ГУМАНИТАРНЫЕ НАУКИ

Automation in Manufacturing Industry of Africa

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Abstract

The present paper studies the transformative role of automation in manufacturing industry of Africa, highlighting its benefits, such as efficiency, cost reduction, and sustainability. It distinguishes barriers, such as high costs, shortage of skilled personnel, and infrastructure challenges, and emphasizes the opportunities for growth due to the government support, affordable automation tools, and use of renewable sources of energy. With forecasted annual growth of the robotics market by approximately 12.89% from 2025 to 2029, the strategic policies and investments can play the key role in making Africa a region capable of using automation for socioeconomic development and competitiveness.

Keywords: automation, manufacturing industry, competitiveness, barriers

Автоматизация обрабатывающей промышленности Африки

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Аннотация

Рассматривается преобразующая роль автоматизации в обрабатывающей промышленности Африки, акцентируется внимание на ее преимуществах, таких как повышение эффективности, снижение затрат и обеспечение устойчивости. Исследуются существующие барьеры, включая высокие затраты, нехватку квалифицированных кадров и проблемы с инфраструктурой, при этом выделяются возможности для роста, возникающие благодаря государственной поддержке, доступным инструментам автоматизации и использованию возобновляемых источников энергии. Учитывая, что прогнозируется ежегодный рост рынка робототехники на уровне 12,89 % в период с 2025 по 2029 год, роль стратегической политики и инвестиций становится ключевой для того, чтобы позиционировать Африку как регион, способный использовать автоматизацию для достижения социально-экономического развития и повышения конкурентоспособности.

Ключевые слова: автоматизация, обрабатывающая промышленность, конкурентоспособность, барьеры

Introduction. Automation is the use of technology, programs, robotics to achieve outcomes that reduce human intervention in the processes. In Africa, the manufacturing industry is developing by implementing automation technologies. Automation has been used by many developed countries, and its implementation into the manufacturing industry of African is now beginning to accelerate [1, 2].

The aim of the study is to analyse the impact of automation on productivity in Africa and evaluate strategies to address its challenges and leverage opportunities.

Results. Manufacturing industry of Africa is rapidly developing in such countries as Kenya, Nigeria, Egypt, and South Africa, especially in automotive, manufacturing, food processing and textile sectors. On the whole, the manufacturing industry of many African countries is still in the early stages of integrating automation into manufacturing processes, the use of automation technologies is transforming various industries, presenting new opportunities and increasing productivity in the countries that need it [3].

Africa benefits from automation in different ways. In food processing industries, where precise measurements are required, automation provides efficiency by allowing the machines to perform faster and with minimal errors compared to the manual work. Another advantage is cost reduction. In the cement manufacturing industry, automation can result in more uniform production, reducing wastes and decreasing the requirement for continuous human supervision [1, 3].

Despite all these benefits there are also barriers that hinder the use of automation in the manufacturing industry of Africa. The high cost of automation technologies, such as AI-driven systems, advanced robotics and IoT-enabled equipment, are among the main challenges as they require major investment that many small and medium-sized enterprises (SMEs) across the continent cannot afford. Skilled personnel gap is one more barrier. Operation and maintenance of the automated systems require the employees with specialized knowledge in robotics, machine learning and AI. Unfortunately, there is a limited number of skilled workers in African countries. Additionally, different parts of the continent are struggling with infrastructure limitations, from inconsistent power supply to unreliable internet connection [1, 4].

Even with those obstacles, there are plenty of opportunities for growth. Countries recognize the importance of automation and develop new strategies to support its implementation. For instance, automation is an important component of the Kenyan government Big Four Agenda focused on boosting manufacture, affordable housing, healthcare, and food security. Some companies are developing low-cost, adaptable automation tools specifically tailored for SMEs, thus, contributing to creation of equal opportunities due to another positive development: the emergence of affordable automation solutions. Sustainable automation is advancing with the emergence of renewable energy such as solar and wind power. By using clean energy to run automated processes, manufacturers will be able to reduce energy costs, contributing to sustainability goals [2–4].

There is limited quantitative information regarding the extent of automation compared to manual labour in African countries. Nevertheless, forecasts suggest a trend for substantial growth in the automation industry. The African robotics market is anticipated to grow at a rate of 12.89 % each year from 2025 to 2029, aiming for a market size of around USD 1.24 billion by 2029 [5].

Gross domestic product (GDP) per capita is an economic metric that indicates the standard of living of the residents of a state. It fluctuates significantly in Africa, illustrating the economic variety across the continent. Figure 1 shows African countries by GDP (PPP) per capita in 2023 [6].
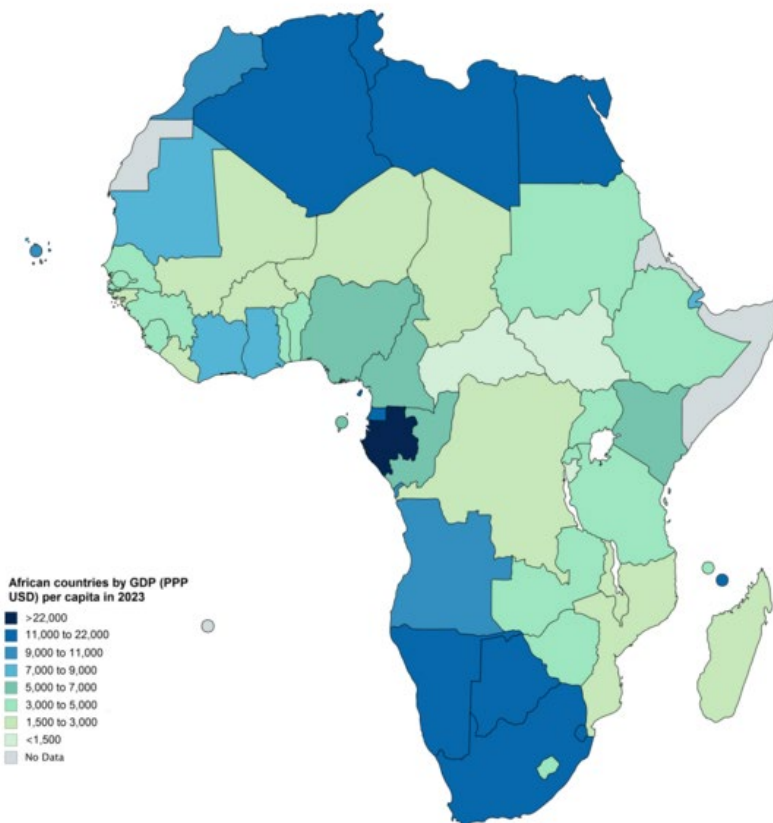

Fig. 1. African countries by GDP (PPP) per capita in 2023

The GDP per hour worked, a metric of labour productivity, varies significantly between African countries. Figure 2 presents the top 10 African countries by GDP per hour worked (USD) in 2023, based on data from the International Labour Organization (ILO) [7].

Top 10 African countries by GDP per hour worked (USD) in 2023
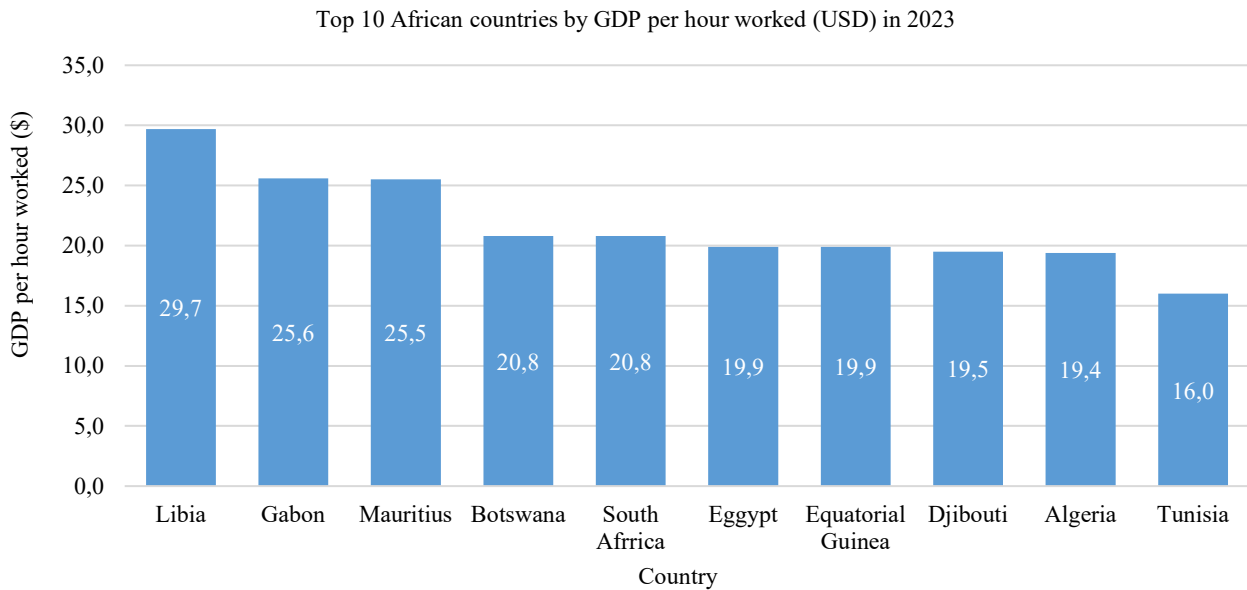

Fig. 2. Top 10 African countries by GDP per hour worked (USD) in 2023

In Russia, the main factors that increase labour productivity are the size of the organisation, availability of export operations, the use of information technologies, and investment activity. This issue should be studied in detail by comparing the situation in Russia and Africa. Figure 3 presents the key needs of Russian companies to improve labour productivity [8].

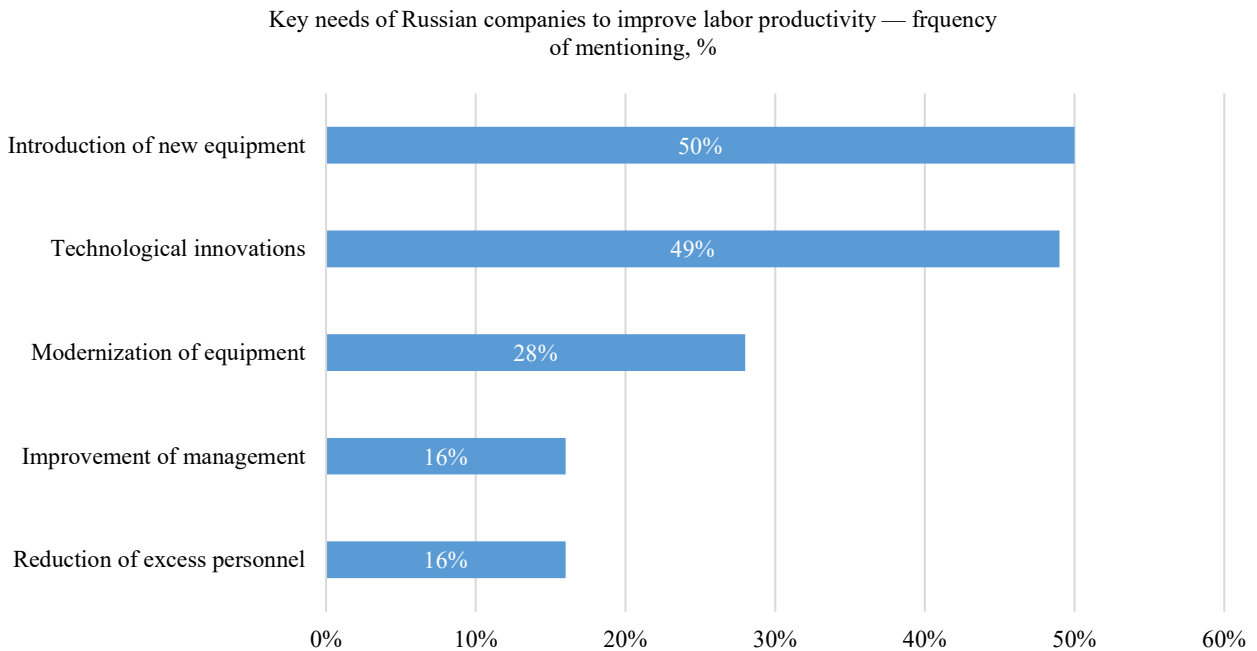Key needs of Russian companies to improve labor productivity — frquency of mentioning, %

Fig. 3. Key needs of Russian companies to improve labour productivity

To improve labour productivity, it is necessary first to check the obstacles that are hindering achievement of a better productivity. Figure 4 presents the obstacles to productivity growth according to the data on Russian companies.

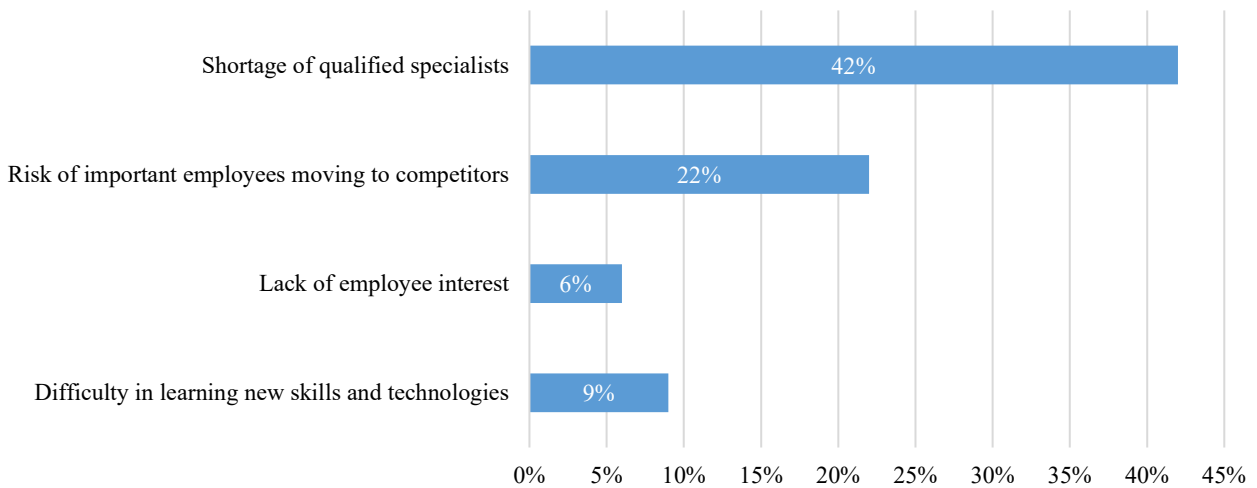Obstacles to productivity growth according to Russian companies

Fig. 4. Obstacles to productivity growth according to the data on Russian companies

Taking into account the productivity growth data from figure 3, it is possible to calculate the forecasted labour productivity by using the following formula: Forecasted Labour Productivity = Current Labour Productivity + (Current Labour Productivity * Coefficient * Productivity Growth); where the current labour productivity is the GDP of a country per hour worked ($), and the coefficient used is 0.5. Figure 5 presents the forecast of GDP growth per hour after implementation of the automation.

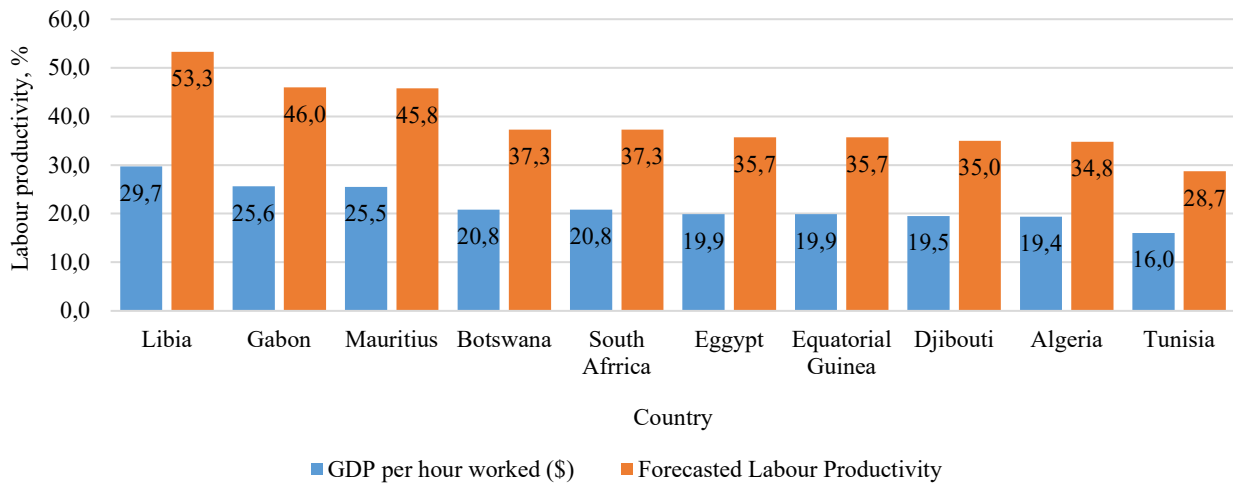Forecast of GDP growth per hour after implementation of the automation

Fig. 5. Forecast of GDP growth per hour after implementation of the automation

Based on the analysis, labour productivity and, accordingly, income per hour of work can be forecasted to grow in case of implementing the automation to a sufficient degree.

The following sectors are promising for implementation of automation in Africa:

1. Energy Sector: In the oil and gas sectors, in the countries such as Angola and Nigeria, automation is being integrated progressively to improve safety and efficiency of exploration and production operations. Automated systems aid in reducing risks and enhancing production levels [9].

2. Agriculture: Digital agriculture technologies, including mobile applications and online platforms, are used to enhance efficiency in farm production and marketing the agricultural products. Such technologies reduce information disbalance and transaction costs for smallholder farmers.

3. Manufacturing: The potential for African competitiveness lies in relatively labour-intensive industries manufacturing such products as textiles, wearing apparel, and leather products, where automation has not been quite as rapid as in some other subsectors.

4. Services Sector: To increase productivity and improve service delivery, other industries, such as retail, healthcare, financial services, logistics, and education, also have potential for automation.

Discussion and Conclusion. The implementation of automation in Africa has the potential to significantly increase labour productivity and contribute to economic growth. As a rule, automation has played a very important role in the process of economic development, causing changes in employment patterns and increasing efficiency. However, automation needs to be adopted in such a way that it supplements human labour and overcomes infrastructural problems such as inconsistent power supply that may hinder progress. With the focus on the sectors where the potential for automation is high and supported by encouraging policies, African countries can use technology as a driver for socioeconomic development.

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