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Chapter: Digital Transformation, Artificial Intelligence, and Organizational Adaptation

Analysis of scientific research on the opposing models of paywalls and clickbait in online media and their relationship with artificial intelligence

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Annotation. This study examines scientific research on paywalls and clickbait as contrasting revenue models in online media and explores how artificial intelligence (AI) is disrupting these models and journalism more broadly. It evaluates the scope of academic interest in these topics and identifies gaps in current scholarship. Using bibliometric analysis of Web of Science (WoS) Core Collection data and science-mapping techniques in VOSviewer, the study analyses publication trends, influential authors, and thematic clusters from the early 2010s to 2024. Findings show that although clickbait receives more scholarly attention, paywall research achieves greater impact, reflecting its focus on revenue strategies, consumer behaviour, and willingness to pay. The prominence of clickbait studies relates to concerns about engagement, credibility, and misinformation. Another key finding is that, while AI is transforming journalistic production, personalisation, and automation, its integration into media business models remains limited. The study underscores the need for interdisciplinary approaches to support sustainable digital media ecosystems.

Keywords: media business models, paywall, clickbait, AI, bibliometric analysis.

JEL classification: L82; O33.

Introduction

Online media permanently seek business models to guarantee their economic viability. The traditional media models of the 20th century collapsed under the pressures of audience fragmentation and the proliferation of online content (Macnamara, 2010). Finding new business models is thus essential to

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protect journalism, democracy, and the broader content production industry. This shift in media models resulted in a decline of standard advertising revenues, which led digital publishers to explore diverse revenue streams to sustain their business models. Example include sponsored content, user donations and payments, grants, e-commerce, events, and consulting (Vara-Miguel *et al.*, 2021).

During the mid-1990s, some online media companies revolutionised their approach to revenue generation, transitioning from a free-to-access model to one where users were required to pay. The 2008 economic crisis accelerated this shift, prompting companies to re-evaluate their strategies and consider charging for previously free content. Arrese (2016) described this new paywall-based revenue strategy as a true retro-innovation, reintroducing payment models for content, as it was before the digital era.

To understand the impact of the implementation of paywalls as a media revenue model, the opposite revenue model is highly relevant. This model, whose maximum expression is *clickbait*, is essentially based on conventional advertising. García Orosa *et al.* (2017) observed that half of the online news media of the 28 EU member countries at the time used attention-grabbing, provocative, and sensationalist titles that put reader curiosity ahead of high-quality content to incite readers to click.

Along with these changes in revenue models, the rapid evolution of technology has continuously disrupted the online media and has rapidly and profoundly transformed journalism over the past 25 years (Salaverría, Martínez-Costa, 2021). Some authors describe this disruption as a revolution, whereas others call it evolution. Artificial intelligence (AI) plays a crucial role in the present and future viability of online media. Its role lies in both adapting paywalls to consumer habits and fighting against misleading content offered by media that use clickbait-based strategies.

Rußell *et al.* (2020) emphasised the need for research to identify optimal monetisation strategies by highlighting the complexity and lack of standardisation in digital paywall design. They concluded that the industry has explored several monetisation techniques. However, a reliable business model capable of accounting for the potential cannibalisation of conventional formats while balancing direct revenue from content sales with indirect revenue from advertising has yet to emerge. Likewise, O'Brien *et al.* (2022) emphasised the need for innovative approaches to media management to produce viable paid content strategies.

One proposal by Fletcher and Nielsen (2020) is to look at how platforms such as Netflix and Spotify have succeeded in attracting subscribers. Fletcher and Nielsen discovered a positive individual-level correlation between purchasing online news and purchasing several forms of online media such as movies, music, and books. They also found a significant correlation between online news subscriptions and payment for entertainment media.

Given these challenges for the viability of the media and the future of journalism, coupled with the need for greater innovation in this area, this paper rigorously reviews the scientific literature on paywalls in online media, as well as on the opposing model of clickbait. The paper also considers the literature on the role of AI in such models. The present study thus responds to a research gap, given the absence of such comparisons and the lack of studies linking AI to these models. AI is a relevant concept in this study given its permeation within the Spanish media ecosystem, extending throughout both news production and the structure and operations of the media (Túñez-López *et al.*, 2021).

Based on bibliometric analysis using data from the Web of Science (WoS) and VOSviewer software, this paper answers the following research questions: Q1. How has scientific interest in these issues evolved over time? Q2. Which strategy has attracted the most scientific research: paywall or clickbait? Q3. Has AI been included in research on paywall and clickbait strategies? Q4. How is AI contributing to media and journalism development in terms of paywalls and clickbait? Q5. What approaches have been used in the research? Q6. Who are the most notable authors and what are their networks? Q7. How has scientific research contributed to progress in all these areas, and what trends and gaps can guide future research?

In sum, in this article, we discuss how scientific research contributes to ensuring the sustainability of media business models and to solving the problem of fake news. We also analyse how paywalls and clickbait interact with the emerging technology of AI, and we explore the implications for the media ecosystem. Our research should be of interest to several readership groups. Researchers investigating gaps and trends in the literature, media business managers and journalism professionals looking for sustainable income models, and market analysts evaluating potential AI applications in digital media can all find value in this study. The study concludes by offering recommendations to enhance the work of media practitioners.

1. Literature Review

The conceptual framework of this study is built on the transformation of business and revenue models in online media, the implications of this transformation for audience behaviour, and the role of AI in this context. We use this framework to compare two contrasting revenue models: one based on paywalls and one based on clickbait-generated advertising. We also examine how AI influences the implementation and impact of these strategies. The conceptual framework provides the theoretical grounding to address the research questions and guides the bibliometric analysis to identify scholarly contributions and gaps in the literature.

1.1. Business Models and the Media

Casadesus-Masanell and Ricart (2010) argued that a business model reflects a firm's *realised* strategy. In the case of the newspaper industry, Doyle (2013) studied adaptation to the digital age through the adoption of a multiplatform distribution strategy. This adaptation has affected the organisation of production activities, content, and business models. Doyle underscored the importance of effectively integrating IT, commercial, and editorial functions, as well as the need for a willingness to experiment and innovate to leverage the benefits of two-way connectivity.

Digital transformation has had profound effects on consumer expectations, consumer behaviours, and market dynamics (Verhoef *et al.*, 2021). These effects have placed pressure on traditional firms and have disrupted various industries, including online media. Vailati *et al.* (2025) investigated the relationship between behavioural variables and the perceptions of newspaper readers in both print and digital formats. They found that digital readers tend to access a greater number of online articles, primarily because of their free availability. Furthermore, a variety of preferences were observed regarding simultaneous activities during digital reading (Vailati *et al.*, 2025).

In the context of digital literacy, Pagán Castaño *et al.* (2025) evaluated whether a critical thinking training programme fosters students' disposition towards critical thinking and their new media literacy. Although they observed a notable improvement in students' disposition towards critical thinking, they did not observe a parallel increase in new media literacy. These findings highlight the need for targeted training in

new media literacy to adequately prepare young professionals for the current media landscape (Pagán-Castaño *et al.*, 2025).

Salaverría (2022) analysed the evolution of cybermedia over the first 25 years of internet journalism, identifying seven stages: pre-web, experimentation, homogenisation, stagnation, prioritisation of social media, prioritisation of mobile devices, and robotisation. In particular, mobile technology has had a disruptive impact on the information industry, which has been particularly notable in journalism (Aguado and Castellet, 2014).

A crucial question is how media strategically adapt their business models. Monsalve-Alamá *et al.* (2023) revealed that media discourse equates their revenue model with their business model, fails to address added value for readers, and detaches concepts such as quality from the business model. Amit and Zott (2001) explored the theoretical foundations of value creation in e-business, developing a model that identifies four interdependent dimensions of value creation: efficiency, complementarities, lock-in, and novelty.

Innovation is a key factor in this context. Olsen (2021) introduced a value creation model that explores the dynamics of local newspapers' value creation from a business, social responsibility, and audience gratification perspective. Meier *et al.* (2022) highlighted the most relevant journalism innovations in five European countries, citing data journalism, collaborative and investigative networks, audience participation, journalism in social media, and the establishment of paywalls.

Vara-Miguel *et al.* (2021) examined the diverse revenue streams employed by digital news publishers in Spain to sustain their business models amid declining standard advertising revenues. They identified alternatives such as sponsored content, user donations and payments, grants, e-commerce, events, and consulting. Vara-Miguel *et al.* (2023) revealed significant differences in revenue models between native and non-native digital media. Payment strategies are more common among non-native digital media, which also tend to diversify their income sources more than those based on free models. Additionally, paywalls and memberships are more prevalent among specialised non-native digital media and generalist native outlets, with local and regional media more frequently requiring payments than national outlets. Another relevant model is crowdfunding, which is becoming increasingly important in the technological landscape (Martínez *et al.*, 2021).

According to Nixon (2020), the ideas of an attention economy and audience labour are useful to reinterpret the process of monetising news to generate revenues from news consumers or advertisers. Another important conclusion to ensure the sustainability of paywalls is that journalists must deepen their understanding of business strategies and experiment with monetisation approaches such as paywalls and personalised content through analytics (Jenkins and Nielsen, 2020). Finally, Olsen *et al.* (2021) revealed a shift from an advertising-based model to an audience-dominated model, leading to a greater diversity of revenue sources but lower total revenues.

1.2. Paywalls and the Media

Pickard and Williams (2014) described paywalls as a potential saviour for newspapers. They defined them as a barrier between an internet user and a news organisation's online content that can be overcome by paying a fee either on a one-time basis or as part of a subscription (Simon, 2009). This setup represents a shift from an advertising model to one centred on subscriptions.

Carson (2015) distinguished between soft and hard paywalls. Soft paywalls include freemium models. Such models offer some free news but not stories with premium value for which consumers might be willing to pay. Likewise, metered paywalls are where readers have access to a number of articles before being required to pay. Hard paywalls prevent free access to all online news content. Carson concluded that metered paywalls are preferred over hard paywalls and are most effective at managing tensions between reach, revenues, and quality journalism. However, they do not account for traditional advertising revenues.

Online media have also introduced paywall exceptions. These exceptions allow unrestricted access to some content based on democratic and commercial interests (Ananny and Bighash, 2016). This model creates a conflict between pursuing financial goals and upholding journalistic integrity. Therefore, paywall design has a major impact on a newspaper's economic outcomes (Aral and Dhillon, 2021) in terms of lower website visits (Chiou and Tucker, 2013) and higher overall traffic (Olsen *et al.*, 2020).

Authors have claimed that the impact of paywalls and subscriptions remains low (Chyi and Ng, 2020) and that they do not contribute to viable online media business models (Myllylahti, 2014). One of the key concepts most widely studied in academia is the willingness of readers to pay for information from online media (O'Brien *et al.*, 2020). The preferences and interests of small audience segments are frequently associated with willingness to pay (Himma-Kadakas and Kõuts, 2015). For readers, exclusive quality and unique web content are key motivations to pay.

Another key topic of study is content personalisation, which refers to readers' needs and the factors influencing their willingness to pay for online news (Fletcher and Nielsen, 2017). Wessel and Thies (2015) examined how different levels of personalisation affect consumers' intentions to pay for online news. They concluded that purchase intentions increase significantly when users can continuously modify content to suit their preferences. This area is one where AI can help media use technology to optimise adaptive and dynamic paywalls.

In relation to successful experiences in implementing paywalls, Olsen and Solvoll (2018) reported that local newspapers have been relatively successful in balancing these strategies, suggesting that paywalls could contribute positively to financing local journalism. Clavio and Moritz (2021) examined the case of *The Athletic*, a digital sports journalism platform that is available solely through subscription. One important conclusion is that paid content tends to be more specialised and offers higher added value (Vara-Miguel *et al.*, 2014). Regarding cases of failure, Valero-Pastor *et al.* (2024) attributed these failures to immature markets, social contexts, and technological tools. Their analysis underscored the role of trial and error as a key component in the innovation of these new revenue and business models.

Despite these examples, in-depth academic research comparing paywall-based models with models based on conventional advertising through clickbait is scarce. However, such research is important to identify the expectations of different users.

1.3. Clickbait and the Media

Clickbait is the maximum expression of revenue models based on digital advertising. It is a viral journalism tactic that uses attention-grabbing headlines and sensationalist content to lure readers into clicking links (Bazaco *et al.*, 2019). This practice has transformed the media industry (Munger, 2020). It is qualified as a form of misinformation (Zannettou *et al.*, 2019) or a type of misleading news that is primarily intended to attract attention and increase website traffic (Chen *et al.*, 2015), thereby helping spread rumours on the

internet. Clickbait encourages readers to form expectations based on minimal or misleading content, compelling them to click a link in search of useful information (Scott, 2021). Headlines aim to pique readers' interest by appealing to their feelings and curiosities (Bravo Araujo *et al.*, 2021). Clickbait employs strategies including hyperbole, repetition, serialisation, soft news emphasis, and incomplete information.

As explained in the previous section, the main aim of paywalls is to provide premium quality news. In contrast, strategies based on clickbait and conventional advertising revenue focus on maximising web traffic, regardless of content quality. In fact, credibility and quality judgements may be lowered by clickbait headlines (Molyneux and Coddington, 2020). Monsalve-Alamá *et al.* (2024) reported that even the media discourse associates the paywall model with higher quality and customer loyalty, whereas the clickbait model is linked to sensationalism and falsified content. The decision to invest heavily in the loyalty-based business model has also significantly affected the handling of audience data and social media, compelling media outlets to cease the use of clickbait content and instead prioritise quality content (Laferrara *et al.*, 2023).

Clickbait strategies are associated with fake news (Chakraborty *et al.*, 2016), so individuals must critically evaluate news sources (Pangrazio, 2018). Accordingly, there is an abundance of research and models for the automatic detection of clickbait. Considering that clickbait is meant to attract users' attention, it can also act as a conduit for trojans, malware, and phishing scams (Bronakowski *et al.*, 2023). In short, there is a gap in the academic study of clickbait, especially in terms of analysing clickbait as an important part of the opposite revenue model to paywalls.

1.4. AI, Paywalls, and Clickbait

The most important recent disruption in both paywall implementation and clickbait detection is the application of AI. Academic studies have focused on these aspects. Deep learning and natural language processing (NLP) are two examples of AI applications used to customise paywalls based on user patterns and consumption habits (Marín-Sanchiz *et al.*, 2023). Personalisation enhances pricing and timing tactics, leading to higher subscriber retention and conversion rates. AI also improves user experience with editorial offerings and aids in the prediction of cancellations. User engagement data have been used by machine learning (ML) models to estimate subscription propensity and target customers with tailored offers (Gupta *et al.*, 2020). To optimise revenue, paywall height can be adjusted for each user depending on propensity scores and engagement trends. Accordingly, on a digital media website with real-time traffic, paywall displays can be managed using propensity-to-subscribe prediction models (Misiorek *et al.*, 2021).

Meanwhile, some research has focused on using AI to identify clickbait. Shu *et al.* (2018) suggested a unique method called stylised headline generation (SHG) to enhance supervised learning-based clickbait identification. Several authors have proposed convolutional neural network-based techniques (based on a deep learning algorithm used for data analysis and learning) that build on established clickbait identification approaches to comprehend headline semantics (Agrawal, 2016; Anand *et al.*, 2017; Kumar *et al.*, 2018; Zheng *et al.*, 2018).

Other studies have enhanced the identification of fake news using advanced ML techniques (Swathi *et al.*, 2024), developing the fake news prediction system (FNPS) to detect patterns in fraudulent content. Click-through-rate (CTR) prediction models are also widely used and could reduce the impact of clickbait (Wang *et al.*, 2021). Alanazi *et al.* (2025) provided insights into the mechanisms underlying clickbait and the effectiveness of ML models in detecting clickbait and mitigating its impact. Their contributions foster the

development of more effective algorithms and tools to combat clickbait and improve news understanding (Alanazi at al., 2025).

For paywall-based business models to work in online media, quality content is necessary. In this regard, new technologies and AI are also important to help journalists. Fernandes *et al.* (2024) proposed a strategy for segmenting online users and identifying the main drivers of subscription. Developing such a classification is challenging. However, when combined with conversion data, it provides useful information to improve online news publishers' acquisition and retention strategies. According to Fernandes *et al.* (2024), different engagement characteristics can influence the results and lead to varying interpretations of the clusters that can result in different editorial and marketing strategies. Graßl *et al.* (2022) stressed the applications of AI in fields including distribution, research, workflow optimisation, and third-party content verification. Likewise, de-Lima-Santos and Cerón (2021) showed that the most advanced subfields in journalism are ML, computer vision, and planning, scheduling, and optimisation, whereas other disciplines remain underused.

Linden (2017) identified several barriers to greater automation, arguing that journalists' flexibility and ideological comprehension of their profession lessen the effects of new technology. Thus, computational journalism is becoming increasingly important and can have a major impact (Vállez and Codina, 2018). Computational news discovery (CND) is a subfield of computational journalism that uses algorithms to steer editorial attention towards events or material that may be noteworthy before being published (Diakopoulos, 2020).

1.5. Bibliometric Analysis

In science, quantitative assessment has become crucial for assessing the calibre of research (Bornmann and Leydesdorff, 2014). A common method for evaluating the relevance and visibility of research is bibliometric analysis. Bibliometric techniques range from the creation of citation indices as an information retrieval tool to research assessment (Haustein and Larivière, 2014). The quantity of bibliometric research and the number of citations it receives demonstrate its increasing popularity and impact among international organisations, public agencies, and scientists (Lopez-Rubio *et al.*, 2021).

The optimal techniques for normalising citation-based bibliometric indicators were examined by Waltman and van Eck (2013) to guarantee fair comparisons between scientific domains and time periods. They showed that two alternative source normalisation strategies outperform conventional classification-system-based normalisation. However, a source normalisation strategy based on fractional citation counts performs poorly.

In bibliometrics, databases such as the WoS and Scopus tend to underrepresent the social sciences, arts, and humanities, while favouring the natural sciences, engineering, and biomedical research (Mongeon and Paul-Hus, 2016). Furthermore, the outcomes of bibliometric analysis can differ based on the database used.

Van Eck and Waltman (2014) studied several software programmes for bibliometric network visualisation, concentrating mostly on VOSviewer. Researchers, managers, and policymakers can benefit from the conceptual and methodological advances highlighted by bibliometric analysis (Bhatt *et al.*, 2020), which has practical ramifications. This study applies bibliometric analysis to examine the degree of scholarly engagement with paywalls and clickbait, while identifying shortcomings in the existing research that warrant further investigation and contextualise the contribution of this study.

2. Methodology

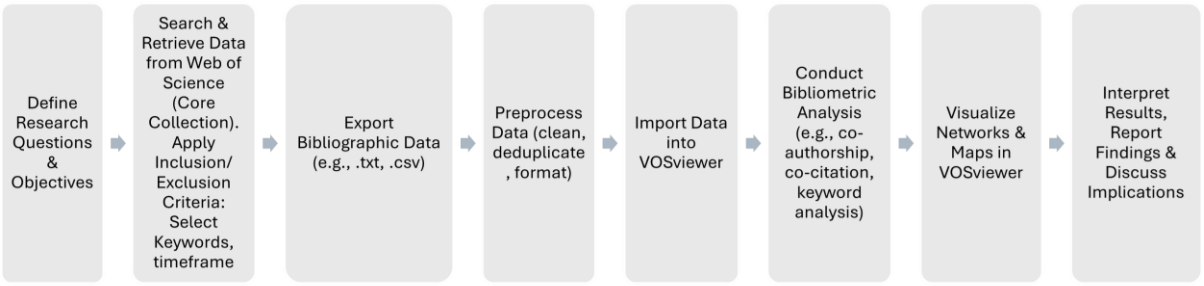
Our analysis examines scholarly output from 1900 to the end of 2024 using the WoS Core Collection, a curated database known for its selection of high-impact journals (Bhatt *et al.*, 2020). Despite the value of other databases, the choice of the WoS in this study is motivated by its data quality, analytical tool compatibility, comparability with existing research, and institutional access considerations. The WoS is recognised for its rigorous journal selection and high-quality indexing, which ensures reliable and reproducible bibliometric analyses (Mongeon, Paul-Hus, 2016). Its robust citation analysis tools and standardised data formats are highly compatible with bibliometric software such as VOSviewer, facilitating accurate network mapping and visualisation (Archambault *et al.*, 2009; van Eck, Waltman, 2016).

Additionally, the WoS's curated journal coverage and historical depth enable robust tracking of media mentions and social impact (Sugimoto *et al.*, 2017; Tahamtan, Bornmann, 2020). Furthermore, the WoS is widely used in high-impact bibliometric research, supporting methodological consistency and comparability with prior studies (Martín-Martín *et al.*, 2018). Practical considerations also played a role in our choice of database. The WoS and Scopus are both widely used comprehensive bibliographic databases and have their respective strengths and limitations. However, as subscription-based resources, they may impose high costs on institutions, so one must often be chosen over the other depending on the available resources (Pranckutė, 2021), as was the case in this study.

Despite the aforementioned biases towards certain sciences (Mongeon, Paul-Hus, 2016), the WoS database was chosen for this study. Our search covered Core Collection of the WoS database, using the following keywords: "paywall", "clickbait", and "artificial intelligence". To obtain results related exclusively to the media, we performed a Boolean search using the term "media" within a specified timeframe. The keyword selection strategy was designed to ensure conceptual clarity, methodological rigour, and adherence to best practices in bibliometric research. We selected terms that precisely captured the core phenomena under investigation, namely media business models, content strategies, and technological transformation. We thereby ensured both conceptual relevance and terminological consistency.

Highly technical terms were excluded (e.g. "machine learning" and "AI-driven"). Although these terms are related to AI, they are predominantly associated with research in computer science and engineering rather than the specific context of media business models and content strategies. Including such terms would have returned irrelevant literature, thereby diluting the focus and interpretability of our analysis. This targeted approach is aligned with recent bibliometric guidelines, which emphasise the importance of a focused keyword set for enhancing the accuracy and interpretability of bibliometric mapping (Aria, Cuccurullo, 2017; Donthu *et al.*, 2021; Zupic, Čater, 2015). In summary, the intentionally narrow keyword selection maximised the validity and interpretability of the analysis by minimising noise from unrelated fields, in line with established recommendations in the literature.

Subsequently, we employed VOSviewer to conduct scientific mapping. This visualisation tool shows the interconnections within the research landscape, including keyword co-occurrence, collaborative networks, and citation relationships, presenting a holistic view of a field's structure (López-Rubio *et al.*, 2021). We designed the methodology to offer a comprehensive overview of global scholarly efforts. To enhance transparency and facilitate understanding of the bibliometric methodology, *Source:* prepared by the authors presents a flowchart summarising the steps taken in the analysis process.



Source: prepared by the authors.

Figure 1. **Flowchart of the Bibliometric Analysis Methodology**

This study is based exclusively on bibliometric data from the WoS, a publicly accessible scientific database. No human participants or personal data were involved. Therefore, ethical approval was not required. The research was conducted in accordance with established ethical guidelines for bibliometric and secondary data analyses.

3. Results

This section reports the main results of the bibliometric analysis, outlining publication trends, leading authors and institutions, core journals, and collaboration patterns. This section also shows citation and co-citation structures, keyword co-occurrence networks, and thematic clusters to reveal intellectual foundations and evolving research streams. Together, these results map the field's growth, influence, and emerging directions. *Source:* prepared by the authors based on WoS presents bibliometric data on the sources resulting from the keyword searches described in the section on methodology. Four key metrics are examined: number of publications, total citations, average citations per publication, and h-index.

Table 1. Keyword searches in the WoS and number of publications (NP), total citations (NC), average citations per publication (Avg. NC), and h-index

Section	Keywords	NP	NC	Avg. NC	h-index
3.1	paywall* AND media	124	1956	15.8	24
3.2	clickbait AND media	182	2384	13.1	24
3.3	artificial intelligence AND paywall*	1	8	8	1
3.4	artificial intelligence AND clickbait AND media	15	109	7.3	5
3.5	artificial intelligence AND media AND journalism	522	6089	11.7	39

Source: prepared by the authors based on WoS data.

The results reveal large differences in scientific output and impact for different search terms. The combination of the keywords "artificial intelligence" AND "media" AND "journalism" returned the most articles (522). The combination ("artificial intelligence" AND "paywall") returned the fewest (only one article). This disparity in article numbers suggests that some topics have received greater academic attention than others.

In terms of total citations, the combination "artificial intelligence" AND "media" AND "journalism" again corresponded to the most citations (6,089). In contrast, "artificial intelligence" AND "paywall" only

corresponded to eight citations. The analysis further reveals that sources including "paywall" (15.8) and "clickbait" (13.1) had more average citations than those including "artificial intelligence" (average citations ranging from 7.3 to 11.7). This finding suggests that, despite the prevalence of articles on the concepts "artificial intelligence" and "journalism", their individual impact is lower than articles on topics such as paywalls.

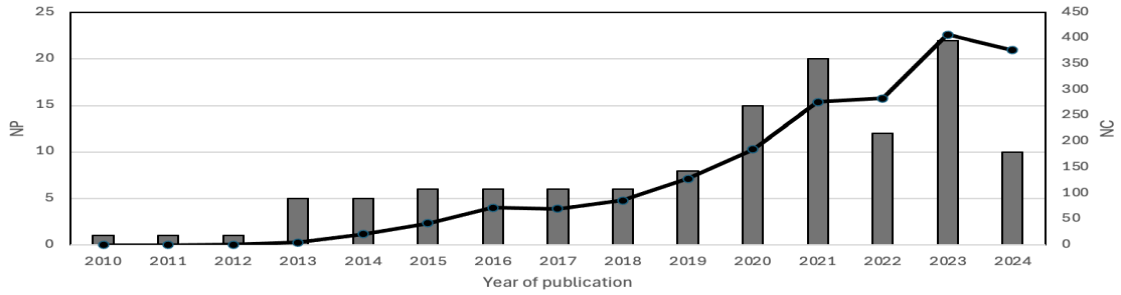
The h-index captures the quantity and relevance of published research. The highest h-index (39) was for "artificial intelligence" AND "media" AND "journalism", indicating that many studies with these keywords had been cited numerous times. Conversely, "artificial intelligence" AND "paywall" had an h-index of only 1, highlighting the limited research output and low visibility of this topic.

Notably, a higher number of publications did not necessarily equate to a higher average impact. For instance, "paywall" AND "media" had fewer publications (124) than "clickbait" AND "media" (182) but a higher average number of citations (15.8 vs. 13.1). This finding suggests that studies focusing on paywalls in the media may be more impactful or more frequently cited than those on clickbait. The analysis also sheds light on the topic of AI and clickbait in the media. This topic had 15 publications but a low average citation rate of 7.3. This finding suggests that, although this area is emerging, it has yet to achieve a major impact in terms of citations.

The following graphs show the results for the number of articles and citations over time; the most-cited studies; the most-cited authors who have included these keywords in their studies on the subject; the most-cited authors for these search terms; and network visualisation of the key studies and mutual citations. The timeframe in each case ranged from when the keywords first appeared until the end of year 2024.

3.1 Paywall AND Media

Figure 2 shows the evolution of the number of published articles and number of citations using the keywords "paywall*" and "media".



Source: Prepared by the authors based on WoS data.

Figure 2. **Number of Publications (NP; Bars) and Number of Citations (NC; Solid Line) for the Keywords "paywall*" and "media" over Time**

Since 2013, there has been a noticeable increase in the number of publications, which suggests that scientists are becoming more interested in the subject of paywalls and the media. Growth was especially noteworthy between 2018 and 2023, indicating that paywalls became more popular in response to the demand for sustainable business and revenue models in the digital media sector. The drop in publications in 2024 might point to a shift in the areas of interest or focus of research on paywalls and media.

Citations have also followed a rising trend, with a peak in 2023. The data imply that earlier research (e.g. from 2018 to 2021) has been extensively cited. In this data set, the number of citations outpaced the number of publications in 2022 and 2024, consistent with the idea that citation-based indicators reflect scholarly attention on a subset of highly influential works (Bornmann, Daniel, 2008; Tahamtan *et al.*, 2016; Waltman, 2016).

With 141 citations, "Innovation and the Future of Journalism" by Pavlik (2013) was the most-cited study. This result illustrates the importance of comprehending the role of innovation in journalism, especially considering digital transformation and revenue-generating strategies such as paywalls. Six of the top 10 most-cited articles appeared in the journal *Digital Journalism*. Hence, this journal appears to be a major source of influential studies on paywalls and the ways in which they affect the media. The fact that authors from a variety of fields, including marketing, management, and economics, have researched this topic illustrates the interdisciplinary nature of paywall research.

The most commonly recurring themes in these papers include digital goods and monetisation strategies, audience behaviour and readiness to pay, and paywall efficacy and revenue. Seven out of the 10 most-cited articles were published in 2013 and 2014. This result implies that the subject attracted a lot of attention in the early 2010s, probably reflecting the field's response to the industry-wide rollout of digital paywalls by news organisations in the early 2010s. Following pioneering moves by *The Times* (London) in 2010 and *The New York Times* in 2011, paywalls spread across the industry. These events prompted research on payment-based digital models, audience behaviour, willingness to pay, and revenue substitution. As legacy outlets implemented metered and freemium paywalls at scale, scholars examined adoption patterns, performance outcomes, and implications for access and democracy. The timing is aligned with a well-documented wave of paywall launches and subsequent analytical work assessing their effects, explaining why 2013 and 2014 were the years where the most-cited research emerged (Arrese, 2016; Pickard, Williams, 2014).

In general, studies from previous years had more citations. This result is in line with the time it takes for academic studies to be acknowledged and cited. Nonetheless, more recent articles continue to have high citation counts, suggesting that paywall research is still relevant and presents an opportunity. However, the drop in new high-impact studies indicates that research needs to be more innovative, perhaps covering subjects such as blockchain or audience analytics in relation to paywall strategies.

We analysed the authors who have studied subjects connected to the keywords "paywall" and "media" in terms of number of publications and citations. Olsen was the most published author in this subject, with five articles, but not the most cited (91). When compared to other authors, Olsen appears to have conducted extensive rather than high-impact work. With just three articles and the greatest citation count (206), Chyi has been heavily cited by other scholars. Single studies by John V. Pavlik (116 citations) and the group of contributors consisting of Bonatti, Ghose, Goldfarb, *et al.* (68 citations each) have also been impactful.

We produced a network visualisation of the key articles on "paywall" and "media" in terms of mutual citations (*Source:* prepared by the authors in VOSviewer.

). We conducted a similar analysis for the main authors (*Source:* prepared by the authors in VOSviewer.

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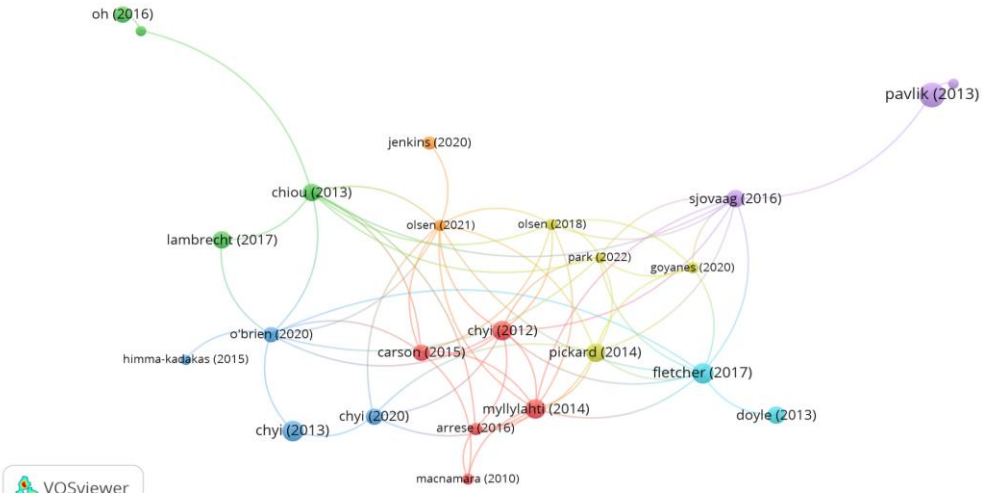
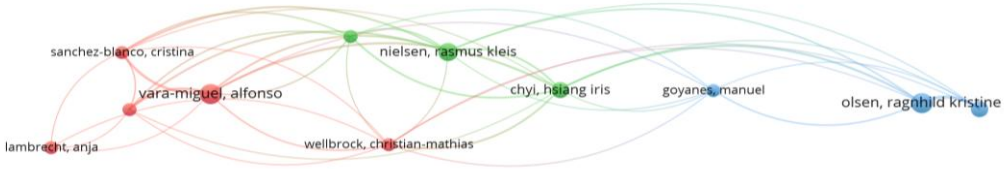


Source: prepared by the authors in VOSviewer.

Figure 3. **Network Visualisation of the Key Studies and Mutual Citations for the Keywords "paywall*" and "media"**

The citation network highlights important studies that are core references in the subject. The most-cited articles include those by Chiou (2013) and Chyi (2013, 2020), which have close ties with research by Lambrecht (2017), O'Brien (2020), and Carson (2015). High interconnectedness among these papers suggests a solid research foundation for more recent investigations. Other commonly cited articles that support and broaden ideas from previous studies are those by Myllylahti (2014), Pickard (2014), and Fletcher (2017), also making a substantial contribution to the academic discourse.

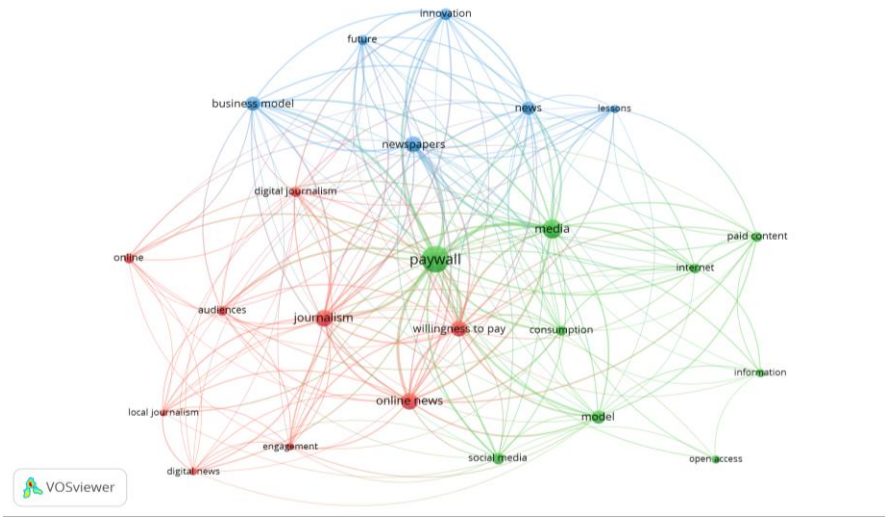
Certain articles are less firmly rooted in the core network, despite having a high number of citations. For example, the paper by Pavlik (2013) seems to be an important standalone study, indicating that it is frequently cited but not directly connected to many later investigations. Goyanes (2020) and Sjovaag (2016) serve as links between disparate publishing sets and promote cross-referencing across diverse research streams. The structure of scholarly debate on "paywall" and "media" is changing, as reflected by recent articles by Olsen (2018, 2021) and Park (2022). These studies demonstrate ongoing engagement with older studies, while providing new citation channels.



Source: prepared by the authors in VOSviewer.

Figure 4. **Network Visualisation of the Key Authors and Mutual Citations for the Keywords "paywall*" and "media"**

An important author in the "paywall" citation network is Olsen, who has been regularly cited by Goyanes and Chyi. These citations demonstrate Olsen's wide-ranging influence. Nielsen connects disparate research viewpoints by serving as a link between clusters. A closely related group consists of Vara-Miguel, Sanchez-Blanco, and Lambrecht, suggesting a specialised cluster. This cluster is reinforced by Wellbrock, who emphasises teamwork. The network visualisation identifies specialised academic areas in paywall research, as well as frequently cited studies. Finally, we conducted an analysis of keyword co-occurrence. The results appear in ***Error! Reference source not found.***.



Source: prepared by the authors in VOSviewer.

Figure 5. **Network Visualisation of Keyword Co-Occurrence for Studies with the Keywords "paywall" and "media"**

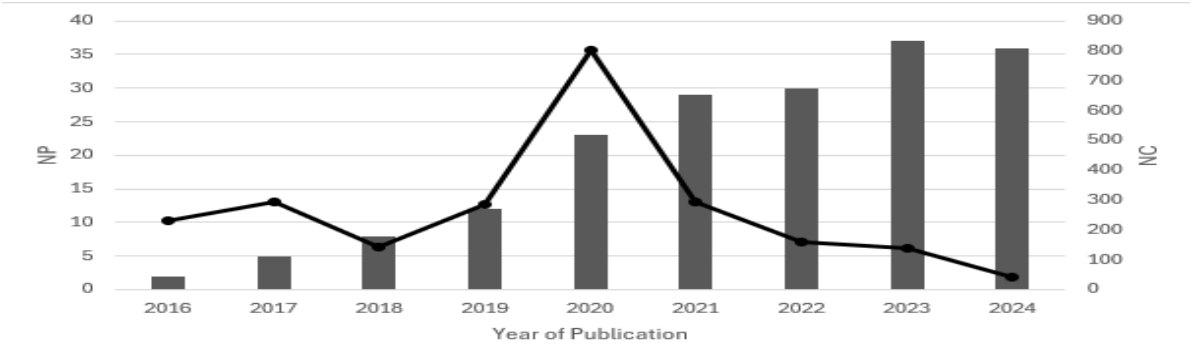
Figure 5 presents an overview of the academic research on paywalls by showing how this keyword interacts with the keywords of "audience behaviour", "media techniques", and "business strategies". Keywords in the blue cluster include "business model", "newspapers", "innovation", "future", and "news". This cluster focuses on how newspapers adjust to digital changes, whether paywalls are economically viable, and how innovation helps maintain media revenue. The inclusion of the keyword "lessons" indicates efforts to assess prior programme implementation achievements and failures.

The red cluster contains terms such as "journalism", "*Digital Journalism*", "online news", "local journalism", "audiences", and "engagement". It highlights how paywalls affect audience behaviour and journalism practices. It looks at the relationship between digital news platforms and their readers, the difficulties in making money from local journalism, and ways to strike a balance between open access and subscription models.

The green cluster focuses on the keywords "media", "model", "willingness to pay", "paid content", "internet", "social media", and "open access". It explores how audiences approach paywalls and how they consume news. The close connections between "consumption" and "willingness to pay" point to recurring discussions on user behaviour and the variables affecting users' choices to look for free alternatives or subscribe.

3.2 Clickbait AND media

The keywords "clickbait" AND "media" appear in 182 articles, with an average citation count of 13.1 and an h-index of 24. The evolution of the number of published articles and citations is displayed in *Figure 6*.



Source: prepared by the authors based on WoS data.

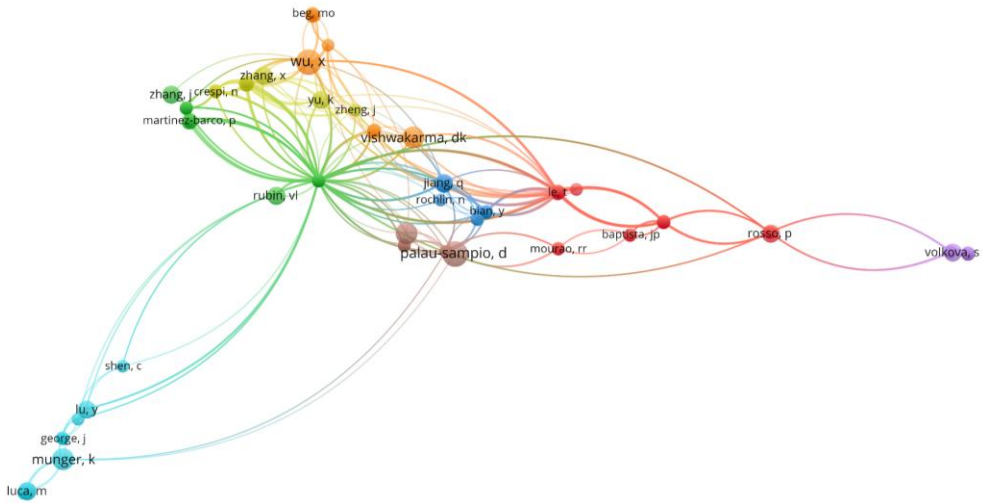
Figure 6. **Number of Publications (NP; Bars) and Number of Citations (NC; Solid Line) for the Keywords "clickbait" and "media" over Time**

From 2016 to 2024, the graph displays the change in number of publications and citations associated with the keywords "clickbait" and "media". Since the sharp rise in 2020, the number of citations has steadily increased. This rise in 2020 coincided with the Covid-19 infodemic, which intensified the study of sensationalist and misleading online content and engagement dynamics with such content (Cinelli *et al.*, 2020). The number of publications remained high from 2021 to 2023, indicating continued interest in the topic. Nevertheless, there was a discernible decline in 2024, which might suggest a change in emphasis on other relevant subjects or a saturation of research exclusively focused on these keywords. Research attention has shifted towards related concerns such as generative AI misinformation, the governance of recommender systems, and platform integrity, potentially crowding out the "clickbait" keyword label (Weidinger *et al.*, 2022).

The citation trend (solid line) follows a different pattern. It rose dramatically in 2020, exceeding 800 citations, indicating that articles in that year had a significant impact. The number of citations gradually fell after 2020, suggesting that, although research output is still high, the impact of more recent articles has been lower. This result may indicate that, although recent studies are still gaining citations, earlier studies had already established the fundamental notions in this field. Because recently published research has not yet received many citations, the steep decline in the number of citations in 2024 might be the result of a natural time lag.

For the keywords "clickbait" and "media", "Fake news, rumor, information pollution in social media and web: A contemporary survey of state-of-the-arts, challenges and opportunities" by Meel *et al.* (2020) is the most-cited article, with 260 citations. The journal *Political Communication* is the outlet for two of the 10 most-cited articles. This choice of journal reflects the impact of clickbait and media on policymakers and the economy. The most-cited authors for these keywords are a mix of high-impact individual contributors and scholars with multiple articles shaping the discourse. Vishwakarma (261 citations, 2 publications) and Meel (260 citations, 1 publication) are the top-cited authors, indicating that their work has had a major impact, despite a relatively low number of publications. Similarly, the presence of Volkova (200 citations,

2 publications) and Chakraborty, Ganguly, Kakarla, and Paranjape (each with 181 citations from a single publication) suggests that their research introduced key findings or methodologies that have gained widespread academic recognition. Meanwhile, Munger (113 citations, 3 publications) is a more prolific contributor, although with slightly lower citation numbers, indicating consistent engagement with the topic rather than a single high-impact study. Hodas, Jang, and Shaffer (168 citations each) follow this trend of single but highly influential contributions. The network visualisation in *Figure 7* provides interesting insights into the main authors using the keywords "clickbait" and "media". Key studies are shown in *Figure 8*, and keyword co-occurrence is shown in *Figure 9*.

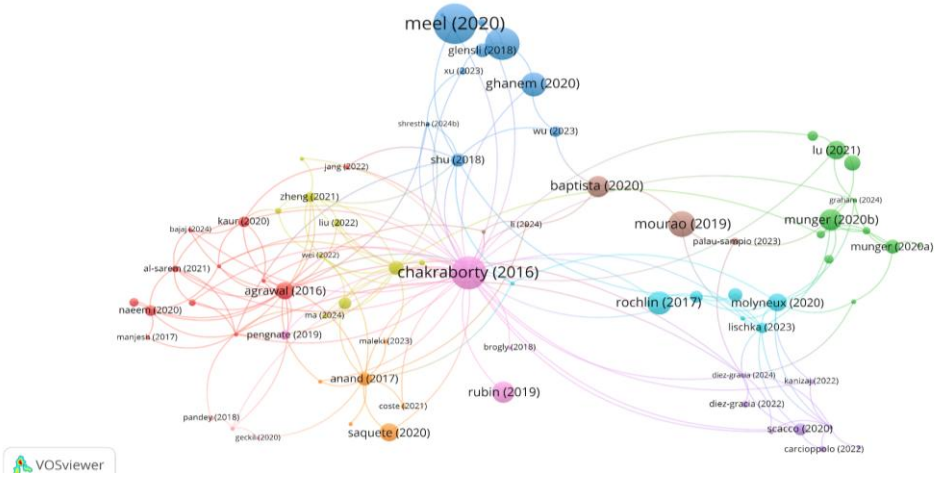


Source: prepared by the authors in VOSviewer.

Figure 7. **Network Visualisation of the Key Authors and Mutual Citations for the Keywords "clickbait" and "media"**

The "clickbait" and "media" author network visualisation shows clusters of related scholars and highlights important citation relationships among well-known authors (*Figure 7*). Vishwakarma is a central figure, bridging multiple groups, suggesting that research by this author is widely cited across different research streams. Zhang, Wu, and Yu form a tightly connected cluster around Vishwakarma, indicating collaborative research in the computational or detection-based analysis of clickbait. Similarly, Rubin is a key connecting node, linking several authors across different thematic areas.

Rosso, Baptista, and Mourão form another important citation cluster, frequently referencing each other's work, which focuses on linguistic and content analysis of clickbait strategies. Though somewhat isolated, Volkova remains a high-impact author, suggesting that research by this author is influential but less directly connected to the work of others in the network. Munger, Lu, and Shen create a separate citation structure, indicating a distinct research focus that interacts minimally with the central clusters. This visualisation reveals a well-structured but diversified research landscape, where different groups contribute to various dimensions of the research on clickbait and the media.

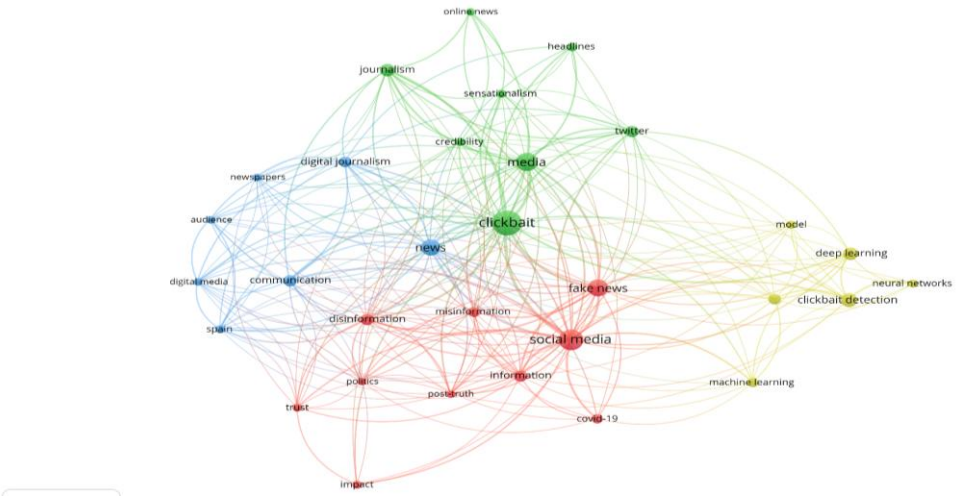


Source: prepared by the authors in VOSviewer.

Figure 8. **Network Visualisation of the Key Studies and Mutual Citations for the Keywords "clickbait" and "media"**

The article network visualisation for "clickbait" and "media" (*Figure 8*) highlights key citation relationships among influential studies, revealing clusters of interconnected research. Chakraborty (2016) is the central figure and is frequently cited across multiple clusters. Around this work, Agrawal (2016), Meel (2020), and Munger (2020b) form distinct but well-connected citation networks, reflecting their influence in shaping different research streams. Similarly, Shu (2018) and Ghanem (2020) are highly cited and link multiple research groups.

Munger (2020a), Lu (2021), and Molyneux (2020) form another important citation cluster, indicating a well-integrated research stream that cites multiple sources. Mourao (2019) and Baptista (2020) bridge different clusters, highlighting their role in connecting different research approaches. Rubin (2019), Rochlin (2017), and Scacco (2020) have strong citation links but are less integrated into the core network, suggesting influential yet specialised contributions. This visualisation demonstrates a well-structured and evolving research field, where core studies continue to shape the scholarly discussions around clickbait and media.



Source: prepared by the authors in VOSviewer.

Figure 9. **Network Visualisation of the Keyword Co-Occurrence in Studies with the Keywords "clickbait" and "media"**

Four major topic clusters, each representing a distinct area of study, are shown in *Figure 9* (visualisation of keyword co-occurrence for "clickbait" and "media"). The green cluster is linked to the terms "journalism", "credibility", "sensationalism", and "headlines". This cluster indicates an emphasis on the ways in which clickbait affects news quality, journalistic practices, and audience perception. This cluster also has connections to "Twitter" and "online news", illustrating how social media contributes to the distribution of clickbait-driven information. Vosoughi *et al.* (2018) found that false or misleading news spreads significantly faster, deeper, and more broadly than truthful information on Twitter (now X), largely because of its novelty and emotional appeal. This finding reflects the nature of clickbait, which relies on exaggerated or misleading headlines to capture attention and encourage sharing.

The blue cluster centres on the terms "news", "communication", and "*Digital Journalism*", highlighting how audience participation and digital media have shaped contemporary journalism. The fact that "Spain" is included in the blue cluster indicates that it is a noteworthy case or area of inquiry in the scholarly discourse on "clickbait" and "media".

In contrast, the red cluster is centred on the terms "social media" and "fake news". It has strong associations with the terms "disinformation", "trust", "misinformation", and "politics", underscoring worries about how clickbait affects public perception and media credibility.

The yellow cluster focuses on "clickbait detection", "deep learning", and "neural networks". It primarily contains studies on computational methods for detecting and reducing clickbait using AI and ML. With this combination of clusters around journalism, media studies, disinformation, and AI-driven detection techniques, *Figure 9* highlights the multidisciplinary nature of clickbait research.

3.3 Paywall AND Artificial Intelligence

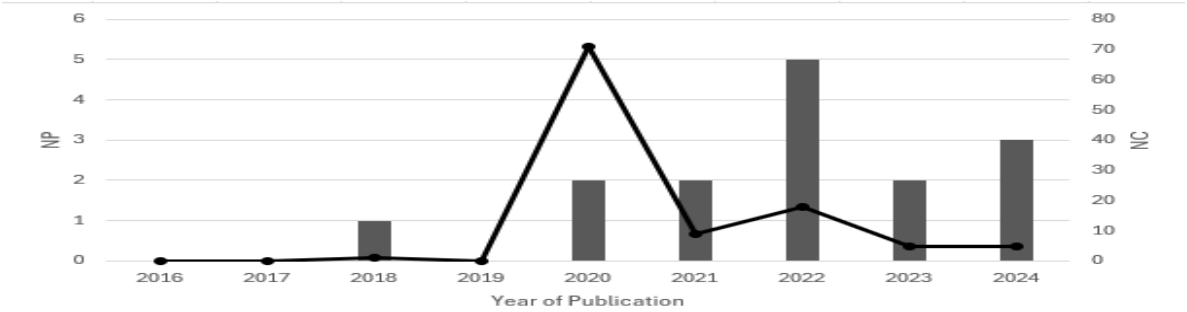
We subsequently analysed studies using the terms "paywall", "clickbait", and "artificial intelligence". The initial analysis revealed the absence of studies including all three terms. A separate analysis was conducted for each term, yielding interesting results. There is only one study referring to "artificial intelligence" and "paywall" in media. This study, entitled "Data Science, Machine learning and big data in

Digital Journalism: A survey of state-of-the-art, challenges and opportunities", by Elizabeth Fernandes, Sergio Moro, and Paulo Cortez, was published in 2023 in the journal *Expert Systems with Applications*. The study has received eight citations. It reviews the role of data science in *Digital Journalism*, identifying key areas such as text mining, event extraction, online comment analysis, recommendation systems, automated journalism, and exploratory data analysis.

The aforementioned survey reviews research gaps and opportunities, including improving personalisation, exploring recommendation algorithms, testing new automated journalism solutions, and enhancing paywall mechanisms. Regarding these gaps and opportunities, the aforementioned survey cites the only article on an objective function for optimal paywall decision making, showing the relevance of user engagement to increase the possibility of subscription (Rußell *et al.*, 2020). This finding suggests that research in this area is limited, with little investigation into the optimal design of paywall solutions.

3.4 Clickbait AND Artificial Intelligence AND Media

In total, 15 studies (collecting 109 citations) simultaneously use the terms "clickbait", "artificial intelligence", and "media". *Figure 10* shows the number of published articles and citations over time.



Source: prepared by the authors based on WoS data.

Figure 10. **Number of Publications (NP; Bars) and Number of Citations (NC; Solid Line) Using the Keywords "artificial intelligence", "clickbait", and "media" over Time**

The data show that this study topic emerged relatively late, with almost no publications prior to 2018 and a major spike in 2020, when the number of publications and citations increased suddenly. These results show that 2020 was a watershed moment for research on AI applications in clickbait and media studies, presumably prompted by growing concerns about disinformation, algorithmic content distribution, and automated detection. However, the steep fall in citations after 2020, despite ongoing publication activity, implies that subsequent research did not have the same academic impact as the initial studies.

Since 2021, publishing output has been reasonably consistent, with a peak in 2022. This peak can be linked to the growing academic interest in deepfakes, multimodal misinformation, and advanced AI detection methods. Such academic interest has expanded the scope of clickbait and media studies beyond text-based analysis to include images, audio, and video manipulation (Mirsky and Lee, 2021; Westerlund, 2019). Interestingly, citation numbers have fluctuated but have never reached 2020 levels, implying a shift in academic focus or the saturation of the field in terms of core studies.

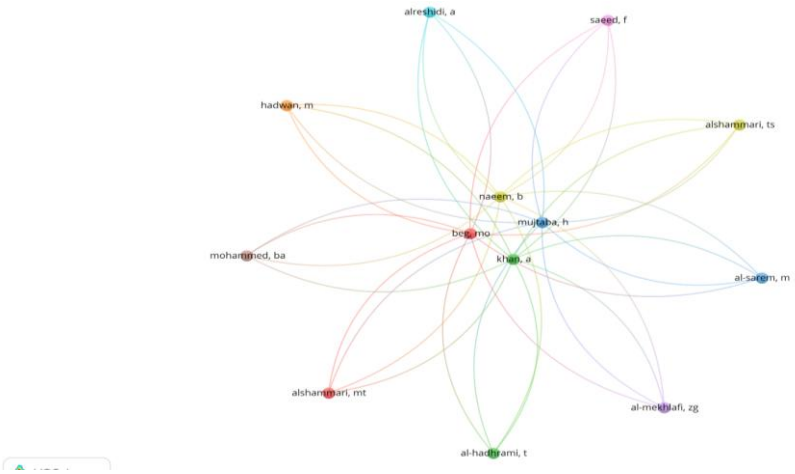
The most-cited papers on "artificial intelligence", "clickbait", and "media" tend to value natural language processing (NLP) and ML as ways of detecting deceptive or attention-grabbing content. The most impactful

paper, by Saquete *et al.* (2020), has received 52 citations. It focuses on post-truth detection using NLP, demonstrating that disinformation and AI-driven content analysis are major concerns in the discipline. Other highly cited studies, such as those of Naeem *et al.* (2020), with 19 citations, and Liu *et al.* (2022), with 10 citations, build on this trend by investigating deep learning models for clickbait detection in social media and messaging platforms such as WeChat. These citations indicate that early AI-based solutions for detecting clickbait became popular and influenced subsequent research.

More recent research, by Ma *et al.* (2024) and Sandrini and Somogyi (2023), focuses on feature engineering, generative AI, and deceptive news consumption. Their research demonstrates the evolution of AI's involvement in media engagement and disinformation detection. However, these more recent studies have yet to receive a high number of citations, probably because of the citation lag effect. Furthermore, emerging research by Gherhes *et al.* (2024) compares ChatGPT-generated headlines to human-written headlines. This research focus indicates a move towards analysing the influence of AI-generated media on engagement. Overall, there has been a steady shift from basic AI-based clickbait detection to broader applications in news trustworthiness, audience manipulation, and AI-powered engagement optimisation.

The most frequently cited authors in these fields form a cluster around Martinez-Barco, Moreda, Palomar, Saquete, and Tomas, each with 52 citations. These results indicate that the collaborative work of these authors has had the greatest impact in this field. Beg, Khan, Mujtaba, and Naeem are the next most-cited authors, with 19 citations. These results indicate that their research on deep learning frameworks for clickbait detection has made a meaningful contribution to the conversation. Despite having several publications, Wu, Zhou, Liu, Wang, Yu, and Zhang have lower individual citation counts (10 citations each), implying that their research is still gaining academic traction.

More recent studies by Damasevicius and Zailskaite-Jakste (6 citations), Ma *et al.* (2024), Huang and Ma (5 citations each), and Sandrini and Somogyi (3 citations) have covered emerging research areas. However, their lower citation counts indicate that these studies are still in the process of building broader academic repercussions.



Source: prepared by the authors in VOSviewer.

Figure 11. **Network Visualisation of the Key Authors and Mutual Citations for the Keywords "artificial intelligence", "clickbait", and "media"**

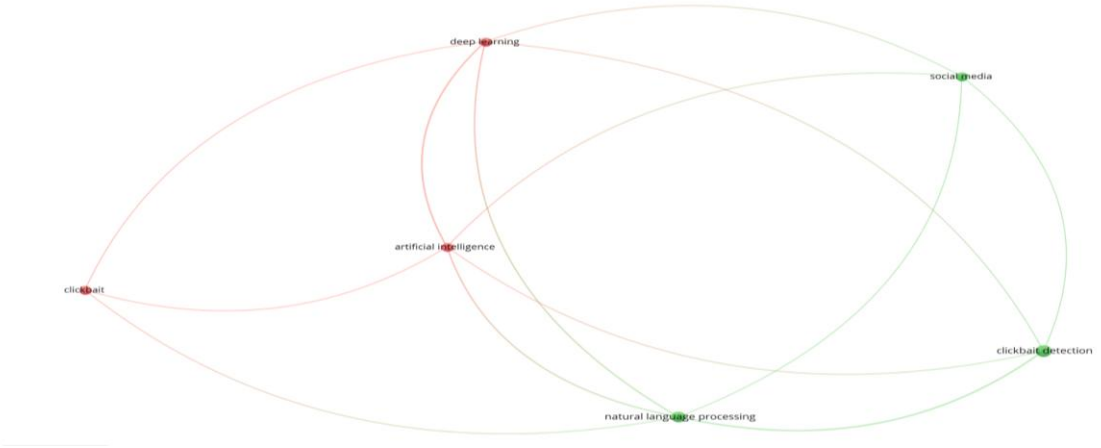
We can also gain interesting insights from the network visualisation of the main authors (*Figure 11*), the key studies in terms mutual citations (*Figure 12*), and keyword co-occurrence of "artificial intelligence", "clickbait", and "media" *(Figure 13*). *Figure 11* shows the citation network of the main authors. This network is well structured, with an equal distribution of citations across the network. Naeem lies at the centre, as a critical figure in the research discourse. Wu, Liu, Al-Sarem, Alshammari (M.T. and T.S.), Hadwan, Mohammed, and Saeed form a symmetrical, interconnected structure around Naeem, indicating a collaborative and well-referenced field of study. The star-like pattern indicates a common research interest, most likely AI-driven clickbait detection techniques in social media. This pattern implies that these authors regularly cite and expand upon each other's work. The evenly distributed linkages suggest that scholars collaborate to advance this specialised topic in a network of mutual citations rather than following a single dominant citation pathway.

This research area appears to have one of the most systematic and integrated citation structures of all research networks discussed in our analysis. The symmetrical connections imply a collaborative field of study in which authors mutually cite and build on one another's work. Compared to networks characterised by fragmented clusters or isolated key authors, this network visualisation illustrates a well-integrated research group, reflecting a high level of internal consistency and shared methodology or research objectives.

Source: prepared by the authors in VOSviewer.

Figure 12. **Network Visualisation of the Key Studies and Mutual Citations for the Keywords "artificial intelligence", "clickbait", and "media"**

The network visualisation for "artificial intelligence", "clickbait", and "media" (*Figure 12*) shows that the number of publications with this keyword combination is low (15). Therefore, the relationship among these studies is relatively weak, with only one co-citation between Naeem (2020) and Al-Sarem (2021) and isolated papers that are not co-cited.



Source: prepared by the authors in VOSviewer.

Figure 13. **Network Visualisation of the Keyword Co-Occurrence in Studies with the Keywords "artificial intelligence", "clickbait", and "media"**

The network visualisation of the keyword co-occurrence for the terms "artificial intelligence", "clickbait", and "media" (*Figure 13*) shows two major interconnected clusters. These clusters represent independent but overlapping fields of study. The red cluster includes "artificial intelligence", "clickbait", and "deep learning". It indicates a major focus on AI-driven methodologies for analysing and creating clickbait content, most likely involving ML models and algorithms. The green cluster comprises the terms "clickbait detection", "natural language processing", and "social media". This cluster emphasises research on detecting and reducing clickbait.

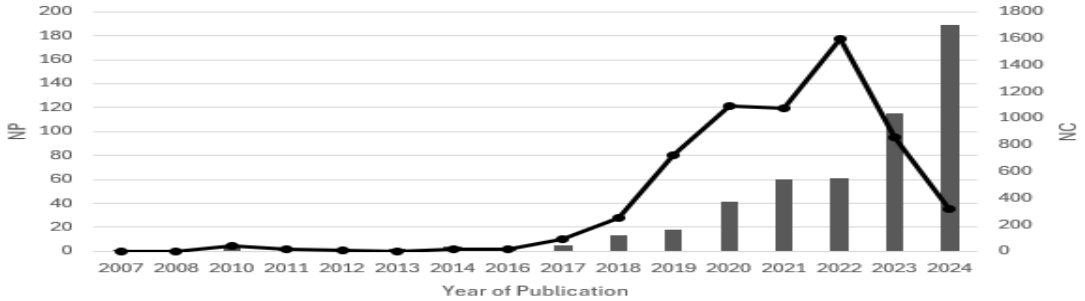
The appearance of the term "artificial intelligence" in both clusters suggests that AI serves two functions. It can be used not only to produce clickbait through deep learning models but also to detect and filter clickbait using NLP techniques. The strong association between "social media" and "clickbait detection" underscores the notion that much of this research centres on the social media platforms where disinformation and engagement-driven content thrive. This visualisation depicts a developing but structured research ecosystem in which AI's role in clickbait is studied from the perspective of both creation and detection.

In summary, the co-occurrence network illustrates two interconnected but distinct research streams. The first focuses on AI-driven generation of clickbait through deep learning models, whereas the other centres on detecting and reducing clickbait using NLP and social media analysis. This dual role of AI for both creating and controlling manipulative content has been highlighted in recent studies on clickbait detection and misinformation (Chakraborty *et al.*, 2016; Raj *et al.*, 2024).

3.5 Artificial Intelligence AND Media AND Journalism

We conducted the bibliometric analysis in two stages. In the first stage, a broad search was performed using the terms "artificial intelligence" and "media". This search returned 16,649 publications. Topics related to social media dominated the discourse in this corpus. Communication and journalism received comparatively limited attention. In the second stage, the search was refined to focus more specifically on the research aim by adding the term "journalism" to the query. This narrower search resulted in 522

publications, which collectively accounted for 6,089 citations and an h-index of 39. *Figure 14* shows the evolution of the number of published articles and citations.



Source: prepared by the authors based on WoS data.

Figure 14. **Number of Publications (NP; Bars) and Number of Citations (NC; Solid Line) Using the Keywords "artificial intelligence", "media", and "journalism" over Time**

Research on "artificial intelligence", "media", and "journalism" has increased considerably in terms of both publications and citations since 2017. This increase reflects growing academic interest in the interactions between AI and journalism. The number of publications has increased steadily since 2017. The surge after 2020 was most likely due to advances in AI-driven content generation, automated journalism, and media analytics. The peak in 2024 (approximately 180 articles) indicates a period of intense research activity. The citation count peaked in 2022, indicating that the impact of earlier articles emerged later. Interestingly, although the number of publications continued to climb in 2024, citation counts declined, potentially because of the delay in citing newer studies or a shift in focus towards more specialised AI applications in journalism. This tendency implies that, although AI in the media is still an active research area, core contributions from prior years continue to have an academic impact.

The most-cited studies on "artificial intelligence", "media", and "journalism" reflect a diversified and multidisciplinary approach to AI's impact on communication and information transmission. The most-cited paper, by Dwivedi *et al.* (2022), attracted 842 citations. This paper examines the metaverse and its consequences, implying that AI-powered immersive environments are a major new research topic. Other highly cited research includes the papers by Guzman and Lewis (2020), with 293 citations, and Vaccari and Chadwick (2020), with 277 citations. These papers focus on human-machine communication and the role of AI in political disinformation, deepfakes, and public trust in news. They thus highlight concerns about AI's impact on public perceptions and media integrity.

Lewis *et al.* (2019) have authored two impactful articles (105 and 85 citations), highlighting their major contribution to AI and *Journalism Research*, particularly in automation and news production. Brennen *et al.* (2021), with 80 citations, and Rodriguez *et al.* (2021), with 77 citations, have linked AI, disinformation, and social impact, notably in health and crisis communications. Ma and Huo (2023), with 79 citations, emphasised the increasing importance of ChatGPT and chatbots in media interactions, indicating a move towards conversational AI's involvement in journalism. Overall, the analysis illustrates a shift away from AI's role in automated journalism and disinformation towards broader debates about emerging

technologies such as the metaverse and AI-generated content that will shape the future of media consumption and public trust.

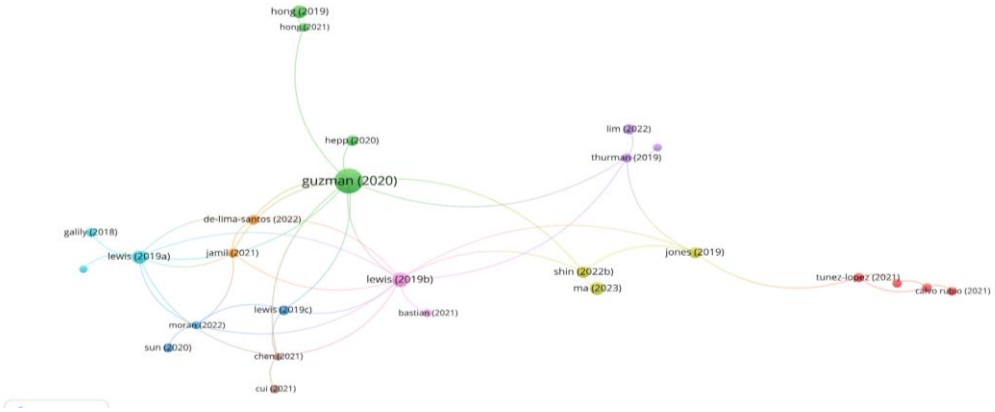
The list of most-cited authors for these keywords combines high-impact contributors and prolific researchers. Lewis (585 citations, 6 publications) and Guzman (483 citations, 3 publications) are the most influential figures in research on AI, journalism, and human-machine communication. For Chadwick and Vaccari (277 citations each, 1 publication), a single high-impact study on AI-driven misinformation has had a substantial impact in the field. Meanwhile, Chen (169 citations, 11 publications), Lee (152 citations, 13 publications), and Park (132 citations, 11 publications) are prolific contributors who produce a high volume of research output but who have a moderate individual impact. The relevance of the work of Simon (135 citations, 5), Shin (133 citations, 3 publications), Hong (133 citations, 5 publications), , and Chuan (156 citations, 2 publications) reflects an increasing interest in AI-generated content and media trust. The balance of core studies and ongoing research implies that AI's role in journalism and media is evolving, with new applications including disinformation detection, audience interaction, and automation.

The network visualisation of the main authors is shown in *Figure 15*. The key studies in terms of mutual citations using these terms are visualised in *Figure 16*.

Source: prepared by the authors in VOSviewer.

Figure 15. **Network Visualisation of the Key Authors and Mutual Citations for the Keywords "artificial intelligence", "media", and "journalism"**

*Figure 15 r*eveals two independent citation clusters with limited interaction between them. Lewis is a central figure in the first cluster, with close ties to Lopez-Garcia, Hong, Chen, and other researchers. This cluster indicates a highly cited and collaborative academic network focused on AI's role in journalism and the media. In the other cluster, Lee, Park, and Cai form a distinct, densely connected group, indicating a parallel but less integrated research stream. The weak citation relationships between these two clusters suggest that, although both groups study AI in the media, their focuses may differ, centring on automation in journalism versus AI-generated content and audience interaction. This separation of these two clusters underlines the need for further multidisciplinary collaboration to unify ideas from these developing AI- and media-related research topics.

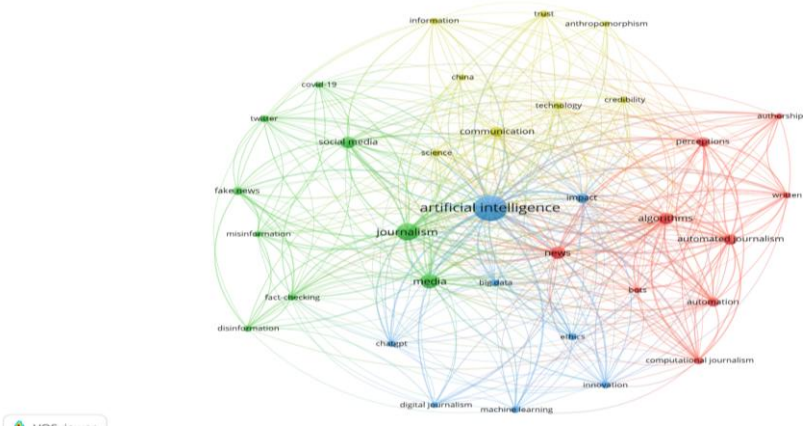


Source: prepared by the authors in VOSviewer.

Figure16. **Network Visualisation of the Key Studies and Mutual Citations for the Keywords "artificial intelligence", "media", and "journalism"**

The visualisation of the key studies on "artificial intelligence", "media", and "journalism" (*Figure 16*) highlights Guzman (2020) as a central figure, with strong citation links to multiple studies, including those of Hong (2019, 2021), Hepg (2020), and De-Lima-Santos (2022). This citation structure implies that the article by Guzman plays a core role in AI-driven media research. Lewis (2019a, 2019b) is also well connected, reflecting a strong impact at the intersection of AI and journalism. Turner-Lopez (2021) and Cui (2021) lie in a more isolated citation cluster, indicating a less integrated, more specialised research focus. The presence of different relationships among these authors indicates a burgeoning interdisciplinary research landscape, in which studies of automation, disinformation, and AI-generated content in media gradually converge. However, the relatively fragmented structure suggests opportunities for greater integration between different fields of study.

Finally, we conducted an analysis of keyword co-occurrence among studies using the keywords "artificial intelligence", "media", and "journalism". The results appear in *Figure 17*.



Source: prepared by the authors in VOSviewer.

Figure 17. **Network Visualisation of the Keyword Co-Occurrence for Studies Using the Keywords "artificial intelligence", "media", and "journalism"**

Figure 17 shows three major interconnected thematic clusters that represent diverse but related research fields. The green cluster includes "journalism", "media", and "social media". This cluster is strongly associated with concepts such as "fake news", "misinformation", and "disinformation", emphasising the importance of AI in fact-checking, credibility assessment, and countering misinformation in *Digital Journalism* (Shu *et al.*, 2017. The red cluster includes "automated journalism", "AI content", and "computational journalism". It centres on AI-driven content creation and automation in news production, while also dealing with the ethical concerns around transparency and accountability in AI-produced news (Hansen *et al.*, 2017). The yellow cluster includes the terms "communication", "credibility", and "technology". It reflects the scholarly debates on how AI technologies influence media trust and reshape audience perceptions of credibility (Tandoc Jr *et al.*, 2019; Waisbord, 2018).

The position of the keyword "artificial intelligence" at the centre of the diagram indicates its role as a unifying concept among these clusters. This central position emphasises the major impact of AI on journalism in terms of both its social implications (e.g. misinformation and public trust) and its technological repercussions (e.g. automation and ML). This visualisation highlights the interdisciplinary nature of AI research in media and journalism, where ethical, technological, and communication issues converge.

4. Discussion

The results of our analysis show how different topics around paywalls and clickbait have aroused increasing scholarly interest. The study of paywalls has been a popular topic in academia since 2010, whereas researchers have centred on clickbait and AI's role in the media and journalism mainly since 2016. One interesting finding is that the development of new AI-based functionalities in recent years has affected not only the media industry but also academic research, with a sharp increase in the number of publications on this topic over the last six years. All topics or terms considered in our study have maintained scholars' interest, and the number of citations has increased consistently. Our study shows that the keywords with the most published studies and academic impact are "artificial intelligence", "journalism", and "clickbait". The relationship between AI and media business models remains an under researched area with potential for further exploration. The analysis reveals that, for the most frequently cited topics, the authors of the most-cited paper or papers are not always the most impactful. This section now responds to the research questions posed in the introduction.

The first question asked how scientific interest in these topics had developed over time (Q1). There have been clear trends in scientific interest in the terms "paywall", "clickbait", and "artificial intelligence" in the "media". Since 2013, paywall research has increased consistently. Research on this topic surged from 2018 to 2023, most likely because of journalism's growing demand for sustainable revenue streams. The notable rise in publications and citations over time indicates that paywalls are an important developing subject in media studies. It also shows how mature and topical this subject is in the academic discourse. However, there were few publications in 2024. This low output could suggest a change in trend or a lack of scholarly interest. Nevertheless, the number of citations relative to the number of publications in 2024 was high, indicating a high impact and influence. This pattern highlights the value of prioritising quality over quantity and implies that, to remain relevant and influential, future research should strive for high-impact contributions. Research on clickbait has increased steadily since 2016, peaking in number of citations in 2020. Since then, research production has remained consistent, while the impact of citations has gradually declined. This trend suggests that the core literature continues to be more relevant than more

recent research. The spike in 2020 is related to the Covid-19 pandemic, as evidenced by López-Pujalte and Nuño-Moral (2020). These authors analysed coronavirus misinformation disseminated in Spain and Latin America between 23 January 2020 and 3 May 2020, finding that the main motivation behind transnational hoaxes was clickbait (54%), seeking virality through misleading headlines. The research output on AI in journalism and the media has increased vastly since 2017, peaking in 2024 this increase reflects a growing interest in AI applications for disinformation detection, content personalisation, and automated journalism. With 522 papers and more than 6,000 citations, AI in journalism and the media has attracted the most attention of these three subjects, far more than the research output on clickbait and paywalls combined.

The second research question concerned the strategy that has attracted the most attention in the scientific literature on the media: paywalls or clickbait (Q2). In total, 182 articles have been published on clickbait, compared to 124 on paywalls. However, the average number of citations per publication is higher for paywalls than for clickbait (15.8 vs. 13.1), indicating a higher academic impact. This finding implies that paywall studies tend to be more influential, even though clickbait has been the subject of more research. The greater prevalence of clickbait studies may be attributable to growing concerns regarding audience engagement, media credibility, and misinformation. Meanwhile, research on paywalls tends to focus on revenue methods and economic models, which may explain the lower volume of publications on this topic. Such research also focuses on consumer behaviour in the choice of paid or free media and the willingness to pay for information. However, this research is mostly related to interests such as business models and monetisation.

The third research question (Q3) asked about the impact of AI on paywall and clickbait research. We find that, although clickbait research covers AI to some extent, paywall research virtually ignores AI. Only one paper (Fernandes *et al.*, 2023) has specifically looked at the use of AI in paywall systems, examining uses including subscription models and personalised recommendations. According to our analysis, AI-based paywall optimisation remains a largely unexplored area. In contrast, 15 papers addressed AI and clickbait in the media, mostly using NLP and deep learning to identify deceptive headlines. This field of study is still in its infancy, and its lower citation rates indicate that its academic impact remains modest. Despite low citation rates, the growth in papers in 2024 implies that AI and clickbait detection remain popular themes, with recent studies still awaiting recognition in the form of citations. This situation could be due to a lag in citations or a shift in research directions combining AI with novel difficulties such as deepfake detection, content moderation, and ethical AI in journalism. Overall, the trend demonstrates the emerging yet dynamic nature of AI-driven clickbait research, with core studies maintaining their strong influence and newer contributions still gaining in popularity. In general, clickbait research actively considers AI, whereas paywall strategy research hardly explores it at all.

The fourth research question dealt with the contribution of AI to the development of media and journalism in terms of paywalls and clickbait (Q4). In response to this question, our study reveals that AI plays a pivotal role in changing journalism and the media. A major contribution of AI is in the field of automated journalism and content creation. AI is increasingly used for news writing, identifying deepfakes, and suggesting tailored content. Our study shows that newsroom procedures are changing because of AI-generated material, which also raises moral questions around bias and authenticity. AI plays a key role in the detection of erroneous information and fake news. ML techniques are likewise used to highlight misleading information and confirm the legitimacy of content. NLP and deep learning models have been very useful in identifying politically motivated disinformation, clickbait, and deceptive headlines. AI is also being studied

as a tool for recommendation and audience engagement systems, as well as subscription model optimisation using predictive analytics. According to Fernandes *et al.* (2023), AI may enhance paywall strategies by analysing user behaviour to raise the probability of subscription. Despite these developments, journalism and media studies continue to face ethical dilemmas related to biased algorithms and AI-generated disinformation.

The fifth research question (Q5) asked about the methodological approaches used in the existing research. In response, we conducted a bibliometric analysis of the keywords of "paywall", "clickbait", and "artificial intelligence". As Fernandes *et al.* (2023) and Saquete *et al.* (2020) have shown, bibliometrics and literature reviews are commonly used to summarise trends and identify gaps in the research on AI-driven journalism and disinformation. Clickbait research is dominated by computational and ML models. These models use neural networks, deep learning, and NLP to identify false content and misleading headlines. Media analytics, automated journalism, and fake news identification also use AI-driven solutions. Therefore, the clusters identified in our analysis focus on content creation, misinformation, trust perception, technologies, and algorithms for reducing and detecting such practices. Paywall studies, in contrast, are more likely to employ empirical and experimental research. They tend to analyse audience behaviour and revenue tactics using surveys, case studies, and econometric models. AI-generated headlines and user engagement have also been investigated. In general, paywall research tends to use behavioural and economic methods to study trends in digital contents. AI research primarily focuses on computational modelling, which is set to play a pivotal role in the future of journalism. Its influence is expected to be particularly strong in the realm of computational journalism, with the aim of generating engaging content. AI can be used to monetise content within more sophisticated paywall models, just as computational AI algorithms are used to address trust issues generated by misinformation.

The sixth research questions dealt with the key authors and their networks (Q6). In response, our research reveals the main authors in all three fields of study. Chyi (206 citations), Nielsen (127), and Pavlik (116) are key contributors to paywall research. Despite having fewer published studies than the other authors, Chyi is the most-cited author. Paywall research has a strong citation network, with core studies impacting more recent research. Olsen is not among the most-cited authors, despite having the most publications (5). This finding indicates that research volume and impact are not always correlated. The most-cited authors in clickbait research are Vishwakarma (261 citations) and Meel (260). Chakraborty (181 citations) is also a key figure in the development of this area of research. With close ties between disinformation, media studies, and computational techniques, the citation network in clickbait research is extremely cooperative. Lewis is the most influential author on AI in journalism (585 citations, 6 publications). However, Guzman and Chadwick have also made important contributions. Finally, there are two separate clusters within the citation network for the keywords of "artificial intelligence" and "journalism". The first concentrates on disinformation detection, whereas the other focuses on automation in journalism. This division suggests that interdisciplinary collaboration in the field of AI and media studies is still in its early stages.

The final research question (Q7) addressed the role of scientific research in driving progress in these domains. A key metric for gauging the impact of scientific research on academia and business is the h-index. A high h-index reflects the growing importance of AI applications in the media, as well as the interdisciplinary nature of AI studies, which span computer science, ethics, and media business models. The h-index was indeed high in the case of research using the keywords "artificial intelligence" and "journalism". Conversely, the lower h-index for research combining the keyword "artificial intelligence"

with "clickbait" and "paywall" indicates important research gaps, particularly in relation to the use of AI to enhance reader retention, optimise digital subscriptions, and counteract manipulative content.

The following items highlight the key findings of our study and their relation to the research questions:

- Trends in scientific interest (Q1): Research on paywalls has grown since 2010, whereas research on clickbait and AI in journalism/media has grown rapidly since 2016, with AI showing especially fast growth.
- Comparative research focus (Q2): Although more papers deal with clickbait, paywall research has attracted more citations, suggesting a stronger academic impact.
- AI integration (Q3 and Q4): AI has scarcely been applied to paywalls but is increasingly used in clickbait detection and journalism (e.g. automated content, disinformation detection, and personalisation), although ethical challenges remain.
- Popular methodologies (Q5): Paywall studies rely on behavioural and economic approaches, clickbait studies rely on computational and ML models, and research on AI in journalism focuses on automation and ML (algorithmic methods).
- Key contributors, authors, and networks (Q6): Different sets of influential authors shape each field, with strong but distinct citation networks in paywalls, clickbait, and AI/journalism.
- Contribution to progress (Q7): AI-related studies have high interdisciplinary impact, whereas the integration of AI into paywall and clickbait research remains underdeveloped, highlighting important gaps for future exploration.

A key implication of our study is that it is crucial to concentrate on research impact rather than volume in order to advance the literature on paywall and clickbait strategies. Moreover, future research will have a greater scholarly influence and will be more likely to be implemented in practice if it is capable of fostering multidisciplinary collaboration, developing AI-driven monetisation models, and improving ethical AI principles. The academic community is confident that research will bring meaningful and creative solutions to the digital media landscape. These solutions can improve the impact rate in terms of citations and publications in areas such as AI-driven paywall optimisation and the ethical governance of AI in the media.

In summary, although AI is transforming journalism, research on its integration into online media business and revenue models such as paywall and clickbait strategies remains underdeveloped. The focus on AI in these areas centres predominantly on the development of algorithms and tools rather than on the potential benefits of such tools for these models.

To contextualise our findings, we compare our research with previous bibliometric analyses. For example, Gálvez (2025) identified sustained growth in scientific production on AI applied to communication. Likewise, Koo (2025) analysed ChatGPT-related articles indexed in the WoS. Our study reveals a similar trend in the analysis of monetisation models and their relationship with AI algorithms in digital media. Nonetheless, all these studies reflect the growing academic interest in the convergence of technology and media content. Methodologically, all three studies employ bibliometric tools such as VOSviewer and CiteSpace to map co-authorship, co-citation, and keyword networks, enabling direct comparison of research focuses and collaboration structures. Our study expands this perspective by identifying how AI is integrated into online monetisation and traffic-generation strategies. Our study thus highlights a convergence between technological trends and business models that has been underexplored in previous studies.

Building on these findings, some specific guidance can be provided for media practitioners. Actionable suggestions include the implementation of adaptive paywalls and the use of AI to personalise content, predict subscriber churn, and detect clickbait. AI could also support fact-checking and content summarisation, promoting higher-quality information. Finally, it is essential to balance monetisation with public access. Paywall decisions should not disproportionately restrict access to critical information or exclude certain audience groups. Meanwhile, they should also safeguard the media outlet's credibility and public trust.

Conclusions, Limitations, and Future Research

Our findings suggest that, although the intersection between AI and journalism is an established field, the relationship of AI with clickbait and paywalls remains underexplored. This gap suggests an opportunity for future research, particularly on the impact of AI on the monetisation and distribution of journalistic content. In addition, the high average number of citations of paywall studies suggests that paywalls are a critical issue in the media industry. This topic thus deserves further attention in terms of the relationship of paywalls with AI. Hence, an opportunity arises for future studies to examine AI-driven economic models for paywalls.

One limitation is that the new and evolving nature of the subject matter means that there has not yet been enough time for articles to become established core references. Another limitation is that this study relied solely on the WoS database. Future research could broaden the coverage of publications and enhance robustness by using multiple databases such as Scopus and Google Scholar. One other valuable future research direction would be to study the application of the topics of paywalls, clickbait, and AI in the media to other sectors such as audiovisual content platforms. Such research could enable assessment of the impact of AI on their business models.

Although this research cannot provide a full conceptual framework given the scope of bibliometric studies, it still highlights some interesting directions for future research. For instance, conceptual and empirical studies of how AI personalises or restricts access in paywall systems could offer valuable insights. Likewise, research on the ethical implications of algorithmically generated clickbait is necessary. Comparative studies on the trade-offs between engagement and information quality in AI-curated models could also provide useful findings. Finally, exploring the cross-cultural differences in audience responses to AI-driven monetisation strategies and the long-term sustainability of AI-optimised revenue models in media organisations could be an enriching line of inquiry.

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MOKAMOS PRIEIGOS IR SENSACINGŲ ANTRAŠČIŲ MODELIAI INTERNETINĖJE ŽINIASKLAIDOJE BEI JŲ SĄSAJOS SU DIRBTINIU INTELEKTU

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Santrauka. Šiame straipsnyje nagrinėjami moksliniai tyrimai, susiję su mokamos prieigos (angl. *paywalls*) ir sensacingų antraščių (angl. *clickbait*) modeliais internetinėje žiniasklaidoje bei analizuojama, kaip dirbtinis intelektas (DI) keičia šiuos modelius ir platesnę žurnalistikos praktiką. Taip pat vertinamas akademinio susidomėjimo šiomis temomis mastas ir identifikuojamos esamos mokslinių tyrimų spragos. Taikant bibliometrinę analizę, paremtą „Web of Science" (WoS) pagrindinės kolekcijos duomenimis, ir mokslo žemėlapių sudarymo metodus programoje „VOSviewer", tiriamos publikacijų tendencijos, įtakingi autoriai ir teminiai klasteriai nuo 2010-ųjų pradžios iki 2024 m. Rezultatai atskleidė, kad nors sensacingų antraščių tyrimai sulaukia daugiau mokslinio dėmesio, mokamos prieigos tyrimai pasižymi reikšmingesniu poveikiu atspindėdami jų sąsajas su pajamų strategijomis, vartotojų elgsena ir noru mokėti. Sensacingų antraščių tyrimų paplitimas siejamas su susirūpinimu dėl auditorijos įtraukimo, informacijos patikimumo ir dezinformacijos rizikos. Taip pat nustatyta, kad nors DI transformuoja žurnalistinės produkcijos procesus, personalizaciją ir automatizaciją, jo integracija į žiniasklaidos verslo modelius vis dar išlieka ribota. Tyrimas pabrėžia tarpdisciplininių prieigų poreikį siekiant tvarių skaitmeninės žiniasklaidos ekosistemų kūrimo.

Reikšminiai žodžiai: žiniasklaidos verslo modeliai; mokamos prieigos (paywall); clickbait, DI, bibliometrinė analizė.