FACTS AND FIGURES ON SKILLS IN MANUFACTURING




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Department:
Trade and Industry
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towards full-scale industrialisation and inclusive growth

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This information brief includes selected results for engineers, but focuses mostly on artisans and technicians.

Longer technical reports on artisans and engineers may be made available on request from: skillsfortheeconomy@thedti.gov.za

Engineering Council of South Africa (2013) Annual report

Department of Higher Education (2014) Higher Education Management Information System (HEMIS)

The Engineering Council of South Africa (ECSA) is a statutory body established in terms of the Engineering Profession Act, 2000 (Act No. 46 of 2000).

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INTRODUCTION

The focus of this information brief is to provide an overview of employment trends for artisans and technicians in manufacturing in South Africa for 2002-2013. Employment trends among the technical workforce are analysed by sub-sector and demographic indicators, including highest education completed, population group, age group and gender. This brief summarises longer, technical reports on artisans and technicians in manufacturing. The data source is the September Labour Force Survey (LFS) 2002-2013 of Statistics South Africa.

Manufacturing is a key determinant of future growth and competitiveness in the provision of a skilled technical workforce. Engineers, technicians and artisans constitute the core of the technical workforce, ensuring innovation and efficiency of the production process through the optimal use, design and maintenance of materials, equipment, capital and personnel.

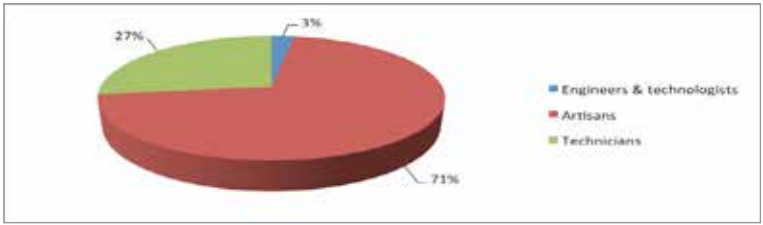
HIGHLIGHTS

- Artisans represent the largest proportion (71%) of the key technical occupations, shrinking at 0,9% per annum.
- Engineers represent the smallest proportion (3%), shrinking at 0,5% per annum.
- Technicians represent 27% growing at 0,7% per annum.
- Most artisans are in the basic metals sector. The textile, wood and cork, and the food and beverage sub-sectors are the second-, third- and fourth-top employers of artisans. The petroleum sub-sector is the top employer of technicians.
- The share of white technicians declined from 47% to 22%; Africans now constitute 50% of all technicians.
- Women constitute about one-third of employed technicians, but only 25% of artisans, declining from 35,4% in 2002.
- In 2013, only 18% of engineering students at universities of technology graduated.
- Most artisans are unqualified (57, 8%); with nearly one-third having Grade 12.
- Most technicians (66%) are under-qualified with either Grade 12 (42%) or less than Grade 12 (24%).
- Black engineers and technicians have the lowest share of registration with professional bodies.

EMPLOYMENT OF ARTISANS AND TECHNICIANS IN MANUFACTURING

Figure 1 shows that artisans represent the overwhelming majority (71%), followed by technicians (27%), while engineers and technologists constitute only 3% of the technical workforce.

Figure 1: Distribution of engineering professionals and artisans in manufacturing (2013)



Source: Statistics SA, QLFS, 2013 and own calculations

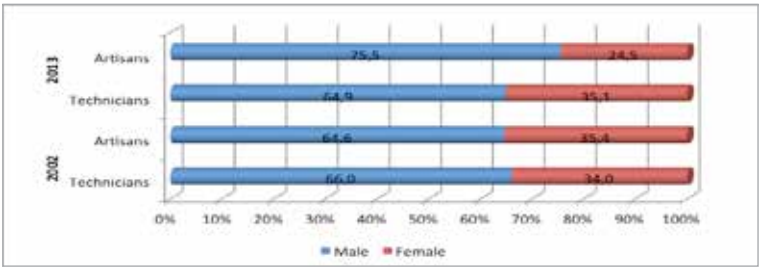
Over the period, total manufacturing employment grew by about 0,7%, just more than a quarter of the annual growth of employment in the economy, which was 2,0%. By comparison, the compounded annual growth rate (CAGR) varied widely in technical occupations in manufacturing, ranging from -0,5% for engineers and technologists to -0,9% for artisans and 0,7% for technicians (2002 to 2013). The employment of artisans and engineers in manufacturing is therefore shrinking. Only technicians grew at a rate equal to that of general employment in manufacturing, which was 0,7% (see Annexure 2). The poor growth rate in the real economy contradicts claims that there are shortages of artisans and engineers, which has led to major efforts to increase the number of artisans.[1] (EDD, 2011: 5). The demand for artisans and engineers is therefore growing below the rate of growth for manufacturing, which is already low.

1. EDD, 2011, NationalSkills Accord (New Graowth Parh : Accord 1)

DEMOGRAPHIC PROFILE OF ARTISANS AND TECHNICIANS

Employment of artisans and technicians (technical workforce) continues to be male-dominated. In fact, the results suggest there has been a significant reversal of gains in the employment of women artisans, with Figure 2 showing a decline of 10%, from 35,4% to 24,5%. The number of women technicians have increased slightly, from 34% in 2002 to 35,1% in 2013. It is clear that there are systemic constraints in the employment of women artisans and technicians. The reasons for the continued marginalisation of women, despite improvements in the enrolment and graduation of women engineers for instance, are not clear. Further, changes to the nature of work, through the use of ICT, implies that artisan work is no longer that of so-called "grease monkeys" or strictly manual[2] (HSRC/merSETA, 2013). The traditional technical or practical reasons for the exclusion of women in occupations that are increasingly more analytical and/or computer-based can therefore no longer hold water.

Figure 2: Employment of artisans and technicians by gender (%) 2002 and 2013



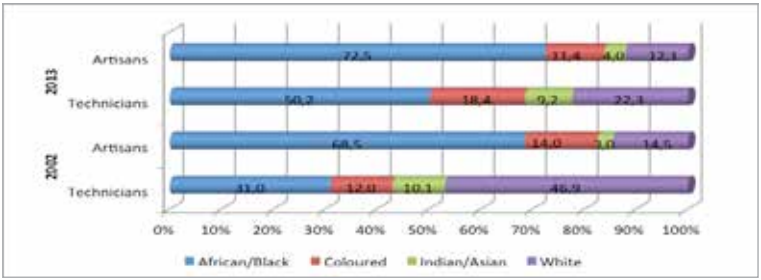
Source: Statistics SA, LFS, 2002 to 2013 and own calculations

2 Wildschut et al (2013), Studying artisans in the manufacturing, engineering and related services sector. Client report prepared for the merSETA/HSRC Artisan Identity and Status project: The unfolding South African story. HSRC: Pretoria..

Figure 3 shows that the decline of white artisans and technicians and increase of African artisans and technicians have continued apace. Du Toit and Roodt (2008) showed that the employment of black technicians increased from 28,6% (1996-1999) to 41,4% (2000-2005)[3]. This trend continued for black technicians.

Figure 3 shows that in 2002 about 46,9% of employed technicians were white, decreasing to 31,8% in 2008 and 22,3% in 2013. Employment of coloured technicians increased from 12,1% in 2002 to 18,4% in 2013. The share of white artisans declined from 14,5% in 2002 to 12,1% in 2013, while the employment of African artisans increased from 68,5% to 72,5% over the same period. This picture contradicts the public perception that the average artisan is white and male (usually more than 50 years of age). The results show that there has been a substantive turnaround in the demographic profile of the employed artisan population, which more closely mirrors the economically active population.

Figure 3: Artisans and technicians by population group (% share) (2002 and 2013)



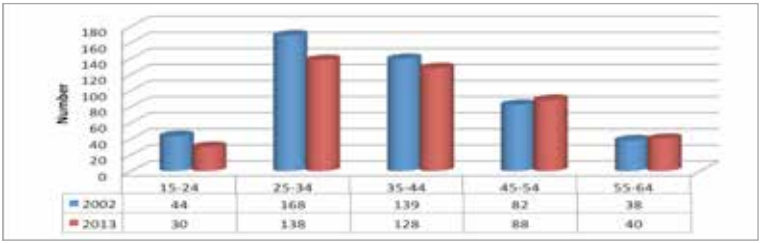
Source: Statistics SA, LFS, 2002 to 2013 and own calculations

3 Renette du Toit and Joan Roodt (2008), Engineering Professionals: Crucial key to development and growth in South Africa, HSRC.

The age profile presented in Figure 4 suggests that there is a balanced mix of youth and experienced artisans, with 40,0% in the age group 15 to 34 years, 30,1% between the ages of 35 and 44 and 30,3% 45 to 64 years of age. However, the decline in the number of artisans from 168 000 to 138 000 (-2% per annum) in their prime productive years (25 to 34 years) is worrying. The number of employed artisans in the age groups 45 to 54 and 55 to 64 increased by 1% and 0,5% per annum respectively over the period.

Availability of experience may be suggested by the relatively high share of artisans older than 35 years. This may positively affect the transfer of skills from older to younger artisans and the availability of experienced mentors in manufacturing. However, the decline (31,8%) in the number of entry-level artisans aged 15 to 24 suggests a slowdown in the skills pipeline. The number of entry-level artisans declined significantly from 46 140 in 2010 to 29 844 in 2013. This may suggest that efforts to increase the number of apprentices through the Human Resource Development (HRD) Council and those of the SETAs are not translating into improved employment of young artisans. It may also suggest that continued shrinkage or retrenchment of the artisan workforce is concentrated among those younger than 35 years, based on the last in, first out (LIFO) principle.

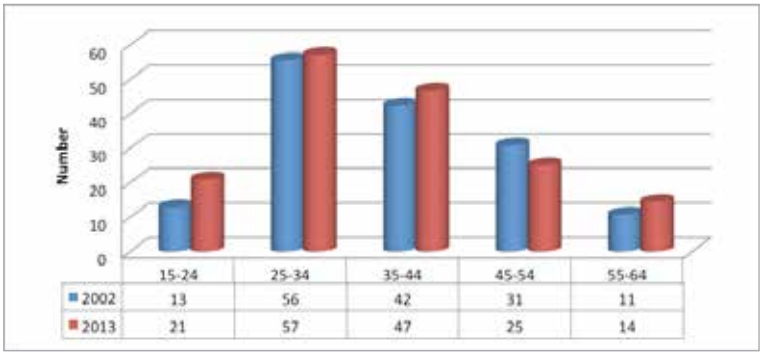
Figure 4: Employment of artisans by age group ('000) (2002 and 2013)



Source: Statistics SA, LFS, 2002 to 2013

There appears to be a more balanced mix of youth and experience among technicians, compared to the age profile of artisans, with 47,6% in the age group 15 to 34 years, 28,4% in the age group 35 to 44 and 24,0% in the age group 45 to 64. Categories 25 to 34, 35 to 44 and 45 to 64 each constitute about one-third, as shown in Figure 5. This implies that the possibilities for mentorships and skills transfer to the younger generation are greatly increased. However, the stagnant growth in the number of technicians in their prime productive years (25 to 34), from 56 000 to 57 000, is worrying.

Figure 5: Employment of technicians by age group ('000) (2002 and 2013)



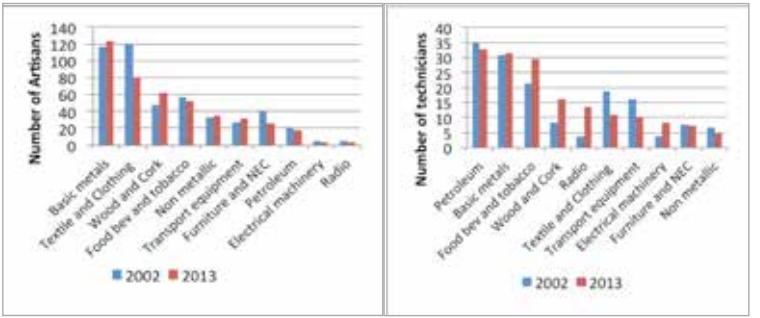
Source: Statistics SA, LFS, 2002 to 2013

EMPLOYMENT OF ARTISANS AND TECHNICIANS BY SUB-SECTOR

By 2013, most artisans were employed in the basic metals sub-sector, as shown in Figure 6. However, employment trends by sub-sectors differed significantly over the period. There was a significant decrease in textile sector artisan employment and a considerable increase in the wood and cork sub-sector.

The top employer of technicians in 2013 was the petroleum sector, followed by basic metals, albeit by a small margin. Employment of technicians in the petroleum sector declined slightly in 2013 as compared to 2002. There was a small increase in the employment of technicians in basic metals and a significant increase in the food and beverages sub-sector in 2013 as compared to 2002. Employment of technicians doubled in the radio, electrical machinery, and wood and cork sub-sectors.

Figure 6: Number of artisans and technicians by sub-sectors ('000) (2002 and 2013)



Source: Statistics SA, QLFS (2002-2013)

EMPLOYMENT OF TECHNICIANS AND ARTISANS BY EDUCATION

One of the key constraints to economic growth is the mismatch between the demand and supply of skills. The extent to which workers are appropriately qualified in line with the requirements of the job is a key indicator of the skills mismatch. Historically, most artisans had less than Grade 12 (at least Grade 9) and a post-school qualification, NTC 1-3, attained at a TVET college. However, given the oversupply of Grade 12s, recently trained artisans have a minimum of Grade 12 plus a TVET engineering qualification.

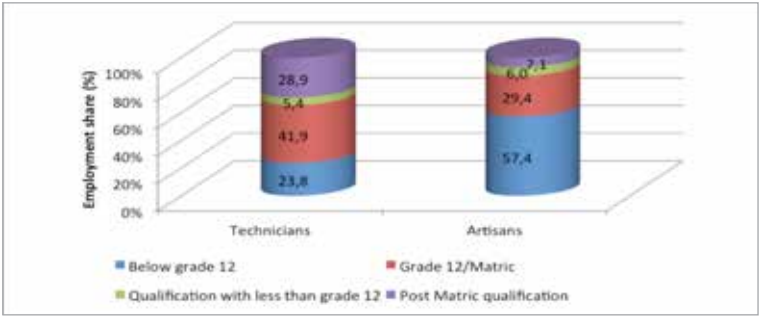
Figure 7 shows that the majority of artisans are underqualified, with most (57%) having less than Grade 12 (with no additional qualification), 29,4% Grade 12 and only 6% the required qualification with less than Grade 12. Interestingly, 7% had a post-matric qualification. The latter may be the result of the more recent phenomenon of Grade 12 being the entry requirement. While those who are unqualified probably have significant experience, it is clear that not enough effort is being made to provide a form of certification through Recognition of Prior Learning (RPL).

In terms of technicians, there is greater dissonance between the baseline qualification required (National Diploma from a University of Technology) and the actual qualifications attained among employed technicians. This is worrying. As a result, only 29% of technicians in the manufacturing sector had post-matric qualifications, implying that the majority was under-qualified. About 5% had a post-school qualification with less than Grade 12. The findings suggest that 66% of employed technicians have either a Grade 12 (42%) or less (24%). These results echo similar

findings for the period 1996 to 2005 (Du Toit and Roodt, 2008). The authors argued that the lack of experiential training in the workplace, as required by the National Diploma qualification, may be a contributory factor to the degree of under-qualification.

This apparent mismatch represents both a challenge and an opportunity in manufacturing. Firstly, technicians may underperform because they do not possess the requisite technical and theoretical knowledge. As assistants to professional engineers they perform an essential function in ensuring the efficiency of the production process. On the other hand, their practical knowledge may compensate (to some extent) for the lack of theoretical and technical knowledge, and needs to be met with efforts for certification through RPL and formal skills upgrading as well as increased work placements for diploma students.

Figure 7: Highest education completed among artisans and technicians (%) (Q3:2013)



Source: Statistics SA, QLFS (2013)

SUPPLY OF ARTISANS AND TECHNICIANS

The supply of artisans and technicians in this paper will be analysed using the following two data sources:

- Artisans trade test results: The number of people enrolled and those who passed the artisan trade test as released by Indlela, based on SETA data; and
- HEMIS data: This dataset has the number of engineering (including technicians) enrolments and graduations from Universities of Technology. Engineering technicians generally hold a National Diploma (NDip) from a University of Technology.

Table 1: Trends in registered and competent artisan trade test learners by IPAP cluster (2012/13 and 2013/14)

	2012-2013		2013-2014		Y/Y Growth Rates (%)	
IPAP Clusters	Registered	Competent	Registered	Competent	Registered	Competent
Plastics, Pharmaceuticals and Chemicals	1 989	1 279	1 694	387	-14,8%	-69,7%
Clothing, Textiles, Footwear and Leather	584	0	426	4	-27,1%	-
Green and Energy-Saving Industries	1 316	37	390	1 841	-70,4%	4875,7%
Agro-Processing	0	36	267	168	-	366,7%
Tourism, Arts and Culture, Hospitality, Sports	662	1 007	312	1 161	-52,9%	15,3%

IPAP Clusters	2012-2013		2013-2014		Y/Y Growth Rates (%)	
	Registered	Competent	Registered	Competent	Registered	Competent
Metal Fabrication, Capital and Transport Equipment	4 951	7 166	10 394	7 522	109,9%	5,0%
Business Processing Services	984	841	968	185	-1,6%	-78,0%
Non-SETA candidates (INDLELA)	5 795	1 355	7 865	2 077	35,7%	53,3%
Not in IPAP	5 568	3 556	5 354	4 765	-3,8%	34,0%
Total	21 849	15 277	27 670	18 110	26,6%	18,5%

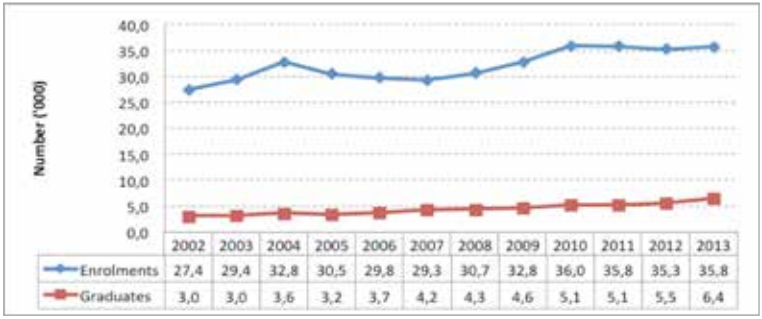
Source: HEMIS, DHET (2014 and own calculations)

Table 1 shows that over the two periods significant annual increases were recorded in the growth of registered and competent apprentices, of 26,6% and 18,5% respectively. However, growth was unevenly distributed by the IPAP sector. Indlela candidates (apprentices off the street who are not registered with a SETA) represent the largest proportion of registered apprenctices and had the highest pass rate. The rate of registered learners grew by 36%, while those of competent apprentices grew by more than 50%. While other sectors, such as green industries and agro-processing, experienced extremely high growth in pass rates, these came off a low base. Importantly for the manufacturing sector, Table 1 shows that the metals fabrication, capital and transport equipment sector recorded growth rates in the number of registered and competent learners (that is those entering and passing the trade test) of 110% and 5% respectively.

The plastics, pharmaceuticals and chemicals category fared the worst and will continue to experience problems in training artisans given the poor registration and pass trends. Similarly, the clothing, textile, footwear and leather sector performed poorly. The turnaround stimulated by the competitiveness enhancement programmes of **the dti** may be placed in jeopardy given the challenges in developing a growing pipeline of apprentices and artisans into the sector.

ENROLMENT AND GRADUATION OF ENGINEERING TECHNICIANS

Figure 8: Trends in Universities of Technology engineering enrolments and graduates (2002-2013)



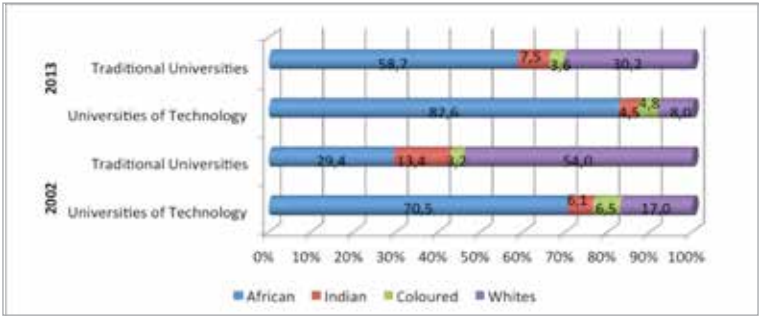
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Enrolments	27,4	29,4	32,8	30,5	29,8	29,3	30,7	32,8	36,0	35,8	35,3	35,8
Graduates	3,0	3,0	3,6	3,2	3,7	4,2	4,3	4,6	5,1	5,1	5,5	6,4

Source: DHET, HEMIS (2002-2013)

The share of engineering enrolment by Africans at Universities of Technology has increased from 70,5% to 82,6%, while the share of all other groups declined over the period. This trend may be

driving the increased employment of Africans as technicians and the huge decline in employment of whites as technicians. In 2002, traditional universities were dominated by whites (54%), however, the share of Africans increased from 29,4% in 2002 to 58,7% in 2013.

Figure 9: Traditional Universities and Universities of Technology engineering enrolments by race, 2002-2013 (%)

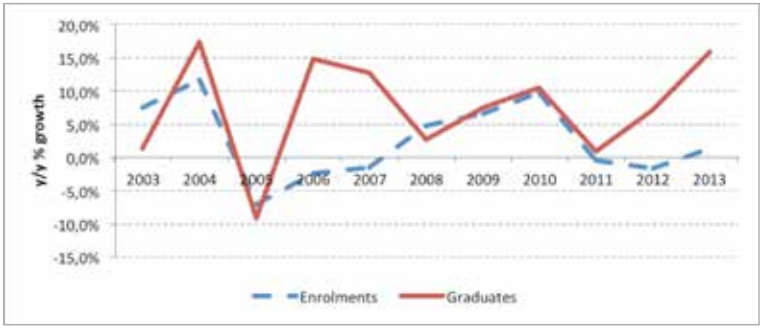


Source: DHET, HEMIS (2003-2013)

The growth in enrolments and graduations at Universities of Technology in engineering fluctuated significantly, with massive spikes and dips over the period. Figure 10 suggests that in 2005, engineering enrolments and graduates declined by close to 8% and 9% respectively. However, the relationship between enrolments and graduates was almost one-on-one between 2008 and 2011. By 2012, this trend was reversed and, since 2011, the annual growth in graduates has

remained high and stable. This recovery will hopefully become more sustainable, providing greater certainty to employers in terms of the technicians' pipeline.

Figure 10: Annual growth in the Universities of Technology engineering enrolments and graduates (2003-2013)

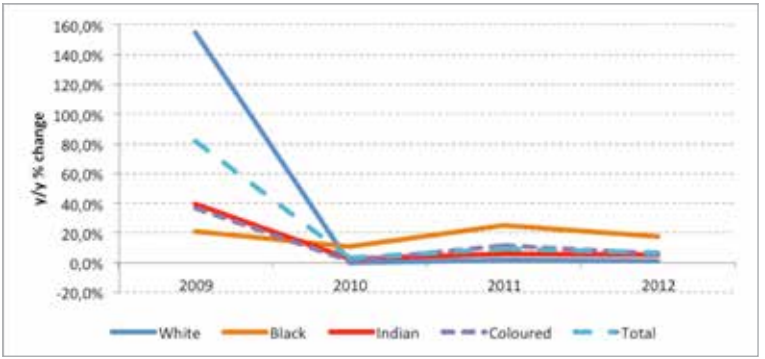


Source: DHET, HEMIS (2003-2013)

REGISTRATION OF ENGINEERING PROFESSIONALS WITH ECSA[1]

Figure 11 provides an analysis of registration annual growth trends for technician professionals. Whites represented the overwhelming share of all professional engineers registered in 2009 and 2012, with 61,0% and 51,6% respectively, but growth in registration was the slowest compared to black engineering professionals. Black engineers constituted 42,5% of registration in 2008. The dip in registration in 2010 may be ascribed to the combined effects of the end of World Cup-related engineering projects and the global recession.

Figure 11: Trends in the registration of professional engineering technicians with ECSA



Source: ECSA, 2008-2013

1 The Engineering Council of South Africa (ECSA) is a statutory body established in terms of the Engineering Profession Act, 2000 (Act No. 46 of 2000).

CONCLUSIONS

The lack of appropriate training capacity, exacerbated by apartheid and an era of discriminatory government policies has left a dearth of young skilled artisans, which today has a negative impact on the growth of manufacturing industry. Skills development may contribute positively to the productivity of the industry and the growth of the economy as a whole. This would only be the case if a serious look is taken at how to actively address elements of the skills mismatch and shortages in the technical workforce as outlined in this brief. A more nuanced approach is required to increase the capacity, quality and relevance of the development of artisan and technicians in South Africa. This is a key co-factor in shifting manufacturing towards more value-added activities and beneficiation.

Annexure 1: Shortened sector names from the LFS (according to SIC)

Shortened sector name	Industry
Basic metals sector	Basic metals, fabricated metal products machinery and equipment and of office and accounting and computing machinery
Textile, clothing and leather sector	Textile, Clothing and Leather
Wood and cork sector	Wood and Wood products
Food bev and tobacco sector	Food, Beverages and Tobacco
Non-metallic minerals products sector	Non-metallic mineral products
Furniture and NEC sector	Furniture and manufacturing NEC
Transport equipment sector	Transport equipment
Chemicals and petroleum sector	Petroleum products, chemicals, rubber and plastic
Radio, TV, communication and medical equipment sector	Radio, TV, communication equipment and apparatus and of medical, precision, optical, instruments, watches and locks
Electrical machinery and apparatus sector	Electrical machinery and apparatus

Annexure 2: Comparison of employment trends in artisans, technicians and manufacturing in South Africa (2002-2013)

Year	Artisans and technicians employment in manufacturing				Total Manufacturing employment '000
	Technicians '000	Y/Y % change	Artisans '000	Y/Y % change	
2002	153		481		1 647
2003	141	-7,9%	453	-5,9%	1 560
2004	120	-14,6%	464	2,4%	1 724
2005	110	-8,1%	545	17,6%	1 742
2006	120	8,4%	547	0,3%	1 757
2007	109	-9,1%	525	-4,1%	1 776
2008	153	40,4%	546	4,1%	1 917
2009	158	3,7%	458	-16,1%	1 771
2010	159	0,2%	445	-3,0%	1 713
2011	130	-18,2%	471	6,0%	1 737
2012	133	2,6%	430	-8,7%	1 727
2013	166	24,4%	434	0,8%	1 778
CAGR	**0.7%**		**-0.9%**		**0.7%**

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