



*Technology Transfer for
Welding and Manufacturing
Training Centers of Excellence*

EXECUTIVE BROCHURE

Building Africa's Industrial Future

Meeting the Growing Demand for Welding and Manufacturing Skills

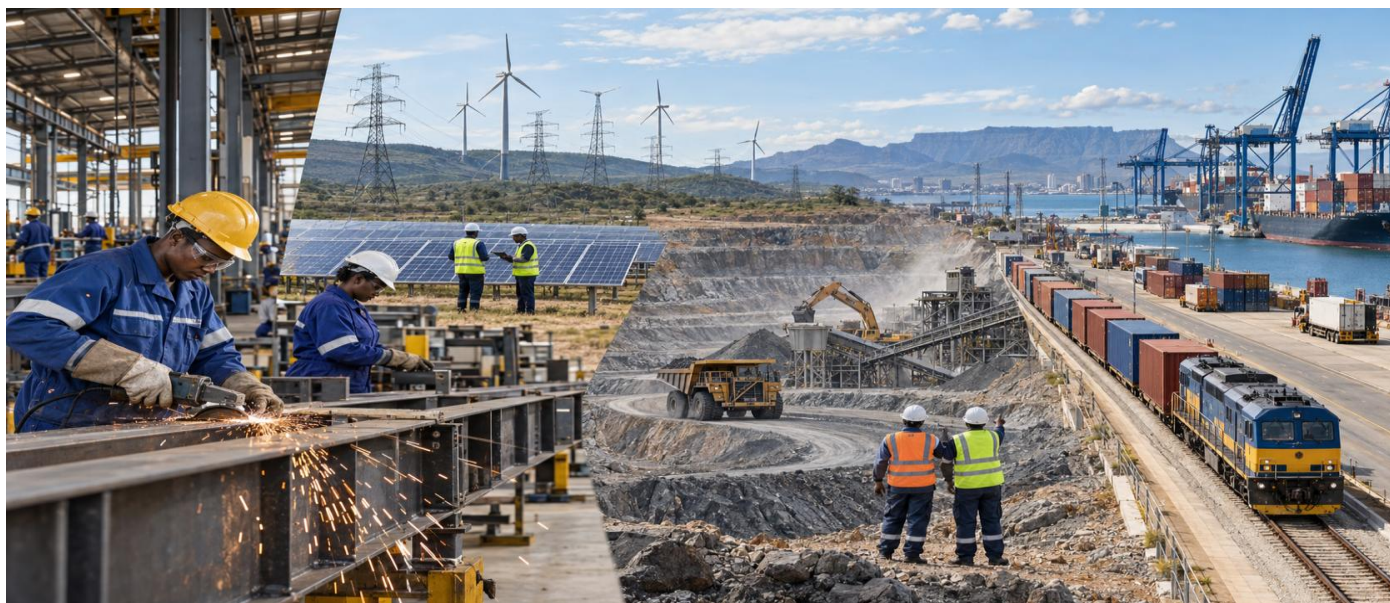
A landscape analysis of industry demand, training capacity, and certification systems



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Africa is entering a period of industrial transformation

Across Africa, large-scale investments in energy, mining, manufacturing, transport, and construction are driving demand for advanced industrial capabilities. Governments are promoting local value addition, industrial processing, and the development of increasingly sophisticated manufacturing systems, while private investors are attracted by abundant resources and a rapidly growing labour force. **Converting these natural and demographic advantages into competitive industries will require skilled workers who can build, operate, and maintain complex modern assets and production systems safely and in line with internationally recognised standards.**



Industrial transformation across sectors

ENERGY (Oil, Gas, Petrochemicals, Power Infrastructure)	MINING	MANUFACTURING	TRANSPORT	CONSTRUCTION
Generation, grids, pipelines and maintenance	Mineral processing, fabrication, and equipment repair	Production, industrial processing, and local value addition	Ports, railways, shipyards and trade corridors	Urban infrastructure and major steel structures

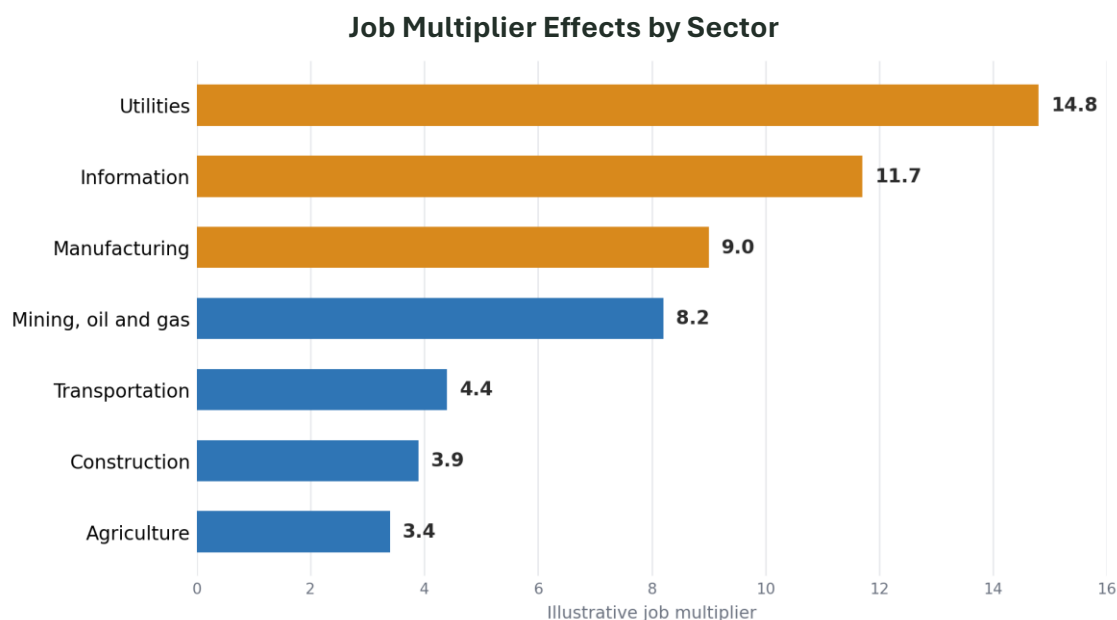
Source: GFP International landscape analysis.

Industrial Transformation Requires Industrial Skills

All major sectors that drive industrial transformation—including manufacturing, extractive industries, and economic infrastructure—rely on welding as a critical skill. In Africa, however, demand for qualified welders already far exceeds the supply produced by existing training systems. **Investments in welding and related competencies are crucial to the continent's ongoing industrialisation, and policymakers should regard them not merely as educational programmes but as strategic development initiatives.**

The sectors that depend most heavily on industrial welding can also generate substantial employment effects across the wider economy. Building a stronger industrial workforce not only boosts employment on production lines and project sites but also across supplier networks, logistics systems, maintenance operations, services, and local consumption. **The manufacturing sector, where welding skills are**

especially crucial, carries an illustrative job multiplier of 9.0. In other words, each additional manufacturing job generates nine more jobs in upstream and downstream sectors. Investments in welding and manufacturing can also increase local participation in major projects, strengthen domestic value chains, improve youth employment, accelerate technology transfer, and enhance industrial competitiveness. Training and certifying African workers can retain more project value locally, reduce dependence on imported technical labour, and strengthen regional and international economic integration.



*Note: Selected industries highlighted for their relevance to welding and manufacturing. Multipliers are illustrative estimates cited in the landscape analysis.
Source: Camoin Associates.*

Demand for workforce skills to enable Africa's industrial transformation

Africa is estimated to require approximately **three million** qualified industrial welders, including about **2.16 million** in manufacturing and **784,000** across general major sectors. In addition, identified oil and gas, refinery and LNG projects could generate demand for more than **200,000** welders over their project lifecycles. Assuming that 30% of these projects are implemented concurrently, peak demand could exceed **60,000** internationally certified welders. These estimates highlight the scale and urgency of strengthening Africa's welding-training capacity, internationally recognised certification systems and pathways for workforce mobility.

Source: GFP International estimates.

Note: Figures are indicative and depend on investment timing, project design, sequencing, local fabrication and prefabrication, and the extent to which major projects proceed concurrently.

Capital investment drives demand for welding and manufacturing skills. The construction and operation of petroleum product refineries liquified natural gas facilities, mines, power systems, ports,

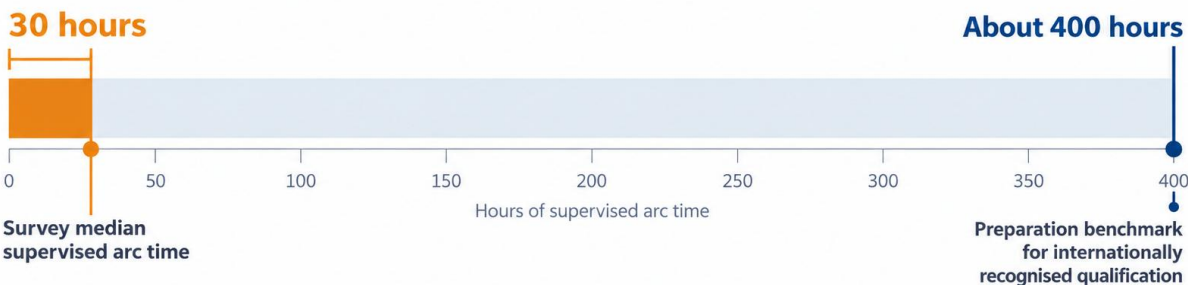
railways, bridges, and factories all require code-compliant welding. Demand is greatest where project safety, pressure containment, structural integrity, and quality assurance are non-negotiable.

The existing training system cannot yet meet industry demand¹

Africa’s existing training infrastructure is wholly inadequate to meet the demands of industry, but **the challenge is not institutional commitment**. In interviews and surveys, leaders and instructors consistently expressed a strong interest in modernising their programmes. The binding constraint is structural: facilities, practical training time, curriculum alignment, instructor preparation, testing services and certification pathways remain insufficient or disconnected. For example, welding competence is acquired through supervised practice, but **training institutions lack the capacity to provide adequate instructional time**. Institutions surveyed by GFP International offered a median of 30 hours of arc time, whereas the internationally recognised qualification benchmark is roughly 400 hours. No amount of classroom instruction can replace hands-on experience.

Hands-on Training Time Falls Far Short of Industry Requirements

Institutions surveyed by GFP International reported a median of 30 hours of supervised arc time, compared with an internationally recognised preparation benchmark of about 400 hours.



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Survey Results

0 of 37 Institutions reported issuing an internationally recognised welding certificate	34 of 37 used locally developed curricula not aligned to international standards	7 of 37 had bend-testing equipment , which is required for welder qualification testing
14 of 37	1 per 2-3 students	16 of 37

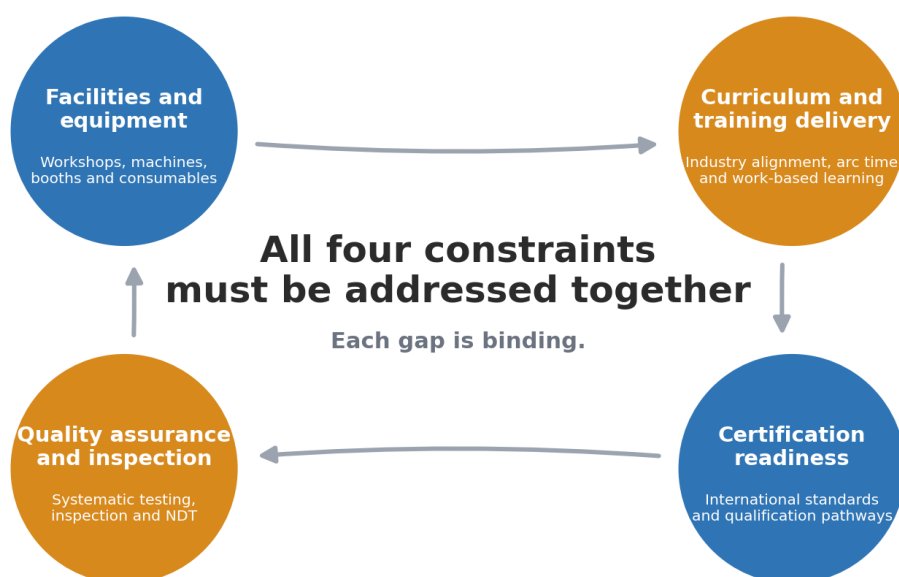
¹ The assessment covered 37 welding and fabrication training institutions in 13 African countries. A list of institutions is provided in the main report.

had formal welding booths	was the average number of welding machines	reported no fabrication, cutting or testing equipment
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Source: GFP Welding School Survey and Equipment Inventory Survey. Arc-time results reflect 24 institutions reporting data.

Four binding constraints limit the supply of qualified welders

Addressing any single component of the training system will not be sufficient to create a complete pathway from enrolment to industrial employment. New facilities and machines cannot compensate for inadequate practice time or curricula that are misaligned with industry requirements. Effective programmes cannot be delivered effectively without suitable consumables, qualified instructors, work-based learning, and employer engagement. Graduates cannot demonstrate competence without systematic inspection and calibrated testing, and qualifications have limited labour-market value without recognised certification pathways.



The solution: regional Centres of Excellence linked through a hub-and-spoke network

Centres of Excellence can concentrate scarce expertise and capital-intensive services while strengthening the reach and quality of surrounding institutions. A Centre of Excellence offers specialised knowledge, standardises processes, and accelerates the adoption of modern industrial technologies. **The Centre of Excellence model is designed to perform overarching systemic functions that go beyond the capabilities of existing institutions.** Whereas a traditional institution primarily trains students, a Centre of Excellence can certify instructors from surrounding institutions and provide testing services, supplies, and reference curricula, raising the output and quality of the entire regional training network.

Centres of Excellence & Regional Training Network



Key features of Regional Centres of Excellence

Advanced skills training Internationally recognised training in the welding processes, positions and materials required by oil and gas, power, mining, shipbuilding and heavy manufacturing.	Instructor development Instructor certification and train-the-trainer programmes that address the instructor-competency gap and strengthen delivery across the network.
Testing & qualification Shared calibrated bend-testing, inspection and non-destructive testing capability that is largely absent from the institutions assessed.	Industry partnerships Structured work-based learning, employer-led curriculum review and direct placement pathways linked to major industrial projects.
Technology transfer CNC systems, welding automation, robotic welding, digital fabrication and simulator-based training introduced into the regional training ecosystem.	Curriculum & quality assurance Reference curricula, welding procedure specifications, documentation templates and safety systems for spoke institutions.

Building on existing institutions and addressing what the system lacks

The landscape analysis underscores the value of building Centres of Excellence around institutions that already combine adequate infrastructure with strong leadership, qualified instructors, active industry partnerships, and a commitment to continuous programme improvement. Several participating institutions — particularly industry-linked training providers and better-equipped technical universities — already offer a foundation on which a Centre of Excellence could be built. Some have strategic plans in place but lack the

financial resources, specialised technical advisory capacity, and accreditation relationships required to implement them.

A practical agenda

- **Select strong institutional foundations:** Prioritise potential Centres of Excellence that offer demonstrated leadership commitment, infrastructure potential, and credible industry relationships.
- **Finance the complete certification pathway:** Fund equipment, instructors, consumables, testing, quality systems, and accreditation as one package.
- **Design for network effects:** Require each Centre of Excellence to support multiple existing training institutions, including universities, private training providers, and industry academies.
- **Make employers co-designers:** Use employer-led standards, work-based learning, and job-placement pathways to keep training aligned with demand.
- **Measure outcomes:** Track practice hours, instructor qualifications, test pass rates, the number of recognised certificates issued, graduate employment rates, and employer satisfaction.



Designed for leverage

Spoke institutions retain responsibility for:	Centre of Excellence hubs concentrate:	The training system gains:
• Foundational instruction • Recruitment and community reach • Local delivery relationships	• Advanced equipment and certified instructors • Testing laboratories • Accreditation and quality systems	• Higher-quality service delivery across multiple institutions • Recognised certifications • Stronger industry linkages

Employer engagement is crucial

The Centre of Excellence model leverages employer engagement to address a recurring implementation gap: capital investment in facilities and equipment produces limited results unless it is paired with specialised technical expertise, instructor development, testing capability, quality assurance, industry engagement and recognised certification. **To ensure that training is demand-driven, employers must be directly involved in informing curricula, supporting hands-on learning, designing assessments that reflect real working conditions, recruiting graduates, and providing feedback to enable continuous improvement.**

The bottom line

A credible supply of internationally qualified welders can improve project delivery, lower dependence on imported technical labour, expand local content, deepen domestic value chains and enable African workers and firms to capture more of the value created by the continent's industrial expansion.

10 initial steps to transform African welder training

No	Action	Status
1	Conduct comprehensive facility and training assessments. Evaluate workshop space and layout, equipment, trainer competence, curricula, practical training hours, testing practices, and certification procedures against national, international, and industry-specific standards.	100% complete at 47 schools in ten African countries.
2	Engage employers and validate industry demand. Consult existing and prospective employers across the manufacturing, construction, infrastructure, energy, mining, and transport sectors to identify current and projected workforce needs, required process knowledge, in-demand technical skills, and certification requirements.	Employer demand study completed by GFP International.
3	Train welding trainers. Provide structured training-of-trainers programmes led by qualified experts to ensure that instructors possess the technical competence, practical experience, pedagogical tools, and familiarity with relevant standards necessary to deliver high-quality training.	Training-of-trainers curriculum has been prepared.
4	Modernise workshop infrastructure. Prepare schematic, architectural, and engineering designs to remodel, expand, or construct new training facilities. Field visits by GFP International to approximately 40 facilities found that all required some degree of workshop improvement or expansion.	Schematic designs have been completed for eight schools.
5	Procure appropriate industrial-grade equipment. Equip training facilities with modern equipment of appropriate capacity and duty cycle for intensive multi-process training that reflects industrial practice.	Competitive quotations have been received by GFP International.
6	Establish testing, tools and materials infrastructure. Establish weld-testing facilities, secure tool rooms, storage for steel and consumables, and supporting systems for effective practical training, assessment, safety and equipment management.	Project funding is pending.
7	Implement industry-aligned curricula and practical training. Combine relevant theory with sufficient hands-on training to produce graduates capable of meeting internationally compliant industrial requirements. Periodically review curricula with employers to maintain alignment with demand.	Global curricula have been evaluated, and best practices have been identified.
8	Train students in application-specific welding procedures. Provide practical training relevant to specific industries, processes, and major projects. Where appropriate, tailor training to identified employment opportunities, including refinery-related welding requirements.	School upgrades and training-of-trainers activities are pending.
9	Establish independent assessment and recognised certification pathways. Engage qualified examiners and certification bodies associated with the American Welding Society (AWS), the International Institute of Welding (IIW), and the Canadian Welding Bureau (CWB), as	Evaluators with professional ties to the American Welding Society, the International Institute of Welding, and the Canadian Welding Bureau have been identified.

	appropriate, to assess graduating welders against recognised standards and award relevant qualifications or certifications.	
10	Connect graduates with employers and track employment outcomes. Create structured agreements with industry partners for internships, apprenticeships, recruitment, and job placements. Track employment, employer satisfaction, wage dynamics, and the continued relevance of training to industry needs.	GFP International tracks industrial project plans and schedules, and its newsletter reaches over 6,000 executives across the public and private sectors.

Based on Building Africa's Industrial Future: Meeting the Growing Demand for Welding and Manufacturing Skills, GFP International, 2026 (forthcoming).