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Navigating the Nexus: Unveiling Challenges and Opportunities of AI Integration in Journalism Practice

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ABSTRACT

The use of artificial intelligence tools in newsrooms is revolutionary and controversial as well. Despite the promising opportunities provided by AI to enhance digital journalism practice, it also raises several legal, professional, and ethical considerations. Research about AI in Arab media is a promising area of interest that increasingly attracts scholars. However, there is a need for systematic and purposeful growth in future research about AI and media that considers the sociocultural and economic contexts of countries and meets the priorities and needs of media organizations. Accordingly, this paper provides researchers with an overview of the main challenges and debates in the field of AI and journalism studies. This study applies a systematic review of a sample of English-written studies from 2014 to 2022 about the implications, challenges, and considerations of using AI in newsrooms. Based on the analysis, the study proposed a future research agenda about AI and journalism.

INTRODUCTION

Artificial intelligence (AI) as a range of technologies, including machine learning, automation, and data processing, is already a significant part of journalism, but it is unevenly distributed (Beckeet, 2019). During the last two decades, the use of artificial intelligence tools has increased in different newsrooms worldwide, including news media outlets, while different newsrooms have started using automated artificial intelligence tools to help in the editing process. An existing language-based divide had prevented news media outlets from adopting such AI tools and limited their implementation, especially in newsroom routine work (Jusoh, 2018).

AI innovation has paved the way for new types of news stories. The widespread adoption of AI in newsrooms has made it an important topic for research. An increased number of studies were conducted to get a deep, insightful perspective on the use on the use of AI in different journalistic practices (Danzon, 2021).

Nowadays, computation and innovative digital tools support journalists by helping them generate news at higher speeds using big data. From another point of view, news generated by algorithms will not be as quality as human-written news because algorithms do not have creativity, values, insights, and emotions (Dalgali, 2020).

Although artificial intelligence was a result of several discipline efforts, from engineering to computer sciences and linguistics, journalism practice benefits from this development in several ways (Thurman, 2019), recently, AI played a crucial role in enhancing journalists' skills and abilities. They can use AI with all types of data.

The increasing usage of AI applications in the field of journalism represents a shift in the journalism industry, which reflects an engagement between social and technological factors. At the same time, using AI in journalism also increasingly attracts researchers' attention. Scholars have widely examined AI applications

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in the field of media practice under different research areas like algorithmic decision-making with respect to the algometric distribution of media content (Matt, 2018), computational journalism that focuses on how advanced technologies support journalists' daily work (Bucher, 2017), and the newsroom automatization discipline that examines the usage of smart applications in the news industry like platforms for distributing news on social media and data mining techniques, etc.

Like data journalism and other innovative media practices, media organizations' usage of AI applications is still in its early stages (Fahmy, 2021). In parallel, there is a rapid growth of research about AI in journalism (Elgayyar, 2021). The sociocultural, economic, and political contexts in countries highlight serious challenges, problems, and considerations of the usage of advanced technologies in media. Bearing in mind the very limited analytical reviews available about AI and journalism in research, there is a need for systematic research to enhance future research outcomes for journalism. Accordingly, this study maps and analyzes the scientific production of the challenges and opportunities of AI in media practice. It provides researchers with a review of debates that are occurring in AI and journalism research and suggests a roadmap for future journalism research.

Literature Review

Nowadays, artificial intelligence has gained popularity as it interacts with different aspects of daily life. Integrating AI in news gathering allows using several features such as machine learning, computer vision, speech recognition to convert voice data into text data, natural language processing (NLP) to understand and respond to text or voice data, and robotics that refer to enabling computers and systems to perform regular human tasks (Fahmy, 2021).

Computational journalism is a broad term that deals with journalism practices that use AI techniques and tools to dig into data and enable journalists to analyze data to identify patterns, trends, and insights from multiple sources; it can also track audience sentiments (Lewis, 2021).

Computational journalism includes many detailed concepts, such as automated journalism, which refers to software that transforms data into readable news stories (Lewsi, 2021). Developing AI tools during the last decade paved the way and helped journalists in different countries produce news stories. (Stray, 2019) mentions that it can help to tell new types of stories that lead to innovative practices in journalism. Fully automated and semi-automated forms of gathering, filtering, composing, and sharing news occupied a greater place in a growing number of newsrooms, opening discussions about shifts in the norms, patterns, and routines of news production and at a more fundamental level, taken-for-granted ideas about who (or what) does journalism was being challenged (Thurman, 2019).

Research on journalism and computation as artificial intelligence and the human-machine communication that it facilitates becomes a more salient factor in the way people make sense of the world and create meaning, both with each other and in relation to machines. In addition, analyzing AI journalism initiatives and practices helped to understand AI journalism's potential and limitations.

Implementing AI tools in newsrooms refers to a wide range of journalism usage, such as finding and contacting sources, adjusting objects, faces or colors, converting speech into text, editing audio and video, and identifying the sentiment of readers on different platforms. Those tasks usually took time and effort from journalists. Research predicts that AI tools will not substitute journalists; these technologies are more likely to complement human work by increasing its quality and efficiency (D.N., 2019).

The production of automated news stories without human intervention was known as automated journalism or robot journalism. AI implementation will not eliminate jobs in the media industry but will increase the speed and efficiency of reporters and video producers through different tools that allow machines to write different versions of one story and create videos of related footage out of keywords (Gouda, 2010).

The digitization of news content production allows it to spread across many digital platforms. It also allows the personalization of news distribution to reach the target audience and opens up a variety of opportunities for collecting and analyzing large amounts of audience and consumption data (Trattener, 2021). Recently, automation in journalism has increased reader revenue for publishers, lowered costs, and rapidly expanded coverage of any topic on which automated content can be produced.

Objectives

- Identify prevailing trends in scholarly research on automated journalism.
- Determine the most studied areas and prevalent methodological approaches in the field, as well as identify gaps in current research.

Research Methodology

The focus of this paper is to analyze the contributions of previous research about the use of AI applications in journalism to identify the main areas of interest and then to propose a research agenda about AI.

This paper applied thematic and quantitative descriptive analysis to analyze the key features of a selected sample of academic contributions to provide researchers with a good understanding of the main debates about the potentials and challenges dominating in this growing research area and to present suggestions for future research about automated journalism.

Data analysis

The selection of the texts based on the existence of specific keywords ("algorithmic journalism", "automated journalism", "artificial intelligence," and "journalism", "big data" and "journalism") whether in the titles and/or abstracts or full text of manuscripts, through four scholar databases which are Google Scholar, Scopus, Research Gate and Dar Almandouma. The sample includes peer-reviewed theoretical and empirical journal articles, book chapters, reports, conference proceedings that were published in English. Overall, 35 texts were examined, covering a period from 2014 to January 2022. Figure 1 shows the increasing interest in research over time. The sample consists of (31) articles published in peer-review journals, (2) reports, (1) conference proceedings, and (1) book chapter.

After a thorough reading of the collected articles, we applied quantitative and qualitative descriptive analysis to manually extract information about the following categories: Basic data: date of the publication, number of authors, title of the article, the keywords, type and scope of the study and the discipline, type of publication, main focus and secondary focuses (if applicable), methodologies and research techniques, theoretical framework, the most important results, and limitations of the study (if applicable).

Sample Characteristics

Co-authored scholar research production represented 55% compared to 49% individually authored. English-published texts constitute 73% of the sample, while other texts constitute 31%. Total (10) texts of the sample cover either geographical inter-national scope or not specific (Kotenidis, 2021) texts of the sample cover countries including Egypt, Nigeria, China, South Africa, Argentina, Spain, and the UK, while only Abdel (2021) texts are of regional scope in Western Europe.

Review showed that (Kotenidis, 2021) texts of the sample belong to the "Journalism and mass communication" discipline, while (Dorr KN, 2017) texts are interdisciplinary, including (6) belonging to Sociology and (4) belonging to Computer Sciences (Figure 2). This reflects that research about the challenges and considerations of using AI in journalism can better go for more interdisciplinary research.

The dominance of the qualitative method in the sample can be partially explained by the explanatory nature of most of the texts, which is understandable considering the early stages of research in this field. The total (18) of the sample applied qualitative Methods applied were mixed-methods and quantitative methods, most of them in studies. Consistently, in-depth interviews were the most qualitative method applied (Danzon, 2021). As used in Diak (2019) texts, surveys were dominant in quantitative studies and were mainly applied to collect data from journalists or media students. Case studies represent media organizations that applied AI.

Impacts and implications of using AI applications in journalism topped as the main focus in 26% of the sample. Besides, even if the studies focus mainly on another topic, the impacts and implications come first as the secondary focus in 52%. Notably, challenges and considerations related to using AI in journalism come as a main focus in just 7% of the sample and as a secondary focus in 29% of the sample. (Figure 3).

The analysis of most-frequent keywords showed that English-written texts used more varied keywords than Arab-written texts (Figure 4). This result indicates the need to achieve a better understanding of the differences between the terms and how these differences could reflect different types of AI use in journalism (Chambaund, 2021).

Result

One of the biggest challenges for automated journalism is the early stage of the development of natural language

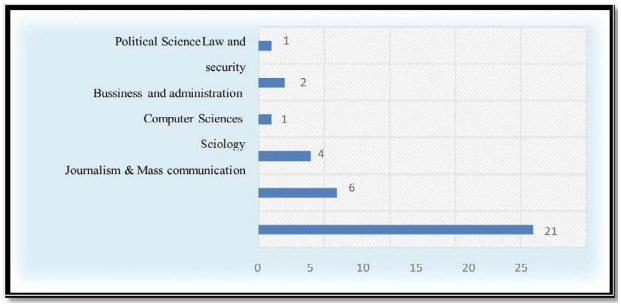

Figure 2: Distribution of the sample according to the discipline

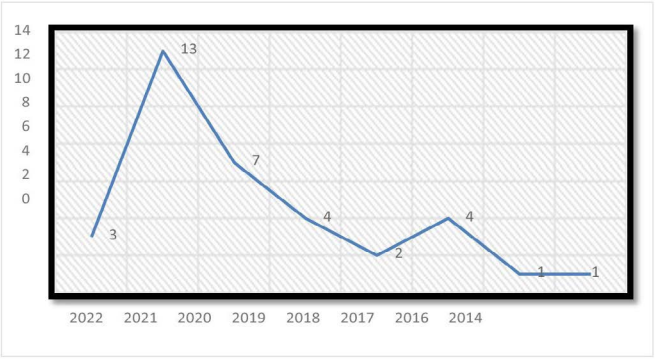

Figure 1: Distribution of the sample from 2014–January 2022

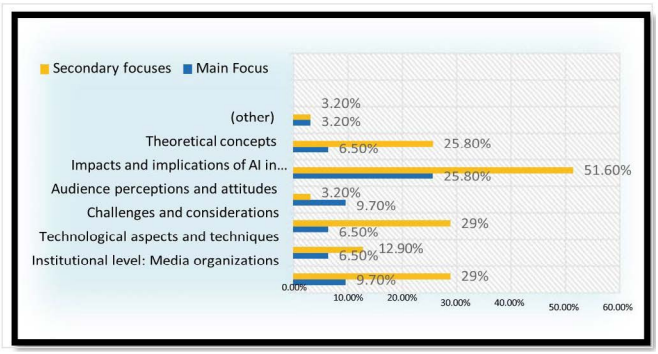

Figure 3: Main and secondary focuses of the research sample

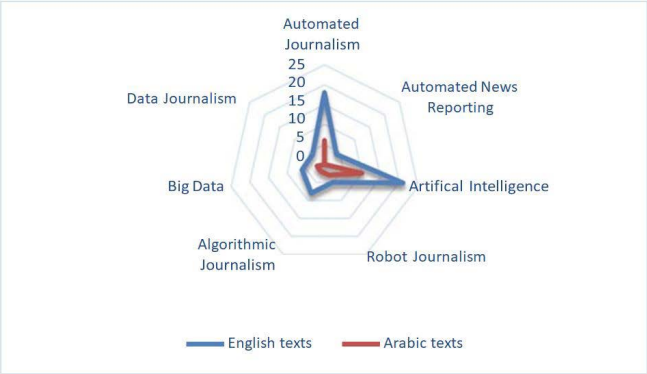

Figure 4: Most-frequent keywords used in the sample

processing (ANLP). This is an application of AI and machine learning used to understand modern standards and dialects.

Despite the increasing research in this field, more work is needed to effectively use it in automated news production.

Research about using AI tools in journalism reflected researchers' perspectives about several ethical and professional challenges that should be carefully handled as long as an increasing number of media organizations adopt AI tools. Using algorithms in journalism can help overcome some of the of ethical challenges that traditional media faces. It helps unburden journalists from their daily extensive routine work, giving them an opportunity to focus on in-depth analysis and reporting, and enables journalists to consider moral requirements in their work, like checking multiple news sources, giving more attention to human dignity and respecting privacy, etc. (Holbuchner, 2017). However, previous research about AI in journalism highlighted several ethical and professional challenges that emphasize the importance of the role of human journalists and the need for advanced skills in modern newsrooms.

In this regard, the meta-analysis conducted by Graefe & Bohlken (Bohlken, 2020) on readers' preferences for human-written versus automated news revealed that human-written news stories were rated better than automated news with respect to quality. However, they pointed to a possible ethical challenge related to news organizations and how they could deal with readers' disapproval of automated news. Moreover, there is another concern in this regard, as news organizations are more interested in adopting AI to avoid the cost of human journalists' resources (Gouda, 2020).

In his article, Ali (Hssoun, 2017) concluded that several professional challenges exist, like undermining creativity and the absence of monitoring and bias, in addition to ethical challenges like missing transparency, insufficient fact-checking, and data manipulation. Regardless of the technological development and the advanced tools used to collect and process data, journalism is still about critical thinking that answers the question "why" and helps to make people better aware of events and important public issues. Biswal and Gouda (2020) highlighted professional concerns about data-driven, AI-driven journalism that could lack creativity, humor, and critical thinking, which will remain forever in the field of journalism. Another perspective about the ethical considerations of using AI in media was provided by Dörr and Hollnbuchner (2017) who discussed concepts of AJ ethics and differentiated between new media ethics, digital media ethics, cyberethics, and traditional media ethics. According to them, algorithmic journalism's ethical implications are in the overlapping fields of digital media and cyberethics.

Research emphasized the danger of AI bias and the hard work human journalists should do to highlight how they used AI to help their reporting or production (Hansen, 2017). The analysis revealed different views in this respect. While Thurman et al. (Kunert, 2019) supported the idea of "mechanical objectivity," or the belief that algorithms, automation, and news machine systems are capable of offering representations and outputs "that overcome the limits of human subjectivity, other researchers urged that algorithms may generate unbalanced news due to biased data obtained from biased sources. Dalgali and Crowston pointed out that data inputs could be created to manipulate readers' minds and attitudes towards current events according to the data providers' purposes, while readers perceive these manipulated stories as objective since they are automatically generated.

In the same context, Monti (2017) urged that the accountability of the automated news transmitted becomes more important in the political field if it reflects the public debate. Readers should be clearly informed of how AI tools were used to collect data, their publicity, perform an analysis, and whether the stories are automatically generated or human-written productions (Hansen, 2017). If not, this is an ethical concern related to transparency. The question is: if ethical rules are violated, errors occur, or collected data is misused, who will be responsible for such violations?

Obviously, the use of AI and big data provides opportunities to enhance reader engagement and content personalization and can contribute to the improvement of professional practice (Calvo, 2021). However, according to Hansen et al.'s production (Hansen, 2017), there is a challenge in achieving "a balance between personalized content focusing on individual interests and remaining committed to journalism's public service mission.". Another concern arises due to the increasing role of the 'Big Tech' technological competitors, like Facebook and Google, in the news industry and their control of research and product development, urging a need for transparency, dialogue, and support for journalism from technology companies.

According to Santos and Ceron, most of the applications that use AI in the news industry rely on grants from big

tech companies such as Google and Facebook, which raises serious concerns about the development of technological innovations in news media since "these 'Big Tech' decide who receives their money, when they receive it, and where it goes". Research also revealed other concerns, as technological developments have no solutions to legal problems emanating from algorithm-generated content about private citizens. The communication and knowledge gaps between journalists who use AI tools and programmers who design them probably lead to journalistic malpractice.

The use of artificial intelligence tools in journalism is still in its infancy. However, as this phenomenon has already changed many professional practices in journalism, researchers from different countries, like the United States and Western Europe, provided some interesting academic work. Meanwhile, reviewing previous studies about AI and journalism revealed that only a few of them suggested future research areas based on their findings.

Accordingly, this study aims to suggest future research agendas based on the thematic analysis of the available academic production. This will help Arab researchers to fill the gap and focus on research areas that meet media organizations' needs to develop their usage of AI and to handle the possible ethical and professional challenges and considerations resulting from using AI in newsrooms.

Theoretical and Methodological Considerations. Although research on AI applications used by news organizations is still in its early stages, the review of the IC sample reflected the emphasis on empirical research without providing sufficient theoretical contributions to study the new phenomena in the socioeconomic, cultural, and political contexts of the countries. This is not a new concern in media research; according to Ayish (1998), the introduction of mass media studies in countries was marked by strong Western influences, limiting the scope of several empirical studies to specific countries (Jia, 2020) or languages and preventing generalization of results. Studies about AI and journalism either repeatedly applied the same theoretical approach, the "Technology Acceptance Model," or the "Diffusion of Innovations.".

We suggest future research work on developing a theoretical approach that helps to study and interpret journalism in a comprehensive context. The analysis also highlighted the ambiguity of definitions between automated journalism, big-data journalism, robot journalism, AI journalism, and algorithm journalism, as those terms were used interchangeably due to the vague boundaries between them. There are different types, starting with computer-assisted reporting (CAR), where journalists use technology to access information, store and process it, use databases and algorithms in data analysis and processing, and then produce fully automated content. Some definitions focus on automated content production as the most important aspect of algorithmic journalism while neglecting other applications of algorithmic technologies in the news production field.

Other definitions described the wider scope of applying algorithms in journalism, referring to the integration of algorithms, technology, data, and knowledge from the social sciences to complement the accountability function of journalism. Although broad definitions include the various technological applications used in journalism and emphasize the contribution of human workers in these procedures, such definitions should be avoided, as they do not help to get a better understanding of the exact focus of the subject matter. Accordingly, we suggest that future research should differentiate between fields of using technology in journalistic professional practices.

Audience Research

In this meta-analysis research, Grace and Bohlken (2017) showed notable findings about users' preferences for automated compared to human-written news, while the direction of effects differed depending on the type of evidence in the study. Studies also concluded that we still do not know what factors make users perceive automated and human-written news to be more or less credible or readable (Gouda, 2020; Jia, 2020; Kotenidis, 2021). It is still not clear why automated news tends to be perceived as more credible but less readable than human-written news. Hence, future research should focus on examining audiences' perceptions of AI-produced news stories.

On the other side, studies about AI application usage in journalism (M, 2021) and Khuly (2020) haven't yet considered readers' perceptions and preferences of automated and human-written journalism. Alternatively, they focused on examining journalists' attitudes towards using AI tools and the impacts of this practice in newsrooms. This highlights the need to thoroughly study the audience and readers' perceptions of automated news and content and what factors affect their perceptions of the quality and credibility of such content.

Conclusion

Although journalists face many problems in most countries to access information and obtain accurate and updated databases available as open source (Fahmy, 2021), we are talking about AI technology as a new actor in the newsrooms. While journalists still fight to get access to data, self-training on using open-source technologies, and practicing digital storytelling, introducing AI in newsrooms at this stage with no adequate preparation raises several concerns and challenges. This critical situation mandates a clear agenda for academic research in this early phase.

Studies discussed AI in the field of journalism from various perspectives: technical (media as professional practices, values, and norms), ethical and legal perspectives, and social perspectives. Other perspectives include media institutions, journalists, and users' preferences.

Many of the reviewed samples did not follow a theoretical framework; few of them focused on the conceptual basis of the new phenomenon. However, examining AI in a wider context requires considering micro and macro factors and analyzing institutional, professional, and socioeconomic factors affecting the usage of AI applications in media.

Although studies pointed to the importance of AI and algorithmic technologies in making news more objective through effective data collection and mining, journalists still hold the responsibility for selecting which stories to publish or to neglect. A controversial aspect of the responsibility of journalists in comparison to robots is that of programmers, one of the most highlighted themes in the literature review. There are many aspects that previous research highlighted as priorities in future research, including how the performance of human-written and automated news evolves over time (Haim, 2017). Future researchers should investigate the new professional roles in newsrooms due to the influence of AI and the role of 'Big Tech' companies in enhancing or limiting innovations in newsrooms (R. Santos, 2021).

We suggest future research should identify which journalism fields AI can improve and produce innovations into with the lowest risk possible. Also, research should analyze the challenges and best innovative practices of using AI in the Arab journalism field to promote and encourage using AI as a work routine.

Developing curriculum to introduce AI skills in universities can support future generations of journalists with AI skills and tools. Meanwhile, organizing training sessions for AI practice in journalism will improve its usage in newsrooms. Scholars should also consider developing new models for traditional theoretical approaches to study the impact of using AI in journalism on their audiences. Users' preferences, behaviors, and attitudes towards automated vs. human-written news content are still uncovered in the in the research area. This could be interpreted by the explanatory phase of AI in journalism. This primary stage allows researchers to conduct empirical studies to examine users's perceptions of credibility, quality, and interest in automated content. Additionally, there are no scholar contributions to educating media skills and the requirements to upskill media students in the AI era. This is a research gap in the academic production of AI and journalism. Finally, despite the limitations of this study, it can help to crystallize the agenda for future research about AI and journalism.

Findings

- There is a critical need for clear academic research agendas to address the challenges and concerns arising from the introduction of AI technology in newsrooms, particularly due to the lack of adequate preparation.
- Studies have approached AI in journalism from various perspectives, including technical, ethical, legal, and social viewpoints, highlighting the need for a comprehensive understanding of its implications.
- While AI technologies contribute to objectivity in news by enhancing data collection and mining, journalists retain responsibility for story selection, prompting discussions on the role of programmers in comparison to journalists.
- Future research should focus on identifying journalism fields where AI can bring improvements with minimal risk, analyzing challenges and best practices in Arab journalism, and developing AI curriculum and training sessions for journalists.
- Scholars should explore new theoretical models to study the impact of AI on journalism audiences, investigate user preferences for automated versus human-written content, and address the gap in educating media students about AI.
- Despite limitations, this study serves to outline key areas for future research on AI and journalism, providing a foundation for further exploration in the field.

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