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IMPROVING RESOURCE EFFICIENCY IN REGIONAL INDUSTRIAL ENTERPRISES THROUGH PRODUCTION PROCESS DIGITALIZATION

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Abstract: The article examines how production-process digitalization can improve the efficiency of raw materials, energy, equipment time, and labor resources in regional industrial enterprises. Automation, Internet of Things (IoT) technologies, and digital monitoring are considered as instruments for obtaining real-time information about production processes, identifying resource losses, and reducing unplanned downtime. The analysis uses industrial production and information and communication service data for Kashkadarya Region as the regional economic context. The results show parallel growth in industrial production and digital service activity, creating a stronger basis for the diffusion of digital management tools. A system of micro-level resource-efficiency indicators is proposed to connect digitalization with measurable operational outcomes. The article argues that digital transformation should be evaluated not by the level of technology adoption alone, but by its effect on resource consumption per unit of output, material losses, equipment downtime, and labor productivity.
Keywords: IoT, automation, resource efficiency, industrial enterprises, digitalization, energy efficiency, production management.

INTRODUCTION

Resource efficiency has become an important component of industrial competitiveness because enterprises must increase output while controlling material, energy, labor, and equipment costs. In production systems, digital monitoring makes it possible to collect operational information continuously, identify deviations from planned parameters, and support faster managerial decisions.

For regional industrial enterprises, the value of digitalization is therefore not limited to introducing software or connected equipment. Its economic contribution depends on whether digital tools improve the use of scarce production resources. IoT sensors, automated control systems, production dashboards, and digital maintenance solutions can provide information needed to detect excessive consumption, equipment abnormalities, production losses, and unplanned downtime.

This study focuses on Kashkadarya Region and considers the growth of industrial production together with the expansion of information and communication services as a regional context for the development of digital production-management capabilities. The central research question is how digitalization can be organized as a practical mechanism for measuring and improving resource efficiency at enterprise level.

RESEARCH METHODOLOGY (METHODS)

The study applies descriptive, comparative, and time-series analysis to regional statistical data. Two indicators are considered: the volume of industrial products produced in Kashkadarya Region and the volume of information and communication services. Industrial production is

examined for 2020–2024 using the supplied statistical series, while information and communication services are examined for 2020–2025.

The methodological framework combines macro-level contextual analysis with a proposed micro-level KPI system. At enterprise level, resource efficiency can be assessed through energy consumption per unit of output, raw-material loss rate, equipment downtime, and labor hours per unit of output. Where sufficient enterprise data are available, the percentage change in each KPI before and after digitalization can be used to assess operational improvement.

A key methodological principle is that correlation between regional industrial growth and digital-service growth should not be interpreted as proof of a causal relationship. The regional statistics establish the economic context in which digital production-management tools may expand; direct efficiency effects require enterprise-level operational data.

RESEARCH RESULTS (RESULTS)

The statistical series demonstrate substantial growth in both industrial production and information and communication services in Kashkadarya Region. Industrial production increased from 14,612.3 billion soums in 2020 to 39,116.8 billion soums in 2024. Over the same 2020–2024 period, information and communication services increased from 574.6 billion soums to 1,364.9 billion soums. In 2025, the volume of information and communication services reached 1,802.7 billion soums.

Thus, industrial production increased by approximately 2.68 times between 2020 and 2024, while information and communication services increased by approximately 2.38 times over the same period. The parallel expansion indicates a growing regional economic base for digital tools that can be integrated into industrial management. However, the figures should be interpreted as contextual evidence rather than a direct estimate of the productivity effect of digitalization.

Year	Industrial production, bn soums	Information and communication services, bn soums
2020	14,612.3	574.6
2021	18,771.9	703.1
2022	22,624.4	902.0
2023	28,767.7	1,083.5
2024	39,116.8	1,364.9
2025	—	1,802.7

Table 1. Industrial production and information and communication services in Kashkadarya Region

DISCUSSION

The results support the view that digitalization should be treated as an operational management mechanism rather than as a technological objective in itself. A production enterprise may install sensors, software, or automated equipment without achieving meaningful resource savings if the collected information is not connected to managerial decisions and process improvement.

For this reason, resource-efficiency assessment should begin with a baseline and then connect each digital intervention to measurable production indicators. Four groups of KPIs are particularly relevant: (1) energy consumption, such as kWh per unit of output; (2) material efficiency, including raw-material loss and waste rates; (3) equipment efficiency, including average downtime and maintenance intervals; and (4) labor and time efficiency, including labor hours and production-cycle time per unit of output.

A practical implementation mechanism can be organized in five stages. First, the enterprise establishes a baseline for resource consumption and operational losses. Second, the most resource-intensive or loss-prone process is selected for digital monitoring. Third, sensors,

automation, or production-management software are introduced. Fourth, management uses the resulting data to adjust production parameters, maintenance schedules, and resource allocation. Fifth, the enterprise compares post-implementation KPIs with the baseline and calculates the economic effect.

This approach also strengthens environmental performance because reductions in energy consumption, material losses, and waste can simultaneously reduce production costs and resource pressure. Nevertheless, the magnitude of these benefits will vary by industry, technology maturity, production scale, and the quality of managerial use of digital information.

CONCLUSION

Production-process digitalization can provide regional industrial enterprises with a practical mechanism for improving resource efficiency when technology is linked to measurable operational targets. The statistical context of Kashkadarya Region shows simultaneous expansion of industrial production and information and communication services, creating favorable conditions for wider adoption of digital production-management solutions.

The recommended approach is to start with pilot IoT and automation projects in the most resource-intensive production processes. Enterprises should establish baseline indicators, monitor energy and material consumption, measure equipment downtime and production-cycle time, and evaluate changes after implementation. Such an evidence-based model allows digital investments to be assessed according to actual operational results rather than technology adoption alone.

REFERENCES

1. OECD. (2020). OECD Digital Economy Outlook 2020. OECD Publishing.
2. World Bank. (2016). World Development Report 2016: Digital Dividends. World Bank.
3. Vial, G. (2019). Understanding digital transformation: A review and a research agenda. The Journal of Strategic Information Systems, 28(2), 118–144.
4. Bharadwaj, A., El Sawy, O. A., Pavlou, P. A., & Venkatraman, N. (2013). Digital business strategy: Toward a next generation of insights. MIS Quarterly, 37(2), 471–482.
5. O‘zbekiston Respublikasi Milliy statistika qo‘mitasi. Qashqadaryo viloyatida sanoat mahsulotlari ishlab chiqarish hajmi, SIAT.
6. O‘zbekiston Respublikasi Milliy statistika qo‘mitasi. Axborot va aloqa xizmatlari hajmi, SIAT.