



CURRENT TRENDS AND FUTURE PERSPECTIVES IN PRINTING AND PUBLISHING TECHNOLOGIES

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Abstract:

This study examines the recent transformations in printing and publishing technologies and evaluates Turkey's position within the sector. With the rapid acceleration of digitalization, e-books, open-access platforms, and online publishing have emerged as strong alternatives to traditional printing. At the same time, artificial intelligence is playing an increasingly significant role in content production and distribution processes; while it facilitates tasks such as editing and translation, it also raises ethical debates. In terms of sustainability, environmentally friendly inks, recyclable papers, and energy-efficient production techniques stand out. The study analyzes the current situation in Turkey through open-access policies, the contributions of national platforms (DergiPark, ULAKBİM), and domestic digital publishing initiatives. In addition, a SWOT analysis is used to evaluate the sector's strengths, weaknesses, opportunities, and threats. The findings indicate that the future of publishing will be shaped at the intersection of hybrid models, AI-assisted content management, and sustainability principles.

Keywords: printing technologies, publishing, digitalization, artificial intelligence, sustainability, Turkey

1. Introduction

Printing and publishing technologies have played a critical role throughout human history in the production, dissemination, and transmission of knowledge. The invention of the printing press marked the beginning of a process that made a significant contribution to the development of mass communication and the democratization of access to knowledge. However, today, this field is no longer limited to traditional printed publications; it is being shaped by new parameters such as digitalization, artificial intelligence, automation, and sustainability.

In recent years, changes in access habits to information, the increase in online content consumption, and the need for cost optimization in the publishing industry have

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led to major transformations in printing and publishing technologies. In particular, e-books, online journals, open-access platforms, and mobile-compatible publishing have emerged as strong alternatives to traditional printing. At the same time, environmental sustainability concerns have encouraged the adoption of eco-friendly printing methods and the use of digital content.

The aim of this study is to examine current trends in printing and publishing technologies, discuss their impacts on the sector, and evaluate potential future scenarios. The study specifically addresses applications of artificial intelligence, sustainable printing techniques, and recent developments in Turkey; in this context, it offers insights into how the publishing industry may transform in the future.

The transformation of printing and publishing technologies is not merely a technical advance; it is also a critical process in terms of access to knowledge, cultural transmission, and the sustainability of academic production. Examining this field specifically in Turkey is important both for understanding the opportunities and risks in the digitalization process and for strengthening competitiveness in the international publishing ecosystem. Therefore, the findings of this study contribute not only to academic circles but also to the publishing industry and cultural policies.

This study was designed as a literature-based qualitative study. Recent national and international academic works on printing and publishing technologies were reviewed, drawing from sources indexed in DergiPark, TÜBİTAK ULAKBİM, TÜİK, and international databases. In addition to the literature review, findings obtained through content analysis were classified and evaluated within the contexts of artificial intelligence, sustainability, and digitalization. The study also incorporates the current situation in Turkey through case studies and statistical data. Moreover, the findings were analyzed using SWOT methodology. In this way, the strengths, weaknesses, opportunities, and threats of the field were identified to provide a comprehensive perspective.

2. Literature Review

The literature addressed in this study summarizes current trends in the field of printing and publishing under several headings: digitalization and open access, artificial intelligence and automation, sustainability and green printing, copyright and blockchain, as well as Turkey's current outlook. The review primarily focuses on recent Turkish studies, while strengthening the framework with relevant international publications where necessary.

The literature shows that the publishing industry is being reshaped along three main axes:

- 1) the merging of open-access and distribution models with digitalization,
- 2) artificial intelligence accelerating processes and transforming quality assurance, and
- 3) the technical and economic feasibility of transitioning to sustainable materials and processes.

In the Turkish context, these axes highlight the need for institutionalization through national platforms and institutional policies, while new technologies such as blockchain offer complementary solutions for copyright and rights management (Avital, 2024; Sarı & Doğan, 2023; Baker, 2022; Hayta, 2023; Kupchina, 2020).

3. Current Technologies in Printing and Publishing

The development of printing and publishing technologies represents one of the most important milestones in the historical process of knowledge production and dissemination. Beginning with Gutenberg's invention of the printing press in the 15th century, the modern printing process accelerated with the adoption of offset printing techniques in the 19th century. Toward the late 20th century, the introduction of digital printing methods increased production speed and reduced costs. Today, digital publishing, AI-supported content production, and online platforms—built upon this historical foundation—play a significant role in the transformation of printing and publishing.

In Turkey, digital publishing has rapidly grown into an ecosystem due to widespread internet access, a young demographic, and platform diversity. Kırık (2024) emphasizes that e-journals, news websites, and domestic platforms (e.g., TRT's digital video and content initiatives) are transforming both content production and consumption. In this sense, rather than replacing print publishing, this development can be seen as an evolution toward hybrid distribution models.

Avital (2024), addressing the impact of digital publishing on academia, highlights the need for the democratization of academic publishing and the role of open access in increasing visibility. In Turkey, too, open-access academic publishing has established a strong institutional structure through the DergiPark/TR Dizin ecosystem and university repositories. Recent studies show that open-access policies in Turkish higher education institutions mostly focus on "information resources" and "information services," while there is still room for improvement in conceptual and practical harmonization (Sarı & Doğan, 2023). The role of ULAKBİM and DergiPark on the national scale is confirmed by both the number of journals and the volume of submissions/visits (Sarı & Doğan, 2023; TÜBİTAK ULAKBİM, 2021; DergiPark, n.d.). It should also be noted that universities display varying attitudes toward access to information resources.

Parallel to the increase in the use of e-resources, library indicators (number of books, material types, and user access) are regularly updated. According to TÜİK's 2024 statistics, the number of books in national and university libraries is rising, although the number of published materials fluctuates by year (TÜİK, 2025). This suggests that digital access opportunities (e-books/journals, databases) influence collection management.

From a sustainability perspective, eco-friendly printing materials and low-impact inks/varnishes are currently at the research and development stage both globally and in Turkey. Recent studies show that incorporating bio-based components and natural resins into offset inks can help reduce environmental impact. Hayta (2023) reports current

frameworks regarding the use of sustainable/ecological materials in printing and publishing.

4. The Role of Artificial Intelligence and Automation

Artificial intelligence technologies are laying the groundwork for a transformation in publishing that accelerates production and distribution processes, reduces costs, and improves content quality. The use of AI-supported tools in areas such as text editing, language checking, and content generation is becoming increasingly widespread in both academic and popular publishing. These tools not only reduce the workload of editors but also make it easier to reach broader audiences (Güler, Gülşenoğlu & Sayılır, 2025). However, Howard (2020) emphasizes that while AI creates opportunities, it also raises ethical concerns.

The development of AI-based translation technologies has increased multilingual publishing activities. In addition to widely used tools such as Google Translate and DeepL, local software initiatives in Turkey are also being used in academic publications. Çetiner (2025) notes that this development particularly facilitates international academic interaction and contributes positively to the circulation of knowledge.

Another reflection of automation is the personalized presentation of content through algorithms that analyze reader preferences. Online journals and news platforms track reader behavior to highlight content relevant to individual interests. This approach increases advertising revenues in publishing while also enhancing user experience (Kırık, 2024).

Although AI integration in publishing in Turkey is still limited, recent studies indicate it is progressing with increasing momentum. In particular, media organizations are testing automated news-writing systems through pilot applications. In academia, the effectiveness of AI-supported writing aids and plagiarism detection software is also being debated (Kaya Erdem, 2021).

5. Sustainability and Eco-Friendly Approaches

Sustainability in printing and publishing has come to the fore in recent years due to both environmental concerns and international standards. In a sector with high paper, ink, and energy consumption, innovative practices aimed at reducing the carbon footprint are being developed. Similar to global trends, Hayta (2023) notes that in Turkey as well, the use of eco-friendly materials and recycling practices in printing and publishing is becoming widespread and increasingly important.

Biobased inks and water-based solutions developed to reduce the negative environmental impact of offset and digital printing have become key elements of sustainable publishing. Research shows that replacing traditional solvent-based inks with products derived from vegetable oils and low volatile organic compounds (VOC) significantly contributes to ecological balance (Hayta, Oktay & Ateş Duru, 2022)

In addition, energy-efficient printing machines and automated production lines play a role in reducing environmental impact. Recent studies in Turkey reveal that waste management, the use of recyclable paper, and eco-friendly logistics practices will be key determinants of the sector's future (Aydemir, Yenidoğan & Arslan, 2019). Baker (2022) stresses that sustainable printing techniques not only benefit the environment but also improve the commercial performance of firms in the sector.

Thus, printing and publishing technologies that consume less energy and raw materials reduce operating costs while also contributing to environmental awareness through a sense of social responsibility (Ünsal & Gövdere, 2023). The economic and social benefits of sustainability are highlighted alongside environmental gains.

6. The Current Situation in Turkey and Examples

The current situation of the printing and publishing sector in Turkey can be described as the continued strong presence of traditional print publishing alongside the increasing share of digital publishing. According to TÜİK data, the number of publications at the national level increased in 2024, with much of this growth coming from digital resources (TÜİK, 2025). This trend is directly linked to users' demand for quick access to information. Nevertheless, the cultural and symbolic value of printed books means that print publishing continues to hold a strong position in Turkey.

The development of digital publishing in Turkey has been shaped largely by national-scale platforms such as DergiPark and ULAKBİM. These platforms not only increase the visibility of academic production but also contribute to the institutionalization of open-access policies (Sarı & Doğan, 2023). However, it is noteworthy that awareness of open access has not yet spread uniformly across universities. Some institutions have developed robust digital archive policies, while others remain limited to only mandatory sharing.

On the commercial side, domestic digital publishing platforms (such as İdefix E-book, Kitapyurdu Dijital, Dergilik, etc.) have developed significantly. These platforms provide new distribution channels for publishers and easier access for readers. Nevertheless, there are still shortcomings in user experience, particularly in terms of copyright and content diversity, which require further improvement (Kırık, 2024).

Sustainability-focused transformation is also critical for the future of the publishing sector in Turkey. Research indicates that eco-friendly printing techniques, though not yet widespread, are being adopted gradually (Hayta, 2023). However, interviews with sector representatives reveal that economic conditions prevent these practices from being fully implemented. This shows that a balance must be struck between economic and environmental sustainability in the future of Turkey's publishing sector.

7. Turkey's Printing and Publishing Sector and Future Perspectives

To better understand the current situation and future perspectives of Turkey's printing and publishing sector, a SWOT analysis was conducted. This analysis aims to identify the strengths, weaknesses, opportunities, and threats of the sector to provide insights into the future.

SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis is a strategic tool widely used in business, management, and social sciences. By systematically identifying strengths and weaknesses alongside opportunities and threats, it enables multidimensional evaluation of a topic. In the literature, SWOT has been frequently used in communication and media studies together with qualitative data analysis methods (Gürel & Tat, 2017; Panagiotou, 2003). In this context, Turkey's printing and publishing sector was classified using SWOT, and its strengths, weaknesses, opportunities, and threats were evaluated academically to provide a future-oriented perspective.

Findings show that the strengths of the sector include the cultural and symbolic value of print publishing, the strong interest of the young population in digital content, the presence of robust academic infrastructures such as DergiPark and ULAKBİM, and the development of domestic platforms such as İdefix and Kitapyurdu Dijital.

Weaknesses include the uneven implementation of open-access policies across universities, deficiencies in user experience and content diversity on digital platforms, limited adoption of sustainability practices due to economic constraints, and the lack of established ethical standards in AI integration.

Opportunities for the sector include the integration of technologies such as artificial intelligence, blockchain, and digitalization; potential alignment with international open-access policies; competitive advantage through carbon-neutral and green printing practices; and the possibility of Turkey becoming a regional publishing hub.

However, there are also threats that need to be considered. These include the limited competitiveness of domestic platforms against global publishing giants, insufficient protection of copyrights against digital piracy, rising costs due to economic fluctuations, and cultural divides deepened by inequalities in access to technology.

Based on these analyses, certain findings can be highlighted for a future perspective. Copyright protection and combating piracy emerged as critical issues, and blockchain technology may provide an effective tool in this regard. Kupchina (2020) notes that blockchain-based systems can secure authors' rights. Investment in blockchain technologies could not only prevent piracy but also provide an international competitive advantage.

Blockchain-based copyright and rights management applications are expected to bring significant innovations to the publishing sector in the future. With NFT technologies verifying authorship, piracy can be prevented. Although still limited in Turkey, the development of this field could create new opportunities for protecting publishers' and authors' rights (Kaya Erdem, 2021). Rapid investment in this area could strengthen Turkey's international competitiveness.

The future and spread of printing and publishing technologies depend not only on technological innovations but also on social needs and cultural habits. With increasing digitalization, hybrid publishing models are expected to gain greater prominence. The development of printing and publishing technologies will not completely eliminate print publications. Given their cultural value, print publishing is expected to coexist with digital platforms. This may also diversify reading habits in Turkey (Gürcan, 2021). The rise of digitalization in Turkey is unlikely to end print culture; instead, it may strengthen it by creating a new synthesis.

The development of AI-based content creation tools has already begun to transform editing and translation processes. Findings suggest that AI does not completely eliminate human labor but instead shifts the editor's role toward supervision and quality control. In this sense, the spread of AI-assisted tools in academic publishing in Turkey could enhance quality but also raise ethical issues such as plagiarism and originality.

One of the most critical issues in the publishing sector is sustainability. Carbon-neutral publishing and green printing practices that have emerged in Europe are expected to spread in Turkey as well (Hayta, 2023). While companies may initially view these investments as costly due to current economic conditions, in the long run, sustainability will become a necessity that also provides a competitive advantage.

8. Conclusion and Recommendations

This study reveals that printing and publishing technologies are undergoing a transformation centered on digitalization, artificial intelligence, and sustainability. In Turkey, print publishing continues to maintain its cultural significance, yet digital publishing, open-access policies, and online platforms are becoming increasingly decisive. AI applications enhance efficiency in content creation and editing processes, but strengthening ethical standards is crucial. Sustainability, although currently perceived as a cost factor, should be seen as a necessity that provides both environmental and competitive advantages in the long run.

In this context, for Turkey to establish a strong publishing ecosystem in the future, the following should be prioritized: supporting hybrid publishing models, institutionalizing ethical principles in AI applications, promoting sustainable production practices, standardizing open-access policies at the national level, and strengthening domestic digital platforms.

Conflict of Interest Statement

The author declares no conflicts of interest.

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