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Research Article

Robot Journalism Based on Artificial Intelligence Technologies: Professional and Ethical Challenges

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ABSTRACT

This study explored Palestinian journalists' awareness of robot journalism based on artificial intelligence (AI) technologies and examined its advantages, disadvantages, and professional and ethical challenges. Using a descriptive-analytical methodology, the researcher surveyed 300 randomly selected Palestinian journalists. The findings revealed a high awareness among journalists about AI-based robot journalism and highlighted several key aspects. The study identified significant challenges, including AI's inability to verify the accuracy of its inputs and the lack of legal accountability for AI technologies. It recommended enhancing journalists' awareness of the importance of accuracy in using AI, ensuring legal and ethical accountability, and providing training to develop relevant skills. Additionally, the study suggested that media institutions should establish clear policies for the use of AI technologies in journalism.

Keywords: Professional Challenges, Ethical Challenges, Robot Journalism, Artificial Intelligence Technologies.

Introduction

Due to significant technological advancements and the emergence of various modern technologies, artificial intelligence (AI) stands out prominently. AI has become a subject of interest among scientists and researchers across various fields. In media, AI has introduced an advanced concept known as algorithmic journalism or automated journalism, commonly referred to as robot journalism (Amato et al., 2019). Robot journalism can be perceived as the amalgamation of algorithms, data, and knowledge derived from social sciences to complement journalistic work. It primarily relies on two familiar approaches in journalism: the first approach involves computer-assisted news reporting (Jung et al., 2017), while the second approach utilizes social science tools in journalism to achieve accuracy (Latar, 2015).

With the rapid development of AI technology, media institutions worldwide have begun adopting robot journalism to meet the increasing demands of their audience (Moran & Shaikh, 2022). This technology has not only enhanced the ability of media institutions to produce high-quality news content rapidly but has also facilitated precise analysis of vast amounts of data, allowing journalists to focus on in-depth investigations and more complex stories (Trattner et al., 2022). However, this radical shift in journalistic methods raises numerous questions about the role of traditional journalists and the future of the journalism profession (Peretti, 2019). Will the increasing reliance on robots diminish the role of human journalists? How can journalists adapt to these changes to ensure their relevance in this digital age? These questions call for an in-depth study to understand the professional and ethical challenges posed by robot journalism.

Furthermore, there is an urgent need to discuss the ethical dimensions associated with the use of AI technologies in journalism. Despite the numerous benefits of these technologies, they may lead to the spread of fake news or inaccurate content if not managed properly (Porlezza, 2023). Therefore, media institutions must establish stringent ethical standards and guidelines to ensure integrity and transparency in news production using robot journalism.

Problem Statement

Many previous studies have highlighted robot journalism as a new concept and a new working mechanism, facing various professional and ethical challenges. For instance, Hassanawi and Saqalli (2017) revealed that despite the advantages offered by robot journalism, it raises several professional challenges related to information transparency, copyright responsibility, and the violation of journalistic ethical standards. Similarly, the study by Al-Werqli and Baadhi (2019) indicated ethical and professional challenges in relying on robot journalism, including the lack of transparency and credibility of the vast amount of collected information, misuse of that information, and accountability issues.

Moreover, Al-Siraira and Tawmar (2018) demonstrated that robot journalism faces numerous ethical and professional challenges, including the level of data research and its accuracy, the authenticity of the algorithms used, their objectivity and transparency levels, data usage methods, misuse levels, and the values and logic included in programming instructions. Additionally, there are ethical challenges related to algorithmic accountability, with a focus on news reporting. Some other challenges stem from the hierarchical structure within media institutions and editorial departments, which have diminished due to the technical nature of robot journalism, as well as the roles played by external service providers.

On the other hand, this type of journalism (robot journalism) faces a challenge in terms of journalists' awareness of its concept, operational mechanisms, and the technologies used in it. Sama Center for Studies (2018) highlighted that robot journalism poses a real challenge for journalists in understanding its operation due to its novelty and its technical and algorithmic complexities. This necessitates journalists to develop their skills to adapt to the new environment. Additionally, the results of Daewon et al. (2018) indicated that 53% of the surveyed journalists do not fully understand the concept of robot journalism, while Thurman et al. (2017) revealed that 64% of journalists working in online journalism, the study sample, are unaware of the mechanisms and technologies of robot journalism. Based on the fact that robot journalism is a new topic in the field of journalism that Palestinian journalists may encounter, the problem of the study arises in answering the main question: What are the professional and ethical challenges of robot journalism based on artificial intelligence technologies from the perspective of Palestinian journalists?

Research Questions

This study aims to answer the main question: What are the professional and ethical challenges of robot journalism based on artificial intelligence technologies from the perspective of Palestinian journalists? This will be achieved through the following sub-questions:

1. To what extent are Palestinian journalists aware of robot journalism based on artificial intelligence?
2. What are the advantages and disadvantages of the proliferation of robot journalism based on artificial intelligence from the perspective of Palestinian journalists?
3. What are the most significant professional and ethical challenges associated with robot journalism based on artificial intelligence from the perspective of Palestinian journalists?

Significance of the Study

The study of the professional and ethical challenges of robot journalism based on artificial intelligence is of great importance from the perspective of Palestinian journalists. Journalists in Palestine focus on maintaining professionalism and content quality by understanding the ethical and professional challenges of these technologies. They also seek to maintain public trust in the media and consider the impact of robot journalism on the journalistic labor market. The significance of the study can be highlighted from both theoretical and practical perspectives:

- **Theoretical Significance:** The importance of the study lies in addressing a new and unique phenomenon in the media field, namely robot journalism based on artificial intelligence. The novelty of the topic and the scarcity of previous Arabic studies – within the researcher's knowledge – prompted the researcher to conduct such a study. The study of robot journalism based on artificial intelligence is a recent field in Arab media studies in general and Palestinian studies in particular.
- **Practical Significance:** The significance of the study lies in the importance of the results it will yield, by identifying the extent of awareness among Palestinian journalists regarding robot journalism based on artificial intelligence, as well as the ethical and professional challenges associated with this type of journalism.

Objectives

This study aims to achieve the following objectives:

1. To determine the extent of awareness among Palestinian journalists regarding robot journalism based on artificial intelligence.
2. To identify the advantages and disadvantages of the proliferation of robot journalism based on artificial intelligence from the perspective of Palestinian journalists.
3. To determine the most significant professional and ethical challenges associated with robot journalism based on artificial intelligence from the perspective of Palestinian journalists.

Literature Review

AI-Powered Robot Journalism and its Professional and Ethical Challenges

The advancements in artificial intelligence (AI) technologies have introduced a sophisticated concept to the realm of media known as robot journalism, which is likely to lead to significant transformations in the structure and operations of media institutions. However, debates persist regarding the threat posed by these robots to journalists, in addition to the legal responsibility in cases where ethical boundaries of the profession are crossed (Mousadi & Al-Saraireh, 2022). AI technologies have strongly penetrated global news organizations, successfully generating thousands of news stories without human intervention, starting from information gathering and classification to editing and publication. This poses a threat to the future of journalists if media institutions opt to replace human elements with robots (Al-Warqali & Al-Ba'adi, 2019).

1. Concept of Robot Journalism

It seems that advancements in AI technologies and the enhancement of robots' creative capabilities are progressing faster than expected. Recently, many media outlets have ventured into this field, including major news agencies and media institutions utilizing intelligent robots to assist in executing some journalistic tasks to lead in the media field (Break, 2020; Hansen et al., 2017). Robot journalism is a new innovation in the field of journalism, involving the use of algorithms to generate news automatically without human intervention. Once programmed, these algorithms automate every step of the news production process from collection and analysis to publication (Višňovský et al., 2019). Here, algorithms refer to a set of procedures and instructions designed to perform a specific task, ranging from simple operations like addition and subtraction to complex tasks such as processing video files used by search engines to display the most relevant results. They are procedures crafted to process data through specific computer operations, consisting of a series of clear instructions ensuring the execution of solving a particular problem (Lemelshtrich, 2018).

Robot journalism, created by algorithms and computer software, is associated with the automation of news in media institutions, raising significant concerns including the potential replacement of journalists and the substitution of AI technologies for them. While still in its infancy, literature indicates that the first news story produced using algorithms was written over forty years ago at Yale University in the United States. Over the past decade, with the use of algorithms, the journalism profession has undergone significant changes due to these technological shifts (Al-Saraireh & Tuomar, 2018). The media industry has begun utilizing algorithms to produce news from organized data without human intervention. For instance, the Associated Press began using algorithms in 2015, employing Wordsmith, a software tool developed by Automated Insights, to produce news reports on corporate earnings (Thurman et al., 2017).

Robot journalism, also known as automated journalism or algorithmic journalism, refers to the creation of stories and news from organized data, delivered automatically (Aljazairi, 2016). Robot journalism can be defined as "the process of combining algorithms, data, and knowledge derived from the social sciences to complete the accountability function in journalism, primarily relying on two familiar approaches in journalism: firstly, connected with writing news reports with the aid of computers, and secondly, related to using social science tools in journalism to achieve accuracy" (Hamilton & Turner, 2016). On another note, robot journalism can also be defined as the collection and classification of information and its transformation into complete news stories and reports automatically, eliminating the known human intervention during the news gathering and editing process (Caswell & Dörr, 2018).

Robot journalism entails the use of artificial intelligence systems in the process of writing news stories without any human intervention (Manaa & Al-Shahab, 2018). It is also defined as journalism relying on algorithms in generating natural language supported by AI applications to automatically convert data into news stories, whether texts, images, videos, or data, and then distributing them across digital platforms. This technology has gained significant importance with its increasing application in various news agencies, newspapers, and websites, revolutionizing news coverage in economic, sports, weather, and disseminating thousands of news stories (Jonathan, 2019).

Pros and Cons of Robot Journalism

The main advantages and disadvantages of robot journalism can be reviewed as follows:

1. Automating Routine Reporting: The use of artificial intelligence in journalism has facilitated the rapid expansion of coverage. It is expected that 90% of articles will be written using AI techniques within 15 years. Similar technology is available to summarize long articles into bite-sized content for social media platforms. Additionally, technology can save journalists time, freeing them to conduct interviews with real people (Abdulhamid, 2020).

2. Providing Faster Insight: Artificial intelligence has the ability to interact immediately with data in real-time, outlining the story's main points. While some quarterly reports, such as performance and attribution reports issued by large mutual funds, traditionally took weeks of effort by a team to craft, these reports can now be prepared using AI techniques in seconds (Abdelzaher, 2019).

3. Lowering Barriers to Entry: AI techniques can reduce the human element in content creation, enabling journalists to create short videos in seconds or gather information from real-world sources. However, this does not eliminate the need for journalists, as the quality of AI journalism depends on the data it uses and often cannot present new issues. It is also currently unable to develop deep critical analysis of described phenomena (Alwarqli & Ba'adi, 2019). Lopez and Abd (2019) argue that robot journalism has a set of disadvantages, which can be summarized as follows:

1. It may serve as a tool for some harmful activities and may suppress the freedom of some media outlets by broadcasting uniform messages. The person controlling a single content setup, which can be shaped through a "robot", autonomous moving cameras, or passing satellites beyond the borders and laws of countries.
2. The entry of robots into journalism requires the establishment of new ethical charters, in which the institution bears the consequences of accuracy, balance, transparency, conflicts of interest, and others.
3. Robots cannot be as creative as humans and do not have the ability to go out into the field and conduct interviews with people; they are only capable of distinguishing between data and their sources.
4. The ethical and professional challenges facing robot journalism. Since its spread in the last two decades of the twentieth century, robot journalism has faced some challenges from both professional and ethical perspectives. These challenges have been discovered at varying levels, including data search level, as well as the authenticity, objectivity, and transparency of algorithms used, methods of data use, extent of misuse, and the level of values and logic included in programming instructions (Aljazairi, 2016).

Ethical Challenges

Ethics in journalism constitute one of the main foundations of the profession, meaning journalistic integrity is crucial in defining the purpose of this profession, which is fundamentally a public service aimed at benefiting society by providing the public with the necessary facts, information, and truths to shape an informed public opinion (Hall, 2018). This role is essential given that public opinion serves as a source of authority in democratic systems. Therefore, media ethics, by defining a set of principles, values, and behaviors, are directed simultaneously towards journalists, ensuring the preservation of the core mission of journalism and keeping journalists away from actions driven by personal motives or detrimental to society or others (Saddiqah, 2008). With technological and social advancements, values and responsibilities allocated to journalism and journalists have changed accordingly. Due to advancements in natural language processing technology, large amounts of text can now be automatically generated from digitally organized data. These transformations have led to various ethical and professional challenges. These challenges have been identified at different levels, including data search levels, the authenticity of algorithms used and their objectivity and transparency levels, methods of data usage, extent of misuse, as well as the level of values and logic embedded in the code instructions. Added to these are the ethical challenges of algorithmic accountability with a focus on news reporting (Thurman et al., 2017).

Journalistic ethics are defined as: "those ethical principles and standards not yet legally established but accepted in journalistic media, supported by public opinion and popular and partisan organizations. It can be said that journalistic ethics are those ethics related to the profession of journalism, a set of values related to the daily practice of journalists and a set of interconnected rights and obligations of the journalist" (Abdelmalek, 2013). Robot journalism faces numerous ethical challenges, including:

- **Objectivity and transparency:** The primary problem with current artificial intelligence articles lies in their low quality in terms of narrative considerations. They face criticisms regarding legal and ethical aspects. Several studies have indicated that the use of artificial intelligence tools in newsrooms - such as machine learning, natural language processing, facial recognition, and rapid input of robots into newsrooms, and using social media for predictive analytics, for example, needs more transparency and disclosure of practices than ever before. For instance, in 2015, Google faced widespread criticism when software engineer Jacky Alcint discovered that Google Photos' image recognition algorithms were tagging Black individuals as gorillas, a horrifying and racist connection. However, the reason behind this was mainly due to a lack of a racist engineer behind the scenes, but rather a misinterpretation of a dataset due to the use of artificial intelligence techniques that linked gorilla images with African Americans (Latoya, 2018).
- **Ethical responsibility:** Manifested in ensuring corporate accountability: Since artificial intelligence technologies cannot be legally held accountable, human accountability must be incorporated at all stages of the content production chain relying on artificial intelligence technology. Content distributors such as Facebook, Google, and Twitter, with unprecedented power to inform and shape public opinion, need to prevent the dissemination and promotion of harmful information by the algorithms they develop. Platforms, as owners of production means, bear responsibility for preventing the deliberate spread of misleading content, while better measures are needed to ensure the cessation of intentionally misleading content (Thurman et al., 2017).

- **Bias and distrust:** Waddell and Franklin (2019) identified a set of factors influencing the credibility and trust of robot journalism. Among these factors associated with the source, the more trusted, respected, and convincing the source is to the public, the more credible and trustworthy it becomes, and the more impactful it is to the recipient. Source credibility is a multidimensional concept comprising many factors, the most enduring of which include source expertise and trustworthiness. Factors related to message framing and presentation are also crucial since source credibility is primarily linked to the persuasive power of the message. Some have associated credibility with message framing in terms of the clarity of language used and the content's coherence. Additionally, message credibility is associated with the concepts of bias, fairness, objectivity, accuracy, and believability.

Professional Challenges

The initial focus of automated journalism was on increasing news production and reducing costs (Kim & Seongcheol, 2018). However, with the proliferation of algorithmic editors and the adoption of this new technology by many major newspapers and media institutions worldwide, discussions shifted towards ethical issues, regulations governing this technology, and defining rights and responsibilities concerning the machine (software) that develops the software and the automatically produced content (Aljazairi, 2014). In general, there are several challenges facing the use of artificial intelligence (AI) techniques in journalism, including:

1. **Availability of Data:** AI techniques can be utilized more effectively when there is sufficient data available to capture patterns, learn from them, and improve the system accordingly. While humans can draw optimal responses from a few similar experiments, AI requires large amounts of data to determine the correct response. Without data availability, the capability of AI is limited (Break, 2020).
2. **Understanding Unstructured Data:** AI techniques also face difficulty when dealing with unstructured data. For example, scheduling results of sports games or profit data can be easily translated into articles using standardized templates. However, for AI to become more prevalent in the creative economy, it needs to harness and process unstructured data, which constitutes the majority of available data today (Mark et al., 2017).
3. **Lack of Self-Awareness:** AI techniques cannot explain their outputs - what they wrote, what they did, or how they arrived there. Understanding how to translate data into a specific story requires designing AI to be accountable to the public. One way to achieve this, especially with data-rich content, is by allowing the audience to adjust algorithm parameters to see how the results change. When applied to news, consideration should be given to whether new journalistic standards are needed so users know whether the story is authored by a machine or a human (Stefan, 2018).
4. **Verifying Authenticity:** AI techniques cannot distinguish whether the inputs they receive are accurate or inaccurate, which can lead to authenticity problems. If AI receives questionable input, the resulting output may be incorrect. The solution lies in developing and implementing mechanisms to ensure the accuracy of articles shared online.
5. **Redefining Copyright and Fair Use:** Modern technologies often challenge copyright laws and creative industries. AI technologies may pose a new challenge as they involve AI learning from expressive works created by humans - a dataset of articles, paintings, or music. This could test the legal interpretation of fair use, as copyrighted material is used to produce journalistic content without permission or payment (Mattia, 2019).
6. **Exacerbating Asymmetrical Power:** Larger newsrooms build their own AI, but smaller newspapers may lack the financial or technical capabilities to do so and may resort to licensing content. This raises concerns that smaller institutions may opt for purchasing instead of building, fueling an arms race favoring AI that strengthens the power of certain companies (Break, 2020).

Many researchers have conducted studies and research on the subject of journalism relying on artificial intelligence technologies, and the professional and ethical challenges of such journalism. Abdelhalim (2024) conducted a study aimed at identifying the reality of Arab journalism in the era of artificial intelligence technologies. The study found that news published by human elements is greater than topics published by artificial intelligence. It also found that the news category is the most utilized journalistic form on the study sample's news websites, and that economic topics ranked at the forefront of topics published by artificial intelligence.

Moravec et al. (2024) investigated the discernment of news articles generated by artificial intelligence (AI) versus those created by humans among 1041 participants in the Czech Republic. Additionally, the study delved into attitudes regarding AI-generated audio recordings and the anticipated role of AI in journalism's future landscape. Results revealed that demographic factors such as gender, age, and socioeconomic status significantly influenced participants' ability to distinguish between human and AI-generated texts. Females exhibited higher proficiency in identifying human-generated content, while males demonstrated greater accuracy in identifying AI-generated content. Moreover, younger respondents generally displayed better recognition of AI-generated texts, with education and income levels positively correlated with discernment accuracy. Attitudes toward AI's integration into journalism varied across age groups, with the 18–29 cohort

expressing ambivalence, the 30–49 cohort exhibiting uncertainty, the 50–69 cohort showcasing diverse perspectives, and the 70+ cohort displaying skepticism. Notably, males were more sanguine about AI's potential in journalism compared to females, particularly among older age brackets. The findings underscore the necessity for targeted digital literacy initiatives tailored to diverse demographic segments, offering valuable insights into enhancing digital literacy and gauging public readiness for automated information dissemination—a critical consideration for navigating future technological advancements.

Masoudi and Al-Saraireh (2022) conducted a study aimed at identifying the trends of Jordanian journalists towards "robot journalism" and its effects on various variables, including journalist employment, ethical and professional aspects in the field, and media language. The study results showed that 33.3% of the Jordanian journalists believe that the term "robot journalism" can be applied to the phenomenon, while the majority (56.7%) do not. Furthermore, 55.3% of the Jordanian journalists perceive "robot journalism" as lacking clear professional rules, and 48.2% of them see it as mechanistic and lacking humanity.

Additionally, Badawi (2021) conducted a study aimed at understanding the application of robot journalism and its production mechanisms on the Cairo 24 news website, as the first Egyptian site to apply this model of artificial intelligence technologies. The study aimed to identify the benefits or value it added to the site, reveal the new practices it imposed, and examine the nature of the relationship between robot journalism and human journalists. The study concluded several important results, including the significance of applying robot journalism in Egyptian news websites for its ability to produce and present more distinctive journalistic content than that produced by human journalists, and its positive impact on the professional and ethical aspects of journalism.

Furthermore, Hamdi's (2020) study aimed to understand the concept of robot journalism, its prevalence in the media scene, and its ability to deal with real-life issues. To achieve this goal, the researcher adopted a descriptive-inductive methodology, reviewing literature, previous studies, and relevant references on robot journalism. The study revealed several results, including the absence of human characteristics in robot journalists, which leads editorial teams to select topics described as realistic for robot writers. Additionally, robot journalists cannot analyze or contextualize stories or support narratives with important facts. On the other hand, robot journalists may bring a set of their own skills, indicating a successful future for robot journalism, as evidenced by the trend of many news organizations towards using algorithms in journalism work.

Furthermore, the study by Lopez, Bran & Abd (2019) aimed to identify the impact of robot journalism on the news industry and the quality of industrial journalism. The study results showed that many organizations are automating journalism in organizational relationships with the media, in the media themselves, in source relations with journalists, in the way journalists communicate with newsrooms, and in the emergence of multimedia contents and the ability to dialogue with audiences to meet their preferences. The results also showed that robot journalism affects the quality of journalism, leading to the widespread dissemination of fake news.

Antono & Kyriazis (2018) conducted a study to understand the concept of robot journalism, its mechanism of action, the technologies used, and to identify the extent of awareness of Greek journalists about the concept and mechanism of robot journalism. To achieve the study's objectives, the researchers adopted a descriptive-analytical methodology, relying on a sample of 90 Greek journalists. The study found that a new type of journalism, robot journalism, has been developed, which relies on artificial intelligence programs and advanced natural language generation, automatically producing articles in human-readable ways. Most Greek journalists (71%) are not fully aware of robot journalism. However, Greek sports journalists who covered the Rio Olympics had the opportunity to work on this type of journalism.

Additionally, Lewis, Sanders, & Carmody (2018) conducted a study to understand the concept of automated journalism (robot journalism) and its accompanying legal concerns and threats, as well as to identify the legal responsibility for the information produced and its relation to defamation. The study results showed that algorithm-based robot journalism, which organizes data and turns it into news stories, poses fears and risks to news institutions. One of the most significant potential legal risks, not explored in journalism studies, is the possibility of algorithms producing defamatory news content. Legal cases involving algorithms and defamation suggest that news institutions must seriously consider legal responsibility while developing and deploying news writing programs.

Lastly, the study by Daewon, et al. (2018) aimed to understand the concept of robot journalism and identify the attitudes of three types of newspaper journalists towards robotic journalism using the Q methodology. The study found that generally, 53% of the surveyed journalists do not fully understand the concept of robot journalism. Three types of attitudes were identified among journalists: the first type believes that journalism surpasses robot capabilities, termed "journalistic elitism." The second type indicates greater concern about robot introduction based on negative scenarios, termed "Frankenstein complex." The last type has a relatively moderate perspective, focusing on a positive outlook despite recognizing some threats.

Methodology

The study adopted the descriptive-analytical methodology suited to the nature and objectives of the study. The phenomenon of robot journalism relying on artificial intelligence and its prevalence were described, and the most significant ethical and professional challenges associated with it were reviewed. Furthermore, the data obtained from the responses of Palestinian journalists to the study tool, represented by a questionnaire developed by the researcher, were analyzed.

Study Population and Sample

The study population consisted of all Palestinian journalists registered with the Journalists' Syndicate, numbering (2622) in the year 2023. As for the study sample, a simple random sample was employed from the study population, consisting of (300) registered journalists in the syndicate.

Validity and Reliability of the Study Tool

The validity and reliability of the study tool were verified through content validity, in addition to the reliability coefficient Cronbach's alpha. This verification included the following:

Content Validity: This refers to the extent to which the items of each study variable accurately represent the variable to which it belongs. Emphasis was placed on ensuring that each study variable is accurately represented by a set of paragraphs or phrases appropriately, and that these paragraphs effectively measure the variable. The content validity of the questionnaire was measured by assessing the relationship between each item and the axis to which it belongs, excluding items with weak correlation coefficients based on correlation relationships exceeding 95% significance level at ($\alpha \geq 0.05$).

Table 1: Content Validity for Domains of Concept and Robot Journalism

Domain	r	Significance Level
Domain 1: Concept of Robot Journalism	0.82	0.000**
Domain 2: Advantages of Robot Journalism	0.89	0.000**
Domain 3: Disadvantages of Robot Journalism	0.91	0.000**
Domain 4: Professional Challenges of Robot Journalism	0.88	0.000**
Domain 5: Ethical Challenges of Robot Journalism	0.81	0.000**

****Statistically Significant at (0.01 Level)**

From the previous table, it is evident that the correlation coefficients for the domains of the study tool items ranged between (0.81) and (0.91). These are statistically significant at the (0.01) level, indicating strong internal consistency for the domains of these items.

Reliability of the Study Tool

The reliability of the study tool was ensured by calculating internal consistency using Cronbach's alpha equation for each domain and for the overall average of the study tool items (the questionnaire), as follows:

Table 2: Reliability of Study Tool Domains Using Cronbach's Alpha Coefficient (n=300)

Domain	Number of Items	α
Domain 1: Concept of Robot Journalism	8	0.88
Domain 2: Advantages of Robot Journalism	6	0.92
Domain 3: Disadvantages of Robot Journalism	5	0.91
Domain 4: Professional Challenges of Robot Journalism	6	0.89
Domain 5: Ethical Challenges of Robot Journalism	6	0.91
Total Items	31	0.93

The results of the previous table indicate that the Cronbach's Alpha coefficient for all domains of the study tool reached (0.93), which indicates reliability, and a reliability coefficient greater than (0.70) is considered acceptable.

Analysis of Study Questions

To understand the perceptions of the Palestinian journalists regarding the axes and areas of the study, and to answer its questions, the arithmetic means and standard deviations of their responses were calculated. The results are presented in the following table:

Answering the first question: To what extent are Palestinian journalists aware of AI-based robot journalism? To answer this question, the arithmetic means and standard deviations of the responses of the study sample to the paragraphs related to the first question were extracted. Table (3) shows these results.

Table 3: A. M. and S. D. of Sample Responses on Paragraphs Regarding the Concept of Robot Journalism

No.	Paragraph	A.M.	S.D.	R.I.
1	Robot journalism is the process of gathering, categorizing, and writing information in the form of news and full news reports automatically.	4.14	0.78	High
2	Using intelligent robots to assist media institutions in performing some tasks of journalists.	3.88	0.78	High
3	Robotic journalism is a new innovation in journalism, where algorithms are used to generate news without human intervention.	4.12	0.73	High
4	Producing news from organized data by computers without human intervention.	3.72	0.90	High
5	Combining algorithms, data, and knowledge derived from social sciences to complete the accountability function in journalism.	3.69	0.99	High
6	Gathering, categorizing, and writing information in the form of news and full news reports automatically.	4.00	0.95	High
7	Algorithm-based journalism in generating natural language supported by AI applications to automatically convert data into news stories.	3.97	0.94	High
8	Journalism that produces news through artificial intelligence programs, by machines rather than human reporters.	3.93	0.88	High
	Mean of Arithmetic Means	3.93	0.86	High

The results in Table (3) indicate that the arithmetic means of the sample individuals' estimations for the paragraphs related to the concept of robot journalism ranged between (3.69-4.14). Paragraph (1), which states: "Robot journalism is the process of collecting, classifying, and writing information in the form of news and comprehensive reports automatically," ranked first, with an arithmetic mean of (4.14) and high relative importance. On the other hand, Paragraph (5), which states: "The integration of algorithms, data, and knowledge derived from social sciences to enhance accountability in journalism," ranked last, with an arithmetic mean of (3.69) and also high relative importance. The data in the previous table also indicate that the arithmetic mean for the paragraphs related to the concept of robot journalism as a whole was (3.93), with high relative importance. This suggests a high level of awareness among Palestinian journalists of the concept of robot journalism.

Answering the second question: What are the pros and cons of the spread of AI-based robot journalism from the perspective of Palestinian journalists? To answer this question, the arithmetic means and standard deviations of the study sample's responses to paragraphs related to the second question were extracted, and Table (4) illustrates these results.

Table 4: A. M. and S. D. of Sample Individuals' Responses to Paragraphs on the Pros of Robot Journalism

No.	Paragraph	A. M.	S. D.	R. I.
1	Robot journalism contributes to rapidly expanding news coverage.	3.82	0.77	High
2	Robot journalism aids in summarizing long articles and presenting them concisely by focusing on key points.	3.77	0.91	High
3	Robot journalism helps access massive data and updates it instantly, continuously, and rapidly.	3.68	0.83	High
4	Robot journalism reduces the human element in content creation.	3.69	0.82	High
5	Robot journalism assists journalists in creating short video clips in seconds.	3.67	0.91	High
6	Robot journalism contributes to raising awareness and international cooperation on the importance and risks of media in bringing about massive changes.	3.72	0.90	High
	Mean of Arithmetic Means	3.72	0.85	High

The results in the preceding table indicate that the arithmetic means of the sample individuals' estimates for the paragraphs related to the advantages of robot journalism ranged between (3.67-3.82). Paragraph number (1), which states: "Robot journalism contributes to rapidly expanding news coverage," ranked first with an arithmetic mean of (3.82) and a relatively high importance. On the other hand, paragraph number (5), which

states: "Robot journalism helps journalists create short video clips in seconds," ranked last with an arithmetic mean of (3.67) and relatively high importance. Furthermore, the data in the preceding table indicates that the arithmetic mean for the importance of the advantages of robot journalism as a whole was (3.72), with relatively high importance. This indicates agreement among most of the sample individuals, Palestinian journalists, regarding the mentioned advantages of robot journalism within the analysis categories.

Table 5: A.M. and S.D. of Sample Individuals' Responses to Negative Paragraphs on Robot Journalism

No.	Paragraph	A. M.	S. D.	R. I.
1	Robot journalism contributes to the loss of a significant number of journalistic job opportunities in favor of smart machines.	3.77	0.82	High
2	It may serve some harmful agendas, and suppress the freedom of some media outlets, by broadcasting one fixed "standardized" message.	3.89	0.90	High
3	The entry of robots into journalism requires the establishment of new ethical codes where institutions bear the consequences of accuracy, balance, and transparency errors.	4.00	0.88	High
4	Robot journalism cannot be as creative as humans, and lacks the ability to go out into the field and conduct interviews with people to the same extent.	4.12	0.85	High
5	Robot journalism contributes to the loss of a significant number of journalistic job opportunities in favor of smart machines.	3.95	0.91	High
	Mean	**3.95**	**0.86**	**High**

The results of the previous table indicate that the arithmetic means of the sample individuals' estimations for the paragraphs related to the negatives of robot journalism ranged between (3.77 - 4.12). Paragraph number (4), which states: "Robot journalism cannot be as creative as humans, and it lacks the ability to go out into the field and conduct interviews with people," ranked first, with an arithmetic mean of (4.12) and high relative importance. Meanwhile, paragraph number (1), which states: "Robot journalism contributes to the loss of a huge number of journalistic job opportunities in favor of smart machines," ranked last, with an arithmetic mean of (3.69) and high relative importance. The data in the previous table also indicate that the arithmetic mean of the importance degree for the paragraphs related to the negatives of robot journalism as a whole was (3.88), with high relative importance. This means that most sample individuals agree on the negatives of robot journalism mentioned within the analysis categories.

Answering the third question: What are the most important professional and ethical challenges associated with AI-based robot journalism from the perspective of Palestinian journalists? To answer this question, the arithmetic means and standard deviations of the study sample's responses to the paragraphs related to the fifth question were extracted, and Table (6) shows these results.

Table 6: A.M. and S.D. of Sample Individuals' Responses to Paragraphs on the Professional Challenges of Robot Journalism

No	Paragraph	A. M.	S. D.	R.I.
1	Robot journalism cannot create the required atmosphere to inspire emotional reactions from readers or viewers and listeners.	3.98	0.91	High
2	Lack of human angles in the texts created by robot journalism.	3.96	0.95	High
3	AI technologies in robot journalism cannot distinguish whether the inputs they receive are accurate or inaccurate.	3.99	0.87	High
4	AI technologies in robot journalism cannot explain their outputs: what they wrote, what they did, or how they arrived here.	3.81	0.90	High
5	Robot journalism requires large amounts of data to know what the correct response should be.	3.70	0.95	High

6	Low quality in terms of narrative considerations of the news stories produced by robot journalism.	3.72	0.94	High
	Average of Arithmetic Means	3.86	0.92	High

The results in Table (6) indicate that the arithmetic means of the sample estimates for the items in the domain of professional challenges of robot journalism ranged between (3.70-3.99). Paragraph (3) states that: "Artificial intelligence techniques in robot journalism cannot distinguish whether the inputs they receive are accurate or inaccurate" ranked first, with an arithmetic mean of (3.99) and high importance. On the other hand, paragraph (5) states that: "Robot journalism requires large amounts of data to determine the correct response" ranked last, with an arithmetic mean of (3.70) and relatively high importance. Furthermore, the data in the preceding table indicate that the arithmetic mean for the items of professional challenges of robot journalism as a whole was (3.86), with relatively high importance. This implies a consensus among most of the sample on the set of professional challenges facing the mentioned robot journalism within the categories of analysis.

Table 7: A. M. and S.D. of Sample Individuals' Responses to Ethical Challenges Items

No.	Paragraph	A. M.	S. D.	R. I.
1	Inability to verify the truth or falsehood of information embedded in artificial intelligence software	3.95	0.86	High
2	Inability to question the legality of artificial intelligence technologies	3.96	0.89	High
3	Inability to protect data from copyright rights in information available to robot journalism	3.85	0.91	High
4	Exemption of the machine or program in robot journalism from liability as it is not a natural person and lacks consciousness and cannot be imprisoned or punished	3.89	0.91	High
5	Bias in creating news stories and the machine's ability to direct them towards a certain direction	3.69	0.89	High
6	Lack of trust in news resulting from the vast amount of information without human intervention	3.88	0.99	High
	Mean of Arithmetic Means	3.87	0.93	High

The results in the previous table indicate that the arithmetic means of the sample individuals' estimates for the paragraphs of the ethical challenges domain facing robot journalism ranged between (3.69-3.96). Paragraph (2), which states: "The inability to hold artificial intelligence technologies legally accountable," ranked first, with an arithmetic mean of (3.96) and a relatively high importance. On the other hand, paragraph (5), which states: "Bias in creating news stories and the machine operator's ability to steer it in a certain direction," ranked last, with an arithmetic mean of (3.69) and relatively high importance. Moreover, the data in the previous table indicates that the arithmetic mean of the paragraphs in the professional challenges domain of robot journalism as a whole reached (3.87), with relatively high importance. This suggests agreement among most of the sample individuals on the set of ethical challenges facing robot journalism mentioned within the analysis categories.

Discussion of Results

The first question results

The results showed a high level of awareness among Palestinian journalists of the concept of robot journalism, as indicated by their average responses to items related to the concept of robot journalism, which amounted to (3.93). This means that most individuals in the study sample of Palestinian journalists agreed that robot journalism is a type of journalism that involves gathering, classifying, and writing information in the form of news and complete news reports in an automated manner, through what is known as algorithm-based robot journalists to generate automatic news without human intervention. They also agreed that robot journalism is journalism based on gathering, classifying, and writing information in the form of news and complete news reports in an automated manner, or that it is journalism relying on algorithms to generate natural language supported by AI applications to automatically convert data into news stories.

The researcher interprets this result in the widespread dissemination of information technology and communication, and that this dissemination in technology has reached everyone and become closely related to all people. The AI technologies on which robot journalism is based have penetrated the technologies of global news institutions strongly and have succeeded in producing thousands of news stories without human intervention, starting from gathering information, classifying it, and then editing and publishing it.

The results of the current study differed from those of (Antono & Kyriazis, 2018), which showed that the majority of Greek journalists were not fully aware of robot journalism, with (71%) of them. This discrepancy also contrasts with the findings of (Daewon, et al., 2018), which indicated that (53%) of the surveyed journalists did not fully understand the concept of robot journalism. This variance in results may be attributed to the time frame of the previous study, conducted in the year 2018, when robot journalism was still emerging, whereas

the current study was conducted in 2023, when robot journalism had become more widespread, and most journalists had a better understanding of its concept than before.
By applying the theory of technological determinism to these results, we find that this theory is one of the modern theories that emerged as a result of developments in media and communication technologies, including robot journalism. It is a reductionist theory aimed at providing a causal link between technology and the nature of society, meaning that robot journalism as a modern technology must be understood and related to by members of society. Among the individuals most related to this technology (robot journalism) are journalists, so they must be aware of its concept and mechanisms of operation.

The second question results

The results showed that there are several positives to the spread of robot journalism, most of which were agreed upon by the sample of Palestinian journalists. Among the most important of these positives is that robot journalism contributes to rapidly expanding news coverage, with an average score of (3.82), and that it helps in summarizing long articles and presenting them in a concise manner by focusing on the main points, with an average score of (3.77). Additionally, it contributes to creating awareness and international cooperation on the importance and dangers of media in bringing about massive changes (3.72), and accessing and updating big data instantly and continuously, with an average score of (3.68).
The researcher interprets this result as the artificial intelligence upon which robot journalism relies in its operation has helped in rapidly expanding coverage, as it has the ability to interact instantly with data in real-time with the story's headlines, which helped in providing a faster and broader insight, thus confirming the positives of using robot journalism, as indicated by (Abdulhameed, 2020). Artificial intelligence techniques can also reduce the human element in content creation, as AI technologies enable journalists to create short video clips in seconds or gather information from sources on the ground, according to a study (Abdelzaher, 2019).
The researcher also interprets this result as robot journalism contributes to strengthening the power of media in reaching the local audience and mobilizing their opinions, as the space is crowded with thousands of satellites controlled by individuals and small institutions before governments, which reinforces the power of artificial intelligence journalism in reaching the local audience in the smallest cities and villages and broadcasting content through micro-screens, available to everyone at the lowest prices. This result agrees with the result of a study by Hamdi (2020), which showed that the robot journalist may bring a set of its own skills, and that robot journalism has a successful future, evidenced by the trend of many media institutions to use algorithmic technology in journalism.
The study's results also showed that there are several negatives to the spread of robot journalism, most of which were agreed upon by the sample of Palestinian journalists. Among the most important of these negatives: robot journalism can never be as creative as humans, and it lacks the ability to go out into the field and conduct interviews with people, with an average score of (4.12), and the entry of robots into the media work requires the establishment of new ethical codes under which the institution bears the consequences of accuracy, balance, and transparency errors, with an average score of (4.00), in addition to the fact that robot journalism may contribute to the loss of a massive number of journalistic job opportunities in favor of smart machines, with an average score of (3.95).
The researcher interprets this result as the recent and current developments in "artificial intelligence" technologies raise numerous concerns worldwide about the loss of a massive number of job opportunities to smart machines. Robot journalism, relying on artificial intelligence technologies, can provide biased results specific to it based on intentionally placed data for analysis, in addition to the fact that robots, no matter how advanced their technology and newness are, cannot be on the same level as humans or journalists in terms of creativity, adaptation, and emotional attachment. This result is in agreement with the result of a study by (Lopez, Bran & Abd, 2019), which showed that robot journalism affects the quality of journalism, as it has led to the presence of fake news and their widespread dissemination.

The third question results:

The study results revealed the presence of a set of professional challenges facing robot journalism, as most participants among the Palestinian journalists agreed on the existence of these challenges. Among the most significant challenges were: the inability of artificial intelligence technologies in robot journalism to distinguish whether the inputs it receives are accurate or inaccurate, with an average score of (3.99). Additionally, robot journalism cannot create the atmosphere necessary to evoke emotional reactions from readers, viewers, or listeners, with an average score of (3.98). Furthermore, there is a lack of human angles in the texts generated by robot journalism, with an average score of (3.96), in addition to the inability of AI technologies in robot journalism to explain its outputs: what was written, what was done, or how it reached this point, with an average score of (3.81).
The researcher interprets these results as robot journalism being a new concept and a recent mechanism in the field of journalism. With its widespread adoption by many major media institutions, it was inevitable for several professional challenges to emerge. Drawing on a study by Aljazairi (2016), these challenges were discovered to vary, including the level of data research, the authenticity of the algorithms used and their objectivity and transparency levels, data usage methods, misuse extent, and the logical values included in the programming

instructions. The first of these challenges lies in the validity of the information integrated into artificial intelligence software, which cannot be verified for accuracy or falsehood if the data provided is non-digital, leading to erroneous outputs at times, as demonstrated by the results of a study by Abdelhamid (2020). This result aligns with the findings of the study by Alwarqli and Badei (2019), which indicated the existence of professional challenges in relying on robot journalism, manifested in its reliance on isolated and singular databases, single-dimensional quantitative data, as well as difficulties in verifying such data.

Additionally, the study results revealed a set of ethical challenges facing robot journalism, as most participants among the Palestinian journalists agreed on the existence of these challenges. Among the most important challenges were: the inability to hold artificial intelligence technologies legally accountable, with an average score of (3.96), as well as the inability to verify the accuracy or falsehood of the information integrated into artificial intelligence software relied upon by robot journalism, with an average score of (3.95). Furthermore, there is the exemption of the machine or program in robot journalism from responsibility since it is not a natural person and lacks consciousness, cannot be imprisoned or punished, with an average score of (3.89), and the lack of trust in news resulting from the vast amount of information without human intervention, with an average score of (3.88).

The researcher interprets this result as the ethics of journalism work in general being one of the main foundations of the journalism profession. With technological and social developments, values and responsibilities allocated to journalism and journalists have changed accordingly. Due to advancements in natural language generation technology, large numbers of texts can be automatically produced from digitally organized data. These transformations have led to ethical challenges, including algorithmic accountability challenges focusing on preparing news reports according to a study by Dorr & Hollnbuchner (2017).

The use of artificial intelligence tools in newsrooms such as machine learning, natural language processing, and facial recognition, and rapid robot input and use for predictive analytics, requires transparency and disclosure of practices. Additionally, due to the impossibility of legally holding artificial intelligence technologies accountable, human accountability must be included at all stages of the content production chain relying on artificial intelligence technology. This result is consistent with the findings of the study by Lewis, Sanders, & Carmody (2018), which indicated that algorithm-based robot journalism for organized data and its transformation into news stories is accompanied by concerns and risks for news institutions. One of the most important of these potential legal risks, an issue not yet explored in journalism studies, is the possibility that algorithms may produce defamatory news content.

Based on the study findings, the researcher recommends working on developing specialized training programs for Palestinian journalists to enhance their understanding and skills in dealing with smart technologies used in robot journalism, including understanding the ethics related to it. Additionally, specific ethical regulations should be established for AI-based robot journalism, including compliance with standards of integrity, objectivity, respect for information privacy, avoidance of bias and discrimination, as well as raising public awareness of the role of smart technologies in news and information production, and clarifying the benefits and challenges associated with this new journalism.

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