

# Skilling artisans for a global competitive metal industry in South Africa

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## ABBREVIATIONS

AATP	Accelerated Artisan Training Programme
DBE	Department of Basic Education
DHET	Department of Higher Education and Training
HET	Higher Education and Training
merSETA	Metal and Engineering Related Sector Education and Training Authority
NAMB	National Artisan Moderating Body
NDP	National Development Plan
NGP	New Growth Path
NSDS III	National Skills Development Strategy III
OECD	Organisation of European Co-operation and Development
SETA	Sector Education and Training Authority
SEIFSA	Steel and Engineering Industries Federation of Southern Africa
STEM	Science, Technology, Engineering, and Math
TVET	Technical Vocational Education and Training
WCM	World Class Manufacturing

## ACKNOWLEDGEMENTS

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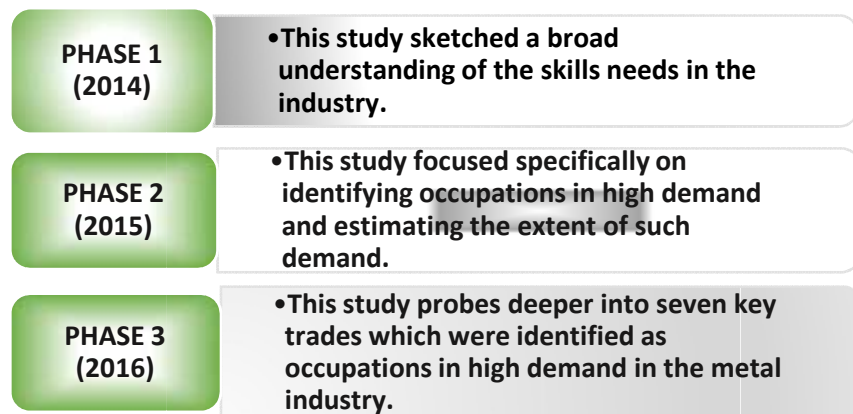
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## SUMMARY OF RECOMMENDATIONS

<p>-----  <b>RETHINK  POLICY  PURPOSE</b>  -----</p>	<p>The purpose of the national skills development policy should fundamentally be to develop high quality, versatile and capable artisans with a craftsmanship mentality, who have mastered their respective knowledge domains and are empowered to function in a modern industrial environment, as opposed to the current policy of “chasing artisan graduate targets.”</p>
<p>-----  <b>CREATE CAREER  PATHWAYS</b>  -----</p>	<p>There should be a significant effort made by the social partners to create career pathways and “professionalise” the trades. This is to ensure that trades become a first choice career option for the youth with opportunities for career development. By “professionalising” the trades, the integrity of artisans will be assured, along with better career prospects.</p>
<p>-----  <b>STRENGTHEN  STEM IN  SCHOOLS</b>  -----</p>	<p>Strengthening Science, Technology, Engineering, and Math (STEM) skills at a school level is the foundation of a world-class artisanal workforce of any nation. It is the basis of enabling an artisan to work proficiently in the workplace. It ensures that the artisan can engage in problem solving, analytical thinking, and the ability to work independently, which is vital today.</p>
<p>-----  <b>CAREER  GUIDANCE AND  COUNSELLING</b>  -----</p>	<p>The entire system of career guidance and counselling in the national education and training system should be “reconditioned” to ensure that it is responsive to the needs of learners at all levels in the system. It should become a mandatory component of the curriculum.</p>
<p>-----  <b>APPRENTICESHIP  DURATION</b>  -----</p>	<p>The duration of apprenticeship should revert to 3 to 4 years to allow the apprentice to accrue sufficient relevant workplace experience. A 1.5 to 2 year programme is not the same as a 3 to 4 year programme. Passing a trade does not make an artisan.</p>
<p>-----  <b>TVET DELIVERY</b>  -----</p>	<p>Public TVET Colleges are the backbone of the post-school system and the engine to drive the manufacturing industry. The highest priority is to strengthen TVET Colleges in this country and turn them into credible institutions of first choice.</p>




## 1. BACKGROUND

The merSETA commissioned SEIFSA to conduct research studies on the state of training in the metal industry over a three-year horizon.



## 2. PURPOSE AND OBJECTIVES

The purpose of this research study is to conduct a needs analysis of artisanal trades with specific reference to the following:

-  Boilermaker
-  Welder
-  Millwright
-  Fitter & Turner
-  Toolmaker
-  Patternmaker
-  Industrial Electrician

*“Intermediate-level artisans remain crucial to the future, as multi-technical systems need maintenance, servicing and repairs. Machine tool producers must make the transition from basic manufacture to the manufacture of more sophisticated machine tools and, in order to do so, they need greater understanding of technology, of electrical systems and of materials science”.*

The objective is to determine what reforms should be implemented to ensure that these artisans are relevant, productive and contributing significantly to improving the competitiveness of local firms in the metal industry over the next three to five years.

Such information is vitally needed by the industry because innovation, technological advancements, new work processes, automation, redesigned work arrangements

and the need for new skills are having a major impact on the productivity of artisans and the competitiveness of firms in the industry.









### 3. KEY RESEARCH QUESTIONS

*Between 40 percent and 45% of all job openings in the economy throughout 2015 will be in middle-skilled occupations that require post-secondary education and training but not necessarily a bachelor's degree.*

- **Van Opstal, D. Thrive**

**What specialised skills will be required for artisans in these trades over the next 5 years to remain relevant, productive and supportive of improving the competitiveness of Metal Industry firms?**

Emanating from the above, the following questions arose:

	How relevant are trade qualifications in a post-industrial economy?
	Is apprenticeship training fit-for-purpose?
	What new skills sets do artisans need to be productive in a changing metal industry?
	What specialised training do artisans need in a modern manufacturing environment?
	To what extent are training providers responsive to a changing metal industry?
	What is the capacity of trainers/instructors to deliver an improved and potentially more demanding training programme?
	Are apprenticeship training delivery modalities accessible?
	What recommendations should be made to merSETA?

#### 4. RESEARCH APPROACH

The research approach takes its cue from the experiences of two previous studies which indicate that metal companies are reluctant to:

- 👤 Complete survey questionnaires - email survey was also administered to 180 member firms of SEIFSA, but responses were low.
- 👤 Unwillingness to attend workshops - two workshops were held in March 2016, but attendance was low.

Consequently, the approach shifted to face-to-face interviews and focused group discussions with company representatives at their work sites. The advantage of taking the research to the workplace enables the researcher to obtain deep analytical insights about artisan training issues in a way that surveys normally cannot provide due to the inherent nature.

*"I want to understand the world from your point of view. I want to know what you know in the way you know it. I want to understand the meaning of your experience, to walk in your shoes, to feel things as you feel them, to explain things as you explain them. Will you become my teacher and help me understand?"*

- James P. Spradley

During interviews and group discussions, participants tend to talk passionately and openly about training issues. The consultations were based on a semi-structured interview schedule allowing a sufficient degree of flexibility for the researcher and participant/s to delve deeper into issues raised, as long as the main themes are covered. Site visits enabled the researcher to view the training areas and meet instructors and learners.

The interviews were conducted with industry experts in the field of artisan training. Visits were also made to private training centres servicing companies in the metal and engineering industry. Some of these are recognised decentralised trade testing centres. We spoke to managers and training instructors.

The interviews and group discussions were approximately one hour in length, although in many instances participants were glad to exceed the allocated duration.



## 5. PARTICIPANTS

The following people contributed to the findings and recommendations in this research study:

Terrence Harrison	ArcelorMittal
Johan Rickert	ArcelorMittal
Nicolene van Emmenes	ArcelorMittal
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Gibela	Richard Louw
SA Institute of Foundrymen	John Davies
Productivity Consultant	Nigel Brain
Errol Beiling	EEC College Kwa Thema
Gary Wilson	Galison Manufacturing
Anna-Marie Lindique	CWI

## 6. POLICY CONTEXT OF ARTISAN TRAINING AND DEVELOPMENT

Artisan training and development is a common thread that weaves through the major policy pronouncements of government:



The New Growth Path calls for a radical review of the post-school training system to address shortfalls in technical skills. It set a target of at least 30 000 engineers and 50 000 additional artisans by 2014 and 2015 respectively. Every SETA should aim to facilitate and co-finance training for 10% of the workforce annually.

Technical Vocational Education and Training (Formally known as FET) colleges have a central role in providing important middle-level skills for young people. An immediate goal was to expand enrolment at TVET colleges, targeting a million students in TVET colleges by 2014.



Persistent skills deficits and mismatches - especially in critical sectors of the productive economy - continue to hamper industrial and technological development.

An urgent need for further demand-led skills interventions in these sectors is needed. These efforts must include: support for better demand-side planning; deeper involvement of SOCs (State Owned Companies) and the private sector in providing resources for training; and a more strategic and sustainable approach to meeting scarce skills needs overall - including on-going review of immigration policy constraints.































The NDP calls for the role of state-owned enterprises in training artisans and technical professionals to be expanded to produce 30 000 artisans per year. Colleges should be the institutions of choice for the training of artisans and producing other mid-level skills. The country lacks the skills to compete with advanced manufacturing countries such as Germany.



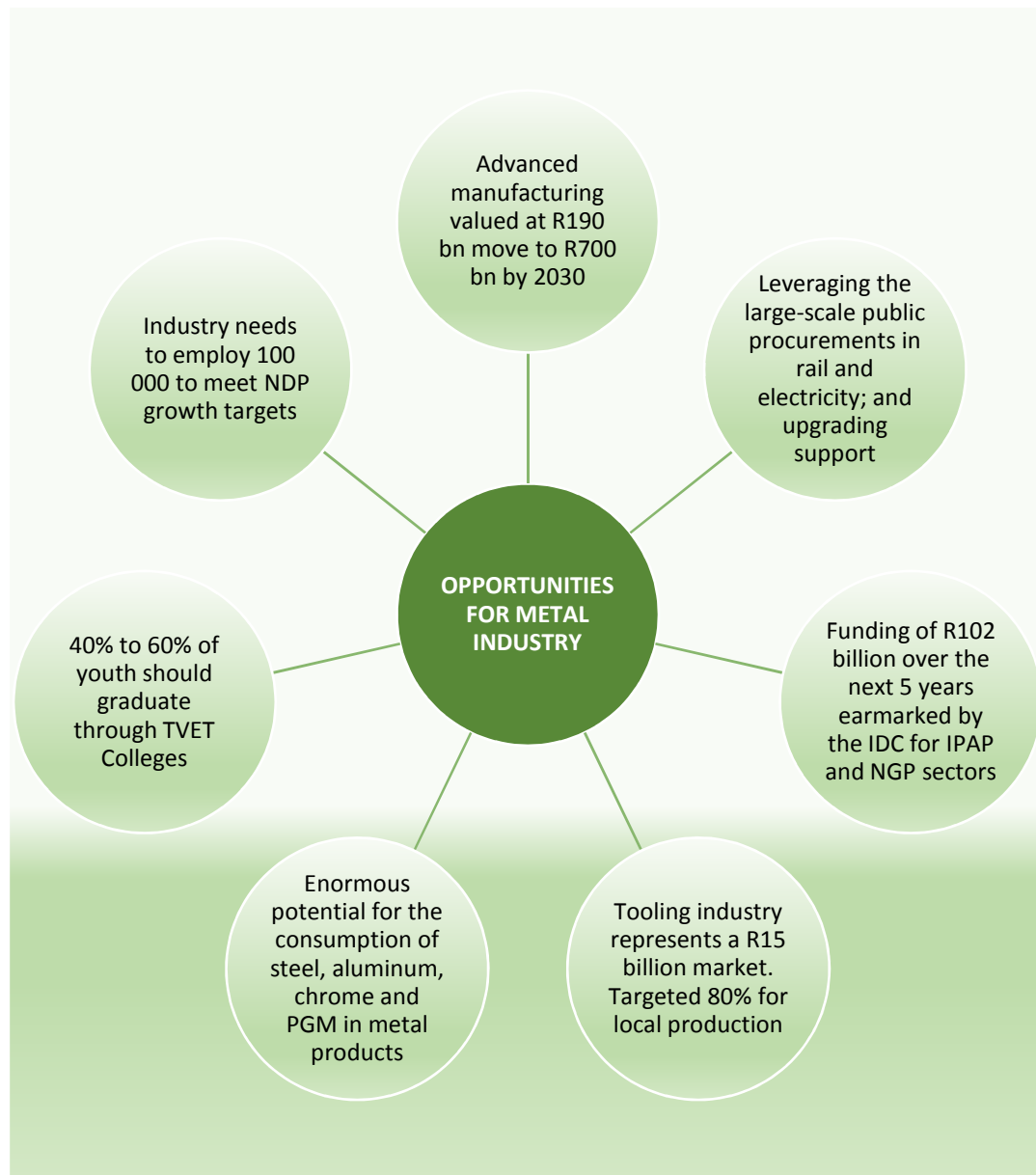
A particular focus of NSDS III is on artisans. Middle skills needs are identified and addressed in all sectors. The target is to produce 10 000 artisans per year who qualify with relevant skills and find employment.

## 7. PERFORMANCE OF METALS INDUSTRY

The year-on-year performance of the industry from 2014 to 2015 was as follows:






Contribution			R125 billion
Capacity Utilisation			75%
Production			-3%
Employment			-1.8% (7 000)
Investments			-16%
Trade Balance			-35.3%
Trade Deficit			-R142 billion
Export: import ratio			-9.9%
Labour Costs			+8% to 10%
Administered Prices			+8%
Social Partnerships			Government, Labour & Business
Policy Uncertainty			Legislation & Plans
Currency Weakness			Devaluation
Downgrade			Junk Status

## 8. OPPORTUNITIES WITH IMPLICATIONS FOR SKILLS DEVELOPMENT






## 9. NEW TRENDS IN ARTISAN TRAINING INTERNATIONALLY


A scrutiny of some of the international debates indicates that:

Intersecting apprenticeships and higher education and training	
	The worlds of apprenticeship and higher education and training (HET) are beginning to intersect. Some HET institutions have initiatives that enable workers from a number of apprenticeship trade programmes to obtain an associate degree or a technical certificate using the credits that they earned for time spent on the job.
Going digital	
	Companies and training providers are embracing digital platforms to offer learning experiences anytime, anywhere. The latter are offering remote skills training for manufacturing, allowing employers and employees alike to make use of self-paced learning that is available 24x7 and is delivered in a way that is best suited for the learner and learning objectives.
Minimum bureaucracy and less “box ticking”	
	Many countries are finding ways to make the apprentice system less bureaucratic so that employers are not burdened with unnecessary paper work.
Simpler occupational standards that remain world class	
	G5 countries recognise the value of keeping occupational competency standards similar, simple and up-to-date with changing employment and technological trends, including the growing need for international standards that may be required by some sectors. Sectors that make use of skilled migration and global supply chains want skills standards that are transnational.
The artisan of tomorrow	
	Artisans need to be qualified in ways that draw on both disciplinary and multi-disciplinary knowledge bases. They need diagnostic and specialist skills at high levels of technical complexity. They need to be well-rounded as persons as they have to interact and communicate in complex inter-personal and team milieus. Life skills are therefore important, as is proficiency in the spoken, written, visual and information technology (IT) languages used in their workplaces and in the technical areas in which they work. They thus need a far broader knowledge, skill and dispositional range than what is usually considered to be technical

	skills.
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Better qualifications of entrants		
	There is a trend towards higher level general qualifications prior to entry into the apprenticeship system. With reference to Germany, students from increasingly middleclass backgrounds with higher levels of general, rather than vocational, educational attainment are winning the competition for ever-fewer apprenticeships.	
New role for schools		
	High-skill, high-tech jobs in the new economy virtually mandate that schools make significant changes in what and how teachers teach and to whom they teach it. Strong mathematics and science backgrounds are a necessity to enter apprenticeships. A new pedagogy is needed to make pupils sensitive to the world of work.	
From certainty (past) to design/innovation/risk (future)		
	<b>The Past</b>	<b>The Future</b>
	<b>The Worker</b>	
	▪ Technical workers are not considered to be knowledge workers and are not taught skills of the knowledge economy.	▪ Every worker is considered a knowledge worker; technical workers are trained to be multi-skilled, creative problem solvers.
	<b>The Partnership</b>	
	▪ Industry and educational institutions form partnerships in an ad hoc manner with limited objectives.	▪ Partnerships are required. Measurable outcomes are established in the development of partnerships.
	<b>The Education</b>	
	▪ Job training occurs in a classroom or institutional setting. ▪ Curriculum is driven by academic expectations. ▪ Curriculum content is not designed to meet industry needs; thus, it is often irrelevant or out of date. ▪ The content delivery system of colleges is ill equipped to address needs of those who have already begun their working lives.	▪ Job training occurs in a contextual, work-like environment. ▪ Curriculum is driven by industry needs. ▪ Curriculum content is based on industry standards and developed in close consultation with industry. ▪ The content delivery system is flexible, includes adult workers, and applies technology to improve productivity.

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	The Past	The Future
<b>The Nature of Work</b>		
	<ul style="list-style-type: none"> <li>▪ Certainty</li> <li>▪ Routine work</li> <li>▪ Procedural work</li> <li>▪ Predictable problem solving</li> <li>▪ Simple tasks/subject matter</li> <li>▪ Technique-focused</li> <li>▪ Supervised work</li> </ul>	<ul style="list-style-type: none"> <li>▪ Design/innovation/risk</li> <li>▪ Unique situations</li> <li>▪ Uncertainty, risk</li> <li>▪ Complex problem solving</li> <li>▪ Complex tasks/subject matter</li> <li>▪ Conceptually-based</li> <li>▪ Autonomous work</li> </ul>
<b>Higher Skills Intensities</b>		
	<p>There are simply fewer roles in most advanced economies that require routine manual work, such as production line operatives. There is a steady decline of “routine cognitive” and “routine manual” work. ‘Non-routine manual’ workers such as plumbers have experienced a steady increase in recent years.</p>	

### ***Artisan of tomorrow***

*“They need diagnostic and specialist skills at high levels of technical complexity. They need to be well-rounded as persons as they have to interact and communicate in complex inter-personal and team milieus. Life skills are therefore important, as is proficiency in the spoken, written, visual and information technology (IT) languages used in their workplaces and in the technical areas in which they work. Moreover, they need to be at home in the multi-lingual and multi-cultural environments that now characterise all workplaces, both locally and internationally. They thus need a far broader knowledge, skill and dispositional range than what is usually considered to be technical skills”.*

***National Governors Association (USA) 2012***

## 10. FINDINGS AND RECOMMENDATIONS



Rather than providing a multitude of research findings gathered from engagements with experts, we discuss 6 key findings which, if properly addressed, will change the direction of artisan training and development in South Africa.

### **Finding 1 # Misdirected Policy Purpose**

Since the mid-1990s the apprenticeship system has been revitalised. This is largely a result of the failure of the learnership scheme to deliver strong technical skills into manufacturing plants. Furthermore, Government's expected roll-out of mega infrastructure projects has also necessitated a sharper focus on apprenticeship training. To incentivise companies to indenture apprentices, the apprenticeship scheme offers grants and tax deductions. This has increased the number of apprentices in the system.

Despite government's good intentions, two major policy problems exist, coupled with delivery challenges. First, the overriding focus of DHET policy is on training people at entry into trades (apprenticeship training). To this effect, hundreds of millions have been spent on pre-artisan training.

Hardly any attention is paid to continuous training and development of existing artisans (post-artisan) in the system. It is the latter group that is critical to driving productivity, improving efficiencies, cutting waste and ensuring the competitiveness of companies in the metal industry. With technology advancements and process innovations, there is a dire need for policy-makers to focus on the training and re-

*"Government needs to talk less and listen more. It needs to understand the importance of the existing artisan workforce to the metal industry. We have no problem recruiting any amount of new artisans, but getting highly skilled and experienced artisans that can troubleshoot on the floor is a rare commodity".*

**-Interviewee from Metal Firm**



training of artisans already in the system. The importance of this area for training appears to be under-rated.

Secondly, another problem is the manner in which government is attempting to increase the quantum of artisans in the economy. The intended focus of state bodies such as the SETAs and NAMB is effectively to increase apprentice enrolments and success rates. This policy is premised on ensuring that national targets are met to support the state's public infrastructure programme.

*"The current SETA system is driven purely by box ticking. SETAs are only concerned with achieving performance targets for their annual report. Apprentices are trained to pass trade tests, not become artisans. We can train an artisan to pass a trade test in 12 weeks. Passing a trade test does not make you an artisan".*

**-Interviewee from Metal Firm**

These targets are enunciated in NSDS III, the NGP and the NDP which collectively aims for at least 30 000 new artisans per year. This "quantitative, target-driven" mind-set gives little consideration to quality. SETAs are under immense pressure to ensure a sufficient number of apprentices are registered annually. Despite ratcheting up artisan numbers there is a flood of foreign artisans entering the country. Quality has effectively been compromised for quantity.

*"Government should not attempt to solve the youth unemployment problem by putting big numbers of youth in apprenticeships. Not everybody is cut out for a career in the trades. People apply for apprenticeships without a clue what a trade is.*

**-Interviewee from Metal Firm**

When a system is driven by targets and levies, it becomes more important for governments to prioritise relatively short-term labour market interventions that yield numbers to meet targets, and pay less attention to longer-term knowledge and skill acquisition that is more expensive and takes longer to yield results.

*"Governments agenda to beef up the numbers of artisans in the economy is compromising quality for quantity. We have removed the concept of craftsmanship. It is now just a job to fix something. In other countries an artisan is a craftsman. We are losing the art in the artisan".*

**-Interviewee from Metal Firm**

The argument supported by interviewees in metal firms is that the apprenticeship scheme is driven by targets and levies in

*"Companies take on apprentices, but do not want to employ them on completion of their training. They would rather employ old artisans because they lack confidence in the new ones".*

**-Interviewee from Training Centre**

pursuit of lowering unemployment statistics, while apprenticeships should be aimed at craftsmanship and longer-term high-level skill formation. The HSRC<sup>1</sup> has found that new artisans are not adequately prepared in critical skills areas; that the skills acquired have not kept pace with technological developments. There is also a wide variation in the skills imparted across sectors and occupations.

Interviews indicate a significant degree of mismatch between what workplaces require in skill terms and the skills acquired by apprentices. Various factors are cited, which mostly relate to shortcomings in the curricula and trade tests, as well as with the alignment between SETAs, training providers and firms.

Finally, a great deal of frustration is evident from discussions with companies and training providers. The problem is the very slow turnaround times to register unit standards and qualifications, develop trade tests and communicate with role-players. There is a strong view that bureaucratic inertia together with convoluted and time-consuming processes has effectively hampered the work of key bodies such as the merSETA, NAMB, and QCTO.

There is also a view that NAMB and QCTO lack sufficient resources and are poor at communicating timeously to clients.






In summary, the current apprenticeship system appears to be driven by increasing the quantity of apprentices at the cost of quality. A conclusion drawn is that although the impact of these systems has been positive in terms of meeting national performance targets in numeric terms, there is a serious concern about the quality of artisanal training.

*“Apprentices do not get enough work experience on a range of tasks/skills”. There are not enough on-the-job assessments. People pass the trade tests but require training from the start when they are employed. There is a mismatch between what apprentices can do and what employers expected of them”.*

**-Interviewee from Metal Firm**

*“The way the trade test works is that if you fail parts of the test, you only go back and redo those parts. This means that an apprenticeship does not need to show mastery over a whole process. It did not work like this in the past. Those days you had to take a full re-test if you failed part of the process”.* **Interviewee from Metal Firm**

## Recommendation 1 # Rethink Policy Purpose

-  *The Department of Higher Education and Training and bodies such as SETAs and NAMB should review its policy intentions with respect to the apprenticeship scheme.*
-  *Greater attention should be given to the training and development of existing artisans in the system (post-artisan training). These artisans should be developed into master artisans and technicians.*
-  *The DHET policy should advance the concept craftsmanship.*
-  *Less emphasis should be placed by government on “chasing” national targets in terms of apprenticeship success rates.*
-  *Bodies such as NAMB and QCTO should be adequately resourced and restructured to improve efficiencies and eliminate wastage.*

## Finding 2 # Career Pathways and Professionalisation of Trades

Historically, there is a tendency to view “apprenticeships” as a second choice option. School-leavers who cannot gain entry to universities are perceived to choose the apprenticeship option. Although this perception is progressively changing in recent years, the “brand” of apprenticeship still lags far behind the professional career “brand” offered through the university system.

Unlike professions such as engineering, newly qualified artisans do not have structured career pathways for the rest of their career. Artisans usually remain in their employment positions for the remainder of their tenure, or if they are promoted, it tends to be to mainly at the level of first line manager. Formal qualification pathways for artisans to progress up the organisational structure into engineering and management positions are lacking. This is one of the reasons why the trades are viewed negatively by youth. If there are career, training and qualification pathways for artisans, trades will become attractive as a career option (instead of as a job).

*“Why do school-leavers want to go to university? With university qualifications there are career ladders. You have career prospects. Graduates earn better and are protected by professional bodies. This does not happen with the trades.*

**-Interviewee from Metal Firm**

Career pathway systems enable artisans to move from their points of entry through education and training programmes to occupational advancement. Artisans will move through the system up to the level of engineer or senior manager. A high-functioning system will lead to outcomes where participants earn industry-recognised credentials and are fully skilled and ready for new occupations and industries. Currently, this thinking is lacking in trades.

Employed artisans often struggle to complete training programmes that provide the necessary credentials for growing their careers. This is especially true for artisans who often have other barriers to training, such as insufficient academic preparedness to pursue programmes at university level. In addition, working artisans have the added challenge of balancing jobs with training, which makes flexible training programmes, such as part-time or distance education in their respective fields critical to their success.

Related to career pathways is the concept of professionalisation of trades. This process involves establishing acceptable qualifications and a professional (trade) body to oversee the conduct of members of the profession (trade) and some degree of demarcation of the qualified from unqualified. Professionalising trades also possess power, prestige, high income, high social status and privileges.

The professionalisation process will establish the group norms of conduct and qualification of members and insist that members achieve conformity to the norm and abide more or less strictly with the established procedures and any agreed code of conduct, which is policed by professional bodies.

### **Post-Artisan Training at ArcelorMittal**

The company has used the merSETA Accelerated Artisan Training Programme, which involves six months of theoretical training, followed by 12 months of on-site practical training to overcome the shorter duration of the programme for training apprentices. The company introduced its Candidate Artisan scheme to ensure the skills of artisans who have learned on an accelerated course are the same as those who have learned on the traditional, four-year course. The Candidate programme involves an additional, one-year focused training programme to prepare the candidate to take on the responsibilities of a fully-qualified artisan. The company also offers its experienced artisans the chance to convert to technicians, by funding diploma programmes at the Vaal University of Technology. Candidates take two academic subjects per semester (there are 24 subjects in total), with the average time for completion estimated at six years. There are currently 83 students enrolled on this course.

**[www.arcelormittalsa.com](http://www.arcelormittalsa.com)**

## Recommendation 2 # Career Pathways and Professionalisation of Trades

 Career pathways or career ladders should be developed for trades.



*has conducted research on developing career pathways for artisans. It provides a starting point for discussion in the Metal Industry to “professionalise” trades, safeguard its integrity and offer career opportunities for artisans. The SCAW Metals Group career pathway model can be applied to a wide range of occupations with modifications:*

BANDS	TECHNICAL PATHWAY	MANAGEMENT PATHWAY	NQF LEVEL	DURATION YEARS	ENTRY	SUPERVISION	MAJOR RESPONSIBILITIES
Engineer	Engineer	Professional Manager	8	3	Engineering Technician (B Tech Y1) + 6-10 years' experience	No supervision	Lead and manage teams / advise senior management / manage and lead projects / oversee quality improvement, productivity and WCM /
Technician	Engineering Technician	Manager	7	1	Master Artisan	No supervision	Optimisation and improvement of processes, systems and machinery / world class manufacturing applications / quality improvement / management of department and teams / training
Artisan	Master Artisan	Foreman	7	4	7-8 years experience	No supervision	The ability to extrapolate beyond known procedures, materials and tools to create a new product, or to adapt an existing product to new specifications.
	Senior Artisan	Supervisor / Trainer	7	2	Pass Trade Test + (N6 / Grade 12 Maths/ Science)	In direct supervision	Capable of producing the full spectrum of production work and performing all the operations required.
	Experienced Qualified Artisan	No route to management	6	2			routine maintenance and repairs / coach and transfer skills to apprentices / fault finding, troubleshoot, testing and adjusting, disassembling, assembling equipment and machinery to specifications / OHSE and training / report writing / root cause analysis / assessment and moderation of apprenticeships / coaching and mentoring
	Newly Qualified Artisan		5	3-4			
Apprentice	Semi-skilled / Section 28	No route to management	4	3-4	Grades 10-12/ N 1-3 / S4 / NCV 3	Direct supervision	mastery of operations
	Basic Skilled		3				competent and experienced in operations
	Basic Skilled		2				novice in operations / follows explicit procedures

🧑 The model is explained as follows:

- *There are 4 bands in the model – apprentices; artisan (newly qualified artisan, experienced qualified artisan, senior artisan/supervisor/trainer and master artisan/foreman); technician/manager and engineer/professional manager. In other words, an apprentice can follow a career pathway and become a professionally qualified engineer or professional manager.*
- *An experienced artisan has a choice of pursuing a managerial pathway or technical pathway. This also ensures that managers in the Metal Industry are technically and managerially proficient.*
- *The model supports the principles of the National Qualifications Framework of accessibility, portability, RPL and progression across bands in the education and training system. An apprentice entering a trade at NQF Level 2 can progress to NQF Level 8 and beyond.*
- *There is a clear distinction between a newly qualified artisan, experienced qualified artisan, senior artisan and master artisan. The model proposes training investments to this neglected category of workers – artisans.*
- *There are clearly stipulated entry requirements and years of work experience required to move up the career ladder.*

🧑 There should be a move towards “professionalising” trades

### **Finding 3 # Mathematics, science and language acquisition in schools**

The major problem identified by companies and training providers interviewed with apprenticeship and technical skills training is the poor state of schooling in South Africa. Interviewees expressed widespread concern over poor numeracy and literacy competencies of prospective apprentices. South Africa’s learners rank second-to-last in the world in mathematics and science, according to an education report by the Organisation for Economic Co-operation and Development (OECD). The OECD findings, based on the test scores of 15-year-olds from

*“School-leavers lack basic maths and science skills to enter trades. Trades are not for everyone. Without the ability to count, read and communicate effectively, it is not possible to master a trade and develop a career. We receive applications from school-leavers who can barely read and write.*

***Interviewee from Metal Firm***

76 countries, show South Africa ranked 75th globally – beating only Ghana. Countries which scored higher than South Africa included Honduras, Morocco, Botswana, Peru, Tunisia, Albania, and Lebanon. The top three countries were Singapore, Hong Kong, and South Korea respectively.

*“Foundational learning is missing. Skills such as arithmetic, science, dexterity, hand skills, technical drawing, chemistry and writing. This should be taught at primary and secondary schools. There is lack of sufficient knowledge to enter into a trade in the first place”.*

***Interviewee from Metal Firm***

According to the report, South African mathematics and science teachers do not have the necessary skills to teach their subjects. Science and Technology Minister, Naledi Pandor, stated in February 2015 that the government has not “been able to improve the science and mathematics teaching in our schools, and this has created a bottleneck in the expansion of our university system and unemployment for many young people”.

*“Education is a powerful predictor of the wealth that countries will produce in the long run. Poor education policies and practices leave many countries in what amounts to a permanent state of economic recession”. **OECD Education Report (2015)***

*“The source of our problem is the lack of maths, science and language skills. If basic education does not address the source, we cannot address skills shortages”.*

***- Interviewee from Metal Firm***

The poor state of the country’s public schooling system is very well documented. The fact of the matter is, unless the quality and performance of school education is substantially improved, post-school education and training will remain compensatory education in order to address the shortcoming of the schooling system. This is already evident with post-school institutions offering bridging programmes in mathematics, science and English to enable students to reach a level that would enable them to engage meaningfully with the curricula. Companies are burdened with the responsibility of the failings of Basic Education.

*“A very specific kind of person should enter trades. Students who lack maths, science, computer literacy, English and cognitive skills on leaving school create a problem for post-school education and training and business. It becomes our job to teach them to read, write and count. Universities are extending 4-year engineering degrees into 5 years at the cost of the taxpayer because of the failure of basic education”.*

***-Interviewee from Metal Firm***





## **ArcelorMittal Science Centres** **transforming tomorrow for our youth**

ArcelorMittal South Africa is committed to transforming tomorrow for the youth. As a result, they continue to boost the local and national economy, to innovate and inspire young minds and create a leading company that will ensure the survival of future generations. Underlining its commitment to education and contributing to the alleviation of the national skills crisis in the sciences and especially in the field of engineering, is the company's R12 million investment in Science Centres in Sebokeng, Saldanah and Newcastle.

The ArcelorMittal Science Centres are non-profit Centres of Excellence that seek to improve mathematics and science performance at schools, stimulate interest and curiosity in these fields and provide information, knowledge and skills training to teachers, learners, school leavers and the general public in the communities surrounding the company's operations.

ArcelorMittal South Africa's core business relies heavily on being able to access skilled people in the scientific, engineering and technological fields. Improving maths and science performance at schools in the communities around the company's areas of operation provides a sustainable resource for ArcelorMittal South Africa and works towards alleviating the national skills crisis.

The ArcelorMittal Science Centres were established to address the country-wide shortage of skills in the engineering fields which is exacerbated by the fact that learners do not follow the science disciplines, inadequate facilities in schools and insufficient qualified teachers. The centres expose students to science and technology in a fun and relaxed environment by providing them with classrooms, fully equipped science laboratories, interactive science exhibitions that enhance their thinking skills and curriculum-linked science and mathematics instruction. ArcelorMittal South Africa also involves educators by providing teacher training to enhance overall teaching ability.



Learners are transported from schools in the catchment area to the respective science centres. They are taught mathematics, science, biology, computers and biology based on the education department's grade 10, 11 and 12 syllabi.

Learners who achieve good scores in Grade 12 are given the opportunity to enter the company's training pipeline with bursaries to enter university engineering courses or apprenticeships. This project has improved learner scores in the mentioned subjects considerably.


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### Recommendation 3 # Mathematics, science and language acquisition in schools

-  *The public schooling system should be declared a “national crisis” and measures should be enacted to improve the performance of educators, department officials and public schools overall.*
-  *An action plan should be devised and implemented over the short-to long-term to improve the performance of learners in mathematics, science and English.*

*The plan should include the re-training of educators in the mentioned subjects; the provision of the requisite facilities and equipment (particularly in previously disadvantaged districts); assessments based on international benchmarks; support mechanisms to ensure schools succeed; and clear accountability and monitoring and evaluation frameworks to measure performance for educators, school managers and department officials.*

 The Institute of Electrical and Electronic Engineers provides a teacher in-service programme (TISP) to demonstrate the application of maths, science and engineering concepts by sharing the real world experiences with pre-university teachers. The IEEE aims to bring teachers hands-on engineering lessons into the classroom. It trains IEEE volunteers (master trainers) to deliver workshops to teachers in their local communities. The goals of the programme are to encourage volunteers to collaborate with teachers; enhance the level of technical literacy, promote applied inquired-based learning; and encourage pre-university students to pursue technical careers, especially engineering.

Master trainers support teachers and students by increasing the level of technological literacy in schools; establish pre-engineering programmes; and develop networks and relationships with teachers.

### Finding 4 # Career Guidance and Counselling

Interviewees cited a lack of career guidance at secondary school level for poor career choices by students entering the post-school education and training system. Training providers indicated that applicants to trade courses in many instances are unsuitable,

*“Students do not have a clue what the trade is about. They say that colleges push them into trades because the business and computer courses are full.”*

**-Interviewee from Metal Firm**

lack any technical knowledge, and often have no idea of the trade they apply to be enrolled.

It appears that career counselling is not formalised or taken seriously in secondary schools. Where schools have guidance counsellors, their knowledge and understanding of the labour market, economy, industries, impacts of technology, and careers in the modern world is lacking.

*"Very few companies recruit apprentices based on technical aptitude. Therefore, apprentices tend to dropout because they are disinterested in the trade".*





**-Interviewee from Training Centre**


These problems are systemic. They are also acute in universities and TVET Colleges. To guide students to make the right career choices in a modern economy, it necessary to have support systems to guide students correctly. If not done so, then students are exposed to the inevitable risk of dropping out or failing to complete courses. This is also a waste of scarce financial resources.


*"Some people on an apprenticeship should never be in trades. They are not guided into trades; they are colour-blind; they cannot communicate; they cannot do simple calculations; they are desperate to get any job. Learners are recruited for grants by companies".*


**-Interviewee from Metal Firm**

#### **Recommendation 4 # Career Guidance and Counselling**

-  *There should be an investigation into the state of career guidance and counselling in schools and post-school institutions.*
-  *The Department of Basic Education (DBE) and the Department of Higher Education and Training (DHET) should run a national multi-media campaign, including television, to promote trades and other occupations in high demand.*
-  *The DHET National List of Occupations in High Demand should be communicated to the public and education institutions, youth agencies and social groups through a variety of interventions.*
-  *Teachers and school managers must undergo training workshops on career guidance and counselling.*

 *The DBE and DHET should appoint master trainers, who have a sound working knowledge of career development, career management, labour markets and drivers of job growth to conduct workshops.*

 *Secondary schools should be measured on the extent of career guidance and counselling provided to learners.*



### Career Guidance and Counselling in Finland

takes guidance and career counselling very seriously. In programmes leading to upper secondary vocational qualifications, the TVET provider co-operates with each student to draw up the student's individual study plan, which covers the student's individual choices, progress in studies, assessment of learning, identification and recognition of student's competencies, on-the-job learning, and vocational demonstrations. Students are entitled to identification and RPL that may reduce the duration of their studies.

For the effectiveness of individual study plans and support for individualisation of qualifications to be guaranteed, TVET programmes include 1.5 credits for guidance counselling. Guidance counselling consists of group and personal counselling as well as other guidance necessary to complete studies.

Guidance counselling involves teachers and other people responsible for guidance and counselling at the vocational institution. The guidance counsellor has the main responsibility for practical organisation of counselling and for its overall planning and implementation.

#### **Finding 5 # Length of apprenticeship**

Apprenticeships in South Africa have been reduced to 1.5 to 2 years. Previously apprenticeships took between 3 to 4 years for completion. Currently, there is an effective reduction of training time by 2 to 2.5 years.

The shortening of apprenticeships was given impetus by the merSETA's Accelerated Artisan Training Programme, and was supported by government in an effort to boost artisan numbers in the labour market. But this has come with consequences.

Interviews have indicated that shortening of apprenticeships effectively mean that the quality of the newly qualified artisan is compromised. They have not been subjected to a sufficient amount of experiential learning and practical application of a variety of tasks.

*"Previously it took at least 4 years to become a qualified artisan. Now it takes between 18 to 24 months. There is insufficient practical exposure. Artisans cannot troubleshoot. An apprenticeship should be at least 3 years".*

**-Interviewee from Metal Firm**

It is contended that the current apprenticeship format lacks the rigour and robustness of previous schemes. Hence, the current system is not producing craftsmen who have a passion for their trades.

Other problems mentioned was that journeymen are not keen to coach and mentor new artisans because they tend to see this as a threat to their jobs and promotion opportunities. There is also no planned structured programme for newly qualified artisans.



*"Industry standards for an artisan are very much higher than the trade tests standards. When you pass a trade, it is the beginning of your learning journey, but employers and artisans sometimes see it as the end result. This is not the case in reality".*

**-Interviewee from Metal Firm**

Some companies in the metal industry have turned the problem of a short apprenticeship to its advantage. For example, ArcelorMittal has introduced a candidate artisan programme which spans over 12 months. During this period, the artisan is coached and mentored; exposed to a wide range of related process critical to the trade; given formal training in theory and practice; and empowered to work without supervision.

The advantage of this is that the artisan is treated with respect by peers in the plant because he is an artisan rather than an apprentice.

#### **Recommendation 5 # Length of Apprenticeship**

-  *The length of an apprenticeship programme should revert to 3 to 4 years, with the extended period allocated to acquiring work-based learning.*
-  *In instances, where companies cannot expose apprentices to the full range of competencies in the workplace due to their specific operations, an apprentice should be sent to a training centre to acquire those competencies.*

#### **Finding 6 # TVET College Delivery**

There is a myriad of problems highlighted by interviewees in the metal industry with respect to public TVET Colleges. These problems are not new. They have been identified in a number of research studies on TVET Colleges.

The following findings emerged specifically from this study:

- 👤 There is a lack of adequate workshop facilities, machinery, tools and equipment. Machinery, tools and equipment are also of questionable quality. Where equipment is up-to-date, it is not being used optimally.
- 👤 There is a lack of well-qualified and experienced instructors at colleges. These instructors appear to emerge in the main from the teaching route, rather than industry route. Some are not interested in workshop activities. They focus on theory in the classroom.
- 👤 There is an unwillingness of instructors to want to learn from industry.
- 👤 College managers and instructors do not understand and appreciate the need to establish a close partnership with industry.
- 👤 The National Certificate Vocational (NCV) programmes are simply not working. They are unsuitable for industry.
- 👤 There are no aptitude tests done to determine the suitability of a student to enter the trades.
- 👤 Programmes offered by colleges are “supply-driven” or “vendor-driven”. It is determined by the physical and staffing resources available at institutions, and are not aligned to labour market skills in demand, nor to potential economic growth sectors.
- 👤 College graduates are not held in high regard by potential employers.
- 👤 Private training providers operate mainly in the urban areas, ignoring provision in areas where skilling is most needed.
- 👤 On-the-job training (work placement) is a significant element of artisan trade programmes, but placements are not arranged by colleges.
- 👤 There is no mechanism to ensure consistency of training outcomes from on-the-job training.
- 👤 The mode of delivery at colleges is full-time studies. This does not accommodate workers in employment or self-employment.
- 👤 There is a lack of articulation between TVET and higher education. VET graduates find difficulties to gain admission to tertiary institutions.

- 🗣️ There is no performance management system in place at colleges to measure performance and hold people accountable.
- 🗣️ The morale of instructors is low. There is a lack of motivation and commitment by instructors.
- 🗣️ Issues surrounding the quality of education provision persist at practically every level in colleges.
- 🗣️ A number of research studies have cited a disjuncture between the expectations of employers and the provision of training in colleges.
- 🗣️ Most programmes lack a work-based training component which is a serious impediment for graduates entering the world of work.
- 🗣️ Training in the trades is institutionally-driven rather than industry-driven.
- 🗣️ There is a lack of industry exposure for instructors. This contributes to poor performance of students. There is a mismatch between what has been learned and what is required by industry.
- 🗣️ The entire model for the delivery of TVET in South Africa is highly problematic. Hence, these colleges are struggling to gain credibility.
- 🗣️ There are leadership deficiencies within the College system.

#### Recommendation 6 # TVET Delivery

Public TVET Colleges are outside the scope of the metal industry. However, the performance of TVET Colleges directly affects the fortunes of the metal industry. The problems in the TVET College system run deep and wide. It structural and systemic in nature.

- 🗣️ *The highest priority is to strengthen TVET Colleges and turn them into institutions of choice. Public TVET Colleges are the backbone of the post-school system. A series of measures should be effected to improve: curricula, quality of instructors and managers, assessment, work-based learning, maths and science, staff development, partnerships, leadership and management, throughputs, graduate rates, standards and public image.*

## 11. CONCLUSION

We put forward the following conclusions based on our research drawn from industry engagements:

- 👤 Many of the impediments faced by the metal industry fall outside its direct sphere of influence – government policy, training standards, administration of the education and training system, implementation failures, performance of public institutions in the education space, and so on. A game changer is needed on the part of government.
- 👤 The recommendations are wide-ranging and will stretch the resources and capacity of the merSETA. Therefore, a key priority is to assess the extent to which the merSETA will be able to implement the recommendations.
- 👤 No matter how well articulated and grounded are the recommendations from the research, no change can be guaranteed unless accountability for its implementation is assured – “what gets measured gets done”.

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