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SMART MANUFACTURING ON THE HORIZON: A Conceptual Shift from Industry 4.0 to Industry 5.0: Industrija

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From Digital Maturity Assessment to Digital Transformation Strategy: Evidence from SMEs in Bosnia and Herzegovina

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Abstract: *Digital transformation has become one of the key prerequisites for increasing the competitiveness, resilience, and long-term sustainability of small and medium-sized enterprises (SMEs). While European industrial policies increasingly promote the transition towards Industry 5.0, many SMEs in developing economies continue to face significant barriers in adopting advanced digital technologies. This paper presents the results of twenty digital maturity assessments conducted in SMEs operating across different sectors in Bosnia and Herzegovina during the period 2024-2026. The assessments were performed using a structured digital transformation methodology consisting of a digital competitiveness questionnaire, expert workshops, digital maturity assessment, development of a digital transformation strategy, and preparation of a detailed priority digital transformation project. Rather than analysing individual enterprises, the paper identifies common patterns, recurring challenges, and strategic priorities shared among the participating companies. The results reveal that despite differences in industrial sectors, SMEs exhibit remarkably similar digital transformation needs, primarily related to process digitalization, data-driven decision making, systems integration, automation, and workforce digital competencies. The findings provide empirical evidence of the current level of digital readiness of Bosnian SMEs and discuss their implications for the gradual transition towards Industry 5.0.*

Keywords: *Digital transformation, SMEs, Industry 5.0, Digital maturity assessment*

1. Introduction

The rapid development of digital technologies has fundamentally transformed the way organizations create value, manage business processes, and compete in increasingly dynamic markets. Driven by globalization, technological innovation, changing customer expectations, and recent global disruptions such as the COVID-19 pandemic, digital transformation has evolved from a technological initiative into a strategic necessity for organizations seeking long-term competitiveness, resilience, innovation, and sustainable growth [1,2,3].

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Although the concepts of digitization, digitalization, and digital transformation are closely related, they represent different stages of organizational digital evolution. Digitization refers to the conversion of analogue information into digital form, while digitalization focuses on improving existing business processes through the application of digital technologies. Digital transformation represents the most comprehensive stage, involving fundamental organizational changes that integrate digital technologies into business models, organizational processes, decision-making, products, services, and organizational culture [1,2,4]. Consequently, successful digital transformation requires not only technological investments but also strategic leadership, organizational capabilities, and continuous development of digital competencies [2,3,5].

Recognizing its strategic importance, the European Union has positioned digital transformation at the centre of its industrial and innovation policies through initiatives such as the Digital Decade Policy Programme 2030 and the Industry 5.0 framework. Building upon Industry 4.0, which primarily emphasized automation, connectivity, and cyber-physical systems, Industry 5.0 promotes a human-centric, resilient, and sustainable approach to industrial development, where technological innovation is expected to generate both economic and societal value [6,7].

Small and medium-sized enterprises (SMEs), which account for approximately 99.8% of all European enterprises, play a central role in economic growth and innovation [8]. Nevertheless, the adoption of advanced digital technologies among SMEs remains considerably lower than in large enterprises due to financial constraints, limited digital capabilities, insufficient access to expertise, and organizational barriers [9]. These challenges are even more pronounced in developing and transition economies such as Bosnia and Herzegovina, where fragmented institutional structures, limited investment capacity, and weak collaboration between industry and research institutions continue to hinder digital transformation. National ICT indicators further demonstrate that the adoption of cloud computing, enterprise software, and other advanced digital technologies remains significantly below the European average [10,11].

As organizations increasingly transition towards Industry 5.0, assessing digital maturity has become an essential prerequisite for successful digital transformation. Recent studies emphasize that successful digital transformation in SMEs depends not only on technology adoption but also on organizational knowledge, digital capabilities, and continuous learning [12]. In this context, systematic digital maturity assessment provides a foundation for evidence-based strategic decision-making [13,14].

Despite the growing international body of literature on digital transformation, empirical evidence on the digital maturity and transformation priorities of SMEs in Bosnia and Herzegovina remains limited. Existing studies predominantly report national ICT statistics and technology adoption rates while providing relatively

little insight into organization-level challenges, strategic priorities, and implementation needs [10,11].

To address this research gap, this study analyses the results of twenty digital maturity assessments conducted in SMEs operating across multiple industrial sectors in Bosnia and Herzegovina between 2024 and 2026. Using a standardized assessment methodology that combines organizational questionnaires, expert workshops, digital maturity evaluation, strategic planning, and the identification of priority digital transformation projects, the study identifies common organizational challenges and digital transformation priorities while assessing the readiness of Bosnian SMEs for the transition towards Industry 5.0. The findings contribute empirical evidence that may support policymakers, Digital Innovation Hubs, researchers, and organizations involved in designing and implementing digital transformation initiatives for SMEs.

2. Methodology

This study is based on empirical data collected through digital maturity assessments conducted in twenty small and medium-sized enterprises (SMEs) operating in Bosnia and Herzegovina during the period 2024-2026. The participating companies represented various industrial sectors, including manufacturing, construction, food production, healthcare, trade, transportation, financial services, tourism, and other professional activities. To ensure confidentiality, all companies were anonymized, and the results are presented only in aggregated form.

A standardized digital transformation assessment methodology was applied to all participating enterprises. The process began with a Digital Competitiveness Questionnaire designed to collect information on company characteristics, business processes, digital infrastructure, data management, automation, digital competencies, cybersecurity, and the current use of digital technologies. The questionnaire served as the basis for a series of expert workshops conducted with company management and key employees, during which organizational processes, digital maturity, and transformation challenges were evaluated. The outcome of this phase was a Digital Maturity Assessment Report describing the company's current level of digital readiness and identifying key strengths, weaknesses, and opportunities for improvement.

Based on the assessment results, a customized Digital Transformation Strategy was prepared for each enterprise, defining strategic priorities, recommended technological solutions, implementation phases, and expected business benefits. Finally, one priority digital transformation project was developed for every company, including a detailed technical concept, implementation roadmap, and expected outcomes.

The findings from all twenty assessments were subsequently analysed using a comparative cross-case approach. Rather than evaluating individual companies, the analysis focused on identifying common digital transformation challenges, recurring technological priorities, and strategic development patterns shared across SMEs from different industrial sectors. This approach enabled the identification of general digital transformation needs of Bosnian SMEs and their readiness for the transition towards Industry 5.0.

3. Results and Discussion

The analysis of twenty digital maturity assessments conducted in SMEs from different industrial sectors revealed a high degree of similarity in digital transformation needs, regardless of company size or business activity. Although the participating enterprises differed in their products, services, and organizational structures, the identified challenges and strategic priorities were remarkably consistent, indicating that SMEs in Bosnia and Herzegovina face common barriers in their transition towards digitally enabled business models.

Although the participating SMEs operated in different industrial sectors, the priority digital transformation projects revealed highly consistent technological recommendations.

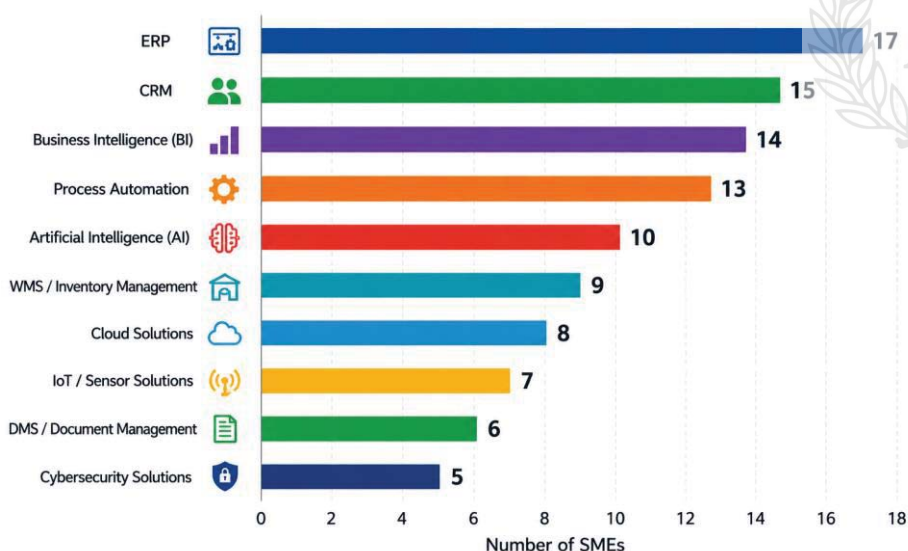


Figure 1. Top 10 recommended digital transformation priorities identified across the analysed SMEs.

As shown in Figure 1, enterprise resource planning (ERP), customer relationship management (CRM), business intelligence (BI), and process automation were the

most frequently recommended solutions. More advanced technologies, including artificial intelligence (AI), Internet of Things (IoT), and cybersecurity solutions, were generally proposed as medium- and long-term development priorities, reflecting the need to first establish fundamental digital infrastructure.

The distribution of recommended technologies confirms that most SMEs are currently focused on establishing integrated digital management systems and improving operational efficiency before adopting more advanced Industry 5.0 technologies.

The aggregated findings from the digital maturity assessments demonstrate a remarkable consistency in the challenges and development priorities identified across participating SMEs. As presented in Table 1, most companies exhibited low levels of process digitalization, fragmented information systems, limited use of business data, and a lack of formal digital transformation strategies. These recurring patterns indicate that digital transformation needs are largely independent of industry sector and organizational size, highlighting common priorities for future digital development.

Table 1. Summary of the most common findings from digital maturity assessments

Assessment area	Most common findings
Business processes	Predominantly manual or partially digitalized
Information systems	Fragmented, poorly integrated
Data management	Limited use of business data for decision-making
Customer management	CRM systems frequently missing
Production	Need for automation and process monitoring
Human resources	Need for digital skills development
Strategic planning	Digital transformation strategies generally absent
Technology priorities	ERP, CRM, BI, automation, AI

One of the most frequently observed challenges was the lack of integrated digital systems. In many companies, business information was distributed across multiple software solutions, spreadsheets, and paper-based documentation, resulting in duplicated activities, inefficient information exchange, and limited visibility of business performance. Consequently, companies identified systems integration and process digitalization as key prerequisites for improving operational efficiency.

Another recurring finding was the limited use of data for decision-making. Although companies generated considerable amounts of operational and business data, these were rarely analysed systematically. Business intelligence solutions, centralized reporting, and performance dashboards were therefore among the most frequently recommended strategic initiatives. Similarly, customer relationship management remained insufficiently digitalized, particularly in service-oriented companies, where customer information was often managed through spreadsheets or manual records.

For manufacturing companies, digital transformation priorities were primarily related to production automation, integration of production and warehouse systems, improved process monitoring, and optimization of production planning. In contrast, companies operating in service sectors more frequently prioritized CRM systems, digital communication, document management, and business process automation. Despite these sector-specific differences, the overall strategic direction remained similar across all participating enterprises.

Beyond technological aspects, the assessments consistently highlighted organizational challenges. Many companies reported insufficient digital competencies, limited employee training, and the absence of long-term digital transformation planning. These findings suggest that digital transformation should be viewed as an organizational change process rather than solely as the implementation of new technologies.

Based on the identified needs, each participating enterprise developed a Digital Transformation Strategy accompanied by one priority digital transformation project. Although individual technical solutions varied, the most common priorities included business process digitalization, implementation of integrated management systems, automation, business intelligence, customer relationship management, and improved data management. Advanced technologies such as artificial intelligence and the Internet of Things were generally recognised as long-term development objectives rather than immediate investment priorities.

Overall, the findings indicate that SMEs in Bosnia and Herzegovina are still building the digital foundations necessary for the transition towards Industry 5.0. Rather than focusing on advanced technologies alone, companies primarily require integrated information systems, digitalized business processes, stronger data-driven decision-making, and improved digital competencies. The similarity of identified priorities across different sectors demonstrates that standardized digital maturity assessments can provide valuable guidance for defining strategic digital transformation initiatives and supporting the long-term competitiveness of SMEs.

4. Conclusion

This study analysed twenty digital maturity assessments conducted in SMEs from different sectors in Bosnia and Herzegovina to identify common digital transformation challenges and strategic priorities. The findings indicate that, despite sectoral differences, SMEs share similar needs related to business process digitalization, systems integration, data management, automation, and digital skills development.

The results suggest that most SMEs are still building the digital foundations required for the transition towards Industry 5.0, with organizational readiness and integrated information systems representing higher priorities than the adoption of advanced technologies. The study provides empirical evidence on the current digital readiness of Bosnian SMEs and demonstrates that standardized digital maturity assessments can effectively support the development of digital transformation strategies and future policy and innovation initiatives. Future research should include a larger sample of enterprises and evaluate the long-term impact of implemented digital transformation projects.

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