "Television Production", "TV Production", "movie", "movie industry", "Cinematic", and the paired forms of film and television). The query was executed on 29 June 2026 and returned 243 documents. It is worth noting that the two concept blocks must be enclosed in parentheses so that the AND operator joins the blocks rather than only the terms adjacent to it; the executed search behaved as a grouped query, and the parentheses were added to the recorded search string so that the strategy can be reproduced exactly.

### *Screening and Eligibility*

Screening followed a transparent, staged logic aligned with PRISMA reporting principles (Page et al., 2021). In the first stage, the 243 records were refined within the database to English-language documents of the types Article and Early Access, which removed conference proceedings, editorial material, meeting abstracts, book reviews, corrections, one retraction, and items flagged as non-English, leaving 106 records. In the second stage, the recorded language of each document was verified against its full text, because the database derives the language field partly from the title and abstract. One record, published in a Spanish-language communication journal, carried an English title and abstract but a Spanish full text, and it was excluded under the English-language criterion, leaving 105 English-language records. In the third stage, the 105 records were screened for topical relevance to film and television production. Forty records were excluded. These comprised homonym matches (10 records), in which "film" denoted a physical thin film in materials and optics studies, an ophthalmic tear film, or, in one case, a confined fluid in petroleum physics; off-scope clinical, psychological, and behavioural-intervention studies (20 records), comprising clinically oriented cinematic-VR work whose outcome was patient education or therapy rather than production, psychology studies that used film or VR only as an experimental stimulus such as the trauma-film paradigm and virtual-nature mood studies, and studies that used CVR purely as a behavioural intervention on outcomes unrelated to film and television such as road-safety, prejudice-reduction, and cultural-identity experiments; and weakly related cultural-studies and advertising analyses (10 records), including one duplicate record indexed under a case variant. This left 65 topically relevant records. In the fourth stage, four records that carried neither an abstract nor author keywords in the database were excluded, because the relevance screening and thematic coding drew on the title, abstract, and keywords together and these items could be assessed only from their titles; they comprised two short features in film magazines, one book chapter, and one humanities article published without a structured abstract. In a fifth step, one early-access article was excluded because its publisher retracted it after the census date, citing compromised editorial handling and peer review in a guest-edited issue. After screening, 60 articles formed the analytic corpus.

## Indicators and Analysis

Full records, including the annual citation counts for each document, were verified and downloaded into Microsoft Excel; additional coding was performed manually. Three indicators were used. Total publications (TP) is the number of articles. Total citations (TC) is the number of citations received from the publication year to the census date of 29 June 2026. Citations per publication (CPP) is TC divided by TP. The indicators are descriptive and are reported with their base counts, because a corpus of this size does not support strong inferential claims. Each record was assigned to one primary theme through manual reading of the title, abstract, and author keywords, with a small number of records that spanned two themes coded to their dominant emphasis. Only articles were retained for synthesis, because they report complete research ideas and results.

## Findings and Thematic Discussion

### Bibliographic Profile of the Corpus

The 60 articles span 2003 to 2026, but the field is recent, with 58 articles (97% of 60) published from 2017 onward and output peaking at 12 articles in 2025 (Table 1). Citations are concentrated in the earlier years of this active period, as expected, because recent papers have had less time to accumulate impact. Total citations to the census date were 686, giving a corpus CPP of 11.43; 13 articles (22% of 60) were not yet cited, most of them published in 2024 or later.

**Table 1: Annual Distribution of Publications and Citation Performance**

| Publication Year | TP        | Share (%)    | TC         | CPP          |
|------------------|-----------|--------------|------------|--------------|
| 2003–2016        | 2         | 3.3          | 5          | 2.50         |
| 2017             | 1         | 1.7          | 88         | 88.00        |
| 2018             | 3         | 5.0          | 99         | 33.00        |
| 2019             | 3         | 5.0          | 171        | 57.00        |
| 2020             | 5         | 8.3          | 30         | 6.00         |
| 2021             | 10        | 16.7         | 116        | 11.60        |
| 2022             | 9         | 15.0         | 77         | 8.56         |
| 2023             | 8         | 13.3         | 54         | 6.75         |
| 2024             | 3         | 5.0          | 15         | 5.00         |
| 2025             | 12        | 20.0         | 31         | 2.58         |
| 2026             | 4         | 6.7          | 0          | 0.00         |
| <b>Total</b>     | <b>60</b> | <b>100.0</b> | <b>686</b> | <b>11.43</b> |

Source: Authors' analysis of Web of Science records (n = 60)

The articles appeared in a wide spread of outlets, which may reflect the field's split between computer science and media studies. Eleven journals carried two or more articles (Table 2). The Journal of Screenwriting and Frontiers in Virtual Reality led with three articles each, followed by nine computing, broadcasting, and screen-studies venues with two each. No single journal dominated, and 36 journals contributed a single article, which suggests a dispersed rather than consolidated field.

**Table 2: Source Journals with Two or More Articles**

| Source Journal                                                                | TP |
|-------------------------------------------------------------------------------|----|
| Journal of Screenwriting                                                      | 3  |
| Frontiers in Virtual Reality                                                  | 3  |
| International Journal of Human-Computer Interaction                           | 2  |
| Scientific Programming                                                        | 2  |
| Creative Industries Journal                                                   | 2  |
| Presence-Virtual and Augmented Reality                                        | 2  |
| International Journal of Advanced Computer Science and Applications           | 2  |
| Mobile Information Systems                                                    | 2  |
| IEEE Transactions on Visualization and Computer Graphics                      | 2  |
| Convergence-The International Journal of Research into New Media Technologies | 2  |
| IEEE Transactions on Broadcasting                                             | 2  |

Source: Authors' analysis of Web of Science records (n = 60)

By Web of Science category, the corpus was led by computer science, with software engineering (12 records) and information systems (7 records) most frequent, followed by cybernetics, electrical and electronic engineering, and film, radio and television (6 records each), interdisciplinary applications and telecommunications (5 records each), and communication (4 records). The available evidence indicates that production-oriented VR research is written about as much in computing venues as in media venues, which may be one reason the literature has not yet been synthesised across these two communities. Author keywords reinforced this reading. After the umbrella terms virtual reality and cinematic virtual reality, the most frequent keywords were immersion, cinematography, presence, 360-degree video, digital storytelling, sound design, and social viewing, which preview the themes below.

Citation performance was concentrated in a small number of articles (Table 3). The most-cited article, by Serrano et al. (2017), examined movie editing and cognitive event segmentation in VR video and had accumulated 88 citations. It was followed by J. Y. Hong et al. (2019) on acoustic environment reproduction for CVR (86 citations) and Rothe et al. (2019) on a taxonomy of guidance in CVR (82 citations). It is worth noting that the three most-cited articles address editing, sound, and viewer guidance rather than production pipelines, which suggests that early scholarly impact has favoured the craft and perceptual questions of the new medium over its industrial tooling.

**Table 3: The Ten Most-cited Articles in the Corpus**

| Rank | Article                  | Source                                  | TC |
|------|--------------------------|-----------------------------------------|----|
| 1    | Serrano et al. (2017)    | ACM Transactions on Graphics            | 88 |
| 2    | J. Y. Hong et al. (2019) | Building and Environment                | 86 |
| 3    | Rothe et al. (2019)      | Multimodal Technologies and Interaction | 82 |
| 4    | Ding et al. (2018)       | Telematics and Informatics              | 62 |

|    |                               |                                                                               |    |
|----|-------------------------------|-------------------------------------------------------------------------------|----|
| 5  | Fernández Langa et al. (2022) | IEEE Transactions on Broadcasting                                             | 30 |
| 6  | Szita et al. (2018)           | Presence-Virtual and Augmented Reality                                        | 25 |
| 7  | Green et al. (2021)           | Convergence-The International Journal of Research into New Media Technologies | 24 |
| 8  | Rothe et al. (2021)           | Virtual Reality                                                               | 21 |
| 9  | X. Liu and Pan (2022)         | Scientific Programming                                                        | 20 |
| 10 | Z. Liu et al. (2023)          | International Journal of Human-Computer Interaction                           | 19 |

Source: Authors' analysis of Web of Science records; TC to 29 June 2026

Based on the country of the corresponding author, mainland China contributed the largest share of the corpus (18 articles), followed at a distance by Spain (5 articles), and by South Korea and New Zealand (4 articles each). This distribution should be read cautiously, because reprint-address coding can misattribute multi-affiliation work, but it is consistent with the broad geography of VR research and with the recent expansion of Chinese film and television technology studies.

Reading across the corpus, the production-oriented literature was organised into seven themes (Table 4). These themes are presented in the order of the production workflow rather than by size, so that the discussion follows the path from pre-production through delivery to training.

**Table 4: Thematic Structure of the Corpus**

| Theme                                       | Articles (n) |
|---------------------------------------------|--------------|
| Production pipelines and virtual production | 18           |
| Cinematography and directing                | 6            |
| Editing and sound in post-production        | 7            |
| Narrative, storytelling and screenwriting   | 10           |
| Viewer experience, presence and guidance    | 11           |
| Social and live-television applications     | 4            |
| Education and training for production       | 4            |
| <b>Total</b>                                | <b>60</b>    |

Source: Authors' thematic coding of Web of Science records (n = 60)

### ***Production Pipelines and Virtual Production***

The largest theme, 18 articles, concerns the tools and pipelines through which VR enters production. An early contribution argued that VR storytelling should borrow established production processes from the movie industry rather than reinvent them (Wages et al., 2004), and much of the later work can be read as testing that proposition. A recurring strand integrates VR with adjacent technologies, including the Internet of Things to reorganise film and television production modes (Q. Song & Wook, 2020; Xie, 2020), wireless perception and simulation (Lei & Kim, 2021), and deep learning to support production decisions and effects (Cui et al., 2022; Y. Tong et al., 2021). A second strand addresses animation creation

specifically, where VR, and in several cases artificial intelligence, is positioned as a production accelerator (Bao, 2022; Z. Hong et al., 2025; X. Liu & Pan, 2022; Yuan & He, 2023). A third strand reports concrete production apparatus, including systems for producing television programmes (Lin, 2022), interactive spatial scheduling for VR movies (R. Tang, 2022), digital interactive display design (He & Wu, 2022), cloud-based exhibition (Zhuang, 2021), and volumetric capture for cinematic-quality VR (Heagerty et al., 2024). Machine-learning methods have also been used to analyse viewers' emotional feedback and to generate and adapt VR film and television content in real time (Y. Tang, 2025), and more recent contributions frame the integration of VR and artificial intelligence as the next phase of production practice (Liang & Han, 2026). It is worth noting that a distinct role has begun to be theorised within this theme, the embodiment director, a proposed crew role responsible for the haptic and sensory technologies that embody the viewer within the virtual scene and for synchronising physical and virtual elements during production (Carpio & Birt, 2022), which may indicate that production roles, and tool are being reconsidered.

### ***Cinematography and Directing***

A smaller theme, six articles, examines how cinematographic craft adapts when the frame is removed. Ross and Munt (2018) proposed the spatialized screenplay as a way to plan action in 360 degrees, and Zhang and Weber (2023) studied how cinematography and editing concepts are modified and applied in CVR film practice. Guidance for content creators has been developed by analysing how movie cuts influence viewer behaviour, to inform cinematographic and editing choices in CVR (Marañes et al., 2023), and case-study analysis has been used to derive heuristics that guide new filmmaking techniques in embodied VR films (Carpio et al., 2025). Two further contributions connect cinematographic training to production outcomes (Harkema & Rosendaal, 2020; Liao, 2025), which point toward the education theme discussed below. Taken together, the theme suggests that the grammar of shot and coverage is being rewritten rather than discarded, but that the rewriting is still at the stage of heuristics rather than codified convention.

### ***Editing and Sound in Post-production***

Seven articles address the post-production crafts of editing and sound, and this theme contains two of the three most-cited articles in the corpus. Serrano et al. (2017) found that editing choices appear to interact with how viewers segment events in VR video, and Tian, Wang, et al. (2021) and Tian, Zhang, et al. (2021) used high-density electroencephalography to study VR film editing and the cognitive load of different cutting rates. On the audio side, J. Y. Hong et al. (2019), a soundscape-research study, assessed the fidelity of spatial-audio reproduction methods used to recreate real acoustic environments in CVR, with implications for how immersive sound is captured and reproduced; a connected line of work examines spatial sound design for the medium, including a bibliometric account and practitioner-facing studies (Chaurasia & Majhi, 2024, 2026; Manolas et al., 2025). The concentration of early citations here may indicate that post-production has been a relatively productive entry point for empirical research on the new medium.

### ***Narrative, Storytelling and Screenwriting***

Ten articles treat narrative construction for the immersive medium. Screenwriting frameworks specific to CVR have been proposed and elaborated (Alves et al., 2023; Amlashi & Adiloglu,

2025), and the relationship between spectator and character has been reframed as the user is integrated into the narrative (Ruiz-Poveda Vera & Gutiérrez, 2023). Other contributions address interactive and hybrid narrative forms (Reyes & Dettori, 2019), the design of transitions into immersion (Jaller & Serafin, 2020), and adaptive playback that lets creators accommodate viewer interaction without losing narrative control (L. Tong et al., 2022). Applied storytelling has been studied for indigenous and heritage contexts (Galeazzi et al., 2025; L. Tong et al., 2024) and for sensitive subjects delivered as poetic documentary (N. Song, 2026). A qualitative account of how such stories hold attention completes the theme (Conway et al., 2026). The theme suggests that narrative theory for CVR is developing in parallel with, and at times ahead of, the production tools that would realise it.

### ***Viewer Experience, Presence and Guidance***

Eleven articles study how immersive content is experienced, and they inform production because production choices are ultimately judged by their perceptual effects. A foundational contribution is the taxonomy of guidance that helps direct viewer attention when there is no frame to compose (Rothe et al., 2019), complemented by analyses of the viewer's role and interaction (L. Tong et al., 2021) and of subtitling in CVR (Agulló & Matamala, 2021). Comparative studies weigh the emotional and recollective effects of CVR against conventional formats (Ding et al., 2018; Gilpin et al., 2021; Szita et al., 2018), and audience research asks what immersive news and documentary offer beyond television (Green et al., 2021). Validation and measurement work has adapted presence instruments for new audiences (Yan et al., 2020). Two reviews within this theme consolidate the reception evidence (Yu & Lo, 2023; Zhang et al., 2025). An early conceptual contribution contrasts the necessity of closure in film with the inherent openness, or "wideness," of VR narrative (Zagalo et al., 2003). The breadth of this theme, and its share of early citations, suggest that reception has been the field's centre of gravity.

### ***Social and Live-television Applications***

Four articles move from solitary viewing toward shared and broadcast contexts, which is where television, as distinct from film, is most directly engaged. Social viewing has been theorised as a design space for shared movie applications (Rothe et al., 2021), and live and broadcast scenarios have been prototyped, including hyper-realistic and interactive social VR for live television (Fernández Langa et al., 2022) and social VR with holographic communications for television and video services (Montagud Climent et al., 2025). Audience acceptance of VR in social television has also been examined in a regional context (Habes et al., 2023). The theme is small but potentially important, because it appears to be the clearest point at which immersive technology meets the economics and habits of television rather than cinema.

### ***Education and Training for Production***

Four articles use VR for training and learning connected to film and television, the theme closest to the question of learning outcomes. A comparative study found differences between immersive and non-immersive VR for teaching filmmaking (Z. Liu et al., 2023), and related work examined how virtual environments and learning modes shape the acquisition of film lighting (Wei et al., 2025). VR-based learning has also been used to support the English proficiency of workers in the Thai film industry (Piayura et al., 2025), and a training tool built around 360-degree film has been developed for difficult, discussion-based subject matter

(Böing et al., 2025). It is worth noting that this theme combines the teaching of production skills with the use of immersive film as a training medium, and that its outcome measures vary widely.

### ***Research Gaps and Future Directions***

Three gaps follow from the profile and the themes. First, the evidence base is small and dispersed, comprising 60 articles across 47 journals, with a long tail of single-contribution outlets and a recent, lightly cited frontier. This argues for cautious interpretation and for synthesis that draws on more than one database. Second, the production workflow is unevenly covered. Reception, narrative, and post-production craft are comparatively well represented, whereas integrated production pipelines are reported mostly as individual systems rather than compared, and the television-specific and live-broadcast applications form only a small theme. Third, and most relevant to practitioner concerns, direct studies of post-production learning outcomes are scarce, and the heterogeneous outcome measures used in the education theme mean that the field cannot yet say with confidence whether, or how much, VR improves the acquisition of specific post-production competencies. Future work could address these gaps by triangulating Web of Science with Scopus and the major computing libraries to recover the conference literature excluded here, by broadening the search beyond the title field to improve recall, and by conducting primary studies that connect defined production or post-production tasks to validated learning-outcome measures. Such studies would also benefit from clearer reporting of which point in the workflow, and which craft, is under examination.

### **Conclusion**

This review set out to characterise and organise the Web of Science literature on virtual reality in film and television production. From an initial 243 title-field records retrieved on 29 June 2026, screening for document type, language, topical relevance, and the availability of analysable metadata produced an analytic corpus of 60 articles. The corpus is recent, with 97% of articles published from 2017 onward and an output peak of 12 articles in 2025; it is dispersed across computing and media venues, with the Journal of Screenwriting and Frontiers in Virtual Reality as the most frequent outlets; and it is dominated by the computer science categories alongside film, radio and television. Mainland China contributed the largest share of corresponding-author articles, and the most-cited article, by Serrano et al. (2017), examined movie editing and cognitive event segmentation in VR video. Seven themes structure the field, spanning production pipelines and virtual production; cinematography and directing; editing and sound in post-production; narrative, storytelling and screenwriting; viewer experience, presence and guidance; social and live-television applications; and education and training for production.

The results provide some initial evidence that VR in film and television production is an emerging but uneven field, in which reception and craft questions are better developed than integrated production tooling, television-specific applications, and the measurement of learning outcomes. Several limitations qualify these conclusions. The same authors and institutions may appear under different names or spellings in the index, which can affect contributor counts; the analysis rests on a single database and on a title-field search, so relevant work indexed only in abstracts or keywords, or held in other databases and in the excluded conference literature, will have been missed; bibliometric indicators count citations without weighting their quality or intent; and recent articles are disadvantaged because impact accrues

slowly. Within these limits, the review offers a production-oriented map that practitioners and researchers can use to locate their work, and it points to multi-database synthesis and primary outcome studies as useful next steps.

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