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Digital Technology Empowering News Production and Dissemination: Innovative Pathways

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Abstract. As artificial intelligence, big data, algorithmic recommendation and short-video technology continue to develop rapidly, the news industry is changing dramatically in the process of digitalisation and will alter its traditional model of news creation and dissemination. This paper explores the current situation of digital technology application in newsrooms, identifies the main problems that have arisen from the changes, and puts forward new ideas for utilising digital technologies in news production and dissemination. Through a systematic review of literature and comparative case studies of top news organisations around the world, it has been found that although digital technology has promoted improvements in production efficiency and expanded the spread of news content, serious problems have also arisen, such as content homogeneity due to algorithmic templates, the formation of information cocoons through personalised recommendations, limited use of technology solely at the distribution stage, and ethical issues caused by artificial intelligence and fake news. Given the circumstances mentioned above, the four directions of innovation proposed in this paper are as follows: A model of human-AI collaborative production; optimised algorithmic distribution with public interest weightings; diversified multi-platform dissemination strategies; and the construction of transparent AI ethics governance frameworks. The above results provide new material for discussions on the future of journalism in the era of generative artificial intelligence and offer some suggestions for news organizations in balancing the efficiency of technology with ethical journalism.

Keywords: Digital journalism, artificial intelligence in newsrooms, algorithmic recommendation, news production, media convergence

1. Introduction

In the last ten years, there have been many developments in the combination of digital technology and journalism. Artificial intelligence (AI), big data analytics, algorithmic recommendation systems and short-video platforms have jointly changed the former linear model of news production and dissemination, making all media organisations around the world reconsider how to operate their work, what kinds of articles to publish and how to engage audiences. This is not just an increase; it is a structural reorganization of what journalism is, how it is made and distributed [1].

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Recently, some statistics show that the size of the change is increasing. According to the Reuters Institute's Generative AI and News Report 2025, the proportion of people who have used any AI system at some time rose from 40% in 2024 to 61% in 2025, and weekly use was about to double from 18% to 34% [2]. Among those who use AI for news purposes, acquiring the latest information and summarising complex articles are among the most popular applications; therefore, one could infer that people are starting to rely on artificial intelligence tools for consuming news. The above data show that news organizations need to build a harmonious and novel plan for the application of technology urgently.

With the popularisation of large language models, scholars have paid more and more attention to artificial intelligence in journalism. A systematic bibliometric analysis of publications from 2010 to 2025 shows that the number of studies in 2024 was up 172% year-on-year, and ethics, misinformation and trust have remained among the problems with few solutions in recent years [3]. Although many studies have been conducted on this topic, scholars still do not know how to go further than the surface level of automation and achieve a deeper integration of digital technology throughout all stages of news production, such as selecting topics, creating content, distributing information and interacting with audiences, etc., in a way that considers ethics.

Most of the previous studies have concentrated on changes in people. Studies have examined how natural language generation (NLG) systems are used for the writing of standard news [4]. Algorithms that recommend democratic information and their effect on the dissemination of such information have been the subject of many studies [5]. Research on AI ethics has established some new norms and rules for behaviour in the newsroom and other places [6]. Research on short-video news has also studied how platform-driven agenda-setting differs from the original editorial selection [7]. Most of the existing studies have addressed the problems of production, algorithms and ethics separately, so most review papers are thematic syntheses rather than comprehensive frameworks guiding news organizations in all aspects of digital transformation.

This paper will address the above problem in an integrated manner. In other words, what is the present situation of the use of digital technology in news production and distribution? What are the problems that have occurred as a result? What new paths can be taken to promote the good and sustainable development of digital transformation in news organisations? The rest of the paper is organised as follows. Section 2 presents the current situation of digital technology in newsrooms. Section 3 will examine the main problems. Section 4 puts forward four new ways. Section 5 is the conclusion.

2. Current status of digital technology in news production and dissemination

2.1. Digital transformation in news production

The application of artificial intelligence in news production has now progressed beyond pilot projects and entered the main body of newsrooms. Algorithmic systems are used in the production of automated journalism, and major news organizations such as the Associated Press, Reuters, and The Washington Post have already begun to employ them. These systems are suitable for the type and amount of information in large volumes, such as financial summaries, sports scores and election results; they can generate many news reports quickly and far exceed the capabilities of a human newsroom [6]. They are good at standardised, data-driven reports, and in-depth investigative journalism and feature-length human-interest stories still need to be based on the reporters' interpretation and situational awareness; they have not been covered by algorithmic systems yet.

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Recently, with the development of generative artificial intelligence that can create contextually fluent prose, its scope of automation has expanded considerably, and now it is being used for areas that were previously covered by human journalists.

Big data analysis has also changed how people choose the subjects of research. Now that people have more data from search queries, social media and other sources on people's reading behaviour, people can use it to know what is popular at present and predict what will be popular in the near future. Thus, the new types of content will be updated more flexibly. AI-based editing tools have also been employed to automate the transcription of speech into text and intelligent trimming and virtual anchoring technology have been used to increase production efficiency and reduce operating costs [8].

Virtual AI anchors are a typical case of the change in form. Systems developed by Xinhua News Agency and Al Jazeera can provide 24-hour, no-fatigue news broadcast services and be quickly localised for many language areas. However, as Farid and Bryson showed in their well-known study, the same deep-fake technology that can create virtual anchors can be used to generate the illusion of trustworthy journalists spreading false information; this result has serious repercussions for the credibility of news and public trust [9].

2.2. Digital transformation in news dissemination

Algorithmic recommendation systems have gradually become one of the primary ways the public accesses news in the distribution stage. Google News, Apple News, TikTok and Weibo are all run by these systems to filter, rank and personalise users' news feeds based on behaviour, and they have become the first point of control over which news is distributed to whom, thereby reducing the need for human editors [5]. Algorithmic recommendation has gradually assumed the function of traditional editors in selecting which news to spread, and at the same time, the proprietary applications and official social media accounts of news organisations still use editorial selection for distribution in addition to platform-driven feeds.

Short-video news is now one of the highly disruptive forms of information spread today. TikTok and Douyin have changed the focus of the news agenda to engage the public's feelings, so now popularity is valued more highly than just newness; however, serious incidents that take place suddenly or politically crucial matters still need to be reported by human journalists first. Newman and Gallo's research shows that among young people aged 18-24, they use artificial intelligence to help them understand difficult news more deeply at present and the future. Live news broadcasting and cross-distribution via social media have extended the time and space for the spread of news further, providing almost immediate coverage of breaking events around the world.

2.3. Audience interaction and participatory journalism

Digital platforms have changed the way reporters communicate with and receive news from the public. The two-way way is used together with, but not to replace, the old one-to-many broadcast model of television and printed newspapers, and both forms of communication still operate independently. Digital platforms have created recommendation algorithms to distribute various content to different groups of people and have also collected data on how the public uses this content to help editors decide what new content to produce [10]. The two have been moving together and have deviated from the older model of mass media.

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3. Challenges and problems in the digital transformation of journalism

3.1. Content homogenisation

One of the more well-known problems of algorithmic content production is the uniformity of news output. When many news organizations use the same NLG templates and shared data sources, the generated text is often formulaic and lacks diversity; thus, it fails to meet the demands for different content and misses the essential charm of outstanding news reporting. As Deuze and Beckett have pointed out, the use of artificial intelligence in newsrooms may result in a reduction of the depth of journalism, and although it is efficient for mass consumption, it is less suitable for in-depth investigation and analysis to advance society [4]. Ioscote and others' bibliometric analysis show that research output has also begun to pay more attention to this trend, and automation has been one of the top three research subjects [3].

3.2. Information cocoons and algorithmic filter bubbles

Personalised recommendation systems have been the subject of many studies on the effect of reducing information diversity and democratic discourse. The idea of an "information cocoon" is that as users' preferences are gradually learned and strengthened by algorithms, their access to new information becomes increasingly limited, and they lose contact with other parts of society that have different political or cultural views. Mitova et al. have conducted many programmatic studies on news recommendation systems; it has been found that they significantly affect the spread of journalistic distribution and people's consumption of political news [5]. Due to the problem of a trade-off between relevance optimisation and exposure diversity, scholars have put forward public-interest weighted algorithms, but they have not been used by the top short-video platforms yet [11].

3.3. Journalism ethics and AI misinformation

The use of generative artificial intelligence in the creation of news has aroused people's concern over the accuracy and transparency of journalism. AI-generated content may be false information, fictitious references and misleading framing; it is difficult to distinguish from fact whether it is true for the public and editors [12]. The problem of ethics is very serious with the development of deepfake technology. Farid and Bryson's experiment shows that artificial intelligence can be used to replace the faces and voices of trusted news anchors in fake videos to spread false information that looks like it comes from reputable news organisations [9]. Porlezza and Schapals also believe that although ethical problems have not always been the focus of early AI application in news organizations, with the spread of generative artificial intelligence, governance of these issues has become an urgent institutional issue [6].

3.4. Shallow technology adoption

Although there are some notable cases of applications in AI, such as virtual presenters and automated writing of articles, a considerable amount of research shows that most news organizations have only used digital technology to a certain extent. Most of the applications are still in the downstream distribution and editing sections, and not many have been deeply integrated with strategic planning, investigative research design, etc. Small-scale outlets have concentrated their efforts in the construction of digital platforms on post-production editing and short-video distribution, and at the same time, leading media organizations have begun to use artificial

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intelligence and big data for upstream work, such as topic identification and investigation lead finding, as well as editorial plan formulation [8, 10].

4. Innovative pathways for digital technology empowerment

4.1. Human-AI collaborative production model

The most promising framework to resolve the conflict between the efficiency of automation and the quality of journalism is the model of human-AI collaborative production; that is to say, algorithms can be used to handle large amounts of data for high-speed tasks, and human journalists should focus on tasks that require contextual judgment, ethical reasoning, narrative construction and source connection. This division of labour is not just for convenience; it is based on the idea that each party will contribute according to its own comparative advantage [8].

In fact, the model will use big data mining to discover new hot topics and less-publicised issues in society, and use artificial intelligence tools for assistance in writing, transcription, data visualisation and fact-checking; at the same time, it will continue to carry out ethical and socially responsible investigative and analytical journalism with human reporters. In addition to front-line reporters, editors and media managers at all levels of news organisations also need to be trained in AI ethics, algorithmic governance and data security for the responsible use of artificial intelligence. Therefore, the new human-AI model will need to invest more in technology, train staff, and adjust the culture of the news organization [4].

4.2. Optimised algorithmic distribution with public-interest weighting

To address the problem of an information cocoon, people need to improve the design of news recommendation. Research has gradually progressed in the construction of hybrid recommendation architectures that can meet the different demands of personalisation, diversity and public interest. Mitova and others have proposed that news recommender systems should also consider explicit editorial values, such as the diversity of sources, the scope of topics and exposure to minority opinions [5]. Thus, the construction and operation of the recommendation algorithm would need to be done in close cooperation with engineers from the platform, the editorial team and public-interest organizations.

A problem with the recommendation algorithms of short-video news platforms is that they generally give more weight to user engagement than to the quality of information or public interest. Al-Rawi and others have found that algorithm-based agenda-setting in short-video platforms has changed how people are informed about public affairs, and as a result, some important but less emotionally appealing matters may go unnoticed [7]. New ways to build an ecosystem in this area need to be sought to promote transparency of algorithmic recommendation in regulations, and at the same time, in cooperation with all relevant parties, such as media organisations and short-video platforms, a general code of conduct for algorithm development should be established [11].

4.3. Multi-platform diversified dissemination strategy

To spread well in today's media environment, news organisations need to build an all-round system of multi-platform strategies that can take full advantage of the various features of different channels. Short videos, live-streaming, social media dissemination and traditional online publication each serve different groups of people and have different types of information. Instead of a single strategy

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for all platforms, new-era news organizations have used big data analysis to create many groups of audiences and tailor different kinds of updates to meet people's different needs on various platforms; only major, urgent incidents are reported using the old way of wire reports to ensure that information spreads rapidly and uniformly [2].

New forms of content have been added, such as data journalism with interactive visualisation, VR and AR immersive news experiences, vlog-style personal journalism; they can draw the attention of the public and inform them about serious issues in other ways. These forms are very suitable for reaching young people who obtain information from unofficial channels, and they are more likely to be interested in stories told in the form of experiences and participation. The main problem is that the cross-platform editorial plan fails to ensure the consistency of journalism and brand image when releasing various types of online articles on multiple platforms [10].

4.4. Ethics governance and transparency frameworks

In order to address the ethical problems of artificial intelligence in journalism, a certain institutional governance system should be established to set reasonable boundaries for the use of artificial intelligence in producing news content, require that the use of artificial intelligence be disclosed to the public, and set up accountability mechanisms for correcting errors or misconduct. Gutierrez-Caneda and others have reported some good practices at leading news organizations, such as the Washington Post and the BBC; they have developed internal editorial rules for the application of artificial intelligence, set up an editorial control office for AI-assisted content, and used transparency labels for automated news stories [12].

The Paris Charter on AI and Journalism has been put forward by Reporters Without Borders at the industry level to establish some rules for the use of artificial intelligence in journalism responsibly. Porlezza and Schapals believe that the news industry has long had an ethical commitment to accuracy, independence and public accountability, so it is suitable for developing trustworthy AI governance systems; it needs to be actively used in the construction and regulation of AI technology, not just mentioned rhetorically [6]. Based on the above framework, news organisations need to increase investment in audience literacy programmes to enable the public to learn how to read news that utilises artificial intelligence properly and better assess its credibility [12].

5. Conclusion

Journalism has been changing in many aspects due to the impact of digital technology, and this paper will examine the present situation of artificial intelligence (AI) application in news production and distribution, identify the main problems that have arisen from this change, and put forward four linked innovative paths for developing digital journalism in an environment of change.

According to the above analysis, although digital technology has been applied to improve the efficiency of newsrooms, extend the reach and appeal of content, various problems have also emerged; that is to say, there is a lack of diversity in news, algorithms often create "filter bubbles" for users, there are ethical issues with AI-generated content, and many new technologies are not fully utilised in practice. To address the above problems, people cannot only make small changes in technology; people also need to make a fundamental change in strategy to place journalistic values at the center of technology design and application.

The four new paths put forward here are not individual proposals but rather the four parts of the same plan for digital journalism: human-AI collaborative creation, optimised algorithmic

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distribution, multi-platform diversified spread and AI ethics governance. It will be necessary to invest in training for journalists and raise people's awareness of artificial intelligence, cooperate with editorial and engineering teams, work with platform companies and regulators, and continuously communicate with the public about the characteristics and values of digital-age journalism.

Some shortcomings should be pointed out. Based on the above, most of the studies are published in English; thus, the views of news organisations in the Global South and non-Western media environments have been excluded, a problem that Ioscote and others have pointed out in the field. In the future, more systematic research should be conducted in the contexts of non-Western newsrooms to see how to adapt the paths put forward here to various regulatory, cultural and economic environments. With the development of generative artificial intelligence, in the future, empirical studies will carry out cross-cultural comparisons of digital transformation strategies, quantify the metrics for public-interest weighting in algorithmic distribution, construct intervention mechanisms for deepfake-based misinformation, and continue to explore the ethical and governance problems mentioned in this paper.

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