

**Between the AI and Traditional Media: Journalists' Perceptions of Employment from Ratings-Driven News Media**

**Musa Nouman Siddiqui**

[musanoumansiddiqui@gmail.com](mailto:musanoumansiddiqui@gmail.com)

Scholar, School of Media Studies Superior University Lahore, Pakistan

**Dr. Nasir Khan**

[fastian.mentor@gmail.com](mailto:fastian.mentor@gmail.com)

Supervisor, School of Media Studies Superior

**Corresponding Author: Musa Nouman Siddiqui** [musanoumansiddiqui@gmail.com](mailto:musanoumansiddiqui@gmail.com)

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## **ABSTRACT**

*The study has aimed to explore the "Perceptions of Journalists from the Ratings Driven Traditional News Media Regarding Employment in the Age of AI". The research has applied a qualitative approach, that allows interviews with industry professionals, to examine how AI influencing employment. The population for this study was consisted of employees working in various departments at Pakistan's top ratings driven news media i.e. ARY News, Geo News, Dunya News and Samaa TV which includes editorial, technical, and administrative staff. A sample of 18 media employees was selected for semi-structured interviews that includes 18 senior media professionals, including editors, reporters, and technological experts, using snowball sampling technique. The study has focus on top ratings driven news media namely Geo News, ARY News, Dunya News and Samaa TV, revealing that while Artificial Intelligence (AI) technologies enhance productivity and content personalization, they also present challenges in terms of job insecurity, skill gaps, and labour market restructuring. The findings have offered valuable insights for media professionals, policymakers, and academics interested in understanding the complexities of AI's integration into journalism and its broader implications on employment in Pakistan's evolving news media landscape.*

**Keywords:** *Perceptions of Journalists, Traditional News Media, AI, employment, Pakistan*

## **INTRODUCTION**

Achieving full and productive employment, encapsulated in the eighth Sustainable Development Goal, necessitates innovation, technological advancements, and diversity, as highlighted by the United Nations in 2024. Historically, technological revolutions alongside the Industrial Revolution have led to increased automation, which raises significant concerns about its impact on employment opportunities as automation potentially displaces human jobs (Liu L., 2018; Morgan, 2019). The concept of "creative destruction" must be embraced to recognize the economic and social progress initiated by emerging technologies (Forsythe, Kahn, Lange, & Wiczer, 2022). Nonetheless, the role of Artificial Intelligence (AI) in shaping job relationships and the direction of technology remains complex and uncertain.

The AI-driven Fourth Industrial Revolution is redefining key sectors, including information technology, power generation, and machinery, with jobs in manufacturing and AI experiencing heightened demand due to China's rapid development (Shen & Zhang, 2024). However, as AI and robotics continue to advance, concerns arise about job displacement in skilled sectors involving tasks such as data entry and administration. A significant urgency is noted as the World Economic Forum projects that automation and

the impact of COVID-19 might lead to a global loss of 85 million jobs, particularly affecting skilled workforces.

While AI offers potential productivity and efficiency enhancements, its integration in the workplace poses ethical and moral dilemmas. It creates new job opportunities aligned with technological innovation, yet also leads to the loss of employment, particularly in lower- to mid-skilled jobs. Even traditionally non-routine cognitive tasks, requiring creativity and social intelligence, are now at risk of automation (Vermeulen & Psenner, 2022). In healthcare, for instance, AI applications in areas such as cancer diagnosis showcase the technology's profound influence on specialized professions (Behera & Das, 2017). Debates surrounding AI's implications for employment reflect concerns over whether machines will indeed supplant human labor across various sectors (Etemad-Sajadi, Soussan, & Schöpfer, 2022; Lan, Yuan, & Gong, 2022).

To mitigate these workforce challenges, upskilling and lifelong learning become essential. As AI progresses, workers must acquire new competencies, particularly in data analytics and machine learning, to maintain relevancy in the labor market. Educational institutions must adjust their curricula to facilitate readiness for these shifts (Daniel, 2023).

In journalism, scholars recognize the rising significance of AI in newsrooms, where it enhances productivity by reducing costs and managing the stream of information (Lewis, Guzman, & Schmidt, 2019). AI aims to develop systems that replicate human cognitive functions like learning and reasoning (Dobrev, 2012). The news sector is undergoing substantial transformations influenced by digital advancements, altering information sourcing and journalistic workflows. AI applications can automate routine tasks while enabling journalists to prioritize crucial functions such as ethical decision-making and storytelling. This collaboration seeks a balance, sustaining the integrity and creativity of journalism amidst the evolving demands of AI (Broussard, et al., 2019).

Finally, AI harbors the potential to innovate audience engagement, potentially increasing news consumption through tailored content and interactive formats (Diakopoulos, 2020). As data and technology increasingly dictate journalistic decision-making, the integration of new technologies is vital for the future of journalism and its economic sustainability (de-Lima-Santos & Mesquita, 2021).

Although Artificial Intelligence (AI) has significantly streamlined the production and delivery of news, the role of journalists remains essential in this evolving landscape. AI technologies excel in automating various processes such as content creation and data analysis, which greatly reduces the time and cost associated with these activities. Nevertheless, journalists possess unique skills—such as investigative abilities, contextualization, and critical thinking—that are crucial in ensuring factual accuracy, ethical standards, and empathetic reporting. This human touch is vital for interpreting complex events and presenting diverse viewpoints with sensitivity (Jamil, 2020). While AI enhances certain aspects of the news production pipeline, the value of journalistic expertise adds depth and credibility to the output.

As AI becomes increasingly integrated into news organizations in developed Western countries, it is employed to boost productivity and innovate storytelling techniques. This trend reflects a broader recognition of technology as a tool for enhancing news communication. By strategically incorporating AI, news organizations exhibit a commitment to innovation and to adapting to changing audience behaviors, which is essential for navigating the digital landscape (Lewis, Guzman, & Schmidt, 2019).

AI-driven news creation technologies have also led to significant cost savings, with some organizations reporting up to a 50% reduction in employment expenditures. For instance, a significant portion of the Pakistani population now obtains news primarily from social media, notably influenced by AI

developments. A case in point is the Pakistani news outlet Dawn, which launched a Facebook Messenger chatbot that utilizes AI to deliver personalized news updates and contextual responses to user queries (Noor & Zafar, 2023).

Research has shown that readers can struggle to distinguish between articles penned by humans and those generated by machines. While machine-generated content tends to score higher in objectivity and perceived trustworthiness, human-written articles excel in coherence, structure, and readability. This disparity highlights the distinct strengths of both human and machine contributions in journalism. For AI integration in journalism to reach its full potential, it is imperative to understand these interactions and the perceptions surrounding them (Graefe, Haim, Haarmann, & Brosius, 2018).

### **Statement of Problem**

The rapid advancement of Artificial Intelligence (AI) is reshaping Pakistan's media landscape, as ratings driven news media leverage AI for enhanced audience engagement, workflows, and content production. While this transition threatens traditional roles in content creation, reporting, and administration, it also offers efficiency gains and cost reductions. AI is automating tasks previously handled by humans, including news writing and video editing, raising concerns about job displacement and the evolving employment landscape in news organizations. Media professionals are at risk as the shift demands new skills in data analysis, digital content strategy, and AI management. Understanding AI's long-term impact on employment trends in Pakistan's ratings driven news media is crucial for developing strategies that mitigate job losses and harness AI for sustainable growth in the sector.

### **Objective of the Study**

To explore the Pakistan's ratings driven news media journalist's perspective regarding employment arising from using artificial intelligence.

### **Research Question**

How do Pakistan's ratings driven news media journalists perceive the employment after the incorporation of artificial intelligence?

### **Significance of the Study**

The study of exploring the Pakistan's ratings driven news media journalist's perspective regarding employment arising by using artificial intelligence is important as it raises awareness, fosters critical thinking, and encourages further research, despite unclear aims. It lays a foundation for more inquiries into the significance of AI in the media sector, initiating discussions among stakeholders and the media community. The study also serves as a catalyst for examining the complexity of AI integration, prompting collaboration among media outlets, educational institutions, and technology firms for comprehensive research. Open-ended questions in the study encourage journalists to explore deeper rationales behind the use of AI, revealing nuanced perspectives previously overlooked.

### **LITERATURE REVIEW**

Artificial Intelligence (AI) is increasingly significant in reshaping journalism, particularly within the context of a potential fourth digital revolution. As highlighted by Islam, Iqbal, and Yasin (2021), AI plays a vital role in post-industrial journalism, aiding the industry in overcoming technical challenges. A pivotal

aspect of this change is the deployment of Natural Language Generation (NLG) technology, also referred to as automated journalism, which automates the creation of news articles with minimal human intervention. Initially, NLG primarily focused on generating shorter texts, though advancements have enabled it to produce extensive, human-like content, thereby demonstrating considerable progress in quality and efficiency compared to traditional methods (Caswell & Dörr, 2017).

Prominent media outlets like The New York Times and The Washington Post have pioneered the integration of AI in journalism. The New York Times initiated its “Editor” initiative to employ tags within traditional articles, while The Washington Post utilized the “Heliograf” tool to cover events such as the 2016 Olympic Games, effectively gathering and synthesizing data into news stories. This evolution in news writing reflects a broader trend where automation is increasingly being harnessed to generate substantial volumes of news content based on structured data, significantly impacting the labor dynamics within journalism (Noor & Zafar, 2023).

Institutions such as the Associated Press, Reuters, and Forbes have embraced automated journalism, producing numerous articles monthly grounded in profit-centric business analytics and live sports reporting (Lecompte, 2015). However, there are inherent challenges to this automation, particularly concerning the roles of humans versus AI in journalism. Current advancements in AI may enable new forms of journalism, but the full realization of AI's abilities, including investigative reporting, is largely hampered by the need for artificial general intelligence (Marconi, Seigman, & Journalist, 2017).

Automated journalism signifies a shift where journalists, though still essential, might not retain their authoritative status in news production as AI continues to evolve (Jamil, 2019). The news production process is becoming increasingly efficient due to algorithms that aid in data collection, analysis, and story generation, a process often referred to as algorithmic journalism (Peiser, 2019). As these technologies advance, they are poised to alter the role of human journalists, with AI-driven systems taking on more responsibilities traditionally associated with human creators of news content (Jamil, 2020).

The media landscape in developed countries showcases a growing reliance on AI, with numerous organizations actively integrating automated processes into their operations. For example, the BBC has utilized the “Juicer” tool for data extraction since 2012, while the Associated Press adopted AI technologies in 2013 to streamline news production, tracking stories trending across social media platforms (Marconi, Seigman, & Journalist, 2017).

In 2016, additional innovations included The Guardian's chatbot project, which facilitated news delivery via Facebook, and Reuters' collaboration with Graphiq to offer interactive data visualizations for publishers. These technological advancements illustrate the breadth of AI's applications in journalism, ranging from news creation to verification and engagement with audiences, highlighting a transformative era in media practices (Liu, et al., 2016; Jamil, 2020).

The integration of artificial intelligence (AI), algorithms, and machine learning is profoundly transforming newsroom operations, enhancing various facets of journalism. An article titled “Automated Journalism: Journalists Say Robots Free up Time for Deeper Reporting” highlights how news automation allows reporters to focus more on in-depth reporting, indicating an increasing reliance on technology to boost productivity. While AI has the potential to assist journalists in discovering and telling stories, its main advantage lies in its ability to accelerate journalism efficiency. However, practical considerations like the high cost of AI engineers compared to reporters raise cost-effectiveness issues impacting profitability. Moreover, manual methods are often preferable for smaller datasets.

Advanced AI applications now permeate numerous journalistic tasks such as data mining, news writing, and fact-checking, which ultimately aids in the production and analysis of media content. Nevertheless, deploying AI responsibly involves navigating challenges like bias mitigation, fostering interdisciplinary collaborations, and training future journalists on the ethical use of AI tools in media. Despite AI's advantages in cost, error reduction, and rapid data collection, its effectiveness is contingent on the quality of analyzed data and its capacity to tackle new issues with comprehensive evaluations. One notable limitation of AI-generated articles is their inadequacy in critical thinking and narrative flourishing.

The problem of misinformation and disinformation in journalism has become critical, as modern technologies facilitate the rapid spread of false information. This necessitates effective strategies to combat false narratives, enhancing the integrity of the information presented. Additionally, the development of natural language processing (NLP) raises ethical concerns linked to biases found in training data, emphasizing the necessity for responsible implementation in the journalism sector.

The global mainstream media's perspective on automated journalism has evolved, as evidenced by research indicating media organizations' willingness to invest in AI technology, with initiatives like The New York Times seeking skilled AI personnel. The growing interest in AI has sparked discussions about its applications and implications, although public understanding of its effects remains limited. Moreover, multinational corporations such as Microsoft and IBM are actively investing in AI initiatives, while advancements in developing countries, including Pakistan, showcase efforts to leverage AI technologies, exemplified by the launch of the first AI news content writer, "Dante," capable of generating reports across various topics.

The report outlines the transformative impact of Artificial Intelligence (AI) on journalism, highlighting how digitalization, increased algorithm usage, and social media growth are reshaping the media landscape. Key changes include disruptions in traditional journalistic practices, such as weakened tactics, schedule interruptions, and an overload of inconsistent information. AI technologies, exemplified by the Washington Post's Modbot, which evaluates online comments for quality, enable journalists to maintain the integrity of comment sections without extensive human effort. Experts project that AI could automate about 15% of reporter duties and 9% of editor tasks, indicating a shift where AI augments journalism, streamlines information processing, and fosters new customization opportunities, despite its limitations in performing various journalistic functions.

The Future Institute highlights AI as the third era of computing, contrasting it with simpler interpretations commonly held in media narratives. Its potential is most significant in story discovery, production, and distribution, where AI aids data journalism by identifying leads and streamlining writing and data visualization processes. Additionally, AI can enhance content distribution effectiveness.

In regions like Pakistan, where there has been little advancement in AI technologies, efforts are underway to boost involvement in the AI sector for international competitiveness. This is evident in the Presidential Initiative for Artificial Intelligence and Computing (PIAIC), aimed at leveraging technological advancements for business, research, and education to drive the country toward the fourth industrial revolution. The initiative aspires to establish Pakistan as a global center for AI and related technologies.

Pakistan hosts thirteen indigenous AI startups, such as Aitomation, CISNR, and RCAI, which are addressing various industry challenges, including environmental issues and economic growth. However, concerns about technological feasibility in the local media continue to persist, impacting the overall health of the news ecosystem despite the burgeoning media industry with six major groups and significant licensing growth.

Investments in Pakistani electronic media increased dramatically, with estimates reaching \$5 billion by 2018. The media sector has shown growth due to improved economic conditions, yet it has faced recent financial strains leading to closures and significant job losses, such as the Jang Group's closures affecting over 1,400 employees. The challenges confronting Pakistan's media are attributed to general economic weaknesses, governmental policies, and declining ad revenues.

In response to these economic hardships, BaseTechnology has created Dante, Pakistan's first AI news writer capable of generating human-like news reports through natural language processing. This development reflects initiatives to incorporate AI within Pakistan's journalism. However, a gap persists in the qualitative understanding of journalists' perspectives on AI as communicators and the hurdles faced by mainstream media in adopting AI technologies. This report aims to investigate these areas further, contributing valuable insights to the existing literature.

## **METHODOLOGY**

The current study employs a qualitative approach to explore the impact of Artificial Intelligence (AI) on employment within Pakistan's ratings-driven news media. It details the research design, sampling methods, and data collection techniques applied throughout the study. A total of 18 Lahore based professional journalists from ratings driven news channels including ARY News, Geo News, Dunya News, and Samaa TV were selected through a snowball sampling method. This non-probability technique involved participants referring additional colleagues, facilitating a targeted sample for in-depth semi-structured interviews aimed at understanding AI's influence on employment dynamics. The interviews focused on how AI affects job displacement, skill requirements, and potential job creation. Data gathered from these interviews were transcribed and analysed using thematic analysis, leading to the identification of significant themes such as job displacement, skill shifts, and adaptation to AI tools, which were compared across participants.

## **RESULTS AND DISCUSSIONS**

The thematic analysis conducted on eighteen in-depth interviews with journalists from Pakistan's leading media outlets provides an intricate view of their perspectives regarding artificial intelligence (AI) and its impact on employment and professional identity. Utilizing Braun and Clarke's six-phase structure alongside theories such as the Diffusion of Innovation, the analysis situates AI amidst the broader structural, economic, and cultural transformations within Pakistan's media landscape. Journalists exhibit a blend of concerns, cautious optimism, and adaptability toward AI, viewing it as a dual-edged sword that enhances productivity while potentially undermining ethical standards and job security.

The first theme addresses algorithmic anxiety and employment insecurity; journalists generally perceive AI as a threat to their job stability, a reflection of anxieties rooted in a precarious media employment environment. Many fear that media proprietors may prioritize cost reduction over job preservation. Concerns regarding the relevance of their expertise compound this fear, particularly among veteran journalists who draw parallels to historical technological disruptions within the industry.

Further, the study highlights fundamental weaknesses among media workers, exacerbated by the economic context of diminished advertising revenues and delayed payments. This environment enhances fears surrounding AI, as it is seen as a key influencer that contributes to inequality in the already saturated media job market. The journalists predominantly identify as "late adopters or disbelievers," swayed more by perceived risks rather than inherent opposition to technology. Despite acknowledging AI's potential to improve organizational efficiency, they express significant worries over job security and job continuity,

framing AI integration in Pakistan's media as predominantly "organization-driven" rather than stemming from the practitioners themselves.

Participants note a "conditional belief" in AI's capacity to serve as a supplementary tool within the news production process, particularly in later stages such as script refinement and data visualization, yet firmly emphasize the necessity of human judgment in initial data processing. They concede that AI could enhance productivity significantly in resource-heavy areas like animations. Nevertheless, these perceived advantages are largely viewed as catering to organizational needs rather than enriching individual journalist welfare.

The interviews emphasize "reskilling" as essential for survival in the face of structural instability in news organizations, with many expressing frustrations at the insufficient formal training provided, leading them to rely on self-directed learning. This shifting of responsibility increases worker insecurity, particularly against a backdrop of unstable contracts and delayed wages. Generational differences reveal that younger journalists are more receptive to AI technologies, while senior journalists often feel threatened; nonetheless, a recognition of the importance of retaining editorial judgment persists among some seasoned professionals.

Concerns around AI's integration also touch on managerial control over newsroom practices, where automated systems could standardize content and monitor productivity intensely. Journalists articulated fears that these metrics and efficiency-focused controls exacerbate performance pressures, potentially eroding editorial independence. The influence of AI on editorial processes is further complicated by its integration of audience analytics, leading to what is described as "algorithmic gatekeeping."

From the political economy standpoint, the findings reveal that AI functions as an ideological instrument reinforcing existing power structures within media organizations, with a strong emphasis on cost efficiency at the potential expense of weakening labour unions and creating further power imbalances. The study also highlights the evolving identity of journalism in the face of mounting AI influence, where core principles of reliability and ethical responsibility remain human-centric despite the encroachment of technology, prompting concerns over an identity crisis among journalists.

Ethical concerns regarding AI-generated content outweigh the benefits, with apprehensions about misinformation and diminished accountability taking centre stage. The analysis reveals that AI integration in the Pakistani media landscape is heavily affected by employment insecurity and underlying power dynamics, challenging simplistic narratives of technological determinism. Journalists predominantly see AI as a managerial strategy aimed at cost-cutting rather than skill enhancement, linking it directly to job displacement and precarity. This perspective aligns with claims that the burden of adaptation increasingly falls upon the individual journalist, heightening stress levels as they endeavour to remain relevant amid evolving industry demands.

Moreover, the research points to AI amplifying management control over journalistic practices, eroding autonomy, and fostering a culture that prioritizes efficiency at the cost of editorial freedom. As seasoned journalists navigate the tension between traditional values and automation pressures, the moral quandaries posed by AI underscore a collective desire to maintain ethical journalism in a landscape marked by declining public trust.

The findings advocate for ethical AI practices, collaborative training efforts, and legislative measures addressing AI's impact on journalism employment. Additionally, a comprehensive overhaul of journalism education focusing on critical AI literacy and ethical reasoning is called for, highlighting gaps in current training methodologies that inadequately prepare graduates for AI-informed newsrooms.

Finally, the study indicates that AI's application in journalism is primarily dictated from the top-down, lacking substantial engagement with journalists, who feel their opinions are marginalized. This contradicts Rogers' Diffusion of Innovation model, which emphasizes grassroots collaboration within social systems for successful technology adoption. Instead, AI's integration into Pakistan's media environment appears enforced by management and ownership, resulting in conflicting sentiments among journalists—while striving to learn about AI, they simultaneously resist its implementation, given the prevailing inequities in power dynamics.

Overall, the precarious state of Pakistan's media—marked by financial hardship, political interference, and diminishing professional standards—is accentuated by AI's arrival, which acts as an accelerant to existing challenges rather than a sole disruptor. This observation resonates with prior studies, illustrating that media technological advances often seek to justify labour conditions, augment control, and reduce operational costs instead of merely enhancing journalistic quality. Grand fears surrounding AI potentially compromising news quality reflect apprehension over sensationalism and misinformation, affirming a doubt about its normative implications rather than its technological capabilities. This comprehensive qualitative study contributes significantly to the discourse on AI's role in journalism by illustrating that labour insecurity, rather than enthusiasm for advancement, characterizes AI adoption within the sector, thus enhancing political economic contentions of Diffusion of Innovation Theory in addressing journalism's contemporary challenges.

## **SUMMARY**

This chapter examines the ramifications of artificial intelligence (AI) on various facets of the television news industry in Pakistan, focusing on employment, professional identity, power dynamics, and ethical journalism. Through thematic analysis of eighteen in-depth interviews, the study presents AI as a dual-edged sword offering both opportunities and threats that are deeply entwined with prevailing structural inequalities. Key findings reveal that the discourse surrounding AI transcends mere technological progress; rather, it delineates a complex environment where journalists are engaged in negotiations pertaining to their professional survival, meaning of their roles, and ethical standards. This foundation paves the way for synthesizing insights in the concluding chapter, which accentuates major contributions to the broader domain of media studies. Additionally, the chapter illustrates that AI's influence reaches far beyond mere alterations in newsroom workflows, as it significantly reshapes the social dynamics within journalism. For journalists in Pakistan, AI presents a multifaceted reality characterized by both opportunities and challenges, alongside processes of adaptation and resistance. The outcomes challenge overly optimistic views on AI's potential for innovation, redirecting focus towards the real-life experiences of media practitioners confronting ambiguity in their work settings. By centring the narratives of journalists, this research highlights the human consequences of technological advancements, advocating for strategies that are ethically considerate and aware of labour implications in the integration of AI into news media.

## **CONCLUSION**

The section examines the influence of artificial intelligence (AI) on employment, professional identity, power dynamics, and ethical journalism within Pakistan's television news sector through a thematic analysis based on eighteen in-depth interviews. The research characterizes AI as a dual-edged sword, presenting both threats and opportunities intricately tied to existing structural injustices. Findings indicate that the narrative surrounding AI transcends mere scientific advancement, illustrating a complex environment wherein journalists grapple with ethical considerations, their professional roles, and the pursuit of survival in a rapidly evolving landscape. This analysis sets the stage for the concluding chapter's synthesis of discoveries, underscoring broader contributions to the field. Furthermore, the chapter elucidates

that the influence of AI extends beyond transforming journalistic methodologies; it disrupts essential interpersonal relationships within journalism. For the journalists of Pakistan, AI embodies a multifaceted experience marked by both potential benefits and significant risks, alongside themes of resistance and adaptability. The findings underscore the real-world experiences of media workers confronted with workplace insecurity, thus challenging overly optimistic narratives regarding AI's creative prospects. This study prioritizes the perspectives of journalists, showcasing the human implications of technological change and advocating for ethically and labour-conscious approaches to the integration of AI in media environments.

## **RECOMMENDATIONS**

The study on the use of artificial intelligence (AI) in Pakistan's ratings driven news media reveals that while AI is being leveraged to enhance productivity and cut costs, it often overlooks implications for job security and journalism practices. Recommendations include, Media companies should implement formal training programs that address both the technical and ethical dimensions of AI to ease technology transitions and mitigate employee resistance. Journalists should actively participate in consultative processes regarding AI implementations to alleviate job-related anxieties and foster organizational trust. Clear communication regarding AI systems' roles and limitations is vital to prevent negative perceptions of surveillance and maintain workplace morale. Instead of displacing jobs, AI should automate mundane tasks to allow journalists to engage in higher-level editorial work, consequently promoting sustainable employment. Establish internal committees to ensure adherence to journalistic standards and maintain public trust. Journalists are encouraged to engage in peer learning and unite through unions to secure training and ethical protections. Understanding AI's impact on journalism practices is essential for maintaining ethical standards and identifying biases in automated systems. National frameworks should address the impacts of AI on journalism, such as automation-related job displacement. Create guidelines for AI in news production focused on accountability and human oversight, ensuring that media organizations are responsible for AI-generated content. Update media ethics to clarify issues concerning authorship and accountability in automated journalism. Encourage partnerships among academia, media organizations, and civil society to promote responsible AI innovation. Educational institutions must adapt their programs to include AI literacy, multidisciplinary knowledge, and practical experience in AI-assisted journalism, ensuring graduates are well-prepared for future professional landscapes.

These recommendations emphasize that the effects of AI on employment in Pakistan's media are shaped by professional engagement and informed policy rather than technology alone.

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