

From adoption to impact: Coordinating Education, Industrial and fiscal policy for AI in South Africa

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1.Introduction

Artificial intelligence (AI), particularly generative AI, is increasingly able to perform or assist with tasks involving language, information processing, prediction, and decision support (Gmyrek et al.; ILO, 2025). As Brynjolfsson, Li and Raymond (2025) demonstrate empirically, these capabilities could help firms improve efficiency, develop products and services, and use resources more effectively. For South Africa, where growth and job creation remain weak, AI could contribute to higher productivity and strengthen the competitiveness of domestic industries (Pain, Rapapali and Steenkamp, 2025; World Bank, 2026). However, as Autor (2015) emphasizes, the effects will depend on whether firms can adopt technology effectively and whether workers have access to the skills and support needed to adapt.

The central policy issue facing South Africa is how to encourage productive technological change while ensuring that workers are equipped to adapt to evolving labor-market demands. Education institutions cannot design relevant training in isolation from employers' changing skills needs; industrial firms cannot adopt AI tools effectively without adequate skills and infrastructure (Avenyo, Bell and Nyamwena, 2024); and fiscal incentives should not subsidize investments that would have happened anyway (Bloom, Griffith and Van Reenen, 2002; National Treasury and World Bank, 2019).

This paper examines how South Africa should redesign its education, industrial, and fiscal policies to harness AI for productivity and economic growth while limiting labor-market disruptions. It argues that these policy areas should be approached as an interconnected framework: education policy should build foundational digital capabilities and support lifelong learning; industrial policy should help firms, particularly small and medium-sized enterprises (SMEs), adopt AI where it addresses genuine productivity constraints; and fiscal policy should encourage additional innovation while supporting workers through technological transitions. The effectiveness of this approach should be assessed not only through productivity improvements, but also through the extent to which it creates credible pathways for workers to adapt and participate in the changing economy.

2. South Africa’s Starting Point: Labour-Market Pressure and the Productivity Challenge

2.1 Labour-market conditions

South Africa is entering the AI transition with a severe employment challenge. Statistics South Africa’s Quarterly Labour Force Survey (QLFS) reported an official unemployment rate of 33.6% in the second quarter of 2026, representing approximately 8.5 million unemployed people. The

same release reported a combined unemployment-and-potential-labour-force measure (LU3) of 43.8% and a broader labour-underutilisation measure (LU4) of 46.3% (Stats SA, 2026a). These indicators describe different forms of labour-market difficulty and should not be treated as interchangeable: the official rate is the clearest headline measure, while the broader measures include additional forms of underutilisation (Stats SA, 2026a, 2026b; SAnews, 2026b, 2026c).

A severe baseline unemployment rate means that worker displacement carries serious social costs. Displaced workers face lengthy spells of unemployment, and structural skills mismatches make finding alternative employment difficult (DHET, 2024; WCG DEDAT, 2025). Furthermore, a clear methodological distinction must be maintained between survey instruments. As Statistics South Africa (2026a) notes, the QLFS is a household survey covering employment across formal and informal sectors, whereas the Quarterly Employment Statistics (QES) focuses on formal non-agricultural employment reported by registered businesses. Claims about formal job trends should be supported by the appropriate enterprise survey rather than inferred directly from household estimates (Stats SA, 2026a). This distinction is important because South Africa's labor market includes formal employment, informal work, and a large population of discouraged work-seekers (DEL, 2025; DHET, 2024).

2.2 Productivity and growth

South Africa needs faster and more inclusive economic growth to absorb its labor force. National Treasury (2026a) projected real GDP growth of 1.6% for 2026 in the Budget Review, identifying persistent infrastructure, energy, and logistics constraints as factors weighing heavily on economic activity. Software tools cannot, by themselves, compensate for unreliable electricity, weak connectivity, costly transport, or limited access to capital (Medici, Alonso and Moroz, 2025; OECD, 2025).

Productivity refers to how efficiently labour, capital, and other inputs are converted into goods and services (Bloom, Griffith and Van Reenen, 2002; Pain, Rapapali and Steenkamp, 2025). AI could improve decision-making, reduce downtime, or allow workers to focus on higher-value tasks (Brynjolfsson, Rock and Syverson, 2021). Evidence from South African manufacturing firms supports this concern: Avenyo, Bell and Nyamwena (2024) find that access to capital and higher-skilled human resources influence digital technology adoption. The study does not examine AI specifically suggests that firms begin the digital transition from unequal positions (Avenyo, Bell and Nyamwena, 2024). Firms need appropriate data, reliable infrastructure, staff training, and organizational changes before AI tools can produce lasting gains (Brynjolfsson, Rock and Syverson, 2021). Policy should target these complementary conditions rather than assume that buying software will automatically raise productivity.

2.3 AI exposure is not the same as job loss

Assessing AI's labour-market effects requires distinguishing between task exposure and actual job displacement. The IMF (2026) estimates that around 22% of employment in sub-Saharan Africa is exposed to AI, with roughly 13% of jobs at significant risk of replacement while close to 10% could benefit through augmentation. However, these are model-based regional estimates, not observed job losses or a direct forecast for South Africa (IMF, 2026). As Autor (2015) explains, automation can replace labour in certain routine tasks while complementing it in non-routine tasks. Technology can improve productivity and create demand for new skills, but these gains do not guarantee sufficient employment opportunities for displaced workers.

In South Africa, research by the Bureau for Economic Research (BER, 2026) shows that labor market adjustment to technology occurs predominantly through dampened entry-level hiring, non-replacement, and natural attrition rather than immediate retrenchments. Econometric modeling by Giwa and Ngepah (2024a) using a Vector Error Correction Model (VECM) demonstrates a statistically significant long-run inverse relationship between AI investment and low-skilled formal employment in South Africa. ARDL bounds testing by Giwa and Ngepah (2024b) shows that while AI investment initially supports skilled employment, structural breaks emphasize the need for social safety nets and reskilling. Policy must focus on identifying vulnerable workplace tasks, establishing transparent worker consultation, and tracking hiring metrics before transitions become crises (DEL, 2025; Nkwenkwe and Khumalo, 2026).

Table 1:Evidence on AI exposure and its limitations (Sources: ILO, 2025; IMF, 2026; Statistics South Africa, 2026; National Treasury, 2026)

Source	Main finding used	Interpretation and limitation
ILO (2025)	Around one in four workers globally are in occupations with some generative-AI exposure; clerical work is among the most exposed.	Global occupational exposure is not a count of actual job losses and does not provide a South Africa specific forecast.
IMF (2026)	Model-based estimates suggest around 22% of employment in sub-Saharan Africa is exposed; some tasks may be replaced while others may be augmented.	Regional estimates should not be presented as measured South African job losses. Infrastructure, skills and adoption affect outcomes.

Stats SA (2026)	The Q2 2026 official unemployment rate was 33.6%; LU3 was 43.8% and LU4 was 46.3%.	These indicators describe the labour-market baseline, not the effect of AI. Definitions differ and must remain distinct.
National Treasury (2026)	Real GDP growth was forecast at 1.6% for 2026.	This is a forecast, not a final outcome, and does not by itself measure productivity.

2.4 Policy context and coordination

South Africa has taken steps toward an AI policy framework, but the draft National AI Policy published for public comment was withdrawn for revision after concerns were raised about fictitious sources in its reference list (SAnews, 2026a). Government stated that the policy would be reworked to establish national standards for ethical AI use (DCDT, 2024; Republic of South Africa, 2026; SAnews, 2026a). The withdrawal does not prove that no relevant laws or strategies exist; rather, it highlights the importance of coordinating existing policies and ensuring that any future national AI policy is credible, implementable, and connected to employment, skills, industry, and fiscal planning (SAnews, 2026a).

The policy problem addressed here is therefore one of coordination and delivery. Education institutions cannot design relevant training in isolation from employers' changing needs; firms cannot adopt AI effectively without skills and infrastructure (Avenyo, Bell and Nyamwena, 2024; World Bank, 2026); and fiscal incentives should not subsidise investments that would have happened anyway (Bloom, Griffith and Van Reenen, 2002; National Treasury and World Bank, 2019). A joint approach can connect these decisions and make the distribution of benefits and adjustment costs more visible.

3. Education Policy: From Digital Access to Adaptable Skills

3.1 Build capabilities, not only coding skills

Education is essential to helping workers adapt to changing technology (DHET, 2024; World Bank, 2026). Training improves people's ability to compete for changing work, but employment outcomes also depend on the number and quality of jobs available in the economy (Card, Kluve and Weber, 2018). South Africa's digital skills pipeline faces persistent gaps between post-school education outputs and employer requirements (World Bank, 2026).

Digital education policy should build core capabilities: literacy, numeracy, critical thinking, problem-solving, data awareness, and safe technology use (DBE, 2023; World Bank, 2026).

These capabilities are more durable than training learners in a narrow set of software tools that may quickly change. Digital access requires devices, reliable connectivity, teacher support, and accessible learning materials. Research on AI in South African schooling by Saal, Matope and Dipaola (2025) identifies infrastructure deficiencies and educators' technical capabilities as critical implementation conditions.

In post-school education, TVET colleges, universities, and SETAs should work with employers to update course content (DHET, 2024). Relevant modules could include data analysis, digital customer-service systems, automated equipment maintenance, cybersecurity, and practical AI use (Avenyo, Bell and Nyamwena, 2024; Setati, 2024). Employer participation is important, but curricula should also provide transferable skills so that learners are not tied to one firm or platform (DHET, 2024).

3.2 Create recognised routes for lifelong learning

Workers already in employment may not be able to leave work for a multi-year qualification (DHET, 2024). South Africa should expand access to short, stackable, accredited learning programs that allow workers to build skills over time (World Bank, 2026). To have value, micro-credentials need clear learning outcomes, quality assurance, formal recognition on the National Qualifications Framework (NQF), and pathways into higher qualifications (DHET, 2024).

Workplace-based learning should be co-funded through employer-matched voucher schemes using SETA discretionary grants (DHET, 2012; BANKSETA, 2026). Employers would contribute to costs and identify workplace tasks for improvement, while workers receive portable credentials. Funding should prioritise workers and smaller firms facing genuine training barriers, with public support depending on reporting completion and employment outcomes (DHET, 2024).

4. Industrial Policy: Turning AI Adoption into Productive Growth

4.1 Target real bottlenecks in priority sectors

Industrial policy can influence where AI is adopted and whether it supports domestic productive capacity (TIPS, 2026). The dtic should work with sector bodies, firms, workers, and research institutions to identify specific problems AI could help solve (the dtic, 2026; TIPS, 2026). Potential applications should be treated as opportunities to test, not as guaranteed gains.

In agriculture and agro-processing, AI could assist with water management, input planning,

and yield forecasting (TIPS, 2026). In manufacturing and automotive assembly, predictive maintenance, quality control, and supply-chain tracking represent priority areas (NRF, 2026; Setati, 2024). In mining, analytics could support maintenance, operational planning, and safety monitoring. Successful adoption depends on electricity, connectivity, equipment, secure data, management capacity, worker participation, and training (Avenyo, Bell and Nyamwena, 2024; the dtic, 2026). Public support should assess the full implementation plan rather than fund software acquisition alone.

4.2 Help SMEs adopt technology

Smaller firms may lack capital, technical expertise, and bargaining power to evaluate or integrate AI products (Avenyo, Bell and Nyamwena, 2024; OECD, 2025). Support accessible mainly to large firms could widen the gap between firms with digital capacity and those without.

The dtic, the Department of Small Business Development, and universities could pilot regional Technology Extension Hubs, drawing on international manufacturing extension models (Jarmin, 1999; Lipscomb et al., 2017). Hubs would provide diagnostics, advice, training, demonstrations, shared services, and implementation support. A pilot should begin in a small number of industrial corridors selected using transparent criteria, expanding only if independent evaluation shows that productivity improves and benefits justify public costs (DPME, 2019; Jarmin, 1999).

4.3 Make public support employment-conscious

Productivity growth does not automatically create more jobs (Autor, 2015). A firm may produce more with the same workforce, expand output and hire, or reduce employment if demand does not grow (Autor, 2015; BER, 2026). Public policy should measure productivity and labour outcomes separately.

Firms receiving technology-adoption support or concessional finance should submit a proportionate workforce transition plan (DEL, 2025; the dtic, 2026). The plan should identify tasks likely to change, explain worker consultation, set out training and redeployment options, and report employee outcomes. The requirement should encourage responsible transitions rather than prohibit all labor-saving technology (Acemoglu and Restrepo, 2019; DEL, 2025).

5. Fiscal Policy: Rewarding Additional Innovation and Sharing Adjustment Costs

5.1 Use existing R&D incentives accurately

Section 11D of the Income Tax Act allows businesses to claim a 150% tax deduction on qualifying research and development (R&D) expenses, provided they meet the legal

requirements and receive the necessary approval (SARS, 2025). However, this incentive is not intended to cover the cost of buying existing AI software or making ordinary technology upgrades (SARS, 2025). It is designed to encourage businesses to invest in developing or improving technology through research. This distinction matters: research that develops new knowledge or qualifying technological advances is different from adopting an existing product to improve business operations. South Africa should retain clear eligibility standards so that the incentive supports genuine, novel research and development activities.

Empirical evaluations by National Treasury and World Bank (2019) show that Section 11D generates positive additionality, with recipient firms spending R1.83 more on R&D for every R1 of tax forgone. However, small innovative firms face complex application processes and long turnaround times (National Treasury and World Bank, 2019). Treasury and the Department of Science, Technology and Innovation should streamline Section 11D administration through a centralized online application system, transparent scoring guidelines, and faster turnaround times (Bloom, Griffith and Van Reenen, 2002; National Treasury and World Bank, 2019).

5.2 Test whether incentives change behaviour

Additionality asks whether incentives encourage activity that businesses would not otherwise undertake (Bloom, Griffith and Van Reenen, 2002; DPME, 2019). Subsidising a project a firm would have undertaken anyway transfers public resources without generating additional public benefit, representing deadweight loss to the fiscus (Bloom, Griffith and Van Reenen, 2002). Not every incentive supporting a profitable firm is wasteful; the question is whether it changes behaviour enough to justify the fiscal cost.

Incentives should be evaluated against baselines and credible comparison groups (DPME, 2019; National Treasury and World Bank, 2019). Evaluation should measure R&D spending, patenting, productivity gains, and employment outcomes (Medici, Alonso and Moroz, 2025; National Treasury and World Bank, 2019). Interventions should be adjusted or ended if evidence shows they do not deliver value.

5.3 Consider a targeted reskilling incentive

National Treasury could assess a time-limited Workforce Reskilling Tax Credit or grant scheme for employers investing in accredited training for vulnerable employees (PwC Strategy&, 2025). Empirical studies of South Africa's Employment Tax Incentive (ETI) demonstrate that payroll tax incentives can influence firm hiring and training behaviour, though careful design is required to avoid substitution effects and administrative deadweight loss

(Budlender and Ebrahim, 2021; Ebrahim, Leibbrandt and Ranchhod, 2017; Ranchhod and Finn, 2014, 2016).

Existing funding initiatives have recognised the need for reskilling in response to digital transformation (BANKSETA, 2026). Where existing mechanisms cannot adequately address identified gaps, Treasury could consider whether additional fiscal support is justified. Any pilot should have a cap, a sunset date, mandatory NQF accreditation, and an independent evaluation before renewal to limit open-ended fiscal exposure (Budlender and Ebrahim, 2021; National Treasury, 2026a).

6. Making the Policies Work Together

6.1 Coordinate delivery without creating unnecessary bureaucracy

Responsibility for skills, industry, taxation, and digital policy is distributed across several government departments (DCDT, 2020; DEL, 2025). A joint interdepartmental steering committee could connect National Treasury, the dtic, DHET, DBE, DCDT, and DEL, with participation from social partners at NEDLAC (DEL, 2025; DPME, 2019). Its mandate would be to coordinate existing programs, address challenges, share information, and recommend adjustments rather than create another institution.

The committee should publish an annual AI Transition Scorecard tracking skills output, SME adoption, productivity, and employment outcomes (DEL, 2025; DPME, 2019). Results should be disaggregated by age, gender, region, firm size, and sector where data quality allows, while protecting personal information.

6.2 Phase implementation and evaluate before scaling

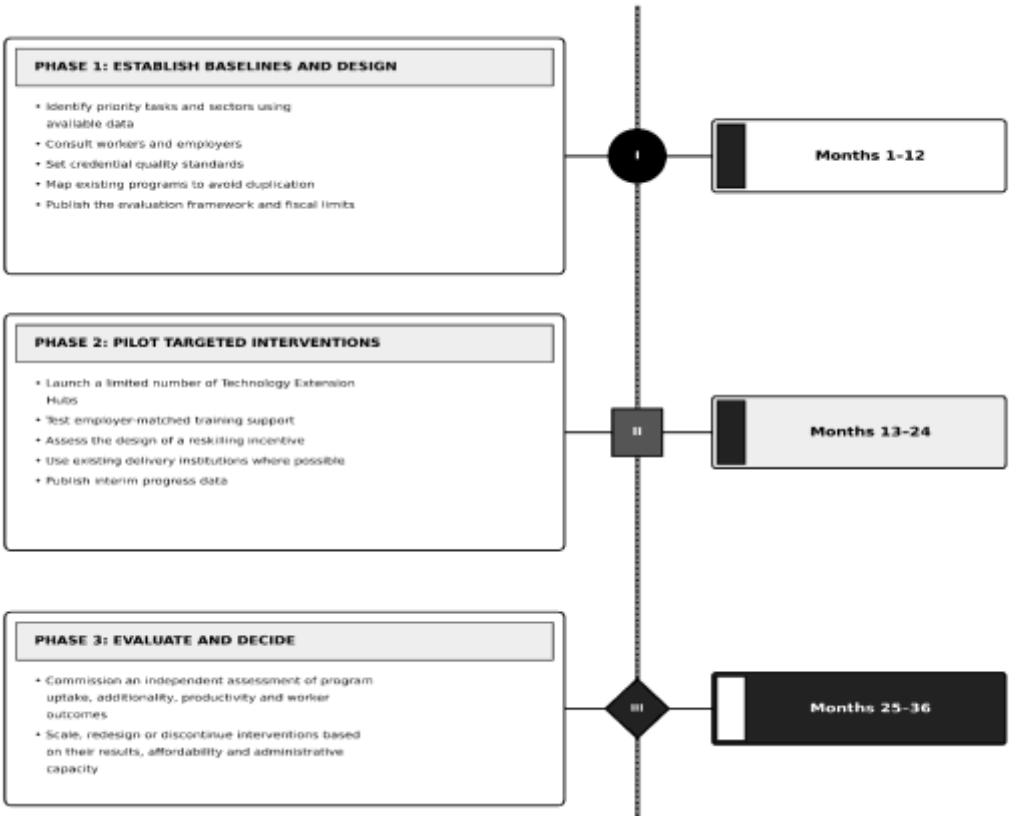


Figure 1:Phase implementation and timeline

6.3 Measure both productivity and worker outcomes

Policy evaluation must track both economic efficiency and worker outcomes (DPME, 2019). Performance scorecards should combine operational productivity metrics with measures of workforce well-being.

Table 2:Policy alignment and proposed evaluation (Sources: World Bank ,2026; DHET ,2023)

Policy area	Proposed intervention	Measures for evaluation	Primary Institutional Vehicle
Education and skills	Employer-matched vouchers for accredited, stackable micro-credentials, with worker and SME access safeguards.	Completion and assessed learning; credential recognition; redeployment or placement; cost per successful outcome.	DHET, SETAs & Private Employers
Industrial policy	Pilot Technology Extension Hubs offering SME diagnostics, technical advice, implementation help and workforce training.	SME take-up and continued use; changes in downtime, defects or input use; output per hour; cost per firm served.	The dtic, DSBD & Universities

Fiscal policy	Pilot targeted reskilling support and improve clarity around existing qualifying R&D incentives.	Verified additional training or R&D; worker outcomes; distribution of benefits by firm size; fiscal cost and cost-effectiveness.	National Treasury, SARS & DSTI
Coordination	Annual interdepartmental AI Transition Scorecard and independent pilot evaluation.	Timely public reporting; data quality; productivity and labour outcomes; decisions to scale, redesign or stop.	DEL, DPME & NEDLAC

Targets should be set only after baseline metrics, and pilot designs are completed (DPME, 2019). Fixed target counts should be avoided; performance monitoring must emphasize verified additional economic activity and public value delivered per rand of expenditure (DPME, 2019; National Treasury and World Bank, 2019).

7.Conclusion

AI could help South Africa improve productivity, strengthen industries and develop new services, but these benefits are not automatic. Given the country's high unemployment and infrastructure constraints, it is important to consider which firms can adopt the technology, who benefits and who bears the costs when tasks change.

A coordinated approach offers a more credible path than treating AI as a stand-alone technology. Education should develop adaptable skills and support lifelong learning. Industrial policy should encourage AI adoption where it addresses real productivity constraints, particularly among SMEs, while protecting workers affected by technological change. Fiscal policy should support genuine innovation and targeted reskilling while ensuring that public spending delivers additional value.

Ultimately, the success of AI adoption should be measured not only by productivity gains but also by whether workers have credible opportunities to adapt. South Africa should expand interventions only when evidence shows that they are effective, affordable and fairly implemented. The aim is not to preserve every existing job, but to ensure that technological progress does not deepen existing inequalities and exclusion.

8.Recommendations

- Create employer-matched vouchers for accredited, stackable digital and technical learning. Use a limited SETA-funded pilot, prioritise workers and SMEs facing genuine training barriers, and evaluate completion and employment outcomes before expanding (DHET, 2012, 2024; BANKSETA, 2026).

- Provide SMEs with diagnostics, independent advice, implementation support and workforce training. Select locations transparently and expand only where independent evaluation demonstrates value (Jarmin, 1999; Lipscomb et al., 2017).

- Require firms receiving relevant technology-adoption support or concessional finance to submit proportionate workforce transition plans covering worker consultation, task impacts, training and redeployment options (DEL, 2025; the dtic, 2026).
- Retain Section 11D's qualifying R&D standards while improving clear guidance and monitoring application processes. Consider complementary competitive support for smaller innovators only where a documented financing or access gap justifies it (National Treasury and World Bank, 2019; SARS, 2025).

- Test a time-limited reskilling incentive against alternatives such as direct training grants. Require recognised training, additionality, reporting and fair safeguards, and cap the pilot's fiscal exposure (Bloom, Griffith and Van Reenen, 2002; Budlender and Ebrahim, 2021; National Treasury, 2026a).

- Establish an interdepartmental AI Transition Scorecard covering productivity, SME adoption, training quality, job transitions and cost-effectiveness. Publish results annually and use them to scale, redesign or discontinue interventions (DEL, 2025; DPME, 2019).

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