



## IMPLEMENTATION AND USE OF DIGITAL SOLUTIONS IN PRINTING PRODUCTION

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**Abstract.** *This paper examines general approaches to the implementation of digital technologies in printing production, with a particular focus on the role of enterprise resource planning (ERP) systems in transforming business processes. It provides a brief analysis of the potential of digital solutions to optimize production and management workflows and outlines the key challenges associated with digitalization in the printing industry. The importance of a strategic approach to the integration of information systems in this field is emphasized.*

Globalization, growing competition, increasing quality demands, and the need for faster service compel businesses to seek new tools for optimization and enhancement of operations. In this context, the printing industry – despite its traditional roots – is actively engaging in digital modernization, allowing for the formation of new business models, cost reduction, and productivity improvement.

Digital solutions in printing encompass a wide range of technologies – from automated design and prepress systems to integrated production management platforms. One of the key elements of this transformation is the implementation of ERP (Enterprise Resource Planning) systems, which provide centralized management of core business operations. This is particularly relevant in printing, where the production of printed materials requires precise planning, raw material tracking, deadline control, and client communication.

ERP systems significantly improve the transparency of business processes. They reduce human error, accelerate information processing, and provide timely data for managerial decision-making. For instance, ERP in printing can handle material consumption accounting (paper, ink, consumables), equipment workload control, print schedule optimization, customer database management, and financial reporting within a unified system [1].

It is important to note that digitalization in printing is not limited to ERP systems. Management Information Systems (MIS) are increasingly used to conduct in-depth analysis of internal processes, while Customer Relationship Management (CRM) systems support effective customer engagement. In some cases, artificial intelligence tools are implemented to forecast orders or optimize printing schedules. Additionally, the Web2Print segment is evolving – platforms that enable customers to place orders online, with data automatically transmitted to production systems [2].

All these technologies support the gradual transition to the concept of a "digital enterprise," where all business processes, including supply chain and logistics, are managed through a unified digital infrastructure. In an unstable economic environment, this enables rapid adaptation to external changes, shorter order turnaround times, and enhanced customer service.

However, the implementation of digital solutions requires thorough preparation. First, financial investment is crucial, as licensed software, hardware



upgrades, and maintenance can be costly. Second, human factors are essential—personnel must be trained and adapted to new working conditions, and management must ensure effective change management. In some cases, resistance to change can delay digitalization and reduce its expected benefits [3].

Another challenge lies in the fact that most ERP systems are designed for general use and must be tailored to the specifics of printing. For example, specialized modules may be needed to calculate complex production processes, manage print runs, or track inventory of roll or sheet paper. This often necessitates custom system development or configuration, requiring time and additional costs.

At the same time, digitalization offers strategic development opportunities for the printing business. Early adopters of digital technologies gain a significant competitive advantage, such as business scalability, new services (e.g., personalized printing), and multichannel customer service. A promising direction is the integration of digital systems with e-commerce platforms, enabling a seamless «order-production-delivery» workflow [4].

Thus, digital solutions – including ERP – serve not only as automation tools but also as the foundation for a new operational paradigm in the printing industry. Successful implementation requires a strategic approach, high management culture, and strong internal collaboration. Continued academic research on this topic will deepen the understanding of digital transformation mechanisms in the industry, especially with regard to Ukrainian enterprises.

The use of digital solutions in printing production is a necessary step in the context of today's economy. ERP systems and other digital management tools enhance efficiency, flexibility, and business resilience. Despite existing barriers, a strategic approach to digitalization opens up opportunities for qualitative renewal in the printing sector. Therefore, the topic of digital transformation in printing deserves further comprehensive exploration, particularly through scientific and practical research and future publications.

#### References

1. Baray, S., & Hameed, S. (2006). Analysing the effectiveness of implementing enterprise resource planning systems in the printing industry. *Journal of Information Systems*, 15(1), 3-15.
2. Mooney, D., & Workman, J. (2019). 2019 Survey of Management Information Systems. Printing Industries of America.
3. Sharara, K., Simuka, J., & Zimucha, T. (2024). Digital transformation strategy for print newspapers: A conceptual framework. Harare Institute of Technology.
4. Lunardi, W.T., Birgin, E.G., Laborie, P., Ronconi, D.P., & Voos, H. (2020). Mixed Integer Linear Programming and Constraint Programming Models for the Online Printing Shop Scheduling Problem. arXiv preprint arXiv:2006.13064.