ENTRY #1673

ESSAY QUESTION

# How should South Africa redesign education, industrial policy, and fiscal incentives to harness artificial intelligence for productivity growth while limiting labour market disruptions?

*Education • Industrial policy • Fiscal incentives*

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(introduction to recommendations, excluding the list of references)

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# 1. INTRODUCTION

Four out of every five South African ten-year-olds cannot read a short text and explain what it says (Department of Basic Education [DBE]: 2023). No growth model captures that fact, yet it shapes the country's economic future more than any forecast, because an economy is built from what its people are able to do.

Economists have treated schooling as an engine of prosperity for decades. A review of evidence from 139 countries puts the average private return at roughly nine per cent for each extra year of schooling, with larger returns in poorer countries (Psacharopoulos and Patrinos: 2018). Time in a classroom is only part of the story. Differences in long-run growth track what pupils learn far more closely than how long they stay enrolled (Hanushek and Woessmann: 2012). Learning therefore works on several fronts at once: it lifts earnings, widens who takes part in work and prepares people for jobs that change shape (Psacharopoulos and Patrinos: 2018; World Bank: 2019). South Africa's labour market shows the price of falling short, with official unemployment at 33.6% in the second quarter of 2026 and 47.4% of people aged 15 to 34 without work (Statistics South Africa: 2026).

Artificial intelligence (AI) now gives education systems something they have rarely had, which is individual attention at scale. In a randomised trial in Nigeria, six weeks of supervised tutoring with a large language model lifted English scores by 0.23 standard deviations (De Simone et al.: 2025). A Turkish study reads as a caution. Pupils given an unrestricted chatbot solved more practice problems but scored 17% lower in an examination once the tool was removed, while a version built with teaching safeguards largely avoided that loss (Bastani et al.: 2025). Whether AI deepens learning or hollows it out therefore depends on design, supervision and rules of use (Miao and Holmes: 2023).

This essay argues that South Africa should treat AI as an education question first and an industrial one second. Skills yield returns only where firms and institutions can absorb them, and better learning raises a firm's ability to adopt and adapt new technology (Filippucci et al.: 2024; OECD: 2026a). The argument therefore runs from the classroom to the factory floor, covering education reform, industrial policy, fiscal incentives, labour-market support and governance. Each is judged by whether it raises productivity, builds domestic capability and widens participation (Acemoglu and Restrepo: 2019; Brollo et al.: 2024).

The essay is a literature study. Section 2 describes the structural problem of technology arriving faster than productive capacity, using World Development Indicators data. Section 3 deals with education reform, Section 4 with industrial policy and Section 5 with fiscal incentives. Section

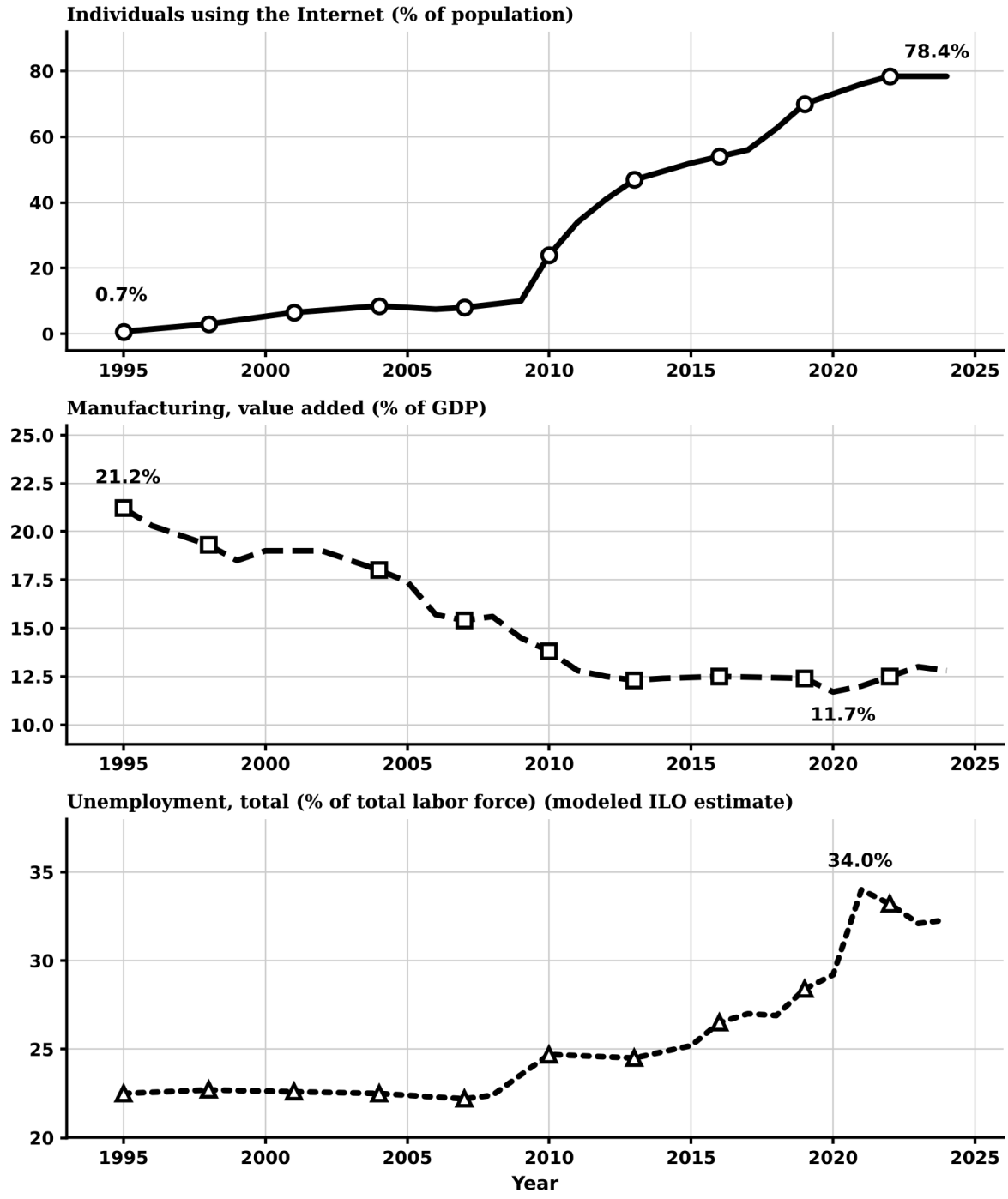
6 covers labour-market disruption and Section 7 governance and implementation. Section 8 concludes, and Section 9 gives my own recommendations and a view on whether they are workable.

## 2. The structural challenge: access without transformation

Technology does not act alone. Its payoff depends on complementary inputs such as skilled labour, dependable infrastructure, finance and management, which is why two firms using the same tool can end up with very different results (Filippucci et al.: 2024; OECD: 2026a).

South Africa's recent history shows the gap between access and transformation. Figure 1 below is a graph with three panels drawn from the World Development Indicators. It shows the share of the population using the internet, manufacturing value added as a share of GDP and the unemployment rate, each for 1995 to 2024 (World Bank: n.d.).

**Figure 1: Internet use, manufacturing and unemployment in South Africa, 1995–2024**




Series: Individuals using the Internet (% of population); Manufacturing, value added (% of GDP); Unemployment, total (% of total labour force) (modelled ILO estimate).

Source: ***Own graph based on World Development Indicators (World Bank: n.d.).***

The graph shows internet use climbing from 0.7% of the population in 1995 to 78.4% in 2024, while manufacturing value added fell from 21.2% of GDP to 11.7% in 2020 and modelled unemployment peaked at 34.0% in 2021 (World Bank: n.d.). The three series use different

bases, so they are parallel trends and not proof of cause. The pattern still fits an economy in which technology spreads faster than productive capacity. Recent labour data point the same way, since employment fell in the second quarter of 2026 and manufacturing was among the sectors shedding jobs (Statistics South Africa: 2026).

Firm-level evidence shows the same unevenness. In a survey of 440 South African manufacturers, digital adoption was closely linked to innovation, foreign ownership, export exposure and skilled staff, while financial constraints held other firms back, although the sample is not representative and the findings cannot be generalised (Avenyo et al.: 2024). Blanket technology subsidies would therefore favour firms that are already capable and bypass smaller ones (Avenyo et al.: 2024; Brollo et al.: 2024).

Industrial strategy faces the same constraint. The 2026 Industrial Development Strategy names deindustrialisation, weak investment in productive sectors and infrastructure deficits as major constraints (Department of Trade, Industry and Competition [the dtic]: 2026). AI cannot make up for unreliable infrastructure or a thin supplier base, so technology policy has to support industrial renewal rather than stand in for it (the dtic: 2026; OECD: 2026a).

## 3. Education reform: building capabilities in the age of AI

### *Foundations first*

Reform should build capabilities rather than collect qualifications. AI automates particular tasks while raising the worth of skills that complement it, such as analysis, judgement, collaboration and adaptability (Gmyrek et al.: 2025; OECD: 2026b). The World Development Report 2019 reaches a similar conclusion about a changing workplace, where adaptability and advanced cognitive skills gain in value (World Bank: 2019).

Foundational learning therefore comes first, since no AI platform can teach a child who cannot yet read the prompt on the screen (DBE: 2023). The National Digital and Future Skills Strategy already stresses capabilities for a changing economy (Department of Communications and Digital Technologies [DCDT]: 2020). School-level digital education should now move from device access toward judging information, understanding how computational systems work and using technology responsibly (DCDT: 2020; Miao and Holmes: 2023).

### *Supervised AI tutoring*

The Nigerian trial offers the clearest evidence that AI can serve this agenda. Gains in English appeared quickly and grew with attendance (De Simone et al.: 2025). South African teachers are stretched, and learners differ widely in home language, so comparable tools could add practice, feedback and language support, provided they sit inside a structured programme (De

Simone et al.: 2025; Miao and Holmes: 2023). Guardrails are not optional, because the Turkish evidence shows how an unrestricted tool becomes a crutch that weakens later performance (Bastani et al.: 2025).

The evidence still needs disciplined reading. The Nigerian programme was short, ran in computer labs and relied on teacher supervision, so it is a promising signal and not a forecast for South African classrooms (De Simone et al.: 2025). Access is the second obstacle. Learners tested in African languages scored well below those tested in English and Afrikaans, and AI tutoring that reached only well-resourced schools would widen that very gap (DBE: 2023). Public rollout should therefore start where learning deficits run deepest, using offline-capable tools and support in learners' home languages.

***Assessment***

Assessment must change with the tools. The Turkish experiment shows that performance with AI and learning without it can diverge sharply (Bastani et al.: 2025). Where AI can draft essays and solve routine problems, examinations that reward recall measure the wrong thing. Institutions should shift toward applied projects, oral defence and reasoning shown unaided, with moderation systems checking that marks reflect independent work.

***Post-school and lifelong learning***

After school, education has to connect more tightly to production. The World Bank finds unfilled digital vacancies sitting alongside high unemployment and traces this to gaps in foundational skills, programme relevance and workplace learning, so extra qualifications alone will not close the divide (World Bank: 2026). TVET colleges should design programmes with employers in manufacturing, agriculture, energy and logistics, and universities should widen interdisciplinary degrees that combine economics, engineering, data science and management (DCDT: 2020; OECD: 2026b).

Work-integrated learning is the practical remedy. Structured internships, apprenticeships and industry-supervised projects let students test theory on real production problems, and shared placement arrangements would let small firms that cannot run training alone take part (OECD: 2026b; World Bank: 2026). Real-time labour-market data would help providers adjust programmes to demand (World Bank: 2026).

Existing workers matter as much as new graduates. Exposure to generative AI signals that tasks will change, not that whole occupations will vanish (Gmyrek et al.: 2025). South Africa therefore needs lifelong learning built on modular training, recognised micro-credentials and employer-supported reskilling, with public money directed at workers facing the largest task changes (Gmyrek et al.: 2025; OECD: 2026b). Reform must run on two clocks, with schooling

building the future workforce and lifelong learning supporting people whose jobs are changing now.

***Teachers***

Teachers remain the centre of any workable design. UNESCO urges human-centred, age-appropriate use of generative AI, which implies clear rules on academic integrity, privacy and data protection, together with professional development so that AI strengthens independent reasoning instead of replacing it (Miao and Holmes: 2023).

## 4. Industrial policy: building domestic capability

Skills cannot transform an economy that offers few productive uses for them. Industrial policy must therefore steer AI toward domestic production, innovation and local technical capability, otherwise firms will import finished systems while research and software work stay abroad (OECD: 2026a; World Bank: 2019).

Priority should go to sectors where AI removes a specific production constraint: predictive maintenance and quality control in manufacturing, crop and water monitoring in agriculture, route planning in logistics and fraud detection in financial services (Filippucci et al.: 2024; the dtic: 2026). Selection should rest on productivity gains, domestic value added and available complementary skills rather than on how advanced the technology looks (Filippucci et al.: 2024). Agriculture and logistics deserve special attention because large workforces meet measurable efficiency gains there.

A central proposal of this essay is a South African AI Productivity Partnership Programme that brings together departments, universities, TVET colleges, industry bodies and firms. Instead of only financing purchases, it would support diagnosis, implementation, workforce training and evaluation, which answers evidence that adoption is shaped by skills, innovation and finance (Avenyo et al.: 2024; Filippucci et al.: 2024). Entry should be competitive and conditional on credible implementation plans, so that public money does not reach firms that would have adopted anyway (Avenyo et al.: 2024; Brollo et al.: 2024).

Domestic research capacity counts as well. Panel data for 66 South African industries between 1993 and 2023 show that returns to research and development (R&D) depend on human skills, although the study does not examine AI itself (Mazorodze et al.: 2025). Public procurement can give local technology firms a first market, provided contracts reward performance and competitiveness rather than open-ended protection (OECD: 2026a). Industrial policy also has failure modes, because support can entrench incumbents or reward lobbying over productivity,

which is why open competition, sunset clauses and published evaluations matter as much as the money.

## 5. Fiscal incentives: paying for value

Fiscal tools can steer AI adoption, but public money is scarce and every rand of subsidy competes with education, health and infrastructure. The test of an incentive is additionality, meaning whether it produces activity that would not otherwise have happened (Brollo et al.: 2024).

The Section 11D R&D incentive is a starting point, since qualifying expenditure attracts an additional deduction subject to approval (South African Revenue Service: n.d.). Its use should be confined to genuine AI-related research and process innovation, not the routine purchase of off-the-shelf software.

A restructured framework could match each instrument to a distinct barrier: R&D incentives for firms that build or substantially improve technology, competitive matching grants for viable small enterprises facing adoption costs, training incentives for recognised workforce development, and collaborative grants linking universities to firms (Brollo et al.: 2024; Filippucci et al.: 2024). Support must carry performance conditions. Recipients should report baselines and track output per worker, costs, quality, innovation and training, with independent evaluation and withdrawal of funding from persistent underperformers (Brollo et al.: 2024).

Distribution matters too. If firms use AI only to cut labour costs, the gains may flow mainly to owners of capital, which is why Brollo et al. argue for fiscal design that spreads the benefits (Brollo et al.: 2024). Incentives can therefore favour firms that pair adoption with training and redeployment, whereas sweeping automation taxes would deter investment among firms already facing high costs and limited finance (Acemoglu and Restrepo: 2019; Brollo et al.: 2024). A first claim on the fiscal envelope belongs to education itself, meaning connectivity, devices, offline content and teacher training for AI in schools, ahead of any firm subsidy. Education is the scarcest input to the whole strategy, and underfunding it would weaken every other incentive.

## 6. Labour-market policy: managing transitions

AI and employment should not be reduced to a story in which every automated task is a lost job. Acemoglu and Restrepo separate a displacement effect, when technology takes over tasks, from a reinstatement effect, when new tasks need human input, and the balance depends on the direction technology takes and the institutions that guide it (Acemoglu and Restrepo: 2019).

That direction is not fixed, so education, procurement and fiscal design can tilt innovation toward tasks that complement workers (Acemoglu and Restrepo: 2019).

Routine administrative, clerical, customer-service and some production roles face the largest task changes, though exposure is not disappearance (Gmyrek et al.: 2025). South Africa's task is to build adaptability and transition pathways, not to resist technology that raises productivity. Policy should protect people rather than particular tasks, with the emphasis on movement between jobs, sectors and regions.

A transition system has to link employers, training institutions and workers. Employment services would publish accessible information on changing skills demand, employers would flag evolving tasks before restructuring, and training would be designed jointly with worker representatives (International Labour Organization [ILO]: 2026; OECD: 2026b). Social protection completes the system, since displaced workers may need temporary income support and employment assistance tied to retraining (ILO: 2026).

## 7. Governance and implementation: accountability for outcomes

A productivity-led strategy crosses education, industry, finance, labour and communications, and split responsibility produces duplicated programmes and weak accountability. A coordination framework should bring departments, universities, firms, labour and researchers together to set priorities, match skills to employer needs and monitor outcomes (ILO: 2026; OECD: 2026a; World Bank: 2026). The World Bank likewise recommends a stronger national coordination function that joins up policy, funding and delivery (World Bank: 2026).

Institutional credibility is at stake as well. In June 2026 Cabinet approved withdrawal of the draft national AI policy for reworking and for the development of standards on ethical AI use, so it cannot be presented as adopted policy (South African Government: 2026). The redraft is a chance to strengthen technical review, consultation and the evidence base (South African Government: 2026). Governance must also address privacy breaches, biased automated decisions, cybersecurity threats and inaccurate outputs, with learner data protected in schools, oversight of AI-assisted recruitment in workplaces and meaningful explanations for people affected by automated public decisions (Miao and Holmes: 2023; OECD: 2026b).

Success should be judged by outcomes, not by technologies bought or partnerships announced. The proposed programme should report firm-level productivity, manufacturing value added, R&D activity, small-business adoption, worker training and transitions, separating effects of the intervention from changes that would have happened anyway (Brollo et al.: 2024; Filippucci et al.: 2024). Monitoring should also show which firms, workers and regions benefit,

which makes inclusion measurable (Brollo et al.: 2024; OECD: 2026a). Pilots should publish independent evaluations, failures included, so that the state learns faster than the technology changes.

## 8. CONCLUSION

This essay examined how South Africa should redesign education, industrial policy and fiscal incentives so that artificial intelligence raises productivity without causing damaging labour-market disruption. It was a literature study. I drew on academic research, reports from international organisations, South African government documents and World Development Indicators data, and read them against one another to see where the evidence agreed and where it was thin. The central finding is that returns to AI depend on what learners can do and on firms able to absorb those skills. Education therefore comes before industrial and fiscal measures. The evidence on AI tutoring is promising but limited, and the evidence on firm adoption rests on small, non-representative samples. Together, these findings shape the recommendations that follow in the next section.

## 9. RECOMMENDATIONS

In my opinion the strategy is workable, but only if sequencing and funding are realistic. Six recommendations follow.

First, make foundational literacy and numeracy the core of AI readiness.

Second, run supervised AI tutoring as structured pilots with guardrails and independent evaluation, and scale only what improves learning.

Third, link TVET colleges and universities to employers through work-integrated learning, and use labour-market data to revise programmes.

Fourth, establish the AI Productivity Partnership Programme as the vehicle for firm-level diagnosis, training and measurement.

Fifth, confine fiscal incentives to additional, performance-linked activity and avoid broad automation taxes.

Sixth, build a transition system that combines reskilling, employment services and temporary income support.

Not all of this is equally workable. Foundational literacy and TVET partnerships rely on institutions that already exist, so they can start soon. AI tutoring and the partnership programme need delivery capacity that the state has struggled to show, so I would pilot them in a few provinces first. A national rollout in the short run is not workable given fiscal limits. Without

deliberate design, AI could widen the gap between well-resourced and under-resourced schools, and between large firms and small enterprises. Delay carries its own cost, because every cohort leaving school without these foundations enters work unprepared. Results should be tracked by learner group, language and province, because averages can hide divergence. The advice to decision-makers is plain: start in the classroom, measure what learners can do without the tool, and let evidence rather than enthusiasm decide what scales.

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