Coding the Future: South Africa's Software Revolution in the Age of 4IR and 5IR

Figure 1: AI collaboration in software development

The world is on the brink of a revolution unlike any other, in which machines will not only carry out tasks but also be able to think, learn, and work alongside people. From self-driving cars to algorithms predicting financial markets, technology is rewriting the rules of society and the economy at a pace once thought impossible. The Fourth Industrial Revolution (4IR) and the soon-to-be Fifth Industrial Revolution (5IR) are two of the world's most significant technological shifts. Software developers in South Africa are at the forefront of this change, entrusted with utilizing low-code development platforms, cloud computing, and artificial intelligence (AI) to stimulate economic growth and innovation. These changes provide great opportunities and formidable difficulties, especially in infrastructure gaps and skills shortages that could prevent equal development.

The 4IR combines biotechnology, blockchain, robotics, IoT, cognitive computing, and cyber-physical systems, changing industries worldwide. By highlighting human-centric innovation, ethical AI, and improved human-machine collaboration, the 5IR expands on this. This translates into changing software practices in South Africa, as developers use these technologies to create customized solutions for industries like manufacturing, healthcare, finance, and agriculture—all

of which are essential to the growth of the country's economy. For instance, Cape Town–based agritech company Aerobotics has developed Aeroview, an AI-driven platform that uses drone and satellite imagery to provide farmers with advanced analytics on crop health, pest detection, and yield optimization (https://pressportal.co.za/it-new-media-and-software/story/precision-agriculture-company-aerobotics-hits-major-milestone-with-10-millionth-tree-processed-in-its-software.html). Such innovations demonstrate how local software practices are evolving to meet sector-specific needs while driving efficiency, sustainability, and competitiveness in the digital era.

Figure 2: Features of low-code platforms.

In 2017, the CEO of GitHub mentioned that the future of coding is no coding (https://fossbytes.com/coding-automation-programming-github-ceo). Low-code and no-code programming platforms are particularly transformative in that they lower the challenges related to software development by enabling a wider range of users to design and deploy applications with minimal coding knowledge. This democratization is essential for South Africa's small and medium enterprises (SMEs), which frequently lack the resources necessary for extensive traditional software development. These platforms enable the rapid and affordable deployment of innovative tools, including health monitoring applications customized to meet the specific requirements of the local community and automated financial platforms (Rokis, 2022; Sufi F, 2023).

Although there has been improvement, South Africa's readiness to properly utilize 4IR and 5IR technology is still lacking. In order to promote responsible tech adoption, the government has started programs like the Centre for Fourth Industrial Revolution South Africa (C4IR SA), which builds governance frameworks and promotes collaborative relationships. Urban centers are the focus of broadband infrastructure investments, but rural areas continue to face poor connectivity and restricted access to resources for digital education. If inclusive measures are not

implemented to solve this digital divide, inequality could worsen. (https://www.csir.co.za/centre-fourth-industrial-revolution-south-africa).

A pervasive challenge is the country's digital skills gap. Software engineering increasingly demands skills in AI, cloud computing, data analytics, and cybersecurity—where current workforce capabilities lag behind global demands. Bridging this gap requires comprehensive upskilling, re-skilling initiatives, STEM education enhancements, and accessible digital literacy programs. Without these, a significant proportion of South Africa's tech talent could be sidelined amid rapid technological evolution (https://www.linkedin.com/pulse/embracing-technology-future-work-south-africas-digital-patrick-mugumo).
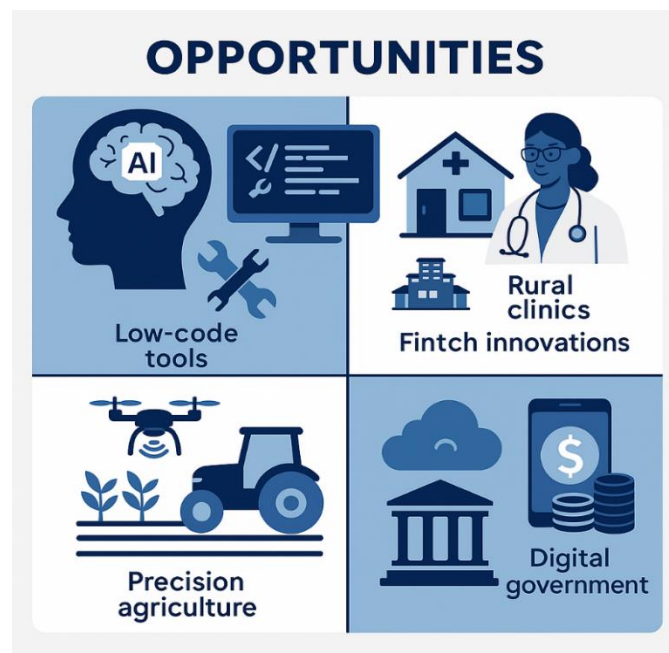

Figure 3: Opportunities of 4IR and 5IR technologies in South Africa.

Nonetheless, the opportunities are transformative. AI-driven development and low-code tools accelerate project delivery, significantly reduce costs, and empower SMEs and governmental agencies to modernize services. For example, AI-powered software can improve diagnostic accuracy and treatment management within rural clinics. At the same time, fintech innovations promote financial inclusivity, linking underserved communities to critical digital banking infrastructure (Department of Trade, Industry and Competition, 2024).

Furthermore, 4IR and 5IR technologies enable South Africa to leapfrog traditional industrialization phases. Precision agriculture, supported by IoT and data analytics, optimizes input use and increases yields, improving food security. Digital government platforms powered by AI and cloud computing can deliver more transparent, efficient, and accessible public services, helping to reduce socio-economic disparities (Centre for Fourth Industrial Revolution South Africa, 2024; UNECA, 2024).

The confluence of software development and 4IR/5IR technologies offers a pathway for South Africa to establish itself as a regional digital leader. Success, however, hinges on inclusive

policies enhancing infrastructure and expanding advanced digital skills training. Growing local innovation ecosystems with active public-private partnerships is essential to sustain competitiveness and inclusive growth (HSRC 4IR Framework Report, 2024).

In conclusion, South Africa's software developers are uniquely positioned at a pivotal moment in technological history. The country can unlock broad economic and social benefits by embracing emerging technologies such as AI, cloud, and low-code development—alongside investments in skills development and infrastructure. The Fourth and Fifth Industrial Revolutions are not just technological transitions; they represent an opportunity to build a more inclusive, innovative, and prosperous South Africa

(https://www.sciencedirect.com/science/article/pii/S0267364924000785).

References

Rokis, K., & Kirikova, M. (2022, September). Challenges of low-code/no-code software development: A literature review. In *International conference on business informatics research* (pp. 3-17). Cham: Springer International Publishing.

Sufi, F. (2023). Algorithms in low-code-no-code for research applications: a practical review. *Algorithms*, *16*(2), 108.

https://hsrc.ac.za/uploads/pageContent/10155/4IR%20Framework%20Report_Final_lowres.pdf

https://iol.co.za/news/south-africa/2025-06-12-bridging-south-africas-skills-gap-strategies-for-the-fourth-industrial-revolution

https://www.thedtic.gov.za/sectors-and-services-2/industrial-development/fourth-industrial-revolution

https://www.destea.gov.za/wp-content/uploads/2020/07/The-state-and-impact-of-the-Fourth-Industrial-Revolution-10.03.2020-FINAL-REPORT.pdf